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RDMA

Malaria Operational Plan FY 2022

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This FY 2022 Malaria Operational Plan has been approved by the U.S. Global Malaria Coordinator and reflects collaborative discussions with national malaria control programs and other partners. Funding available to support outlined plans relies on the final FY 2022 appropriation from U.S. Congress. Any updates will be reflected in revised postings.

This document was prepared in the early months of 2021 as the COVID-19 pandemic continued to evolve worldwide, including in PMI-focus countries. The effects of the pandemic on malaria control and elimination work in 2022 are difficult to predict. However, because U.S. Congressional appropriations for PMI are specific to work against malaria and any appropriations for work against the COVID-19 are specific for that purpose and planned through separate future U.S. Government planning processes, this FY 2022 MOP will not specifically address the malaria-COVID-19 interface and will reassess any complementary work through timely reprogramming in countries.

CONTENTS

ABBREVIATIONS

ACT	Artemisinin-based combination therapy
AFRIMS	Armed Forces Research Institute of Medical Sciences
AL	Artemether-lumefantrine
ANC	Antenatal care
API	Annual parasite incidence
APMEN	Asia Pacific Malaria Elimination Network
AS-MQ	Artesunate-mefloquine
BMGF	Bill & Melinda Gates Foundation
CDC	Centers for Disease Control and Prevention
CHAI	Clinton Health Access Initiative
CMPE	Center for Malariology, Parasitology, and Entomology
CQ	Chloroquine
CSO	Civil Society Organization
CY	Calendar year
DHA-PIP	Dihydroartemisinin-piperaquine
DHIS2	District Health Information Software
DVBD	Division of Vector Borne Disease
eLMIS	Electronic logistics management information system
EPI	Expanded Program on Immunization
FY	Fiscal year
G6PD	Glucose-6-phosphate dehydrogenase
GDP	Gross domestic product
GHI	Global Health Initiative
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria
GMS	Greater Mekong Subregion
HLC	Human landing collections
HMIS	Health Management Information System
HSS	Health systems strengthening
iDES	Integrated drug efficacy surveillance
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
IT	Information technology
ITN	Insecticide-treated mosquito net
KAP	Knowledge, attitudes, and practice
Lao PDR	Lao People's Democratic Republic
LLIN	Long-lasting insecticide-treated nets
LMIS	Logistics management information system
LSIS	Lao Social Indicator Survey
MICS	Multiple Indicator Cluster Survey
MIP	Malaria in pregnancy
MIS	Malaria indicator survey
MME	Mekong Malaria Elimination

MMP	Migrant and mobile population
MOH	Ministry of Health (Lao PDR)
MOP	Malaria Operational Plan
MOPH	Ministry of Public Health (Thailand)
MQ	Mefloquine
NGO	Non-governmental organization
NMCP	National Malaria Control Program
NSP	National strategic plan
OR	Operational research
PCR	Polymerase chain reaction
PE	Program evaluation
PMI	U.S. President's Malaria Initiative
RAI2E	Global Fund regional artemisinin initiative 2 elimination grant
RAI3E	Global Fund regional artemisinin initiative 3 elimination grant
RDMA	Regional Development Mission for Asia
RDT	Rapid diagnostic test
SBC	Social and behavior change
SMC	Seasonal malaria chemoprevention
SM&E	Surveillance, monitoring, and evaluation
SP	Sulfadoxine-pyrimethamine
TA	Technical assistance
TES	Therapeutic efficacy study
TICA	Thailand International Cooperation Agency
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
VHV	Village health volunteers
VMW	Village malaria worker
WHO	World Health Organization

EXECUTIVE SUMMARY

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Thailand, Lao People's Democratic Republic (Lao PDR), and the Greater Mekong Subregion (GMS) to end malaria. PMI has been a proud partner of Thailand, Lao PDR, and GMS since 2011, helping to decrease malaria morbidity and mortality through investments totaling almost $50 million.

The proposed PMI fiscal year (FY) 2022 budget for Thailand, Lao PDR, and Regional is $3 million. This Malaria Operational Plan (MOP) outlines planned PMI activities in Thailand, Lao PDR, and Regional using FY 2022 funds. Developed in consultation with the National Malaria Control Program (NMCP) and key malaria stakeholders, proposed activities reflect national and PMI strategies, draw on best-available data, and align with the country context and health system. Proposed PMI investments support and build on those made by the relevant GMS governments as well as other donors and partners.

PMI will support investments in the following intervention areas with FY 2022 funds:

- Vector Control
  - PMI will support the NMCPs in Thailand and Lao PDR, working with key stakeholders and partners on entomological aspects of foci investigation and strengthening entomological capacity through training and cross-border technical assistance (TA).
  - PMI will procure insecticide-treated nets (ITNs) to fill gaps among the at-risk target populations in Thailand and Lao PDR, based on NMCP estimation of needs for migrant and mobile populations (MMPs) and active foci of transmission.
- Human Health
  - Although it is anticipated that Global Fund and domestic resources will meet most case management procurement needs through 2023, PMI will plan to fill any gaps, especially rapid diagnostic tests (RDTs), to ensure access to malaria testing in remote areas due to unanticipated outbreaks, natural disasters, or the end of the current Global Fund grant.
  - PMI will resume support for therapeutic efficacy studies (TES) and integrated drug efficacy surveillance (iDES), where implemented, to monitor drug efficacy in Thailand, Lao PDR, and Vietnam. With regional funding, PMI will support TA to all GMS countries for TES/iDES and will also continue to support microscopy training and regional slide banks.
  - PMI will support malaria in pregnancy interventions (ITNs and Case Management) reaching pregnant women through procurement of ITNs distributed to vulnerable MMPs, and in some cases to pregnant women attending antenatal care clinics as well as strengthening overall case management including ensuring commodities are available to diagnose and manage cases of malaria in pregnancy.

Cross-Cutting and Other Health Systems

- Supply Chain (with malaria focus)
  - As malaria cases continue to decrease and malaria becomes increasingly focal, PMI will support NMCPs with TA to improve their coordination and management of the supply chain by developing and improving the availability of logistics data to ensure continuous availability of commodities while

limiting expiry of unused products. PMI will continue to support strengthening the quality of the logistics management information systems data and reporting while also ensuring commodity data is incorporated into the malaria information system.

- Surveillance Monitoring and Evaluation (SM&E)
  - Thailand continues to scale up its 1-3-7 strategy nationally with marked improvements to date in reporting and completeness. However, quality of services and data needs to be ensured, especially as malaria services transition from vertical malaria clinics/posts to integrated health promotion hospitals providing broader general health services. PMI will continue to support strengthening the transition and integration of malaria services reporting from malaria clinics to the general health services (health promotion hospitals).
  - With an updated risk stratification and national elimination strategy, Lao PDR is intensifying case-based surveillance activities in all elimination districts. The malaria module of the District Health Information System 2 (DHIS2) has expanded to include private–public mix data, elimination data (case notification, case investigation, case classification, focus investigation, and response), iDES, vector control interventions and entomological surveillance. PMI will continue to support use of DHIS2 data to inform decision-making at all levels, particularly capacity-strengthening at the district level.
- Program Evaluation & Operational Research (PE & OR)
  - Key OR questions for Thailand and Lao PDR are currently supported through Global Fund and Bill & Melinda Gates Foundation (BMGF) funding. Although PMI does not plan to support any OR with FY 2022 funding, PMI will closely monitor the outcomes of these OR projects to inform potential roll-out of promising approaches in the near future.
- Social Behavior Change (SBC)
  - No SBC-specific activities are planned for PMI funding. PMI in-country staff will continue to support the NMCPs with their SBC strategies.
- Health Systems Strengthening (HSS) general/other (work force, DHIS2, LMIS, etc.)
  - PMI supports strengthening national program capacity as a key priority. Depending on need and evolving epidemiology, PMI will continue to support national and regional capacity-building and training efforts in program management, malaria elimination, quality assurance/quality control for diagnostics, supply chain, SM&E, and entomology.

I. INTRODUCTION

The U.S. President's Malaria Initiative (PMI)—led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC)—delivers cost-effective, lifesaving malaria interventions alongside catalytic technical and operational assistance to support Thailand, Lao People's Democratic Republic (Lao PDR), and the Greater Mekong Subregion (GMS) to end malaria. PMI has been a proud partner of Thailand, Lao PDR, and GMS countries since 2011, helping to decrease malaria morbidity and mortality through investments totaling almost $50 million.

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Thailand at a Glance

- **Geography:** Thailand is at the center of the Southeast Asian Indo-Chinese Peninsula and is composed of 77 provinces. The country is 513,120 million square kilometers (198,120 square miles) in size and shares a border to the north with Burma and Lao PDR, to the east with Lao PDR and Cambodia, to the south with Malaysia, and to the west with the southern portion of Burma.
- **Climate and Malaria Transmission Seasonality:** Thailand is characterized as tropical wet and dry. The weather is hot all year with three seasons: rainy or southwest monsoon season (mid-May to mid-October), summer or warm season (mid-February to mid-May), and winter season (mid-October to mid-February). The average daily temperature is generally around 30 degrees Celsius (86° Fahrenheit). The peak malaria transmission months are June through August.
- **Population in 2021:** 69.9 million (https://worldpopulationreview.com/countries/thailand-population)
- **Population at Risk of Malaria:** 13.1 million (including approximately 652,000 migrants and mobile populations residing in A1 and A2 strata) (https://www.who.int/malaria/publications/country-profiles/profile_tha_en.pdf?ua=1)
- **Principal Malaria Parasites:** *Plasmodium falciparum*, *Plasmodium vivax* (https://www.who.int/malaria/publications/country-profiles/profile_tha_en.pdf?ua=1)
- **Principal Malaria Vectors:** *Anopheles dirus* and *Anopheles minimus* (Tainchum et al. 2015, Trends Parasitology 109-19)
- **Malaria Case Incidence per 1,000 Population:** Annual parasite incidence (API) = 0.067 (Division of Vector Borne Disease [DVBD], Mekong Malaria Elimination [MME] virtual presentation, October 2021)
- **Under-Five Mortality Rate:** 9.0 per 1,000 live births (2019) (https://data.unicef.org/country/tha/)
- **World Bank Income Classification and Gross Domestic Product:** Upper-middle income since 2011 (World Bank); Annual GDP growth = 2.065% (2019) (https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=TH)

- **Government Health Budget:** 268.5 billion Baht = 8.5 billion USD; $276 per capita or 3.8% of GDP (2018) (https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS?locations=TH)
- **Trafficking in Persons Designations, 2018–2020:** Tier 2 (2018), Tier 2 (2019), and Tier 2 (2020) (https://www.state.gov/reports/2020-trafficking-in-persons-report/thailand/)
- **Malaria Funding and Program Support Partners Include:**
    - U.S. President's Malaria Initiative (PMI)
    - Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund)
    - World Health Organization (WHO)
    - Bill & Melinda Gates Foundation (BMGF)
- **PMI Support of National Malaria Control Strategy:** In line with the national malaria strategic plan, PMI supports Thailand in achieving its malaria elimination goal by 2024. PMI supports surveillance for therapeutic efficacy and antimalarial drug resistance, NMCP capacity- strengthening in surveillance, monitoring and evaluation, and malaria prevention and control activities to reduce transmission and eliminate malaria. PMI support focuses on strengthening malaria programming at national and subnational levels and use of strategic information, providing limited commodity support and TA for improved surveillance and response, capacity- strengthening, and pharmaceutical management systems.
- **PMI Investments:** Thailand began implementation as a PMI focus country in FY 2011. The proposed FY 2022 PMI budget for Thailand, Lao PDR, and Regional is $3 million; that brings the total PMI investment to nearly $50 million.

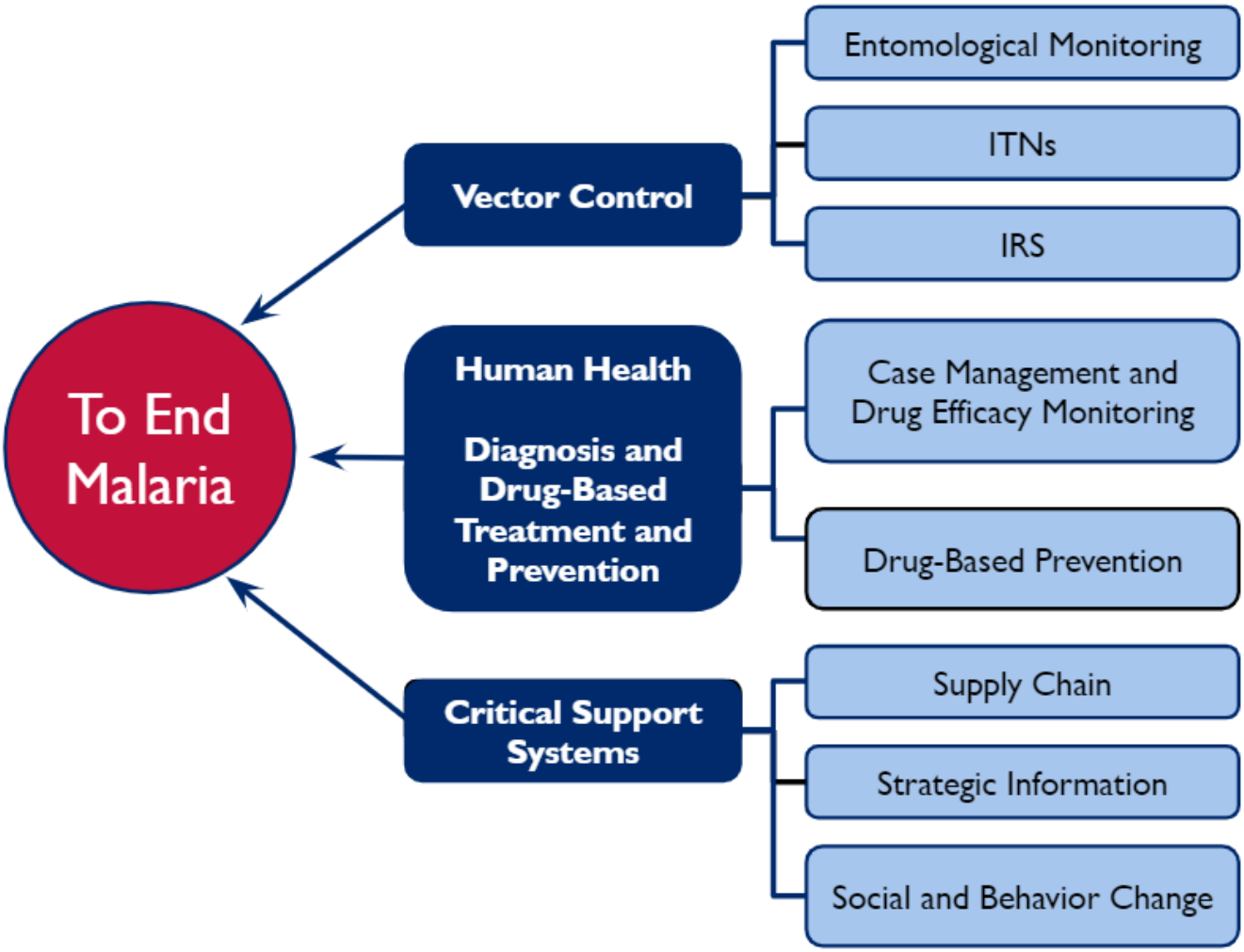
Lao PDR at a Glance

- **Geography:** Lao PDR is a landlocked country in Southeastern Asia, sharing borders with Burma, Cambodia, China, Thailand, and Vietnam. The country is 236,800 square kilometers in size.
- **Climate and Malaria Transmission Seasonality:** Lao People's Democratic Republic has a tropical climate that is influenced by the southeast monsoon, which causes significant rainfall and high humidity. The climate is divided into two distinct seasons: rainy season, or monsoon, from May to mid-October, followed by a dry season from mid-October to April. The average annual rainfall is about 1,300–3,000 mm. Average temperatures in the northern and eastern mountainous areas and the plateaus are 20°C and in the plains 25–27°C. There are also two malaria transmission peaks: May–June and a smaller peak in October–December. (https://www.adaptation-undp.org/explore/south-eastern-asia/lao-peoples-democratic-republic)
- **Population:** 7.2 million (2019) (https://data.worldbank.org/indicator/SP.POP.TOTL?locations=LA); Annual growth rate: 1.5%
- **Population at Risk of Malaria:** 3.7 million (World Malaria Report, 2020)
- **Principal Malaria Parasites:** *P. falciparum* and *P. vivax* (National Strategic Plan for Malaria Control and Elimination 2021–2025)
- **Principal Malaria Vectors:** *An. dirus*, *An. minimus*, *An. maculatus* and *An. jeyporiensis* (WHO, World Malaria Report 2018)

- **Malaria Case Incidence per 1000 Population:** 0.49 per 1000 population (2020, NMCP)
- **Under-Five Mortality Rate:** 45.5 per 1000 live births (2019) (https://data.unicef.org/country/lao/)
- **World Bank Income Classification and GDP:** Lower middle income; GDP: 18.2 billion USD (2019)
- **Government Health Budget:** $71 per capita (2018) or 2.8% of total GDP
- **Trafficking in Persons Designations, 2018–2020:** Tier 3 (2018), Tier 2 Watchlist (2019), Tier 2 (2020) https://www.state.gov/reports/2020-trafficking-in-persons-report/laos/
- **Malaria Funding and Program Support Partners Include:**
    - Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund)
    - Bill & Melinda Gates and Melinda Foundation (BMGF)
    - U.S. President's Malaria Initiative (PMI)
    - World Health Organization (WHO)
    - Armed Forces Research Institute of Medical Sciences (AFRIMS)
    - Institute Pasteur of Lao PDR
- **PMI Support of National Malaria Control Strategy:** In line with the Lao PDR's national strategy plan (2021–2025), PMI supports the NMCP in achieving its malaria elimination goal by 2030 as part of PMI's overall support to regional elimination efforts. PMI supports surveillance for therapeutic efficacy and antimalarial drug resistance, NMCP capacity-strengthening in surveillance, monitoring and evaluation, and providing limited commodity support and TA for improved surveillance and response and pharmaceutical management systems.
- **PMI Investments:** Lao PDR began implementation as a PMI focus country in FY 2011. The proposed FY 2022 PMI budget for Thailand, Lao PDR, and Regional is $3 million; that brings the total PMI investment to nearly $50 million.

PMI organizes its investments around the activities below, in line with the Thailand (2017–2026) and Lao PDR (2021–2025) national malaria strategies.

Figure 1. PMI's approach to end malaria[1]



Building and strengthening the capacity of GMS countries' people and institutions—from the central level to communities—to effectively lead and implement evidence-based malaria control and elimination activities remains paramount to PMI. As denoted in Table 2 (the budget table), nearly all of PMI's planned support for FY 2022 in the areas of vector control, human health, supply chain, and strategic information contains elements of capacity-building and system strengthening. Regional support through the Regional Development Mission for Asia (RDMA) based in Bangkok continues to play an important role in providing specialized malaria expertise to assist NMCPs and partners, including those in non-presence countries, as needed, to address cross-cutting, trans-boundary issues that affect all GMS countries, and to build capacity at the regional level for NMCPs to address complex technical and programmatic challenges. PMI provides technical support to Thailand and Lao PDR as the countries develop and implement their plans toward achieving malaria elimination by 2024 and 2030, respectively. In particular, PMI is working to improve technical and programmatic capacity for use of strategic information and to

[1]A number of actions are cross-cutting in nature. For example, social and behavioral change (SBC) is embedded in all vector control and human health work; program evaluation (PE) and operational research (OR) are relevant in all of the fieldwork; finance and management support and the introduction of new tools/interventions are critical for all programs; and elimination requires work across the full spectrum of transmission.

strengthen national malaria surveillance and monitoring and evaluation (SM&E) systems for malaria control and elimination. PMI support to Vietnam is limited to drug efficacy monitoring and regional capacity training activities.

While PMI is cognizant that it will take time before Thailand and Lao PDR are capable of fully financing their development priorities, PMI will work with other partners (e.g., the Global Fund) to jointly track Thailand's and Lao PDR's funding commitments across the malaria portfolio.

II. MALARIA SITUATION AND PROGRESS

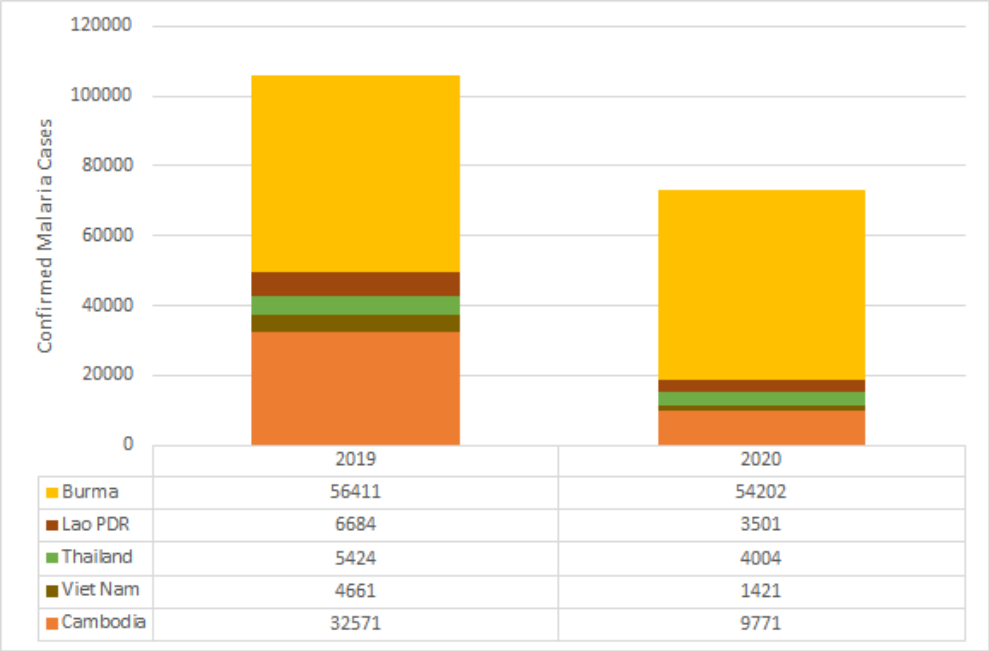
Regional:

The GMS is considered the epicenter of antimalarial drug resistance starting with chloroquine (CQ) resistance in the late 1950s, followed by resistance to sulfadoxine-pyrimethamine (SP), mefloquine (MQ), and decreased sensitivity to quinine being identified in the 1980s and 1990s. Resistance to these antimalarials eventually spread or developed de novo throughout the region and globally. The emergence of artemisinin resistance along the Thai–Cambodia border in the early 2000s occurred in the same geographical area where chloroquine resistance emerged 50 years earlier.

Although considerable progress has been made in malaria control in the GMS over the past 10 years, malaria remains a major concern for the international community, ministries of health, and the people of the region. This is due primarily to the development and spread of resistance to artemisinin drugs, the principal component of the combination therapies for malaria that now are the first-line treatment for malaria throughout the GMS and the world. *Plasmodium falciparum* resistance to artemisinin drugs was first confirmed in western Cambodia; treatment failures to artemisinin-based combination therapy (ACT) including their partner drugs have been reported from multiple sites in the region.

The malaria situation across the GMS is very heterogeneous with some areas having interrupted malaria transmission. Unlike most sub-Saharan African countries, *P. vivax* is a major cause of malaria and is now more prevalent than *P. falciparum* in all GMS countries. Furthermore, at least 10 species of anopheline mosquitoes (primarily exophilic) are involved in malaria transmission in the GMS. Primary vectors include *An. dirus*, *An. minimus*, and/or *An. maculatus* mainly found in forest or forest-fringe areas.

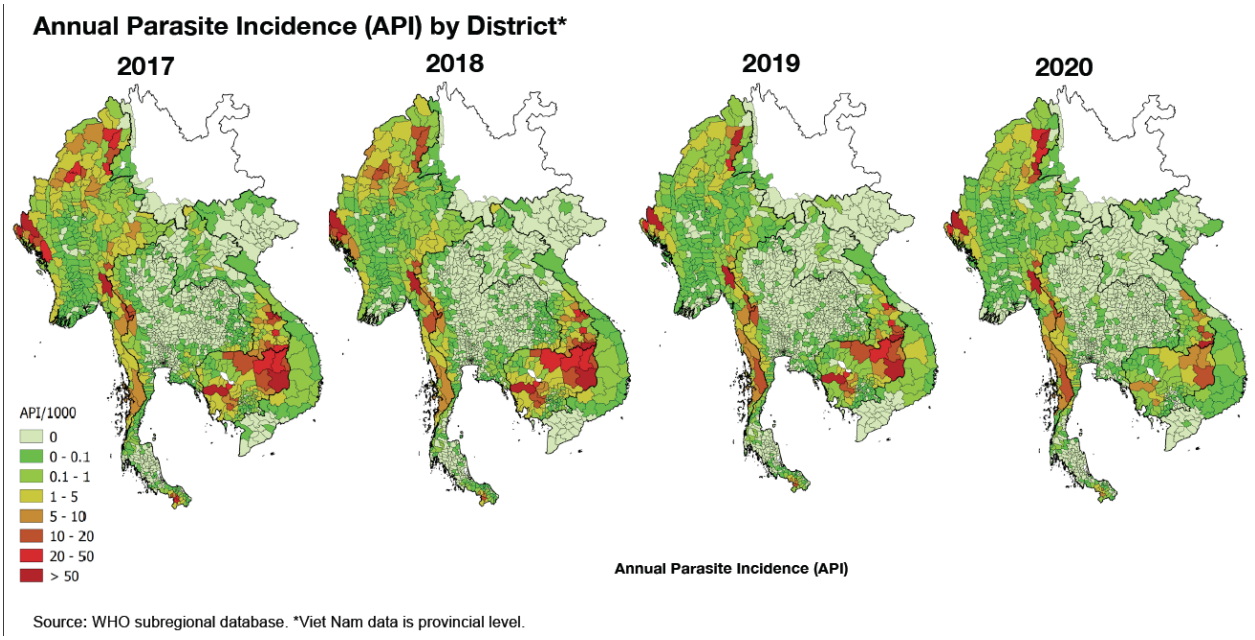
Figure 2. Malaria case distribution in the Greater Mekong Subregion



	2019	2020
Burma	56411	54202
Lao PDR	6684	3501
Thailand	5424	4004
Viet Nam	4661	1421
Cambodia	32571	9771

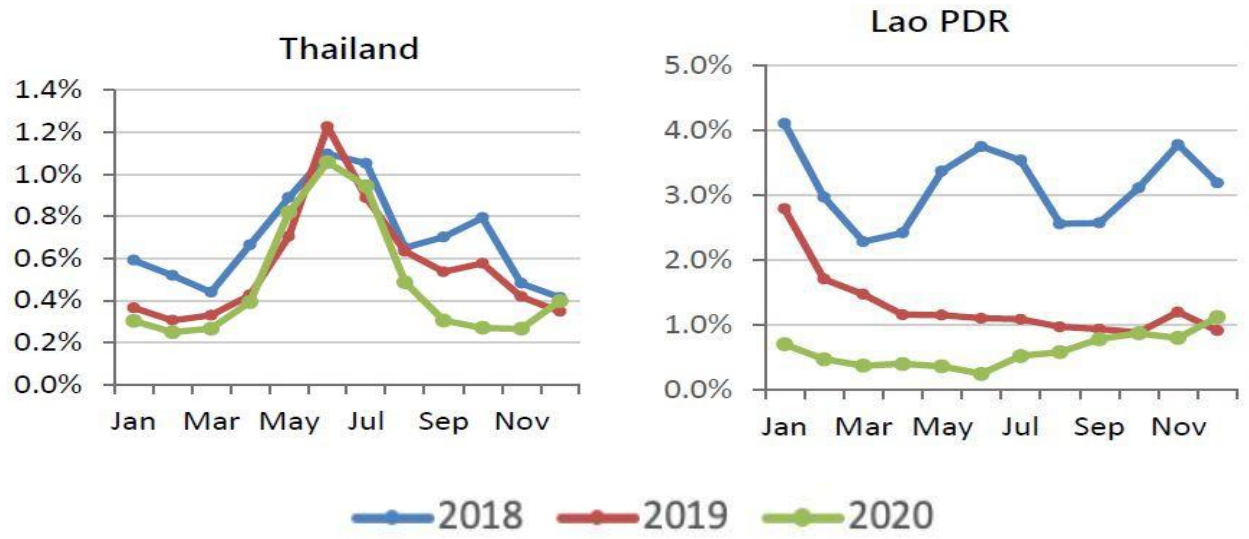
Source: WHO Mekong Malaria Elimination (MME) Epidemiology Summary, Volume 12, December 2020.

Figure 3. Malaria incidence by district, Greater Mekong Subregion, 2017–2020



Source: World Malaria Report, 2020.

Figure 4. Malaria test positivity rates trends in Thailand and Lao PDR (2018–2020)



Source: WHO MME.

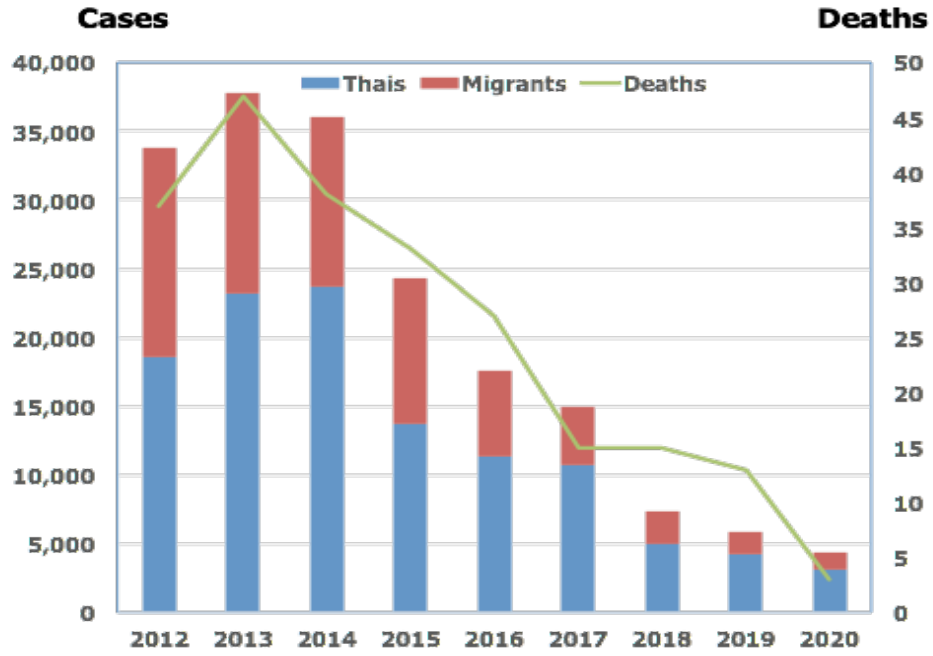
Thailand

Malaria cases in Thailand mainly occur in the provinces bordering Burma, Cambodia, and Malaysia. The groups at risk for malaria in Thailand consist of refugees in camps, workers in rubber plantations and fruit orchards, people who spend the night in the forest (including the military), and ethnic minority groups. The introduction of rubber plantations in many parts of the country during the past 10 years and movement of workers has resulted in the emergence of sporadic new foci. Conflict in southern Thailand has also contributed to a dramatic increase of malaria cases reported in 2016–2019. Due to labor shortages, Thailand continues to draw large numbers of migrant workers from Burma, Cambodia, and Lao PDR. These migrant workers live and work along the border districts and provinces where malaria is still endemic while others move back and forth between home communities and various work destinations in Thailand.

In Thailand, malaria cases and active foci are concentrated in provinces along the borders with neighboring countries. Only four provinces accounted for nearly 70 percent of malaria cases in 2020. In particular, provinces along the Thai-Burma border (Tak, Kanchanaburi, and Mae Hong Son) accounted for 28 percent, 12 percent, and 7 percent, respectively, of total malaria cases, which include Thai, non-Thai migrants, cross-border migrants, and displaced people in these areas. Yala province in southern Thailand accounted for 23 percent of total malaria case reports. Transmission is local and occurs in forest, forest fringe, and rubber plantations affecting Thai communities and personnel from the military and border police conducting security activities in Yala. Conflicts in Yala have impacted the ability to fully implement malaria elimination activities.

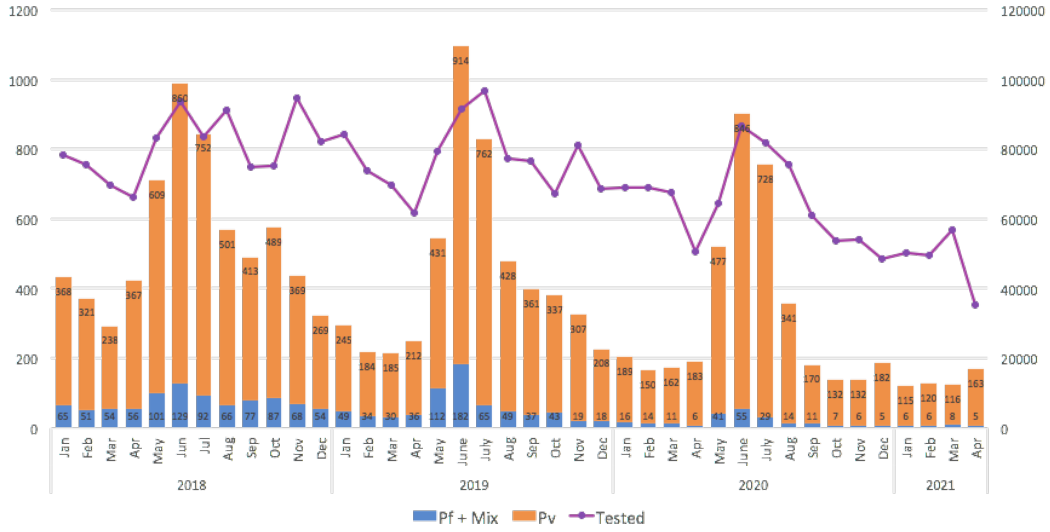
Despite these remaining challenges, the national malaria program has made significant progress in the reduction of malaria incidence. Mortality due to malaria has also declined from 33 deaths in 2015 to 3 deaths reported in 2020. The increasing proportion of *P. vivax* malaria cases is observed with the proportion attributable to *P. vivax* steadily increasing from 72 percent in 2016 to 92 percent in 2020. In FY 2020, Thailand reported only 252 *P. falciparum* cases and 4,080 *P. vivax* cases.

Figure 5. Trend of malaria cases reported among Thais and migrants and deaths in Thailand (2012–2020)



Source: DVBD.

Figure 6. Malaria trend and species distribution in Thailand (2018- April 2021)

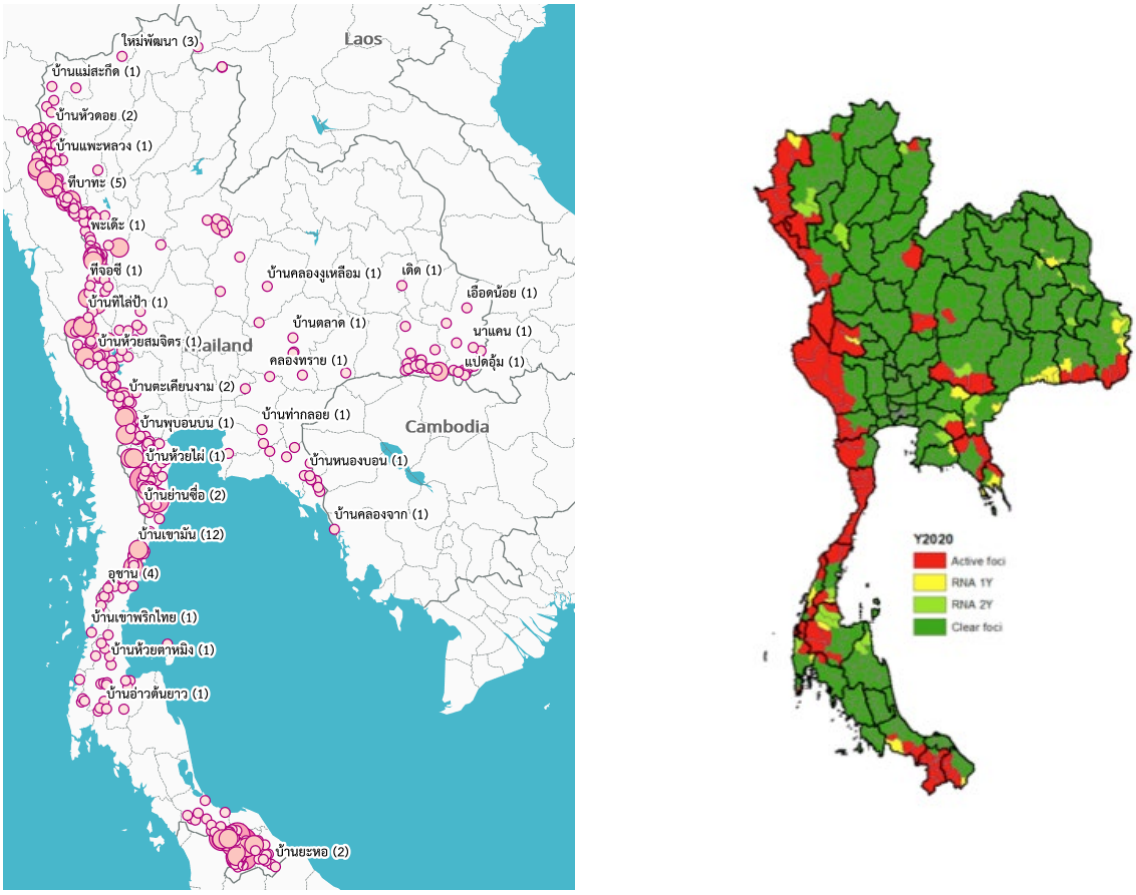


Source: Malaria Elimination Database, WHO.

Thailand has made rapid progress in targeting and reducing the number of active foci of transmission in the country from 1,108 in 2016 to 605 in 2020. The total number of reported confirmed malaria cases has decreased from 43,939 in FY 2011 to 4,449 in FY 2020. Despite the tremendous progress in reducing the number of active foci and residual non-active foci to cleared foci, two provinces (Phuket and Chaiyaphum) out of a total of 35

provinces nationwide that were declared as malaria-free in 2018, reverted their status to active-foci provinces in 2019 due to reported indigenous cases. Another province, Phitsanulok, despite not having reported malaria cases for several years, reverted to an active-foci province in 2020 due to an influx of migrants from Burma working in rubber tapping plantations. Remaining active foci are clustered in three border areas: in the west with Burma and in the east with Cambodia, where high population mobility associated with importation of malaria parasites complicates surveillance, and in the south with Malaysia, where civil unrest disrupts service delivery.

Figure 7. Map of active foci (left) and district stratification (right) in Thailand, 2020



Source: DVBD.

Table 1. Key indicators from health surveys in Thailand

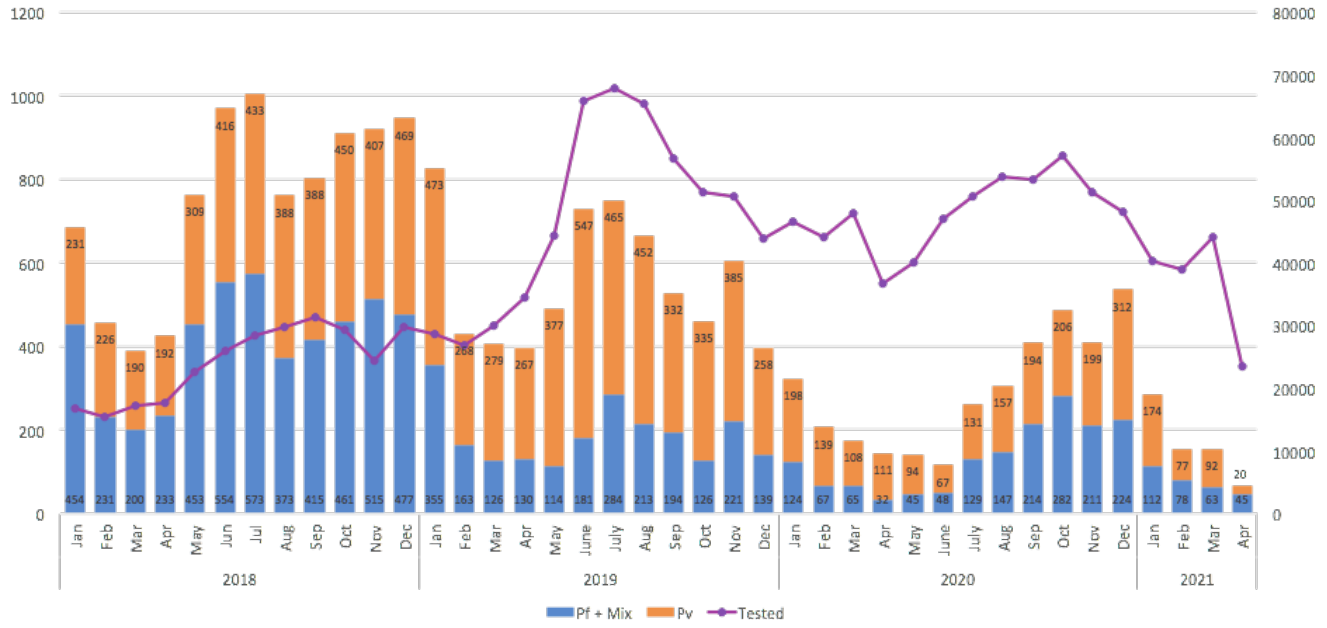
Indicator	2012, TMS*	2015, KAP**	2017, MMP***	2021, TMS****
% Households (respondents) with any nets	90%	90%	94%	TBD
% Households (respondents) with at least one ITN	47%	51%	39%	TBD
% Children under five years of age who slept under an ITN the previous night	33%	56%	n/a	TBD
% Pregnant women who slept under an ITN the previous night	36%	n/a	n/a	TBD
% Forest-goers who slept under an ITN the previous night	26%	n/a	13%	TBD
% Population (respondents) that slept under an ITN the previous night	29%	39%	n/a	TBD

*Thailand Malaria Survey, ** Knowledge, Attitude, and Practice, *** Mobile and Migrant Population Survey,
**** Thailand Malaria Survey (Nov. 2020), results pending.

Lao PDR

In 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 higher transmission (API > 30) in remote, forested areas of the south. *Plasmodium falciparum* has been the predominant species but has significantly decreased, accounting for only 46 percent of all recorded malaria cases and *P. vivax* accounting for 54 percent in 2020 (Center for Malariology, Parasitology, and Entomology [CMPE], 2020). Both *P. falciparum* and P. vivax are found concentrated in the southern part of the country; however, 85 percent of *P. falciparum* malaria cases are reported from only seven districts. The primary vectors in Lao PDR are *Anopheles dirus*, *A. minumus s.l.*, and *A. maculatus*, all of which can be found in forested areas. Lao PDR has reported zero malaria deaths since 2019.

Figure 8. Malaria trend and species distribution in Lao PDR (2018–April 2021)



Source: Malaria Elimination Database, WHO.

Most transmission has been found to occur in forested areas and those most at risk are ethnic minorities and mobile populations, including forest workers, who are usually males between 15 and 45 years of age. In addition to the cross-border and local population movement, development projects and deforestation increases human–vector interaction. These at-risk populations are isolated, have limited access to healthcare, and can display different healthcare-seeking behavior—highlighting the importance of community engagement and targeted case management initiatives. Both indoor and outdoor biting takes place, but primary vectors are characterized at least seasonally in the early evening outdoor biting habit. This is a key feature of the epidemiology of malaria throughout the Greater Mekong Subregion, which limits to some extent the effectiveness of key interventions for vector control and personal protection. Based on the entomological surveillance and patient travel history data collected during outbreak response, the evidence showed emerging significant parasite reservoirs remain in some villages in areas where persistent and ongoing transmission occurs among forest-goers and farmers.

A wide variety of mobile and static population groups at risk of malaria in endemic areas drives the epidemiology considerably from one group to another, which requires different malaria control strategies adapted to risk group behaviors, local cultural and traditional practices, local health infrastructure, and environmental conditions. The level of malaria risk for each of these groups varies according to several location-dependent factors including degree of endemicity, accessibility, health system strength, and poverty. Villages located within the high-risk forested areas of Lao PDR belong to a broad range of ethnic minority groups with 240 distinct languages spoken, challenging health messaging and communication. Poverty in these communities is often extreme.

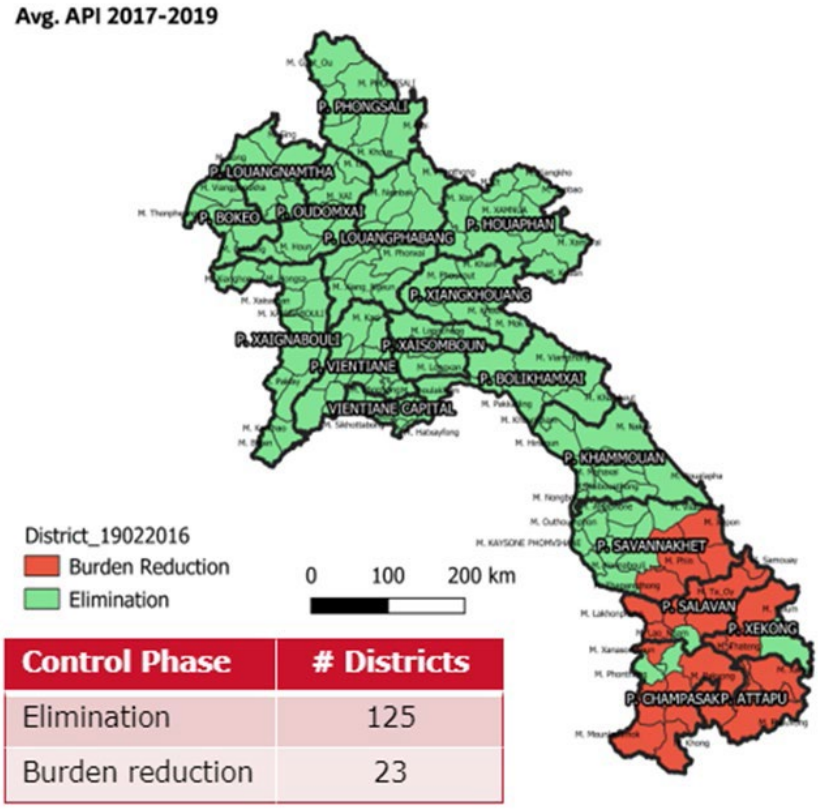
Despite an outbreak of cases in 2011 and 2014 in the southern provinces, Lao PDR has made significant progress in reducing the malaria burden, resulting in an API of less than 1 per 1,000 population. The number of reported malaria cases in Lao PDR has declined precipitously from 46,153 in 2012 to 3,501 in 2020 and correspondingly the API declined 6.81 per 1,000 in 2012 to 0.49 per 1,000 in 2020. The number of malaria deaths also decreased

significantly from 44 deaths in 2012 to 0 deaths reported in 2019 and 2020. Based on recent stratification, 125 out of 148 districts nationwide (84 percent) reached an API of less than 1 per 1,000 population and have been designated as malaria elimination districts. The remaining 23 districts (16 percent) are classified as burden reduction.

Since 2010, there has been a continued declining trend in numbers of *P. falciparum* cases detected, when 98 percent of cases were attributed to this species. In 2019, 32 percent of the malaria cases reported were *P. falciparum* infections. *P. vivax* infections have been recorded in the country, including in some northern provinces, which reflect the relative difficulty in controlling *P. vivax* due to its persistent liver stages. These can be only cleared with a long course of primaquine for 14 days or 8 weeks depending on glucose-6-phosphate dehydrogenase (G6PD) status. G6PD testing has been available only at district-level sites, which makes treatment adherence difficult to administer. While malaria transmission in northern provinces is low and sporadic, the vast majority (95 percent) of malaria cases are concentrated in five southern provinces. Partially this is explained by the fact that the intensity of transmission varies greatly between the different ecological zones, from low transmission in the plains along the Mekong River and in areas of high altitude (greater than 1,000m) to intense transmission in hilly, forested areas.

The first travel restriction in response to COVID-19 occurred in mid-March to early May 2020 and the second from the end of April to May 2021. More than 1,000 COVID-19 confirmed cases have been recorded, and Lao PDR has received donated vaccines from Russia, China, and COVAX (WHO COVID-19 Vaccine Global Access). The restrictions caused the delay of some malaria activities at subnational and communities, but the malaria program has not reported any significant impact thus far.

Figure 9. Stratification of malaria by district in Lao PDR (2019)



Control Phase	# Districts
Elimination	125
Burden reduction	23

Source: Stratification of malaria in Lao PDR, CMPE, September 2019.

Table 2. Key indicators from health surveys in Lao PDR

Indicator	2006, MICS*[1]	2012, LSIS**[2]	2017, LSIS-2[3]
% Households with at least one ITN	45%	50%	61%
% Households with at least one ITN for every two people	N/A	N/A	38%
% Population with access to an ITN[4]	N/A	N/A	52%
% Population that slept under an ITN the previous night	N/A	N/A	51%
% Children under five years of age who slept under an ITN the previous night	41%	43%	50%
% Pregnant women who slept under an ITN the previous night	N/A	46%	52%
% Children under five years of age with fever in the last two weeks for whom advice or treatment was sought	15%	14%	60%
% Children under five years of age with fever in the last two weeks who had a finger or heel stick	N/A	9%	9%
% Children receiving an ACT among children under five years of age with fever in the last two weeks who received any antimalarial drugs	0.1%	0.2%	4%

MICS = Multiple Indicator Cluster Survey. **LSIS = Lao Social Indicator Survey.

Table 3. Key malaria indicators reported through routine surveillance systems for Thailand and Lao PDR

Indicator	Lao PDR 2019	Lao PDR 2020	Thailand 2019	Thailand 2020
# Suspect malaria cases[1]	N/A	N/A	N/A	N/A
# Patients receiving diagnostic test for malaria[2]	566,192	569,324	927,673	781,977
Total # malaria cases[3]	6,684	3,501	5,424	4,004
# Confirmed cases[4]	6,684	3,501	5,424	4,004
# Presumed cases[5]	N/A	N/A	N/A	N/A
% Malaria cases confirmed[6]	100%	100%	100%	100%
Test positivity rate (TPR)[7]	1.18%	0.61%	0.58%	0.51%
Total # malaria cases in children under five years of age[8]	1080	472	303	238
% Cases in children under five years of age [9]	16.2%	13.5%	5.6%	5.9%
% Cases in children 5 to14 years of age	N/A	N/A	1,265 (23.3%)	982 (24.5%)
Total # severe cases[10]	N/A	N/A	67	31
Total # malaria deaths[11]	0	0	13	3
# Facilities reporting[12]	1,526	1,526	N/A	N/A
% Data completeness[13]	72% (1,102/1,526)	N/A	N/A	N/A

1. Number of patients presenting with signs or symptoms possibly due to malaria (e.g., fever). 2. RDT or microscopy, all ages, outpatient and inpatient. 3. Total reported malaria cases; all ages, outpatient and inpatient, confirmed and unconfirmed cases. 4. Diagnostically confirmed; all ages, outpatient and inpatient. 5. Clinical/presumed/unconfirmed; all ages, outpatient and inpatient. 6. # confirmed cases divided by total # cases. 7. Confirmed cases divided by # patients receiving a diagnostic test for malaria (RDT or microscopy). 8. Outpatient and inpatient, confirmed and unconfirmed. 9. Total # <5 cases divided by total # of cases. 10. "Severe" cases are not reported in the Malaria Information System. 11. All ages, outpatient, inpatient, confirmed, and unconfirmed. 12. Total # of health facilities reporting data into the Health Management Information System (HMIS)/DHIS2 system that year. 13. # monthly reports from health facilities divided by # health facility reports expected.

III. OVERVIEW OF PMI'S SUPPORT OF THAILAND AND LAO PDR MALARIA STRATEGIES

Thailand

Thailand's National Malaria Elimination Strategy (2017–2026) calls for the elimination of all indigenous malaria cases by 2024. The National Strategic Plan (NSP) objectives are as follows:

1. To reduce malaria morbidity to not more than 0.009/1,000 pop by 2024
2. To reduce malaria mortality to not more than 0.003/100,000 pop by 2024
3. To eliminate malaria transmission in all districts by 2024
4. To prevent reintroduction of transmission in malaria-free areas

Four strategies guide the elimination goal and objectives including scaling up malaria elimination activities in Thailand; developing technology, innovation, measures, and models that are appropriate for malaria elimination; developing partnerships among stakeholders at national and international levels to enable malaria elimination; and promoting/empowering the community to take an active role in malaria prevention. To this end, the Division of Vector Borne Disease (DVBD) is undertaking the development of a robust and integrated surveillance system that is able to rapidly and efficiently respond to the malaria situation; increase capacity and coverage of services in diagnosis and treatment at all levels and sectors and for all populations at risk of malaria based on the principle of equity; scale up detection of symptomatic and asymptomatic malaria patients, including submicroscopic parasitemia cases; scale up coverage of prevention of malaria transmission through vector surveillance, vector control, and personal protection among the target populations; and develop a system to follow-up each malaria case to ensure cure and elimination of drug-resistant malaria parasites. PMI supports the DVBD's goals and objectives by supporting strengthening malaria programming at national and subnational levels and using strategic information, providing limited commodity support and TA for improved surveillance and response, capacity-strengthening, and pharmaceutical management systems.

The National Strategic Plan (NSP) for Malaria Elimination in Thailand utilizes the district as the unit of analysis for malaria elimination. As proposed in the Global Fund Regional Artemisinin Initiative 3 Elimination (RAI3E) grant, which is implemented over the period 2021–2023, DVBD aims to focus its resources and strategy on the identification and response to the remaining active and non-active residual foci in the country.

The Global Fund RAI3E supports the majority of Thailand's malaria commodity needs, including rapid diagnostic tests (RDTs), ACTs, and ITNs. The RAI3E malaria grant also supports the delivery of diagnostics and case management services through malaria health posts and the engagement of civil society organizations (CSOs) for implementation of community mobilization and SBC activities in targeted communities and migrant and mobile populations. In light of the Global Fund RAI3E grant support as well as Thailand's socioeconomic improvements over the past decade, PMI support to Thailand has generally transitioned from malaria commodity procurement and distribution to an overall health systems strengthening (HSS) approach that focuses on expanding the role of malaria surveillance and response, improving existing supply chain management systems, and ensuring informed decision-making based on evidence and strategic information at all levels. PMI's support in Thailand will shift toward increasing domestic resource mobilization and advocacy for malaria elimination at national and subnational levels—leveraging partnerships and resources from domestic local government sources, private and corporate sectors, and other non-health sectors.

Lao PDR

The recently updated NSP (2021–2025) has set its goal to eliminate all forms of non-zoonotic, human malaria in Lao PDR and includes strengthened interventions targeted to the southern part of the country to reduce the primary malaria burden while beginning efforts to eliminate malaria in the remaining focal areas in central and northern Lao PDR. The 2021–2025 Strategy is the second part of a three-phase approach to eliminate all forms of malaria in Lao PDR and includes strengthened interventions targeted to the southern part of the country to reduce the primary malaria burden, while also expanding and enhancing efforts to eliminate malaria in low-burden focal areas across the whole of the country.

The goal of the NSP (2021–2025) is to eliminate *P. falciparum* malaria in the entire country and to eliminate all species of malaria in the 13 Northern provinces.

- Eliminate the transmission of *P. falciparum* in the 13 Northern provinces by 2021.
- Eliminate the transmission of *P. falciparum* in the entire country by 2025.
- Eliminate the transmission of *P. vivax* in the 13 Northern provinces by 2025.
- Reduce the incidence of indigenous cases of *P. vivax* to <1 per 1,000 in the Southern provinces by 2025.
- Prevent reestablishment of malaria in areas where it has been eliminated.

The final phase of the NSP strategy (2026–2030) is to eliminate malaria by 2030 in the entire country.

- Eliminate the transmission of malaria in the entire country by 2030.
- Prevent the reestablishment of malaria in areas where it has been eliminated.
- By 2030, initiate the process for certifying malaria-free status.

In line with the Global Technical Strategy, the NSP outlines the following strategic objectives and supporting elements:

Strategic Objectives

1. Maintain universal access to quality malaria diagnosis, increase testing to reach national annual blood examination rate targets, and provide effective treatment to 100 percent of cases.
2. Ensure effective and evidence-based preventative and communication measures are delivered to targeted high-risk populations by 2025.
3. Ensure effective nationwide and integrated surveillance system that is elimination capable by 2022.

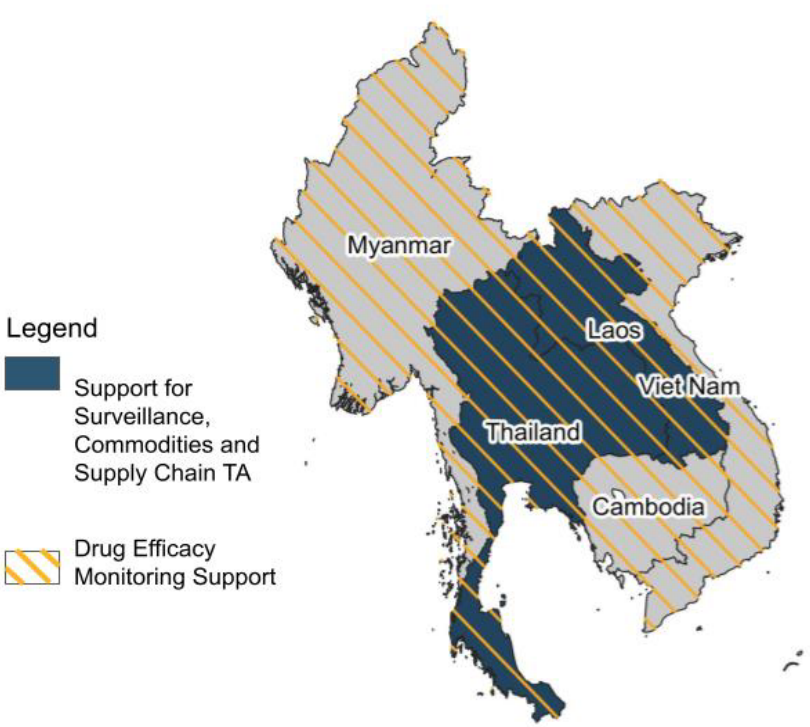
Supporting Elements

1. Expand operational research and use of technology to addresses bottlenecks in operations and find innovative ways to address residual malaria transmission and effectively deliver services to hard-to-reach populations.
2. Strengthen the enabling environment by building sustainable human resources, program and financial management capacity, and coordination and alignment of partners and greater empowerment at the district level.

Lao PDR conducted a Malaria Program Review in October 2019 to review the progress achieved under the previous NSP (2016–2020) and guide the development of the next NSP. Although the overall review indicated that Lao PDR is on track to achieve its malaria elimination targets by 2030, the key recommendations from the review included (1) strengthen data use at all levels, (2) intensify and improve service delivery for high risk groups, (3) ensure availability of commodities, (4) strengthen subnational staff capacity to operational malaria elimination strategies, and (5) introduce radical cure for *P. vivax* at health center level.

The majority of programming needs, including commodities (RDTs, ACTs, and long-lasting insecticide-treated nets [LLINs]) and SBC and community mobilization, are met by the country's Global Fund RAI3E malaria grant. PMI supports working with the national malaria program and in-country partners to assist the country to reach elimination nationally by 2030. PMI provides limited technical support to Lao PDR to improve technical and programmatic capacity for of strategic information and strengthen national malaria SM&E systems for malaria control and elimination.

Figure 10. PMI-supported activities in RDMA – Thailand, Laos, and Greater Mekong Subregion



Not pictured: Activities supported nationwide or at the Central level, including:

PMI's regional program focuses on supporting GMS countries towards malaria elimination, and in particular:

- Monitoring of therapeutic efficacy of antimalarial drugs
- Strengthening malaria surveillance systems
- Filling malaria commodity gaps, including procurement support for LLINs
- Providing technical assistance to strengthen supply chain management systems in the context of malaria elimination settings.

*Myanmar and Cambodia have individual MOP documents wherein their funding is represented.

Source: RDMA - Thailand/Laos MOP Funding Table 2, Fiscal Year 2021 Malaria Data Integration and Visualization (M-DIVE).

IV. PARTNER FUNDING LANDSCAPE

PMI emphasizes the importance of partner alignment for malaria control, recognizing that different partners bring complementary expertise and resources. In recent years, PMI, the Global Fund, and the BMGF have harmonized financial, supply chain, and programmatic data. In particular, PMI and the Global Fund agreed to a harmonized financial taxonomy to aid comparison of our investments to better identify potential overlap or gaps.

Due to the U.S. Government fiscal budget cycle and approximate timing of annual appropriations, PMI MOP resources fund activities that largely occur during the following fiscal year. For example, this FY 2022 MOP is anticipated to largely fund implementation of activities starting in 2023. Global Fund resources are based on the calendar year (CY) and planned for a three-year grant cycle. Most partner country governments and other partners also budget based on the calendar year.

The tables below summarize contributions by key external partners and partner country governments in calendar years 2020–2022, providing insight into total country investments. Because new grants funded through the Global Fund 2021–2023 grant cycle are just beginning, or will begin later in 2021, Global Fund country investments may

still evolve in some countries. The partner country government invests substantial funding into the national-to-local infrastructure and service delivery that benefits malaria programs and many others. However, it is not always possible to attribute funding for malaria specifically from the partner country government without a standardized method. There may be similar challenges for attributing other partner funds.

Table 4a. Annual budget by Level 1 category for FY 2019/CY 2020 [Thailand]

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$0.3M	$0.1M	-	$0.4M	$0.8M	-	$1.6M
Global Fund	$0.4M	$1.9M	-	-	$0.4M	$1.0M	$3.7M
Gov[4]	$0.7M	$0.7M	-	-	$11.0M	$0.2M	$12.6M
Total Per Category	$1.4M	$2.7M	-	$0.4M	$11.4M	$2.2M	$18.1M

Table 4b. Annual budget by Level 1 category for FY 2020/CY 2021 [Thailand]

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$0.1M	$0.4M	-	$0.3M	$0.5M	-	$1.3M
Global Fund	$2.4M	$2.8M	-	-	-	$4.8M	$10.0M
Gov[4]	$0.7M	$0.7M	-	-	$6.2M	$0.2M	$7.8M
Total Per Category	$3.2M	$3.9M	-	$0.3M	$6.7M	$5.0M	$19.1M

Table 4c. Annual budget by Level 1 category for FY 2021/CY 2022 [Thailand]

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$0.2M	$0.3M	-	$0.4M	$0.5M	-	$1.4M
Global Fund	$1.5M	$2.3M	-	-	-	$4.3M	$8.2M
Gov[4]	$0.6M	$0.6M	-	-	$5.0M	$0.2M	$6.4M
Total Per Category	$2.3M	$3.2M	-	$0.4M	$5.5M	$4.5M	$16.0M

1. Drug-based prevention, including seasonal malaria chemoprevention (SMC) and malaria in pregnancy (MIP) where applicable. 2. Covers management of in-country warehousing and distribution of malaria commodities, except for ITNs, which are separately captured under Vector Control. 3. HSS = health systems strengthening. 4. Global Fund RAI3E proposal Funding Landscape.

Table 5a. Annual budget by Level 1 category for FY 2019/CY 2020 [Lao PDR]

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$0.2M	$0.3M	-	$0.1M	-	$0.3M	$0.9M
Global Fund	$0.1M	$1.2M	-	$0.1M	$0.3M	$1.2M	$2.9M
Gov[4]	-	$0.2M	-	-	-	-	$0.2M
Total Per Category	$0.5M	$0.4M	$0.0M	$0.5M	$1.1M	$0.6M	$3.0M

Table 5b. Annual budget by Level 1 category for FY 2020/CY 2021 [Lao PDR]

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$0.2M	-	-	$0.2M	$0.4M	-	$0.8M
Global Fund	$0.2M	$1.5M	-	-	-	$1.3M	$3.0M
Gov[4]	-	-	-	$0.1M	-	$0.1M	$0.2M
Total Per Category	$0.4M	$1.5M	-	$0.3M	$0.4M	$0.4M	$4.0M

Table 5c. Annual budget by Level 1 category for FY 2021/CY 2022 [Lao PDR]

Funder	Vector Control	Case Management	Drug-Based Prevention[1]	Supply Chain[2]	Monitoring, Evaluation & Research	Cross-cutting and HSS[3]	Total Per Funder
PMI	$0.4M	$0.1M	-	$0.2M	$0.3M	-	$1.0M
Global Fund	$1.0M	$0.6M	-	-	-	$1.0M	$2.6M
Gov[4]	$1.0M	-	-	-	-	$0.1M	$1.1M
Total Per Category	$2.4M	$0.7M	-	$0.2M	$0.3M	$1.1M	$4.7M

1. Drug-based prevention, including SMC and MIP where applicable. 2. Covers management of in-country warehousing and distribution of malaria commodities, except for ITNs, which are separately captured under Vector Control. 3. HSS = health systems strengthening. 4. Global Fund RAI3E proposal Funding Landscape.

Table 6a. Annual budget, breakdown by commodity, FY 2019/CY 2020 [Thailand]

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	Indoor Residual Spraying (IRS)[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$0.2M	-	-	-	<$0.1M	<$0.1M	-	-	$0.2M
Global Fund [3]	$0.3M	-	-	-	$0.2M	-	-	-	$0.5M
Gov[4]	-	-	-	-	-	-	-	-	-
Total	$0.5M	-	-	-	$0.3M	$0.0M	-	-	$0.8M

Table 6b. Annual budget, breakdown by commodity, FY 2020/CY 2021 [Thailand]

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$0.4M	-	-	<$0.1M	<$0.1M	<$0.1M	-	-	$0.4M
Global Fund [3]	$0.1M	-	-	-	-	-	-	-	$0.1M
Gov[4]	-	-	-	-	-	-	-	-	-
Total	$0.4M	-	-	$0.0M	$0.1M	$0.0M	-	-	$0.5M

Table 6c. Annual budget, breakdown by commodity, FY 2021/CY 2022 [Thailand]

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$0.2M	-	-	-	-	-	-	-	$0.2M
Global Fund [3]	$0.2M	-	-	-	$0.1M	-	-	-	$0.3M
Gov[4]	-	-	-	-	-	-	-	-	$0.0M
Total	$0.4M	-	-	-	$0.1M	-	-	-	$0.5M

Note: Categories reflect the harmonized financial taxonomy (Levels 1-3) developed by BMGF, Global Fund, and PMI in 2019, as part of a broader data harmonization initiative but may continue to evolve. 1. IRS insecticide: for PMI, commodity costs may be inextricable from IRS implementation costs in historical data – field identified as ND where this is the case. 2. PMI commodity costs are fully loaded, including costs for the ex-works price of the commodity, quality control, freight, insurance, and customs. 3. Global Fund commodity costs in the table above only include ex-works commodity value. 4. Global Fund RAI3E proposal Funding Landscape.

Table 7a. Annual budget, breakdown by commodity, FY 2019/CY 2020 [Lao PDR]

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$0.2M	-	-	<$0.1M	$0.3M	-	-	-	$0.5M
Global Fund[3]	$0.1M	-	-	$0.1M	$0.1M	-	-	-	$0.3M
Gov[4]	-	-	-	-	$0.2M	-	-	-	$0.2M
Total	$0.3M	-	-	$0.1M	$0.6M	-	-	-	$1.0M

Table 7b. Annual budget, breakdown by commodity, FY 2020/CY 2021 [Lao PDR]

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$0.2M	-	-	-	<$0.1M	-	-	-	$0.2M
Global Fund[3]	$0.1M	-	-	<$0.1M	$0.4M	-	-	-	$0.5M
Gov[4]	-	-	-	-	-	-	-	-	-
Total	$0.3M	-	-	$0.1M	$0.4M	-	-	-	$0.7M

Table 7c. Annual budget, breakdown by commodity, FY 2021/CY 2022 [Lao PDR]

Funder	ITNs *Continuous Distribution*	ITNs *Mass Distribution*	IRS[1] *Insecticide*	ACTs	RDTs	Severe Malaria	SMC-Related	IPTp-Related	Total
PMI[2]	$0.3M	-	-	-	<$0.1M	-	-	-	$0.3M
Global Fund[3]	$0.7M	-	-	-	$0.1M	-	-	-	$0.8M
Gov[4]	$0.6M	-	-	-	$0.3M	-	-	-	$0.9M
Total	$1.6M	-	-	-	$0.4M	-	-	-	$2.0M

Note: Categories reflect the harmonized financial taxonomy (Levels 1-3) developed by BMGF, Global Fund, and PMI in 2019, as part of a broader data harmonization initiative but may continue to evolve. 1. IRS insecticide: for PMI, commodity costs may be inextricable from IRS implementation costs in historical data – field identified as ND where this is the case. 2. PMI commodity costs are fully loaded, including costs for the ex-works price of the commodity, quality control, freight, insurance, and customs. 3. Global Fund commodity costs in the table above only include ex-works commodity value. 4. Global Fund RAI3E proposal Funding Landscape.

V. ACTIVITIES TO BE SUPPORTED WITH FY 2022 FUNDING

The FY 2022 budget tables contain a full list of activities that PMI proposes to support in Thailand, Lao PDR, and Regional with FY 2022 funding. Please visit www.pmi.gov/resource-library/mops for these FY 2022 budget tables. Key data used for decision-making for this MOP planned investments is provided in Annex A of this document.

ANNEX A: INTERVENTION-SPECIFIC DATA

This section outlines key data that helped inform decision-making around FY 2022 MOP funding allocations to PMI-supported activities.

1. VECTOR CONTROL

NMCP Objective

Thailand

- The Thai DVBD National Strategic Plan (2017–2026) targets one insecticide-treated mosquito net (ITN) for every 1.8 residents, while a ratio of 1:1 is used for migrant populations and military personnel based in malaria-endemic villages. ITNs are to be replaced every three years.
- Long-lasting insecticide-treated hammock nets are distributed in endemic villages of targeted provinces where ITNs cannot be used (e.g., migrants and soldiers spending nights in the forest and on the Thai–Cambodia border).

Lao PDR

- The Lao National Strategic Plan (2021–2025) has set out to protect 100 percent of targeted high-risk populations with appropriate vector control interventions, including ITNs.
- The NMCP's primary distribution channel is through mass distribution campaigns every three years and continuous distribution for pregnant mothers through ANC and other high-risk populations.

NMCP Approach

Thailand

The Thailand NMCP identified targeted populations and endemic areas for vector control activities as described below:

Populations living and working in areas with indigenous malaria cases[2]; people who engage in outdoor activities or are exposed to outdoor transmission including rubber tappers, military, border police, forest rangers; school-aged children under 15 years of age; and displaced persons in temporary shelters.

1. LLIN distribution in A1 and A2 areas with a ratio of 1.8 per net and 1:1 for mobile migrants. Long-lasting insecticide-treated hammock net distribution in A1 areas.
2. IRS along with reactive case detection based on micro stratification, new foci, persistent foci, and outbreak or emergency settings including new settlements.
3. Entomological surveillance and insecticide resistance monitoring in outbreak areas, persistent foci, new active foci, and temporary shelters of displaced persons.
4. Information, education, communication and SBC communication conducted by community based organizations targeting displaced persons, migrants, forest-goers, A1 and A2 residents, and school children under 15 years of age.

[2] Thailand updated its foci classification in 2017 to align with WHO recommendations: active foci with reported indigenous transmission in the current year (A1) and residual non-active foci with no indigenous cases in the current year but with indigenous cases in the previous three years (A2).

Along with other GMS NMCPs, Thailand is increasingly exploring personal protection against outdoor biting among forest-goers and MMPs such as long-lasting insecticidal hammock nets, treated clothing, and topical and spatial repellents.

Lao PDR

Current strategies include delivery of family-size LLINs every three years to targeted high-risk populations (based on risk strata) through mass distribution; annual continuous distribution of family size LLINs to pregnant women, and single-size LLINs to MMPs as well as the military and other formal sector forest-goers such as forest and wildlife protection personnel.

Additional strategies to expand coverage of LLINs include increasing the number of single nets for MMPs through the continuous distribution channels, and using a bottom-up approach in consultation with provinces, districts, and CSOs to estimate the number of nets for this cohort; establish a stockpile of emergency nets available centrally and in key provinces for active foci response, outbreak response, and public health emergencies (e.g., flooding and displacements); and providing LLINs for all beds in health facilities in high-transmission risk settings.

The Lao PDR NMCP has requested support for strengthening entomology. PMI has discussed with the Thai national program, which has expertise in entomology, whether such support can be provided by Thai experts. Given the close similarity of the Thai and Laotian languages, such an approach seems reasonable and mutually beneficial.

PMI Objective in Support of NMCP

Thailand

- PMI supports the procurement of ITNs targeted for distribution to MMPs residing in A1 and A2 strata.
- PMI does not provide support for IRS.
- PMI supports training related to comprehensive, integrated epidemiological and entomological foci investigations, coordinating closely with key stakeholders in the region including engagement with WHO and the Asia Pacific Malaria Elimination Network (APMEN) Vector Control Working Group.

Lao PDR

- PMI supports the procurement of ITNs targeted at areas with ongoing malaria transmission, primarily in the south of the country, and to at-risk vulnerable populations including forest-goers, remote ethnic minority groups, and pregnant women.
- PMI supports training related to comprehensive, integrated epidemiological and entomological foci investigations, coordinating closely with key stakeholders in the region including engagement with WHO and the APMEN Vector Control Working Group.

PMI-Supported Recent Progress (2020 and 2021)

Thailand

- PMI procured and delivered 102,150 LLINs in 2020 and 130,873 LLINs in January 2021 for Thailand.

Lao PDR

- PMI procured and delivered 88,100 LLINs in 2020 and is in the process of procuring 70,000 LLINs in 2021 for Lao PDR to reach at-risk populations including forest-goers, migrant and remote, ethnic minority populations, and pregnant women attending antenatal clinics (ANC).

PMI-Supported Planned Activities (2022)

Thailand

- PMI plans to procure 50,000 LLINs in early 2022 for Thailand.
- PMI will support the NMCPs in Thailand and Lao PDR, working with key stakeholders and partners on entomological aspects of foci investigation, and strengthening regional entomological capacity through training and cross-border TA in collaboration with Thailand International Cooperation Agency, where appropriate.

Lao PDR

- PMI will procure 220,314 LLINs for Lao PDR in 2022 to contribute to the mass LLIN campaign with Global Fund and domestic contributions.

1.1. ENTOMOLOGICAL MONITORING

Key Goal

Determine the geographic distribution, bionomics, and insecticide resistance profiles of the main malaria vectors in the country to inform vector control decision-making.

Key Question 1

Where is entomological monitoring taking place, what types of activities are occurring, and what is the source of funding?

Supporting Data

Although PMI does not provide direct support for entomological monitoring in Thailand or Lao PDR, the following information is based on published literature, WHO Threats database and Ministry of Health (MOH) data/reports. Many of the malaria vectors across the GMS belong to species complexes that are difficult to separate morphologically. Members of these complexes can range from primary vectors to secondary/suspected vectors or non-vectors.

A study by Tananchai et al.[3] suggests that site-specific investigations are required to determine the actual transmission dynamics and the relative importance of outdoor exposure. To achieve elimination, a combination

[3] Tananchai, C., Manguin, S., Bangs, M., & Chareonviriyaphap, T. (2019). Malaria Vectors and Species Complexes in Thailand: Implications for Vector Control. *Trends in Parasitology*. 35. 10.1016/j.pt.2019.04.013.

of established and newer vector control tools need to be evaluated to target more precisely those mosquitoes with a greater proclivity to feed outdoors and during early evening hours.

Thailand

Thailand's malaria elimination strategy, includes entomological investigation in areas of outbreaks, active/new foci and persistent foci. To determine factors contributing to malaria transmission and determine vector control measures (e.g., ITNs or focal spray) to be implemented if appropriate, entomological collections are conducted using larval surveys and adult mosquitoes collected with human and/or animal-baits. From the Ministry of Public Health (MOPH) Malaria Information System database, 2020 entomological collections from south, west, north, and east parts of Thailand identified mosquitoes from the *An. minimus* complex to be the most abundant primary vector, followed by *An. dirus* and *An. maculatus* complex mosquitoes. The most abundant secondary vector collected was *An. epiroticus* followed by *An. aconitus*. Several suspected vectors were found including *An. barbirostris*, *An. campestris*, *An. philippinensis*, *An. anularis*, *An. culicifacies* and *An. kochi.* The abundance and biting behavior of these vectors varies both geographically and seasonally. *An. minimus* is widely distributed, with a tendency to zoophily when there are animal host options for feeding and a preference for outdoor biting. Members of the *An. maculatus* complex are also found throughout Thailand, especially along the Thai-Burma border and are mainly zoophilic with preference for outdoor feeding. *An. dirus* predominantly inhabit forest and forest-fringe regions and show a preference for feeding on humans and outdoor biting.

Global Fund-RAI3E supports epidemiology-driven entomological surveillance and insecticide resistance monitoring, including in outbreak areas, persistent transmission foci, and in new active foci and in temporary shelters if human resource and funding are available. The Thai domestic budget will support capacity-strengthening of entomologists at the regional level to conduct epidemiology-led entomological monitoring and provide technical support to the district and subdistrict levels.

Furthermore, Thailand International Cooperation Agency (TICA), Thailand's development agency, has conducted cross-border meetings for information-sharing and technical capacity-strengthening in the past. In 2019 and 2020, with support from TICA and WHO, DVBD conducted a cross-border training on foci investigation for health staff from Cambodia to learn about how Thailand implements foci investigation, including entomological investigation. The outcome of this training was to enable the participants from Cambodia to understand and gain skills to conduct foci investigation for malaria cases found among Cambodia migrants.

Lao PDR

In response to a large increase in malaria cases in the southern provinces, the Ministry of Health (MOH) and Center for Malariology, Parasitology, and Entomology (CMPE) conducted mosquito surveys in the provinces of Khammouane, Savannakhet, Saravan, Champasak, Sekong, and Attapeu, from July to November 2020. This coincided with the rainy season and the high season for malaria transmission. The aim was to determine vector species and biting/resting behavior around villages and in forested areas. One district per province was selected and a village within the district was targeted based on epidemiological data. Indoor/outdoor human landing collections (HLC) in village houses, HLC in forested areas, and cattle-baited collections were used for monthly mosquito collections. A total of 1,287 *Anopheles* were collected, 80 percent of which were from cattle sheds and 20 percent from HLC from houses and forest areas. Thirty-nine percent were primary vectors from *An. dirus*, *An. Minimus,* and *An. maculatus* complex. Forty-seven percent were mosquitoes that could be considered

secondary vectors (e.g., *An. nivpes*, *An. Philippinensis,* and *An. barbirostris.)* Other mosquitoes collected included *An. vagus*, *An. hycanus*, *An. kochi*, *An. Umbrosus,* and *An. tesallatus.* A study in Phongsaly Province on the Lao-China border[4] identified *An. sinensis* as the predominant vector species. Mosquito abundance of the various species varied between sites, as did the location of biting. A survey of community behavior indicated that people were active in the hours before midnight and in the early morning hours when a number of the primary and secondary vectors were collected. High collections of mosquitoes from cattle-baits supports other reports of these primary and secondary vectors feeding on both humans and animals and the possibility of zoopotentiation with the proximity of livestock to housing.

Table A-1. Overview of residual malaria transmission in various ecological settings in the GMS (adapted from Hii et al., 2021)[5]

District, province, country	Ecotype	% Access to LLIN	% Use of LLIN	Proportion of *Anopheles* bites or infective bites in relation to sleeping time
Eastern region: Borkeo & O'Chum districts, Rattanakiri Province; Western region: Pailin & Pursat provinces; Cambodia	Forest plots and villages	68.4% (Ratanakiri)	70.7% (forest workers)	After 22:00 h 71%
	Forest plots	69.2% (Pailin); 81.8% (Pursat)	66.3% (forest workers)	Before 22:00 h 29%
Ma Noi and Phuoc Binh communes, Ninh Thuan Province, south-central Vietnam	Village	NA	85%	Before 22:00 h 45% (bites only)
	Way to the forest	NA	NA	Before 19:00 h 13% (bites of *An maculatus)*
	Forest plots	NA	53%	Before 21:00 h 64% (bites only)
Tha Song Yang, Tak Province, Thailand	Village	78%	80%	Before 21:00 and 05:00 h 20.0% Suan Oi 33.7% Pha Man 37.6% farm huts
	Hamlets	100%	75–95%	
	Farm huts	NA	NA	
Son Thai commune, Khan Hoa Province, central Vietnam	Village	78%	95%	Before 20:00 and 05:00 h 26% farm huts 37% forest
	Farm huts	NA	62.7%	
	Forest	NA	25%	

[4] Zhang, C. et al., Survey of asymptomatic malaria and mosquito vectors in Muang Khua District of Phongsaly Province, China–Laos Border, International Journal of Infectious Diseases (2020).

[5] Hii, J. et al. Residual malaria transmission in select countries of the Asia-Pacific region: Old wine in a new barrel. JID 2021:223 (Suppl 2) (2021).

Key Question 2

What is the current insecticide resistance profile of the primary malaria vectors?

Supporting Data

Thailand

Most of the insecticide resistance testing has been carried out along the eastern border with Burma or along the Cambodia and Lao PDR borders, which historically are areas of high malaria transmission. Along the Thailand-Burma border, Chaumeau et al. found deltamethrin resistance in *An. maculatus* and suspected resistance in *An. dirus* but *An. minimus* was susceptible to permethrin.[6] In east Thailand, on the border with Cambodia, Sumarnrote et al. found that both primary vectors, *An. dirus* and *An. maculatus,* were susceptible to permethrin and deltamethrin.[7] In contrast, the rice field secondary vector, *An. hyracanus,* showed a high level of resistance to these insecticides. In the same region, Pemo et al. found that both *An. dirus* and *An. minimus* were susceptible to the pyrethroids tested.[8] The only published data available for the south of Thailand are for the secondary vector, *An. epiroticus* (member of the *An. sundaicus* group), which showed susceptibility to pyrethroids, though with some evidence of behavioral avoidance of insecticides in one of three sites.[9] Data available on the WHO Threats database shows little evidence of resistance in *An. dirus* and *An. minimus* in southern Thailand.

Lao PDR

According to a study[10] published in 2017, *An. minimus* and *An. maculatus* resistance testing was carried out in 10 provinces in Lao PDR along a north-south transect. In general, no resistance to pyrethroids was detected in the primary vectors from the *An. dirus*, *An. Minimus,* and *An. maculatus* complexes. Reduced susceptibility to permethrin was detected in two sites. No pyrethroid resistance was detected in secondary vectors. DDT resistance was found in primary and secondary as well as non-vector species in several provinces.

Conclusions for Entomologic Monitoring Investments

- With FY 2022 funding, PMI will support entomologic training in Lao PDR at provincial level in support of foci investigations, mosquito resistance monitoring, and reactive vector control measures. PMI will look at opportunities to work through TICA to strengthen cross-border collaboration and TA.
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

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[6] Chaumeau, V., Cerqueira, D., Zadrozny, J. *et al.* Insecticide resistance in malaria vectors along the Thailand-Myanmar border. *Parasites Vectors* 10, 165 (2017).

[7] Sumarnrote, A., Overgaard, H.J., Marasri, N., et al. Status of insecticide resistance in Anopheles mosquitoes in Ubon Ratchathani province, Northeastern Thailand. Malar J 16, 299 (2017).

[8] Pemo, D., Komalamisra, N., Sungvornyothin, S., & Attrapadung, S. Efficacy of three insecticides against *Anopheles dirus* and *Anopheles minimus*, the major malaria vectors, in Kanchanaburi Province, Thailand. Southeast Asian J Trop Med Public Health. 2012 Nov;43(6):1339-45.

[9] Ritthison, W., et al. Pyrethroid susceptibility and behavioral avoidance in *Anopheles epiroticus*, a malaria vector in Thailand. Journal of Vector Ecology (2014).

[10] Marcombe, S., Bobichon, J., Somphong, B., Phommavan, N., Maithaviphet, S., Nambanya, S., et al. (2017) Insecticide resistance status of malaria vectors in Lao PDR. PLoS ONE 12(4): e0175984.

1.2. INSECTICIDE-TREATED NETS (ITNs)

Key Goal

Achieve high ITN coverage and use targets with effective nets, based on insecticide resistance data; and maintain high coverage and use with consistent ITN distribution (via campaigns and/or continuous channels).

Key Question 1

How has net ownership evolved since the start of PMI in the country?

Supporting Data

Figure A-1. Trends in ITN ownership in Thailand

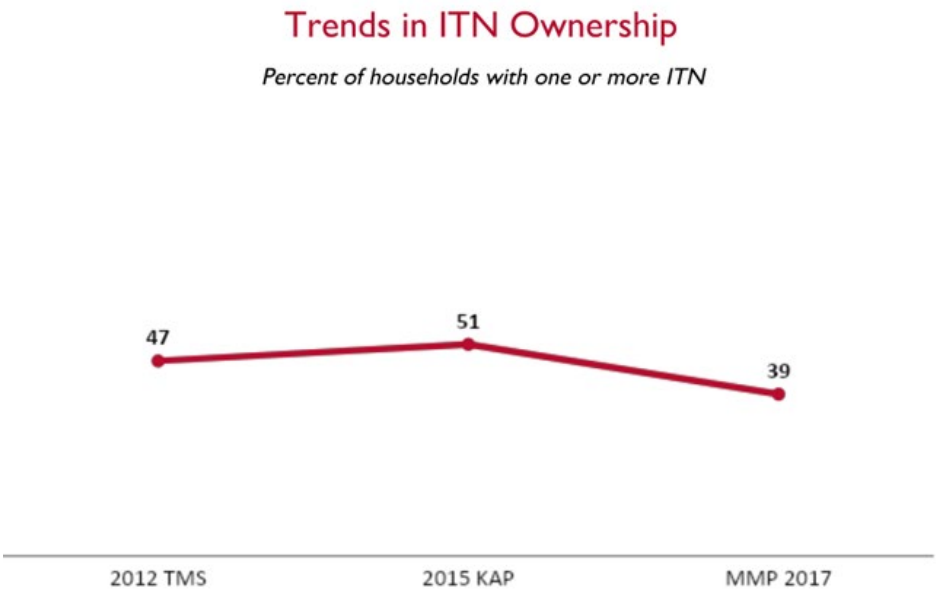
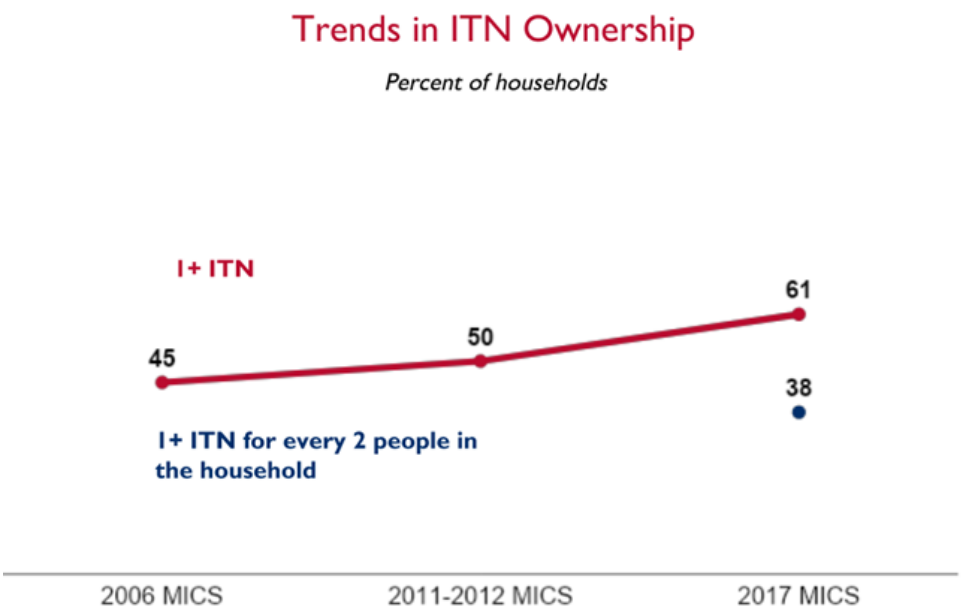


Figure A-2. Trends in ITN ownership in Lao PDR



Because ITNs are targeted to residual foci, forest-goers, and MMPs, standard household survey metrics are ill-designed to accurately assess ITN coverage in this context. In both Thailand and Lao PDR, overall ITN ownership is expected to decline as malaria persists in decreasing numbers of active foci. The primary challenge is the estimation of a rapidly changing denominator based on the rapidly declining number of villages with transmission ("active foci") and numbers of forest-going people, which shifts rapidly in response to market factors and conflict.

Key Question 2a

What proportion of the population has access to an ITN? Of those who have access, what proportion of the population reports using an ITN?

Supporting Data

Thailand

In Thailand, bed net ownership is very high (94 percent of the population), but most are untreated. A survey conducted in 2017 shows that the Thai population has very low ITN coverage (39 percent) and use (37 percent). However, these surveys do not adequately target at-risk areas or forest-going populations. Access to IRS is also low (17 percent) though this reflects the fact that IRS is used primarily for outbreak response. Data from the survey also showed low coverage (15 percent to 46 percent) of ITNs in high-transmission border areas. Only 8 percent of forest-goers MMPs use ITNs in the forest. The lowest ITN coverage is in the Thai–Malaysia border, where civil unrest is hampering malaria control efforts. Poor road conditions, especially during the rainy season, and lack of transportation to carry LLINs into the remote villages/communities could also contribute to the low coverage of LLINs in remote areas.

Lao PDR

Overall, net ownership and use is high throughout the country, particularly in the southern provinces with the highest malaria burden. The more recent Social Indicator Survey from 2017 noted high conventional net ownership (93 percent) and improvements on ITN ownership (61 percent in 2017 vs. 50 percent in 2012) and use among children under five years of age (50 percent in 2017 vs. 43 percent in 2012). ITN ownership is higher in the southern provinces, where the burden of malaria is higher. The northern part of the country has, at present, little transmission; thus ITN distribution is being phased out.

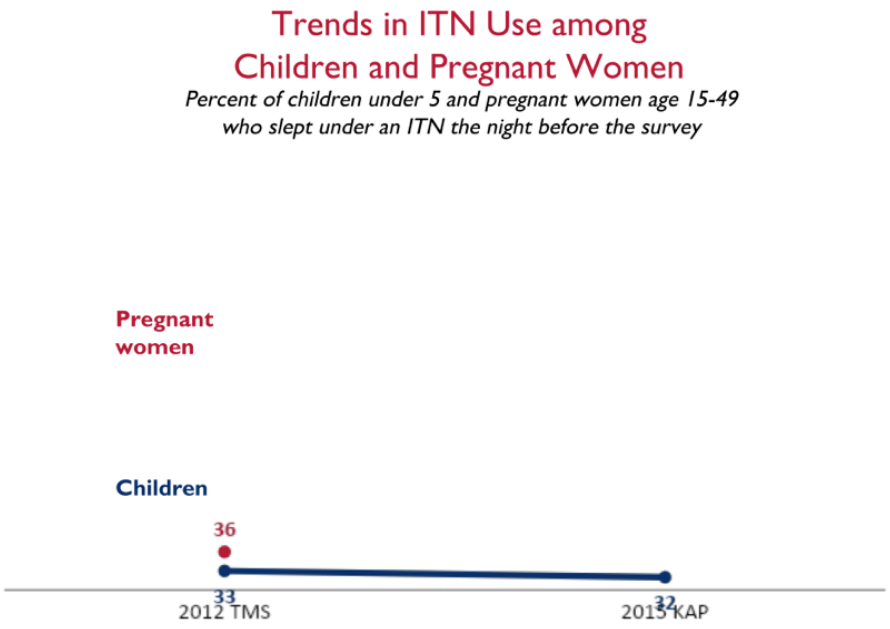
Key Question 2b

What percent of pregnant women and children under five years of age report sleeping under an ITN?

Supporting Data

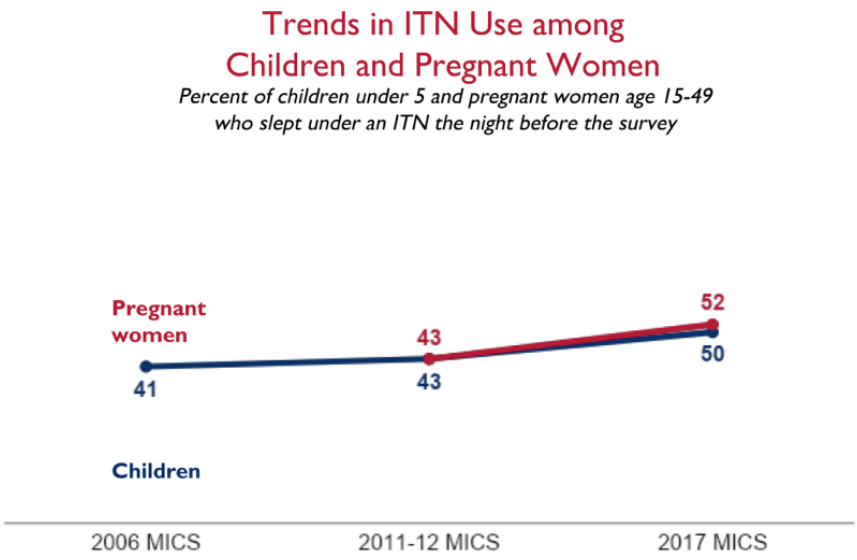
There is limited data available in Thailand and Lao PDR on ITN use by pregnant women and children under five years of age.

Figure A-3. Trends in ITN use among children and pregnant women in Thailand



In Thailand, ITN use by children remained unchanged from 33 percent in 2012 to 32 percent in 2015. Use of ITNs by pregnant women was 36 percent in 2017.

Figure A-4. Trends in ITN use among children and pregnant women in Lao PDR



In Lao PDR, 52 percent of pregnant women and 50 percent of children under five years of age reported using an ITN according to the 2017 MICS survey. The primary targets of ITN use in Lao PDR are MMPs as well as forest-goers, for which limited survey data exists.

Key Question 3

If ITN access is high but use is low, what significant structural and/or behavioral challenges affect the adoption and maintenance of ITN use and care behaviors?

Supporting Data

In Thailand and Lao PDR, as in much of southeast Asia, ownership and use of untreated nets is common although ITN ownership and use is improving. In some instances, people will use ITNs only after their untreated nets are worn out and unusable. Untreated nets are often decorative, colorful, and viewed as a household furniture offering rather than as a disease prevention intervention.

A study[11] in villages of the Thailand–Burma border found that the reasons individuals cited for not sleeping under a net included that they did not own enough nets, that using a net was too hot, that they did not like using a net, or that they found a net uncomfortable to breathe under. The study also recommended that additional bed nets should be provided for use in areas where people have farm huts outside of villages.

[11] Edwards, H.M., Sriwichai, P., Kirabittir, K., Prachumsri, J., Chavez, I.F., & Hii, J. Transmission risk beyond the village: Entomological and human factors contributing to residual malaria transmission in an area approaching malaria elimination on the Thailand–Myanmar border. Malar J. 2019;18:221.

Key Question 4

What type of nets are being distributed via which channels?

Supporting Data

The primary channels for ITN distribution in Thailand and Lao PDR are targeted community-based distribution channels in active foci that reach MMPs and forest-goers in some areas in high-transmission provinces.

Table A-2. ITN distribution in Thailand

Level	Type of Campaign	ANC	EPI*	School	Community	MMPs
Thais + M1[12] + M2[13] (in at-risk areas)	Continuous 2021–2023 (pyrethroid)				X	X

*EPI = Expanded Program on Immunization

Table A-3. ITN distribution in Lao PDR

Level	Type of Campaign	ANC	EPI	Community	Military	MMPs
Strata 3[14] and strata 2b[15] in 5 southern provinces	Mass campaign 2019 (pyrethroid)			X		
Strata 3[16] and 4[17]	Mass campaign 2022 (pyrethroid)			X		
Strata 3 and 4	Continuous 2021–2023 (pyrethroid)	X			X	X

Key Question 5

What is the estimated need for ITNs during calendar years 2021–2023? How many, and what types, of ITNs will be procured, and by what partners? Through what channels will ITNs be distributed? Are there any projected ITN gaps?

[12] M1 = migrants in Thailand 6 months or longer.

[13] M2 = migrants in Thailand less than 6 months.

[14] High-burden villages with API >10/1,000 (Lao NSP, 2016–2020).

[15] Low-burden villages with API < 10/1,000 (Lao NSP, 2016–2020).

[16] Moderate risk with total cases between 5 and 20 based on health facility catchment area (Lao Malaria Stratification, 2019).

[17] High-risk with total cases greater than 20 based on health facility catchment area (Lao Malaria Stratification, 2019).

Table A-4. ITN Gap Analysis Table [Thailand]

Calendar Year	2021	2022	2023
Total country population	69,480,520	69,661,169	69,842,288
Total population at risk for malaria	696,502	451,623	274,967
PMI-targeted at-risk population	696,502	451,623	274,967
Population targeted for ITNs	696,502	451,623	274,967
Continuous Distribution Needs			
Channel 1: ANC	0	0	0
Channel 2: Forest goers	91,224	54,877	27,510
Channel 3: M1 & M2 accessing ACD and PCD	60,873	36,523	18,262
Channel 4: Refugee camps	53,779	53,919	54,059
Channel 5: Additional refugees	10,000	0	0
Additional ITNs required to avoid ITN stockouts	0	0	0
Estimated Total Need of LLIHNs for Continuous Channels (Forest-goers only)	91,224	54,877	27,510
Estimated Total Need of LLINs for Continuous Channels	124,652	90,443	72,321
Mass Campaign Distribution Needs			
Mass distribution campaigns	0	0	0
Estimated Total Need for Campaigns	0	0	0
Total ITN Need: Continuous and Campaign	*215,877*	*145,320*	*99,831*
Partner Contributions			
ITNs carried over from previous year	0	52,787	72,865
ITNs from Government	*36,566*	*60,521*	*60,521*
ITNs (LLIHNs) from Global Fund	90,000	0	0
ITNs (LLINs) from Global Fund	10,000	0	0
ITNs from other donors	0	0	0
ITNs planned with PMI funding	130,873	50,000	60,000
Total ITN (LLIHNs) Surplus (Gap)	*(1,224)*	*(54,877)*	*(27,510)*
Total ITNs Contribution Per Calendar Year (LLINs)	*177,439*	*163,308*	*193,386*
Total ITN (LLINs) Surplus (Gap)	*52,787*	*72,865*	*121,065*

Thailand

Thailand currently conducts only continuous distribution of ITNs each year. Based on the gap analysis, the needs through 2023 are as follows: 124,652 (2021), 90,443 (2022), and 72,321 (2023). PMI is planning to provide 120,873 LLINs in 2021, 50,000 LLINs in 2022, and 60,000 LLINs in 2023, targeting MMPs through continuous distribution channels. Through domestic resources, Thailand routinely conducts retreatment of conventional nets and the data on retreatment has been taken into account in the calculated need. With the Global Fund RAI3E resources and according to the gap analyses conducted in consultation with DVBD and partners, there are no projected gaps in 2021–2023.

Table A-5. ITN Gap Analysis Table [Lao PDR]

Calendar Year	2021	2022	2023
Total country population	7,095,919	7,202,358	7,310,393
Total population at risk for malaria	1,573,316	1,596,129	1,619,273
PMI-targeted at-risk population	1,573,316	1,596,129	1,619,273
Population targeted for ITNs	1,573,316	1,596,129	1,619,273
Continuous Distribution Needs			
Channel 1: ANC	45,812	0	47,151
Channel 2: EPI	0	0	0
Channel 3: School	0	0	0
Channel 4: For MMPs and Military	99,210	99,923	100,647
Channel 5: Emergency use	25,000	20,000	20,000
Additional ITNs required to avoid ITN stockouts	0	0	0
Estimated Total Need for Continuous Channels	170,022	119,923	167,798
Mass Campaign Distribution Needs			
Mass distribution campaigns	0	972,310	0
Estimated Total Need for Campaigns	0	972,310	0
Total ITN Need: Continuous and Campaign	***170,022***	***1,092,233***	***167,798***
Partner Contributions			
ITNs carried over from previous year	7,265	0	0
ITNs from Government	*0*	*217,788*	*0*
ITNs from Global Fund	74,605	634,131	100,647
ITNs from other donors	0	0	0
ITNs planned with PMI funding	50,000	240,314	70,000
Total ITNs Contribution Per Calendar Year	***131,870***	***1,092,233***	***170,647***
Total ITN Surplus (Gap)	***(38,152)***	***0***	***2,849***

Lao PDR

Lao PDR conducts both mass campaigns and continuous distribution channels. Based on the gap analysis, the estimated need for the 2022 mass campaign is 972,310 LLINs, of which 217,788 will be procured with domestic resources, 634,131 by Global Fund, and 240,314 by PMI. Furthermore, PMI is planning to procure 70,000 LLINs for distribution in 2023 to target pregnant women and other vulnerable populations through continuous channels. With the Global Fund RAI3E resources and according to the gap analyses conducted in consultation with CMPE and partners, there are no projected gaps in 2021–2023.

Key Question 6

What is the current status of durability monitoring?

Supporting Data

ITN durability monitoring has not been conducted in Thailand or Lao PDR.

Conclusions for ITN Investments

- PMI plans to procure 60,000 LLINs for Thailand and 70,000 LLINs for Lao PDR for delivery in 2023 with a focus on forest-goers and MMPs, including pregnant women.
- With FY 2022 funding, PMI will procure 60,000 LLINs for Thailand and 50,000 LLINs for Lao PDR for delivery in 2024 to fill gaps among the at-risk target populations, based on NMCP estimation of needs for MMPs and active foci of transmission, particularly after the end of Global Fund RAI3E.
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

1.3. INDOOR RESIDUAL SPRAYING (IRS)

PMI does not support IRS activities in Thailand or Lao PDR.

2. HUMAN HEALTH

2.1. CASE MANAGEMENT

NMCP Objective

Thailand

For Thailand to be malaria-free by 2024, the country has the following objectives related to case management:

- Increase capacity and coverage of malaria case management at all levels, all sectors, and all population groups based on equity.
- Scale up detection of asymptomatic and low-parasitemic patients through active case detection in malaria transmission areas and among populations at risk, military bases, and refugee camps by using microscopy and molecular technique.
- Scale up an integrated drug efficacy surveillance system for patient follow-up to ensure cure and to eliminate drug-resistant parasites.

Lao PDR

To eliminate *P. falciparum* by 2023 and all malaria by 2030, the Lao NSP 2021–2025 has a strategic objective of maintaining universal access to quality malaria diagnosis, increasing testing to reach national annual blood examination rate targets and providing effective treatment to 100 percent of cases.

NMCP Approach

Thailand

In non-transmission areas, diagnosis and treatment only occurs in hospitals (not in the community). In transmission areas, diagnosis and treatment occurs both in the community (RDTs and microscopy) and in

hospitals (microscopy only). In perennial transmission areas (A1) two rounds per year of proactive case detection are conducted. In periodic transmission areas (A2), proactive case detection is done once per year.

Directly observed treatment is recommended for all days of treatment for both *P. falciparum* and *P. vivax.* The first-line ACT for *P. falciparum* in Sisaket and Ubon Ratchathani provinces is pyronaridine-artesunate as of July 2019; in the rest of the country it remains dihydroartemisinin-piperaquine (DHA-PIP). The change to pyronaridine-artesunate was prompted by decreased DHA-PIP efficacy (80 percent) in Sisaket.

Thailand has a long history of administering single-dose primaquine as part of its treatment regimen for *P. falciparum*. The current treatment guidelines (2015) specify that a single dose (30 mg) of primaquine be administered with an ACT for the treatment of uncomplicated *P. falciparum* malaria without the need for G6PD testing. Thailand uses a higher dose than is currently recommended by WHO because Thailand's policy predates the WHO recommendation of 15 mg and countries with prior policies were encouraged to not lower their dose. Treatment for *P. vivax* is chloroquine and primaquine (0.25mg/kg for 14 days). Thailand recommends G6PD testing, where possible, prior to administration of radical treatment for *P. vivax,* although administration of primaquine without G6PD testing has been long practiced and still continues where testing is not available. According to Malaria Indicator Survey (MIS) data,[18] 61 percent of *P. vivax* cases received follow-up on Day 14 following radical treatment in 2020. Tafenoquine has been registered in Thailand and ongoing pilot studies are supported by Medicines for Malaria Venture and PATH.

As malaria incidence has declined over the years in Thailand and throughout the GMS, it has increasingly become more difficult to enroll patients for the standard WHO TES studies to monitor drug efficacy and resistance. As a result, through PMI support, WHO has provided TA to DVBD to pilot the iDES initially in three sites with the aim of scaling up throughout the country. Due to the challenges of patient enrollment for TES in malaria elimination settings, iDES relies on the routine malaria surveillance system to track, follow up, and ensure effective treatment outcomes for every malaria case. Evaluated in Thailand with PMI support for data analysis and quality assurance, this approach serves as a model for other malaria-eliminating countries that are unable to enroll sufficient numbers of patients to conduct the standard WHO TES.

Lao PDR

Malaria control and elimination in Lao PDR has embraced a comprehensive service delivery model. In addition to the services provided in public facilities, the program works closely with a network of community-based healthcare providers through village malaria workers (VMW) and with selected private outlets through a Public–Private Partnership.

A new testing algorithm in 2018 calls for testing of all febrile cases and high-risk populations. First-line treatment for *P. falciparum* is artemether-lumefantrine (AL) with a single dose of 0.25mg/kg of primaquine without the need for G6PD testing. For the radical treatment of *P. vivax*, 14 days of primaquine is provided after testing for G6PD. Quantitative G6PD testing is being rolled out in phases first starting at the hospital level. For patients with *P. vivax* or *P. ovale* without access to G6PD testing or an abnormal G6PD result, weekly primaquine is given for eight weeks.

[18] Sudathip, P., Saejeng, A., Khantikul, N., et al. Progress and challenges of integrated drug efficacy surveillance for uncomplicated malaria in Thailand. Malar J 20, 261 (2021). https://doi.org/10.1186/s12936-021-03791-2

Quality assurance of pharmaceuticals is conducted in collaboration with the Food and Drug Department twice a year. A national slide bank was initiated in 2016 but was not maintained due to limited samples. For external quality assessments, slides are sent to Lao PDR twice a year for reading; and for internal assessment, the districts and provinces send their slides to CMPE for parasite count validation and assessment.

Providing malaria services to the MMPs has been a challenge as it is in other countries in the region. Potential strategies that will be explored include: expanding the roles and responsibilities of the VMWs to conduct outreach work during risk periods (rice and crop harvesting); conducting targeted testing of high-risk forest-going populations though village-based focal test and treat and/or reactive screening around index cases; placing mobile malaria workers at key travel routes for high-risk populations; and access to quality case management for migrant workers at high-risk work sites.

Lao PDR has reported *P. falciparum* parasite resistance to ACTs, which poses a threat to the country's elimination goal. This is supported by the identification of the presence of K13 mutants (C580Y, Y493H, and R539T) in southern provinces of Lao PDR. Treatment failures have been reported in two of the available ACTs during TESs conducted in Lao PDR, DHA-PIP in 2016–2017, and AL in 2017. A TES was also conducted on two new ACTs in 2017–2018, pyronaridine-artesunate and artesunate-mefloquine (AS-MQ). Results of the study indicated that both treatments were efficacious and the NMCP is currently working with the Food and Drug Department to register both of these pharmaceuticals in Lao PDR. In the light of artemisinin resistance in the region, strong vigilance has been maintained toward implementing high-quality antimalarial TES in sentinel sites and now piloting iDES.

PMI Objective in Support of NMCP

In the region, PMI supports gap-filling for malaria case management commodities, iDES/TES to monitor drug efficacy, and quality microscopy. PMI does not support health facility or community-level case management implementation.

PMI-Supported Progress (2020 and 2021)

Thailand

- PMI is in the process of procuring 3,000 vials of injectable artesunate, 2,000 treatment doses of DHA-PIP, 35,000 tablets of 7.5 mg formulation of primaquine, and 12,500 RDTs and personal protective equipment for Thailand in 2021.
- Due to COVID-19, planned national and external competency assessments of malaria microscopists were unable to be conducted and the WHO certification was extended for one year.
- PMI supported iDES (see details below), drug policy reviews, and related meetings. PMI also supported the development of a dashboard, standard operating procedures, analytics, and presentations to improve iDES and routine use of generated data.

Lao PDR

- From 2020 to March 2021, PMI procured and delivered 500,000 RDTs, 14,070 treatment doses of AL, and 200,000 tablets of primaquine.
- PMI supported TESs and an iDES pilot (see details below), drug policy reviews, and related meetings.

Regional

- PMI continues to provide support for monitoring, oversight, and TA on TES/iDES to the GMS countries (Thailand, Lao PDR, Vietnam, Burma, and Cambodia). The annual GMS TES meeting to review the TES/iDES results, review treatment policies, and plan upcoming in-country TES/iDES activities was held virtually in October 2020.

PMI-Supported Planned Activities (2022)

- PMI will provide TA for implementation of iDES in Thailand, Lao PDR, and Vietnam. PMI will also provide monitoring and oversight of TES/iDES by WHO to all five GMS countries, support drug policy review, and convene an annual, regional meeting.
- PMI will support microscopy training and accreditation (external competency assessments) in the region, maintenance of regional and national slide banks, and training of trainers for microscopy.

Key Goal

Improve access to and use of timely, quality, and well-documented malaria testing and treatment by providing facility- and community-based health workers with training, supervision, and malaria commodities to be able to provide quality, effective care supported through domestic and Global Fund resources in the region.

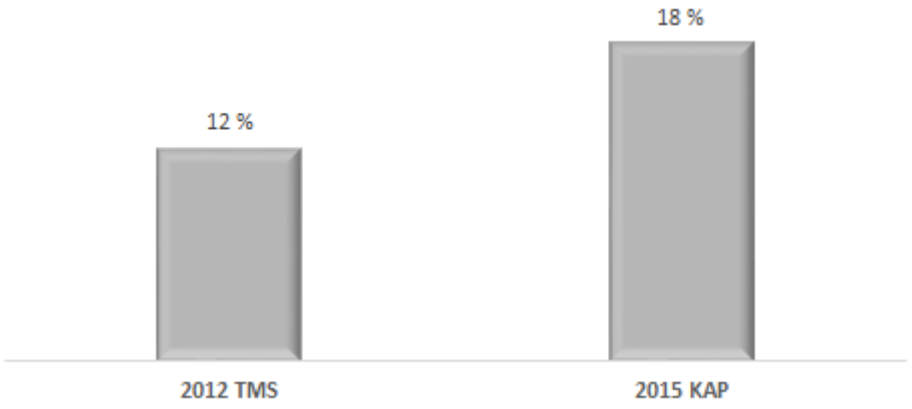
Key Question 1a

What is the status of care-seeking and/or access to care for children under five years of age with fever?

Malaria is relatively low among children under five years of age in the region. The majority of malaria cases occur among males 15 to 49 years of age, especially those with forest exposure. However, malaria incidence among young children between 5 and 14 years of age in some geographical areas of Thailand makes up a quarter of the malaria burden. Data from the MIS show that children 5 to 14 years of age make up 23 percent in 2019 and 25 percent of total cases in 2020.

Figure A-5. Trends in care-seeking for fever in Thailand

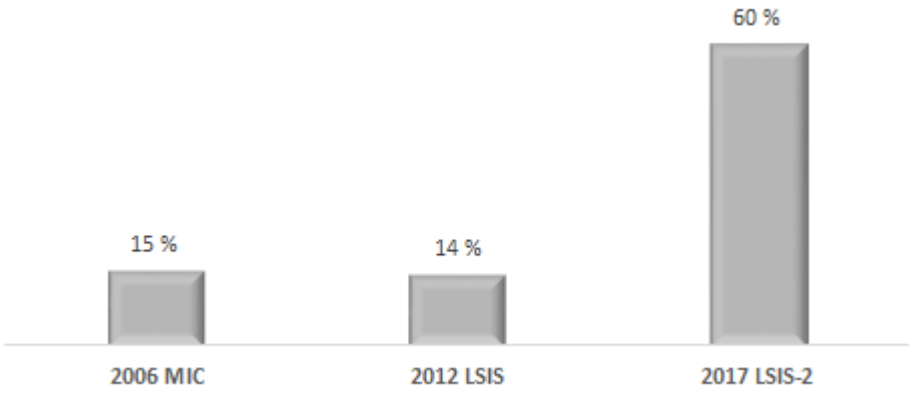
Among children under five years of age with fever in the two weeks before the survey, percentage for whom advice or treatment was sought



According to the last Thailand Malaria Survey conducted in 2012, treatment seeking for all ages of reported fever cases in the previous two weeks was quite high, with 77.4 percent having gone to a health provider of any kind and 73.4 percent of them doing so within 48 hours.

Figure A-6. Trends in care-seeking for fever in Lao PDR

Among children under five years of age with fever in the two weeks before the survey, percentage for whom advice or treatment was sought



Despite the burden of malaria among children under five years of age being less than 10 percent in Lao PDR, care-seeking behavior among children under five years of age has substantially improved from 15 percent in 2006 to 60 percent in 2017.

Key Question 1b

What significant structural and/or behavioral challenges affect prompt care-seeking?

Supporting Data

Although active case detection activities through mobile malaria clinics and mobile malaria workers have increased access to services, many barriers remain in the region for accessing care. According to the Thailand Mobile Migrant Population study, in 2017 27 percent of MMP had never heard of malaria and 47 percent had low knowledge of malaria. There was also limited knowledge about the signs of severe malaria, with 60 percent of participants not knowing at least one sign or symptom of severe malaria. External factors, such as citizenship status, also served as barriers to prompt care-seeking. In Lao PDR, for instance, a large majority (89 percent) of foreign workers reported not seeking healthcare services from public health centers.[19]

Barriers related to prompt care-seeking will increasingly become an issue as malaria transmission decreases. Further research is needed on specific barriers to treatment for more mobile populations, including MMP literacy and language barriers, access to health insurance, and criminalization of border-crossing populations.

Key Question 2a

What proportion of patients are being tested and appropriately treated for malaria?

Currently, 100 percent of suspected cases are tested and 100 percent of confirmed cases are treated in both Thailand and Lao PDR.

Supporting Data

All suspected malaria cases receive a parasitological test in the public and community sectors in Thailand.[20]

Although ACTs are provided for all confirmed malaria cases in Lao PDR, G6PD testing and prescription of primaquine radical cure for *P. vivax* is a relatively recent policy. Access to G6PD testing has improved from 0 percent in 2018 to 30 percent in 2020. Receiving primaquine radical cure has also improved from 35 percent in 2018 to 59 percent in 2020. CMPE continues to track *P. vivax* case management indicators, conduct monthly data reviews, follow up with poor performing facilities, and explore ways to improve adherence.

Key Question 2b

What significant structural and behavioral challenges affect testing and treatment practices among providers?

Supporting Data

With the continued progress around the elimination of malaria, malaria case management services are integrated into health promotion hospitals, where malaria is not commonly diagnosed and malaria commodities are often out of stock or expired. Furthermore, unlike the dedicated malaria clinics and malaria posts maintained by the vertical program, malaria services in hospitals are only available to Thais and legal migrants with insurance.

[19] Pongvongsa, T., Nonaka, D., Iwagami, M., et al. Malaria among foreign migrant workers in Savannakhet Province, Lao People's Democratic Republic. *Trop Med Health*. 2019;47:10.

[20] Thailand Essential Data Table for Global Fund RAI3E and WHO World Malaria Report 2019.

Key Question 3

What is the current and planned support for case management at health facilities and in the communities by CHWs?

PMI does not support health facility and community level case management implementation. Community health workers, VMW, and village health volunteers (VHVs) are supported by the NMCPs with Global Fund support in both Thailand and Lao PDR.

Supporting Data

Thailand

With the focus on elimination objectives, Thailand is prioritizing the integration of the malaria program into the general health system, and specifically delivered through the Health Promotion Hospitals. This decentralization is increasing the roles of relevant ministries and local authorities through district health boards. The DVBD plans to expand the role of village health volunteers and CSOs to implement this strategy at the local level.

Lao PDR

The National Malaria Program has made significant progress in reducing the burden caused by malaria through a combination of a strong vertical program and the strengthening of village health workers (both generalist VHVs and specialized VMWs). Approximately 1,600 VHVs and VMWs have been trained and they will continue to be instrumental in ITN distribution and in early diagnosis and treatment.

Key Question 4

What is the estimated need for RDTs during calendar years 2021–2023? Are there any projected RDT gaps based on anticipated partner contributions compared to estimated needs?

Table A-6. RDT Gap Analysis Table [Thailand]

Calendar Year	2021	2022	2023
Total country population	69,480,520	69,661,169	69,842,288
Population at risk for malaria	696,502	451,623	274,967
PMI-targeted at-risk population	696,502	451,623	274,967
RDT Needs			
Total number of projected fever cases	0	0	0
Percent of fever cases tested with an RDT	0%	0%	0%
RDT Needs (tests)	144,925	84,550	37,200
Needs Estimated based on Other (specify in comments)			
Partner Contributions (tests)			
RDTs from Government	*0*	*0*	*0*
RDTs from Global Fund	144,925	84,550	32,700
RDTs from other donors (C19RM)	10,000	0	0
RDTs planned with PMI funding	12,500	0	0
Total RDT Contributions per Calendar Year	*167,425*	*84,550*	*32,700*
Stock Balance (tests)			
Beginning Balance	223,025	215,525	215,525
- Product Need	144,925	84,550	37,200
+ Total Contributions (received/expected)	167,425	84,550	32,700
Estimated expiry	30,000	0	0
Ending Balance	215,525	215,525	211,025
Desired End of Year Stock (months of stock)	0	0	0
Desired End of Year Stock (quantities)	28,985	16,910	7,440
Total Surplus (Gap)	***186,540***	***198,615***	***203,585***

Table A-7. RDT Gap Analysis Table [Lao PDR]

Calendar Year	2021	2022	2023
Total country population	7,095,919	7,202,358	7,310,393
Population at risk for malaria	1,573,316	1,596,129	1,619,273
PMI-targeted at-risk population	1,573,316	1,596,129	1,619,273
RDT Needs			
Total number of projected fever cases	643,349	675,516	709,292
Percent of fever cases tested with an RDT	83%	84%	85%
RDT Needs (tests)	**533,980**	**567,433**	**602,898**
Needs Estimated based on HMIS Data			
Partner Contributions (tests)			
RDTs from Government	*0*	*0*	*0*
RDTs from Global Fund	285,960	503,170	675,070
RDTs from other donors	150,000	0	0
RDTs planned with PMI funding	450,000	0	0
Total RDT Contributions per Calendar Year	***885,960***	***503,170***	***675,070***
Stock Balance (tests)			
Beginning Balance	450,660	802,640	738,377
- Product Need	533,980	567,433	602,898
+ Total Contributions (received/expected)	885,960	503,170	675,070
Ending Balance	802,640	738,377	810,549
Desired End of Year Stock (months of stock)	8	8	8
Desired End of Year Stock (quantities)	355,986	378,289	401,932
Total Surplus (Gap)	***446,654***	***360,088***	***408,617***

Although the majority of RDTs are procured through Global Fund resources and no RDT gaps are anticipated in Thailand or Lao PDR through 2023, PMI is supporting an emergency procurement of 12,500 RDTs for use in the quarantine centers along the borders to ensure malaria testing in addition to COVID-19 testing.

Key Question 5

What is the estimated need for ACTs during calendar years 2021–2023? Are there any projected ACT gaps?

Table A-8. ACT Gap Analysis Table [Thailand]

Calendar Year	2021	2022	2023
Total country population	69,480,520	69,661,169	69,842,288
Population at risk for malaria	696,502	451,623	274,967
PMI-targeted at-risk population	696,502	451,623	274,967
ACT Needs			
Total projected number of malaria cases	179	108	54
Total ACT Needs (treatments)	179	108	54
Needs Estimated based on Other (specify in comments)			
Partner Contributions (treatments)			
ACTs from Government	*0*	*2,000*	*0*
ACTs from Global Fund	1,500	0	0
ACTs from other donors *[specify donor]*	0	0	0
ACTs planned with PMI funding	2,000	0	0
Total ACTs Contributions per Calendar Year	*3,500*	*2,000*	*0*
Stock Balance (treatments)			
Beginning Balance	2,658	3,455	5,348
- Product Need	179	108	54
+ Total Contributions (received/expected)	3,500	2,000	0
Estimated Expiry	2,524	0	0
Ending Balance	3,455	5,348	5,294
Desired End of Year Stock (months of stock)	0	0	0
Desired End of Year Stock (quantities)	4,463	4,377	4,313
Total Surplus (Gap)	***(1,008)***	***971***	***981***

Table A-9. ACT Gap Analysis Table [Lao PDR]

Calendar Year	2021	2022	2023
Total country population	7,095,919	7,202,358	7,310,393
Population at risk for malaria	1,573,316	1,596,129	1,619,273
PMI-targeted at-risk population	1,573,316	1,596,129	1,619,273
ACT Needs			
Total projected number of malaria cases	3,768	2,864	2,177
Total ACT Needs (treatments)	***3,768***	***2,864***	***2,177***
Needs Estimated based on HMIS Data			
Partner Contributions (treatments)			
ACTs from Government	*0*	*0*	*0*
ACTs from Global Fund	13,873	21,653	8,596
ACTs from other donors *[specify donor]*	0	0	0
ACTs planned with PMI funding	0	0	0
Total ACTs Contributions per Calendar Year	***13,873***	***21,653***	***8,596***
Stock Balance (treatments)			
Beginning Balance	35,746	39,216	58,005
- Product Need	3,768	2,864	2,177
+ Total Contributions (received/expected)	13,873	21,653	8,596
Estimated Expiry	6,635	0	0
Ending Balance	39,216	58,005	64,424
Desired End of Year Stock (months of stock)	0	0	0
Desired End of Year Stock (quantities)	20,185	20,185	20,185
Total Surplus (Gap)	***19,031***	***37,820***	***44,239***

The true ACT gap in 2021 for Thailand is uncertain because there are ACT minimum stocks on hand at all service delivery points that might not be utilized. Otherwise, no other ACT gaps are anticipated in Thailand or Lao PDR through 2023.

Key Question 6

What is the estimated need for definitive treatment and pre-referral treatment for severe malaria during calendar years 2021–2023? Are there any anticipated gaps?

Table A-10. Inj Art Gap Analysis Table [Thailand]

Calendar Year	2021	2022	2023
Injectable Artesunate Needs			
Projected number of severe cases	50	30	15
Projected number of severe cases among children	0	0	0
Average number of vials required for severe cases among children	0	0	0
Projected number of severe cases among adults	50	30	15
Average number of vials required for severe cases among adults	15	15	15
Total Injectable Artesunate Needs (vials)	756	454	227
Needs Estimated based on Other (specify in comments)			
Partner Contributions (vials)			
Injectable artesunate from Government	2,000	0	0
Injectable artesunate from Global Fund	0	0	0
Injectable artesunate from other donors [specify donor]	0	0	0
Injectable artesunate planned with PMI funding	3,000	3,000	0
Total Injectable Artesunate Contributions per Calendar Year	*5,000*	*3,000*	*0*
Stock Balance (vials)			
Beginning Balance	53	4,297	6,843
- Product Need	756	454	227
+ Total Contributions (received/expected)	5,000	3,000	0
Ending Balance	4,297	6,843	6,617
Desired End of Year Stock (months of stock)	0	0	0
Desired End of Year Stock (quantities)	6,330	6,330	6,330
Total Surplus (Gap)	***(2,033)***	***513***	***287***

Table A-11. Inj Art Gap Analysis Table [Lao PDR]

Calendar Year	2021	2022	2023
Injectable Artesunate Needs			
Projected number of severe cases	8	6	5
Projected number of severe cases among children	0	0	0
Average number of vials required for severe cases among children	0	0	0
Projected number of severe cases among adults	8	6	5
Average number of vials required for severe cases among adults	10	10	10
Minimum Stock Requirements	2,600	2,600	2,600
Total Injectable Artesunate Needs (vials)	***84***	***64***	***49***
Needs Estimated based on HMIS Data			
Partner Contributions (vials)			
Injectable artesunate from Government	0	0	0
Injectable artesunate from Global Fund	0	2,852	0
Injectable artesunate from other donors [specify donor]	0	0	0
Injectable artesunate planned with PMI funding	0	0	0
Total Injectable Artesunate Contributions per Calendar Year	***0***	***2,852***	***0***
Stock Balance (vials)			
Beginning Balance	4,491	4,407	7,194
- Product Need	84	64	49
+ Total Contributions (received/expected)	0	2,852	0
Estimated Expiry	0	896	0
Ending Balance	4,407	7,194	7,146
Desired End of Year Stock (months of stock)	0	0	0
Desired End of Year Stock (quantities)	2,600	2,600	2,600
Total Surplus (Gap)	***1,807***	***4,594***	***4,546***

No injectable artesunate gaps are anticipated in Lao PDR through 2023.

Thailand has in the past procured artesunate injections domestically, but due to the recent cessation by the local manufacturer and inability to procure from a WHO pre-qualified source, a national gap is anticipated. Thailand's gap in 2021 will be addressed with an upcoming shipment of 3,000 vials in August 2021 and no further gaps are anticipated through 2023.

Key Question 7

What is the estimated need for any other standard antimalarial drug used in the country (e.g., primaquine for *P. vivax*) during calendar years 2021–2023? Are there any anticipated gaps?

Table A-12. Primaquine 7.5 Gap Analysis Table [Thailand]

Calendar Year	2021	2022	2023
Total country population	69,480,520	69,661,169	69,842,288
Population at risk for malaria	696,502	451,623	274,967
PMI-targeted at-risk population	696,502	451,623	274,967
PQ Needs			
Total projected Pf cases (single)	50	45	40
Total projected Pv cases (single and mixed)	1,262	1,136	1,022
Total Primaquine 7.5 mg Needs (tablets)	31,937	28,743	25,869
Needs Estimated based on Other (specify in comments)			
Partner Contributions (tablets)			
ACTs from Government	*0*	*0*	*0*
ACTs from Global Fund	3,000	0	0
ACTs from other donors *[specify donor]*	0	0	0
ACTs planned with PMI funding	35,000	0	0
Total ACTs Contributions per Calendar Year	***38,000***	***0***	***0***
Stock Balance (tablets)			
Beginning Balance	0	6,063	0
- Product Need	31,937	28,743	25,869
+ Total Contributions (received/expected)	38,000	0	0
Ending Balance	6,063	-22,680	-25,869
Desired End of Year Stock (months of stock)	0	0	0
Desired End of Year Stock (quantities)	70,456	66,943	63,781
Total Surplus (Gap)	***(64,393)***	***(89,623)***	***(89,650)***

Table A-13. Primaquine 7.5 Gap Analysis Table [Lao PDR]

Calendar Year	2021	2022	2023
Total country population	7,095,919	7,202,358	7,310,393
Population at risk for malaria	1,573,316	1,596,129	1,619,273
PMI-targeted at-risk population	1,573,316	1,596,129	1,619,273
ACT Needs			
Total projected Pf cases (single)	447	170	65
Total projected Pv cases (single and mixed)	3,321	2,694	2,112
% of P.v and mixed malaria cases tested with G6PD	22%	90%	92%
% of G6PD Deficiency	7%	7%	7%
Primaquine for all P.f cases, at all levels	894	340	130
Primaquine for P.v G6PD-def cases (7.5mg tabs)	2,433	8,123	6,549
Primaquine for P.v G6PD-normal cases	18,852	62,953	50,572
Primaquine for cases of P.v and mix that were not G6PD tested	124,657	13,270	7,824
Total Primaquine 7.5 mg Needs (tablets)	***146,836***	***84,686***	***65,075***
Needs Estimated based on HMIS Data			
Partner Contributions (tablets)			
Primaquine from Government	*0*	*0*	*0*
Primaquine from Global Fund	22,760	124,730	105,110
Primaquine from other donors *[specify donor]*	0	0	0
Primaquine planned with PMI funding	200,000	0	0
Total Primaquine Contributions per Calendar Year	***222,760***	***124,730***	***105,110***
Stock Balance (tablets)			
Beginning Balance	183,069	198,287	124,730
- Product Need	146,836	84,686	65,075
+ Total Contributions (received/expected)	222,760	124,730	105,110
Estimated Expiry	60,706	113,601	59,655
Ending Balance	198,287	124,730	105,110
Desired End of Year Stock (months of stock)	0	0	0
Desired End of Year Stock (quantities)	91,930	91,930	91,930
Total Surplus (Gap)	***106,357***	***32,800***	***13,180***

No primaquine gaps are anticipated in Lao PDR through 2023. For Thailand, there are no gaps anticipated for primaquine 15 mg tablets through 2023. Gaps are anticipated for the lower dose tablets which PMI will procure to allow for easier administration in pediatric populations.

Key Question 8

Are first-line ACTs effective and monitored regularly?

TES has been the flagship PMI activity in the region since 2011 and it was the TES network funded by USAID since 2001 that first detected the emergence of artemisinin resistance. To date, AS-MQ and pyronaridine-artesunate remain efficacious in Lao PDR for the treatment of *P. falciparum* and *P. vivax* infection. There were concerns of decreasing efficacy to AL, but it remains the first line treatment and recent studies have been more reassuring. In Thailand, DHA-PIP appears to be effective outside of Sisaket and Ubon Ratchathani provinces, where pyronaridine-artesunate is currently the first-line treatment for *P. falciparum.*

Supporting Data

Thailand

Table A-14. Recently completed and ongoing antimalarial therapeutic efficacy studies

Year	Sites	PMI Funded Y/N*	Treatment Arms	PCR-Corrected ACPR>90%	Location Molecular Resistance Work Completed or Planned
Oct 2017–Sept 2018 (iDES)	Pf and Pv cases in 8 pilot provinces	Y	DHA-PIP (Pf) CQ (Pv)	**2018 N=402 (Pf)** Overall: 94.7% Sisaket: 81.8% **2018 N=3,386 (Pv)** Overall: 99.1% Sisaket: 55.2%	PCR and molecular genotyping done at DVBD-MOPH, Thailand
Oct 2018–Aug 2019 (iDES)	Pf and Pv cases nationwide	Y	DHA-PIP (Pf) CQ (Pv)	**2019 N=575 (Pf)** Overall: 95.2% (95%CI 90.9-97.5) Sisaket: 58.3% (28.9-79.13) **2019 N=3,514 (Pv)** Overall: 96.4% Sisaket: 77.3% (95%CI 66.7-84.9)	PCR and molecular genotyping done at DVBD-MOPH, Thailand
Oct 2019–Sept 2020 (iDES)	Pf and Pv cases nationwide	Y	DHA-PIP (Pf) CQ (Pv)	**2020 N=192 (Pf)** Overall: 97.9% (95%CI 93.6-99.3) Sisaket and Ubon Ratchathani reported only 3 Pf patients; they received pyronaridine-artesunate and are not included in this analysis **2020 N=3,345 (Pv)** Overall: 97.1% Sisaket: 70.0% (95CI 45.1-85.2)	PCR and molecular genotyping done at DVBD-MOPH, Thailand

CQ – chloroquine; DHA-PIP – Dihydroartemisinin + piperaquine; DVBD – Division of Vector Borne Disease, Ministry of Public Health; iDES – integrated drug efficacy surveillance; IPC – Institute Pasteur Cambodia; MOPH – Ministry of Public Health; Pf – *Plasmodium falciparum*; pfmdr – *Plasmodium falciparum* multi-drug-resistance transporter gene; PCR – polymerase chain reaction; Pv - *Plasmodium vivax.*

** PMI funding supported technical assistance.*

Lao PDR

Table A-15. Recently Completed and Ongoing Antimalarial Therapeutic Efficacy Studies

Year	Sites	PMI Funded Y/N	Treatment Arms	ACPR>90%	Location Molecular Resistance Work Completed or Planned
2017	1. Salavanh 2. Champassak	Y	AL DHA-PIP	1. AL: 83% (Pf) 2. DHA-PIP: 56% (Pf)	IPC: All Day 0 DBS were tested for *k13*, *pfmdr1* copy # and *plasmepsin2*
2018	1. Salavanh 2. Champassak	Y	AS-PYR AS-MQ	1.100% (Pf); 100% (Pv) 2. 100% (P); 100% (Pv)	IPC: All Day 0 DBS were tested for *kK13*, *pfmdr1* copy # and *pPlasmepsin2*
2019–2020	1. Salavanh 2. Savanakhet 3. Champassak	Y	AL AL AL	1.100% (Pf); 100% (Pv) 2. 100% (Pf); 100% (Pv) 3. 96% (Pf); 100% (Pv)	IPC: All Day0 DBS were tested for *kK13*, *pfmdr1* copy # and *pPlasmepsin2*
2019 (iDES)	1. Luang Prabang 2. Phongsaly	Y	AL	Pf: n=0, Pv=3 (100%)	IPC: pending
2020 (iDES)	1. Luang Prabang 2. Phongsaly	Y	AL	Pf: n=0, Pv=14 (100%)	IPC: pending

AL – artemether + lumefantrine; AS-PYR – artesunate + pyronaridine ; AS-MQ – artesunate + mefloquine; CQ – chloroquine; DBS – dried blood spot; DHA-PIP – Dihydroartemisinin + piperaquine; ; K13 – Kelch 13; IPC – Institute Pasteur Cambodia; iDES – integrated drug efficacy surveillance; Pf – *Plasmodium falciparum*; pfmdr – *Plasmodium falciparum* multi-drug-resistance transporter gene; PCR – polymerase chain reaction; Pv – *Plasmodium vivax.*

Key Question 9

Are there other areas (e.g., lab strengthening, private sector support, etc.) that should be considered for PMI support?

PMI will support microscopy training and accreditation in the region and maintenance of regional and national slide banks and training of trainers for microscopy.

Supporting Data

As malaria control efforts become decentralized and the general health services structure or local health facilities are expected to take on more responsibility for malaria activities, the technical expertise across the full range of malaria management in the vertical programs is expected to weaken. Skilled microscopists are essential and a lack of this critical expertise will jeopardize elimination efforts.

Conclusions for Case Management Investments

- Although it is anticipated that Global Fund and domestic resources will meet most of the case management procurement needs, PMI will plan to fill any unanticipated gaps due to unanticipated outbreaks, natural disasters, or the end of Global Fund grant.

- PMI will continue to support TES and iDES, where implemented, to monitor drug efficacy in Thailand, Lao PDR, and Vietnam. With regional funding, PMI will support TA to all GMS countries for TES/iDES and will continue to support microscopy training and regional slide banks.
- Joint planning of PMI and Global Fund resources helps meet the overall case management needs within the public sector of Thailand and Lao PDR.
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2. DRUG-BASED PREVENTION

NMCP Objective

- Given the very low overall prevalence of malaria, IPTp is not recommended and has not been implemented in GMS countries. Instead, Thailand and Lao PDR provide ITNs to households in high-risk areas and ensure prompt diagnosis and treatment of malaria cases during pregnancy.
- The GMS countries do not implement SMC.
- Currently neither Thailand nor Lao PDR are implementing any drug-based prevention interventions in elimination settings, although an OR study is underway in Thailand to investigate community-led reactive focal mass drug administration and Lao PDR is piloting targeted mass drug administration and intermittent preventive treatment for high-risk groups (e.g., forest-goers) as part of a *P. falciparum* elimination acceleration plan.

NMCP Approach

Thailand

- The NMCP strategy supports distribution of ITNs to households in malaria risk areas, with beneficiaries including pregnant women.
- Pregnant women with suspected malaria are referred to the district hospitals for malaria diagnosis and treatment. First-line treatment for *P. falciparum* is quinine in the first trimester and AS-MQ in the second and third trimesters. *Plasmodium vivax* is treated with chloroquine in all trimesters. There is no policy to prevent vivax relapses during pregnancy.

Lao PDR

- The NSP supports procurement of small batches of ITNs for continuous distribution via health centers primarily for pregnant women and MMPs, for replacement of damaged ITNs, and for new residents in high-risk areas.
- Malaria treatment guidelines advise the use of oral quinine in the first trimester of pregnancy, but this is rarely found in hospital outpatients or ANCs nor is clindamycin widely available. AL is first-line for management of malaria in the second and third trimesters for both vivax and falciparum malaria. Similar to most countries in the Mekong, there is no policy or strategy to prevent vivax relapses during pregnancy.

PMI Objective in Support of NMCP

For Thailand and Lao PDR, PMI supports a two-pronged approach to prevent malaria infection among pregnant women including provision of ITNs and early effective case management of malaria and anemia.

PMI-Supported Recent Progress (2020 and 2021)

Thailand

- No drug-based prevention activities were supported.

Lao PDR

- No drug-based prevention activities were supported.

PMI-Supported Planned Activities (2022)

Thailand

- No drug-based prevention activities are planned.

Lao PDR

- No drug-based prevention activities are planned.

2.2.1. MALARIA IN PREGNANCY (MIP)

Key Goal

For Thailand and Lao PDR, PMI supports a two-pronged approach to prevent malaria infection among pregnant women including provision of ITNs and early effective case management of malaria and anemia, in accordance with WHO recommendations.

Key Question 1a

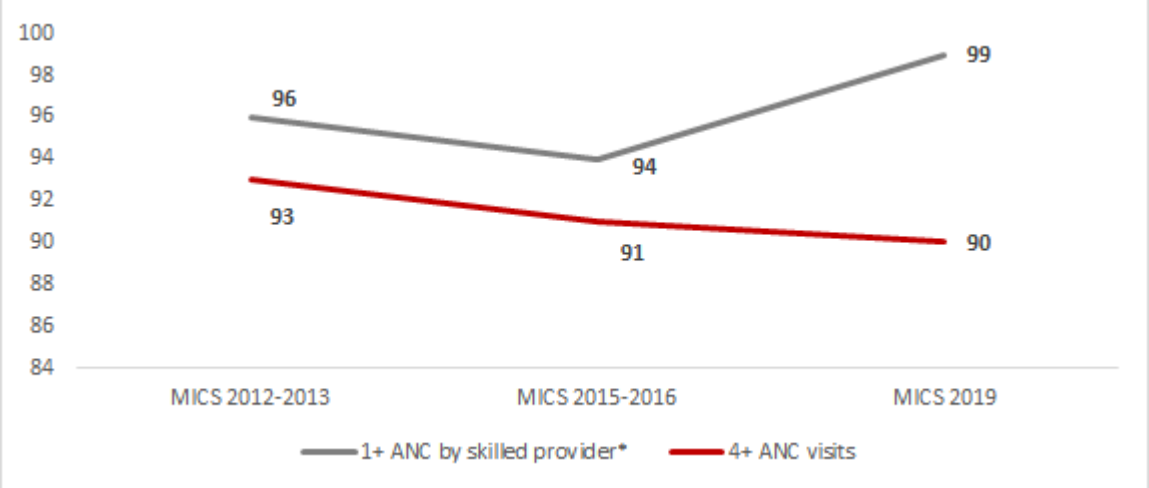
What proportion of pregnant women are accessing ANC early and frequently (as recommended by national and/or WHO strategies) during their pregnancy?

Supporting Data

Antenatal care attendance is generally high in all GMS countries; however, there are identified environmental barriers related to accessibility and cost of services, particularly among vulnerable populations, including MMPs and vulnerable populations residing in geographically remote, isolated areas.

Figure A-7. Trends in ANC coverage in Thailand

Percent of women 15 to 49 years of age with a live birth in the five years before the survey for the most recent birth

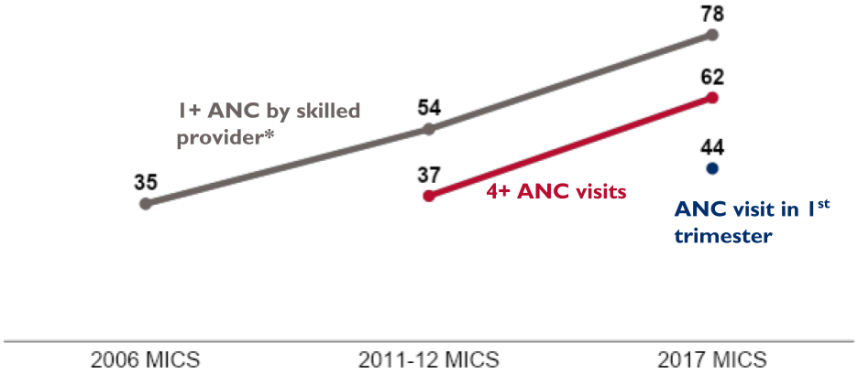


*Skilled provider includes doctor, nurse, midwife, or physician assistant.

ANC attendance is very high in Thailand (94 percent) and most pregnant women complete the recommended four visits (91 percent). Thailand follows the focused ANC guidance including promoting four ANC visits during pregnancy. The MOPH is aware of the updated 2016 WHO ANC guidance and is considering how to incorporate the new recommendations for Thailand.

Figure A-8. Trends in ANC coverage in Lao PDR

Percent of women 15 to 49 years of age with a live birth in the five years before the survey for the most recent birth



**Skilled provider includes medical doctor, nurse/midwife, or auxiliary nurse.*

In Lao PDR, 78 percent of pregnant women complete at least one ANC visit, with 62 percent completing the recommended four visits. The MOH has adopted the 2016 WHO ANC guidance including the recommended eight ANC visits during pregnancy.

Key Question 1b

Are there important health system and/or behavioral barriers to ANC attendance at health facilities?

Supporting Data

Thailand

According to the sixth Multiple Indicator Cluster Survey (MICS) conducted by the Thai National Statistical Office and United Nations Children's Fund (UNICEF) Thailand in 2019, the survey revealed that 98.6 percent of pregnant women had at least one ANC visit and 90 percent of them had four ANC visits by any provider, and 66.1 percent had at least 8 visits by any provider.

Since 2013, antenatal care services have been provided for free at Health Promotion Hospitals. These services include prenatal screening and preventative care, HIV counseling and testing for couples, and antiretroviral medicines to infants as soon as possible after birth, as well as provision of LLINs in malaria-risk areas. IPTp, which is not recommended for GMS countries, is not included in the services provided at ANC. Despite relatively good access to ANC services, uptake among pregnant migrant workers is correlated significantly with cultural beliefs around pregnancy. Particularly among ethnic minority groups and migrants, women may be reluctant to attend ANC because of language barriers and/or mistrust of medical providers and western medicine (https://he02.tci-thaijo.org/index.php/bkkmedj/article/view/239977/163617).

Lao PDR

Lao PDR has the highest maternal mortality rate (151 per 100,000 births) and under-five child mortality rate (46 per 1,000 live births) of all Association of Southeast Asian Nations (ASEAN) countries. Although 64 percent of deliveries were attended by a skilled birth attendant (2017), the number drops to 34 percent in rural areas without a road. Lack of access to health facilities and quality services, language, and cultural barriers and beliefs all contribute to the poor ANC attendance rates at health facilities. While social norms related to the roles and decision-making agency of women are diverse in Lao PDR, in general, women often rely on their husbands and families when it comes to health-seeking behaviors, with male household members deciding whether and where women will seek care. Financial factors are an important constraint to obtaining health advice or treatment. Furthermore, a lack of cultural competency and language skills among providers serving in diverse ethnic minority areas also contributes to lower utilization rates of ANC services.

Key Question 2

What proportion of pregnant women are receiving the recommended doses of IPTp?

Supporting Data

N/A—IPTp is not a national policy or intervention supported in Thailand or Lao PDR.

Key Question 3a

What is the gap between ANC attendance and IPTp uptake (i.e., missed opportunities for giving IPTp at ANC)?

Supporting Data

N/A—IPTp is not a national policy or intervention supported in Thailand or Lao PDR.

Key Question 3b

What significant health system and/or behavioral challenges affect provider delivery of MIP services (e.g., IPTp and ITN distribution at ANC)?

Supporting Data

N/A—IPTp is not a national policy or intervention supported in Thailand or Lao PDR.

Key Question 4

Does the national ANC program or health information system collect data and track the proportion of pregnant women with fever, those tested for malaria, those found to have malaria infection, and those who are treated?

Supporting Data

Thailand

Table A-16. Trends in proportion of women of reproductive age with malaria in Thailand (2016–2020)

	2016	2017	2018	2019	2020
# Women 15 to 44 years of age with malaria (%)	2,995 (15.7)	1,734 (15.0)	804 (12.0)	755 (13.9)	542 (13.7)
# Women with malaria (%)	6,847 (35.9)	3,955 (34.1)	1,912 (28.4)	1,815 (33.4)	1,341 (34.0)
# All malaria cases reported	19,059	11,585	6,724	5,433	3,945

Data on this intervention strategy is limited. Thailand does not report cases of malaria in pregnancy in the MIS. PMI was, however, able to extrapolate from the MIS database, the number of women of reproductive age and the number of malaria cases. Overall, the data indicates a decline in malaria cases in women of reproductive age.

Lao PDR

Although malaria in pregnancy data is captured in the DHIS2 malaria surveillance, data on reported cases of malaria in pregnancy is very limited. PMI will explore with DVBD and CMPE about the need to capture information on treatment of malaria in pregnancy.

Key Question 5

What is the estimated need for SP during 2021–2023? Are there any anticipated SP gaps? Are there gaps in other IPTp commodities?

Supporting Data

N/A—IPTp is not a policy or intervention in Thailand or Lao PDR.

Conclusions for MIP Investments

- PMI will support MIP interventions (ITNs and case management) reaching pregnant women through procurement of ITNs distributed to vulnerable MMPs, and in some cases to pregnant women attending ANC clinics as well as strengthening overall case management including ensuring commodities are available to diagnosis and manage cases of malaria in pregnancy.
- Please see FY 2022 MOP budget tables for a detailed list of proposed activities with FY 2022 funding.

2.2.2. SEASONAL MALARIA CHEMOPREVENTION (SMC)

SMC is not a recommended intervention for Thailand or Lao PDR.

2.2.3. ADDITIONAL DRUG-BASED PREVENTIVE STRATEGIES

Country Goal

Thailand

Thailand's National Malaria Elimination Strategy (2017–2026) calls for the elimination of all malaria cases by 2024. (Please see Section III for a description of Thailand's elimination strategy and objectives.)

DVBD's primary approach for eliminating malaria is the 1-3-7 strategy. There are no drug-based prevention approaches currently employed as national policy; however, a Global Fund operations research activity conducted in collaboration with DVBD is exploring the effectiveness of community-led reactive focal mass drug administration for reducing *P. falciparum/ P. vivax* targeting high-risk villages and forest workers. The cluster randomized trial in four provinces (40 subdistricts) of Thailand will assess the feasibility and acceptability of the reactive focal mass drug administration strategy.

Lao PDR

The goal of the NSP (2021–2025) is to eliminate *P. falciparum* malaria in the entire country and to eliminate all species of malaria in the 13 northern provinces. (Please see Section III for a description of Lao PDR's elimination strategy and objectives.) The Lao NSP does not currently support any drug-based prevention approaches. WHO and CMPE are observing Cambodia's experience with intensification activities including targeted mass drug administration and intermittent preventive treatment for forest-goers and may adapt these interventions for the Lao PDR context once more data and results are shared.

PMI Goal

Support the national strategy for pre-elimination or elimination addressing relevant geographic areas in accordance with WHO recommendations.

Thailand

PMI supports the DVBD's goals and objectives by supporting strengthening malaria programming at national and subnational levels and use of strategic information, providing limited commodity support and TA for improved surveillance and response, capacity-strengthening, and pharmaceutical management systems.

Lao PDR

PMI supports working with the national malaria program and in-country partners to assist the country to reach elimination nationally by 2030. PMI provides limited technical support to Lao PDR to improve technical and programmatic capacity of strategic information and strengthening the national malaria SM&E systems for malaria control and elimination.

PMI-Supported Recent Progress (2020 and 2021)

- PMI does not support any drug-based prevention strategies in Thailand or Lao PDR.

PMI-Supported Planned Activities (2022)

- PMI does not plan to support any drug-based prevention strategies in Thailand or Lao PDR.

Key Question 1

What specific drug-based preventive or proactive strategies are directed toward pre-elimination and/or elimination in the near-term? Which of these merit PMI support for FY 2022 funding with consideration of existing or planned national or other partner funding?

Supporting Data

Thailand conducts proactive case detection activities such as focal mass drug administration in hotspot areas. In perennial transmission areas (A1) two rounds per year of proactive case detection are conducted. In periodic transmission areas (A2), proactive case detection is done once per year. Although PMI has no plans to support any drug-based prevention approaches or proactive strategies in Thailand or Lao PDR, PMI will closely monitor the results and findings of the reactive focal mass drug administration study in Thailand as well as intensification plans in Lao PDR.

Conclusions for Other Preventive Drug-Use Investments

- No PMI investments are planned with FY 2022 MOP funds; however, PMI will monitor and await the results of current OR studies on drug-based prevention strategies.

3. CROSS-CUTTING AND OTHER HEALTH SYSTEMS

3.1. SUPPLY CHAIN

NMCP Objective

Thailand

To support Thailand's goal of malaria elimination by 2024, DVBD aims to expand the functionality of the malaria surveillance system and other relevant databases to reflect the malaria situation in each area. To this extent, they have proposed to develop a malaria-specific logistic and supply chain management application system for pharmaceuticals, insecticides, and other non-drug supplies to augment the malaria surveillance system with longer term plans for most malaria commodities to be incorporated into the general healthcare system of the MOPH.

Lao PDR

To support Lao PDR's goal of malaria elimination by 2030, CMPE has set as an objective to establish effective program management and coordination at all levels of the health system to efficiently deliver a combination of targeted interventions for malaria burden reduction and elimination. Its aim is to manage procurement and in-country supply chain management for pharmaceuticals and other malaria commodities to ensure continuous supply for all interventions.

NMCP Approach

Thailand

- In Thailand, the NMCP delivers commodities to facilities, particularly to the public sector malaria clinics and posts as well as Health Promotion Hospitals. Although Global Fund support has strengthened DVBD, Provincial Health Offices, and District Health Offices to ensure that commodities are monitored and distributed to health facilities at subdistrict and communities, there is no stock status information reported from health facilities for DVBD to efficiently respond to and adapt to malaria case load or outbreaks.
- DVBD has requested the Offices of Disease and Prevention Control to identify regional hospitals that could carry a minimum stock of key malaria commodities to be able to supply health facilities within the vicinity when in need. Shifting to this model would mean that smaller health facilities in regions of low transmission would no longer need to continually carry stock (that ends up expiring unused) yet there would be an efficient system in place to ensure they can access antimalarial pharmaceuticals swiftly from the regional hospitals upon request.
- Though the principle of "first expired-first out" is applied, nearly expired ACTs and RDTs are found at malaria posts in border areas. The above system of using regional hospitals should lead to fewer expired commodities.

Lao PDR

- In Lao PDR, health infrastructure and supply chain systems are relatively weak. Generally, the Procurement Unit of the Global Fund Principal Recipient procures most of the malaria commodities,

according to a forecast provided by CMPE. The pharmaceuticals are stored with the Medical Products Supply Center within the MOH. Once the commodities are delivered to a warehouse in the capital, the pharmaceuticals and other supplies are then distributed to the provinces per CMPE's recommendations. Commodities are supplied from the provinces, to district level, and then on to the health centers. Village health workers obtain their supplies from the health center. Supply chain delays and stockouts of RDTs and ACTs occur in part due to difficulties accessing geographic and hard to reach areas, and limited logistical and supply chain management capacity.

- The Medical Products Supply Center has been working with Clinton Health Access Initiative (CHAI) to pilot and scale up mSupply, a commodity logistics management tool, in the central warehouse and selected regional warehouses. The mSupply will be integrated into DHIS2 as part of the Global Fund Health Systems Strengthening component establishing an electronic logistics management information system (eLMIS).
- Efforts are being made by partners such as Global Fund, United Nations Office for Project Services (UNOPS), CHAI, and PMI to support CMPE in improving data use for forecasting and supply planning of malaria commodities and identifying and addressing bottlenecks in data and logistics management at the provincial and district levels. Improvements to the LMIS have been made to strengthen the stock reporting of malaria commodities. CMPE receives monthly summary reports from the provincial level containing aggregated consumption data from all districts, hospitals and health centers in each province. Previously CMPE received stock-on-hand data from the provinces via the Open Data Kit platform, mSupply, and DHIS2, but by the end of 2020, all data was transitioned to the DHIS2 platform.

PMI Objective in Support of NMCP

In addition to the procurement of malaria commodities, PMI also supports strengthening pharmaceutical management and supply chain systems in the region through the provision of TA in supply chain management. PMI supports improving system performance and visibility to ensure that malaria commodities are available when and where they are needed, strengthening in-country supply systems and enhancing the capacity for effective management of the malaria commodity supply chain.

PMI-Supported Recent Progress (2020 and 2021)

Thailand

- Supported the procurement of malaria commodities to contribute to national needs.
- Assisted in the development of a 2020–2022 supply plan for malaria commodities as an output of support given toward the annual forecasting and supply planning exercise.
- Conducted quarterly analysis of central stock levels, commodity procurements, and supply plans.
- PMI continued to provide technical support to DVBD to strengthen the county's capacity in supply chain management for malaria elimination and rapid response of any resurgences or outbreaks.
- Assisted in the improvement of commodity data visibility at the central level, management of logistics transactions and expiry tracking through the initial development of a paper-based and online data reporting platform for use at service delivery points and higher management points to augment the Malaria Information System.

Lao PDR

- Executed procurement process for the supply of malaria commodities for vector control and case management.
- PMI continued to provide TA to CMPE for supply chain management, support for supply chain coordination and strengthened stock management and reporting at subnational levels.
- Assisted in the development of a 2020–2022 supply plan for malaria commodities as an output of support given toward the annual forecasting and supply planning exercise.
- Conducted quarterly analysis of central stock levels, commodity procurements, and supply plans.

PMI-Supported Planned Activities (2022)

Thailand

- PMI will provide TA in the execution of procurement processes for the supply of malaria commodities.
- Assist in the development of a supply plan for malaria commodities as an output of support given toward the annual forecasting and supply planning exercise.
- Conduct quarterly analysis of central stock levels, commodity procurements, and supply plans.
- PMI will continue to provide TA to DVBD for supply chain management and LMIS strengthening in malaria endemic provinces and provinces transitioning to elimination and prevention of reintroduction.
- PMI will support the further development and rollout of the online Stock Reporting Application, which gathers stock status information at the health facility level where malaria products will be distributed to patients, and provides a dashboard, some analytical reports, and a warehouse reporting tool for documenting products received and distributed. This system will help improve malaria commodities' data visibility, track and manage products and avoid stockouts, strengthen stock reporting operation including inventory tracking, and replenish used or expired products. An eventual focus of PMI is to leverage this support toward its application within the general health service systems.

Lao PDR

- PMI will provide TA in the execution of procurement processes for the supply of malaria commodities.
- PMI will conduct a quarterly analysis of central stock levels, commodity procurements, and supply plans.
- PMI will continue to work with CMPE, UNOPS, and CHAI on malaria commodities forecasting and supply planning. PMI will provide TA to the quantification team to review the forecasting methodologies and existing tools, and to identify data needs and capacity gaps for forecasting and quantification for malaria commodities (taking into account epidemiology and seasonality factors). The results of the review will inform the quantification team on what and how to address the gaps to ensure continuous availability of needed commodities.

Key Goal

Ensure continual availability of quality products needed for malaria control and elimination (ACTs, RDTs, Art. Inj., and ITNs) at health facilities and community level.

Key Question 1

Has the central level, (or subcentral level, if appropriate) been stocked according to plan for ACTs, RDTs, and Art. Inj. over the last year (2020)? If not, have they been under, over, or stocked out?

Supporting Data

Though the central level does hold some stock, the standard procedure is for newly arrived shipments to be quickly distributed to provincial and regional levels. Stock levels from these subcentral points are not regularly communicated to the central level. It is anticipated that with PMI support the DVDB will be able to answer questions such as this in the future.

Thailand does not yet have a web-based system to track subnational stock information. PMI is providing support on the introduction and rollout of a stock reporting application that will be linked to the MIS. With the declining number of *P. falciparum* malaria cases, the requirements for DHA-PIP has lessened. However, ensuring a minimum stock in each facility will remain an important area of focus in the context of malaria elimination.

Central level stocks of AL were maintained between minimum to below minimum throughout 2020. Central level stocks of RDTs were maintained between minimum to below minimum throughout the second half of 2020 which is for when data is available. CMPE sets 20 vials of minimum stock in each provincial health facility and 10 vials in each district-level facility. The central level maintained sufficient stock throughout 2020 to address lower level needs.

Key Question 2

What are the trends in service delivery point stockout rates for ACTs (including ability to treat), RDTs, Art. Inj., and SP over the last year (if tracked)? Is there a seasonal or geographic difference in stockout rates?

Supporting Data

Data for determining trends in facility-level stockout rates in Thailand is not routinely made available to the central level program personnel or other stakeholders.

In Lao PDR, facility-level stockout rates are to be incorporated and rolled out within the DHIS2. Currently, there is no data available.

Key Question 3

What is the difference between quantities for ACTs consumed and malaria cases, and RDTs consumed and numbers tested? What is driving any differences seen?

Supporting Data

The small PMI allocations for RDTs and ACTs for Thailand and Lao PDR are intended to fill unanticipated gaps, particularly for situations where Global Fund or country procurements are delayed, to respond to outbreaks or upsurges in cases, or to reach MMPs. As facility consumption data for RDTs and ACTs is not routinely made available to the central level, comparisons between logistics and case data cannot be routinely made.

Key Question 4

To what extent does a functional LMIS provide visibility into timely and quality logistics data from various levels of the system? To what extent is commodity data visibility dependent on surveys or supervisory data rather than routine data reported by an LMIS?

Supporting Data

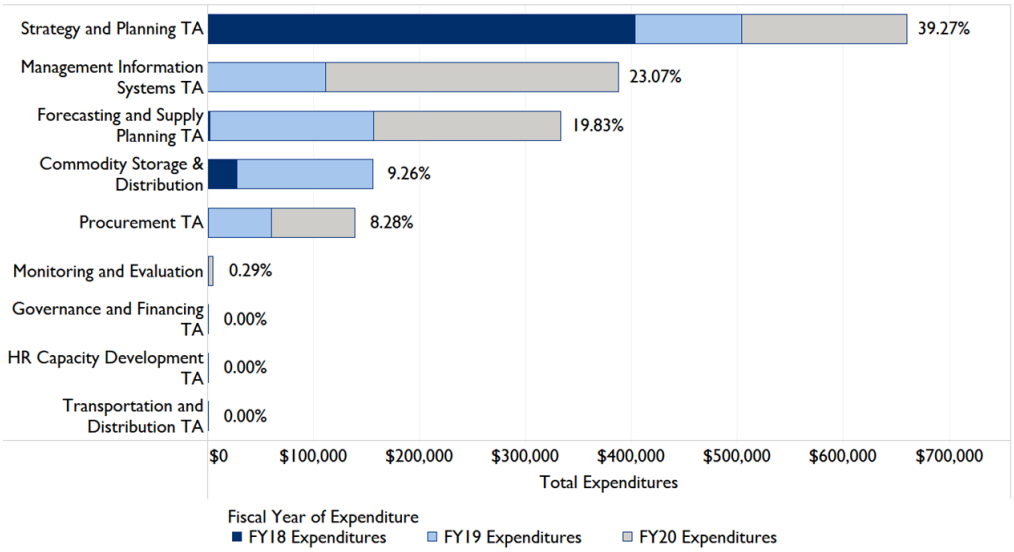
Determining and maintaining the appropriate quantity of different malaria commodities to keep on hand at the service delivery sites in a low-transmission setting requires routine logistics reporting of all service delivery point-managed commodities so that routine resupply can be well informed. Key data points such as LMIS reporting rates and central/facility level stockout rates cannot currently be produced for either Lao PDR or Thailand reflecting either the outright lack of a mechanism to produce key logistics data or, where a system exists that produced logistics data at lower levels, a current inability to access this data at the central level. In Thailand, PMI conducted a partner landscaping and further engagement with supply chain partners and ministry stakeholders to sharpen understanding of areas best suited for PMI-specific investment. From these insights, PMI developed an integrated 24-month supply chain stockout reduction investment plan, which will include a set of supply chain activities funded by PMI investments required to significantly and sustainably reduce stockouts. In addition, PMI supported the development of an online Stock Reporting Application (Phase 1) to gather stock status information at the health facilities level where malaria products will be distributed to patients, development of a dashboard, and some analytical reports. This system will help improve malaria commodities' data visibility, track and manage products and avoid stockouts, strengthen stock reporting operation including inventory tracking, and replenish used or expired products.

Key Question 5

What are the main supply chain TA functions supported by PMI? Are there additional investments that PMI should make (e.g., increasing visibility of demand at health facilities) to ensure continual availability of quality products needed for malaria control and elimination at health facilities and the community level? In areas performing well, is it dependent on PMI/donor funding (e.g., PMI and Global Fund pay for warehousing and distribution)? Should more be done to foster self-reliance in domestic systems and, if so, what approaches should be considered?

Supporting Data

Figure A-9. Distribution of PMI investments across supply chain technical area in Thailand and Lao PDR



Source: Global Health Supply Chain–Procurement and Supply Management (GHSC-PSM).

PMI investments in supply chain management technical areas for Thailand and Lao PDR have largely focused on TA Strategy and Planning (39 percent), Management Information Systems (23 percent), and Forecasting and Supply Planning (20 percent) in FY 2020.

Key Question 6

Are there any other considerations that impact funding allocation in this category? If there is a specific budget line item in Table 2 that is not covered by the above questions, address here.

Supporting Data

As malaria cases continue to decrease and malaria becomes increasingly focal, NMCPs will need TA to develop and improve the availability of logistics data at a coordinating and management level to ensure continuous availability of commodities while limiting expiry of unused products or stockouts resulting from expiries not being adequately planned for. PMI will continue to focus on providing TA to ensure that malaria information system data can be reviewed alongside the LMIS data while continuing to strengthen the quality of the LMIS data reporting.

Conclusions for Supply Chain Investments

Thailand

- PMI will gradually reduce commodities support as the burden of malaria declines and shift priority toward TA to improve supply chain management in the context of malaria elimination. Further support is needed to ensure rollout of the stock reporting tool and linkage to the MIS. PMI supports efforts geared toward improving the visibility of key logistics data at the central level in partnership with other donors.

- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

Lao PDR

- Support in Lao PDR has largely focused on commodities procurement to fill gaps due to support already provided by other partners on supply chain management. However, PMI will continue to improve coordination of supply chain support with other key stakeholders including UNOPS, CHAI, etc.
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.2. SURVEILLANCE, MONITORING, AND EVALUATION (SM&E)

NMCP Objective

Thailand

To support the goal of malaria elimination by 2024, Thailand aims to develop a single, responsive malaria elimination surveillance system capable of supporting the certification process while ensuring interoperability with the broader general health system.

Lao PDR

The objective is to transform malaria surveillance into a core intervention which emphasizes response, with the aim of eliminating malaria from the country by 2030.

NMCP Approach

Thailand

Malaria surveillance is the responsibility of the DVBD through a network of Malaria Clinics and Malaria Posts, managed by the vertical program, and health promotion hospitals and private clinics which are under the General Health Services. In malaria-free provinces that are already integrated, the Provincial Health Offices report malaria cases to the Bureau of Epidemiology's integrated surveillance system.

DVBD's approach includes the following:

- To develop capacity of Surveillance and Rapid Response Teams at all levels and enable them to implement malaria elimination activities.
- To conduct annual village-level stratification with four categories as follows: active foci (A1) with indigenous cases in the current year, residual non-active areas (A2) with cases reported within one to three years; (B1) with no malaria cases for more than three years, but in which vectors remain present, and non-transmission; and cleared foci (B2) with no malaria cases for more than three years and without vectors.
- To set up a comprehensive and prompt system of reporting, malaria case investigation, and rapid response using the 1-3-7 approach.
- To review all reports of malaria deaths.

Lao PDR

Malaria is overseen by the CMPE. Recognizing the heterogeneity of malaria transmission in the country, two surveillance and response guidelines have been developed: surveillance and response in burden reduction areas (Southern Provinces) and surveillance and response in elimination areas (Northern Provinces). In burden reduction areas, case reporting is based upon aggregated numbers that are reported monthly into the DHIS2 system and response is provided at the population level. In elimination areas, the low volume of confirmed cases allows for an individual-level case response.

- The BMGF has supported the development of an Emergency Operations Center for Public Health that sits in the Department of Communicable Disease Control within the Ministry of Health.
- Malaria was recently established as a notifiable disease in 2020.

PMI Objective in Support of NMCP

Thailand

PMI supports DVBD's goal for malaria elimination and will focus our support on TA to the national program in the following areas: (1) ensuring the collection and use of quality, standardized routine data that feeds into a comprehensive national surveillance system, particularly linking the data flow between the vertical and general health systems; (2) supporting DVBD in expanding the various modules of the malaria information system, including capacity for routine case follow-up and monitoring treatment outcomes, foci investigations, and supply chain management; and (3) supporting DVBD to document and disseminate lessons learned to the wider malaria community.

Lao PDR

PMI supports surveillance strengthening nationally, but is focused on individual case reporting and response (1-3-7) in malaria elimination districts.

PMI-Supported Recent Progress (2020 and 2021)

Thailand

- PMI continued to provide TA to improve SM&E, data quality, use of strategic information, and evaluation of malaria elimination models and interventions in Thailand with a focus on analysis and dissemination of information products.
- PMI supported DVBD to standardize Thailand's malaria-free verification process for the provinces. To date, PMI supported the development of data analysis briefs for Satun, Chiang Rai, and Buriram to facilitate the verification process.
- PMI published two key peer-review publications on malaria elimination in Thailand:
    - Implementation and success factors from Thailand's 1-3-7 surveillance strategy for malaria elimination. Malar J. 20:201 (2021). This paper is the first of two papers describing the implementation and outcomes of the 1-3-7 approach in Thailand.

- A Foci Cohort Analysis to Monitor Successful and Persistent Foci Under Thailand's Malaria Elimination Strategy. Malar J. 20:118 (2021). This paper analyzed and identified key factors that contribute to persistent foci, including proximity to international borders and forest disturbance.

Lao PDR

- PMI provided TA to improve SM&E, data quality, use of strategic information, and evaluation of malaria elimination models and interventions in Lao PDR. PMI supported the regular review of DHIS2 data to assess data quality (timeliness, completeness, and availability of expected reporting on malaria case notification, identification, and response) and data use.
- PMI provided TA to update and disseminate the National Surveillance Guidance for Malaria Elimination and Response.

PMI-Supported Planned Activities (2022)

Thailand

- PMI will explore support to DVBD as they pilot and roll out a new mHealth platform (REVEAL) to conduct foci investigations at the community-level. PMI will provide TA to support DVBD to link REVEAL data with the Malaria Information System in addition to exploring opportunities to integrate climate and environmental variables. The Malaria Information System in the long-term will be integrated into a broader Bureau of Epidemiology's information system.
- PMI will support the ongoing data collection, analysis and dissemination of findings from the iDES activities to inform guidelines for first-line treatment.

Lao PDR

- In coordination with the Global Fund, WHO, and the national malaria program, PMI will support the training of health staff in 125 malaria elimination districts on the updated National Surveillance Guidance for Malaria Elimination and Response, which focuses on case investigation, foci investigation, and response.
- PMI will conduct an assessment of the 1-3-7 approach to identify technical, operational, and programmatic gaps for effective implementation of this strategy.

Key Goal

To support the NMCP to build their capacity to conduct surveillance as a core malaria intervention using high quality data from both surveys and routine health information systems.

Key Question 1

Which data sources are available to inform estimates of intervention coverage, service availability and readiness, and morbidity and mortality?

Supporting Data

Table A-17. Available malaria surveillance sources in Thailand

Source	Data Collection Activity	2019	2020	2021	2022	2023	2024
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies (TES)						
Malaria Surveillance and Routine System Support	Integrated Drug Efficacy Surveillance (iDES)	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System (eLMIS)	X	X	X	P	P	P
Other	Knowledge, Attitudes and Practices Survey, Malaria Behavior Survey		X*				

* X denotes completed activities and P denotes planned activities.

Table A-18. Available malaria surveillance sources in Lao PDR

Source	Data Collection Activity	2019	2020	2021	2022	2023	2024
Malaria Surveillance and Routine System Support	Therapeutic Efficacy Studies (TES)	X*	X*	X*	X*	X*	
Malaria Surveillance and Routine System Support	Integrated Drug Efficacy Surveillance (iDES)				P	P	P
Malaria Surveillance and Routine System Support	Support to Parallel Malaria Surveillance System	X	X	X	P	P	P
Malaria Surveillance and Routine System Support	Electronic Logistics Management Information System (eLMIS)	X	X	X	P	P	P

*Asterisk denotes non-PMI funded activities, X denotes completed activities, and P denotes planned activities.

Key Question 2

What HMIS activities have been supported? What current priorities will be supported with FY 2022 MOP funding?

Supporting Data

PMI continues to provide technical support to improve SM&E, data quality, use of strategic information, and strengthening of the malaria information system to enhance case-based surveillance, investigation, and response activities based on the 1-3-7 strategy in Thailand and Lao PDR. In both countries, significant support is provided

through domestic resources and their respective country components of the regional Global Fund grant. As the malaria burden continues to decline, the programs will need to ensure capacity at the lowest levels to detect and respond to malaria cases and outbreaks and navigate the integration of the malaria information system into the broader general health system and Emergency Operation Center frameworks in Thailand and Lao PDR, respectively.

Key Question 3

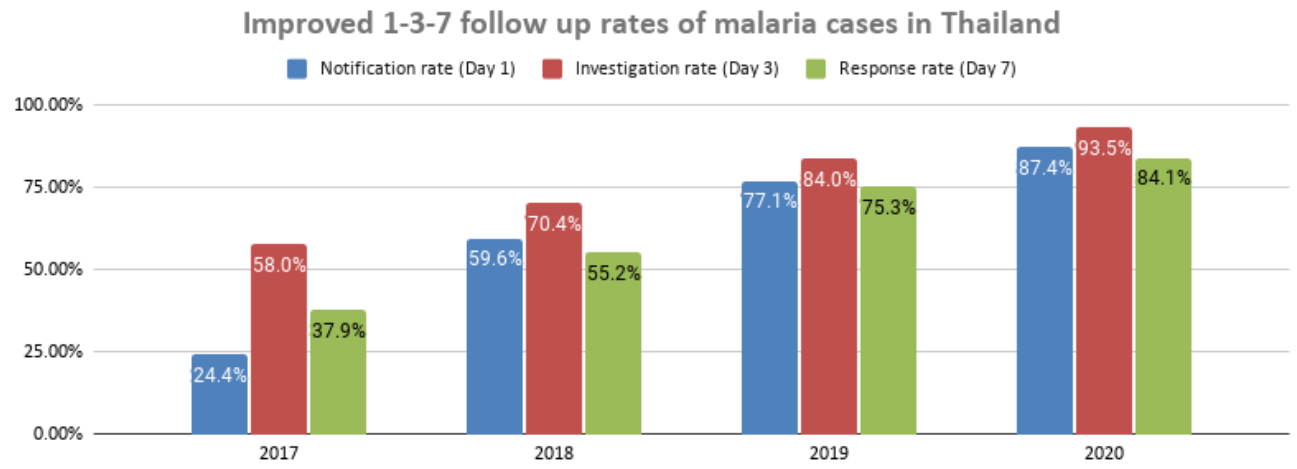
Are there specific outcomes of past/current HMIS strengthening efforts that can be identified?

Supporting Data

Thailand

Thailand implements the 1-3-7 strategy aimed to eliminate malaria by 2024. In 2020, the 1-3-7 reporting system indicated that 87 percent of cases are reported within one day, 94 percent of cases are investigated within three days, and 84 percent of reported cases are responded to within seven days with prevention and control interventions, showing a steady improvement of the 1-3-7 follow-up rates from previous years (Tables A-17 and A-18). The national program review of malaria indicators conducted in June 2019 recommended areas for improvement, including developing a system to monitor treatment adherence to ensure effective radical treatment of *P. vivax* malaria and strengthening application of real-time reporting and monitoring for implementation of 1-3-7 strategy at all levels.

Figure A-10. Trends of the 1-3-7 follow-up rates in Thailand (2017–2020)

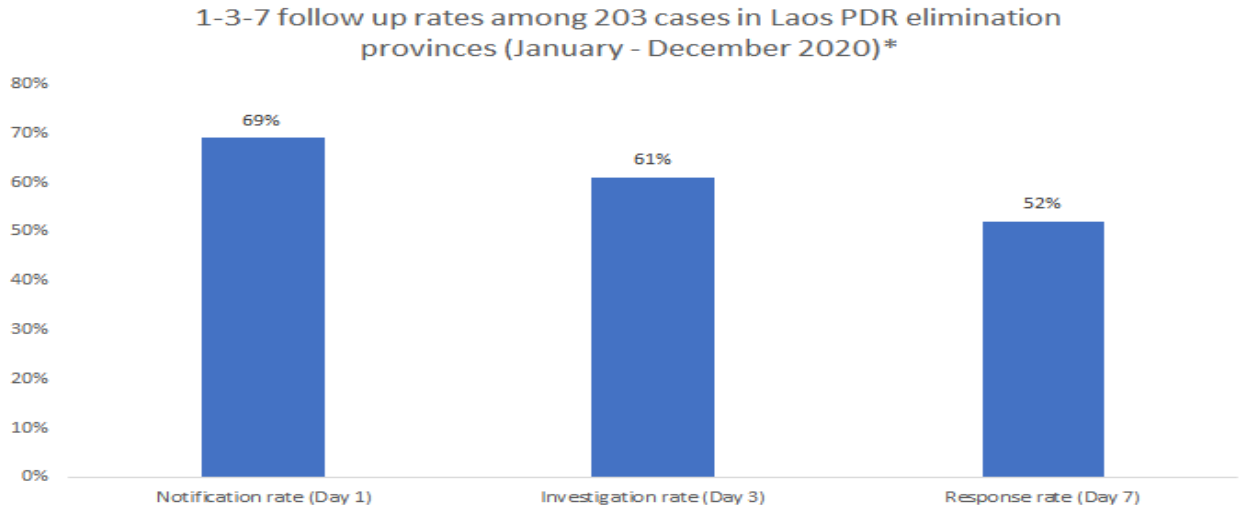


Source: Malaria information system, DVBD.

Lao PDR

With an updated risk stratification and national elimination strategy, Lao PDR is intensifying its case-based surveillance activities in all elimination districts using the 1-3-7 approach. The malaria module of the DHIS2 has expanded to include private-public mix data, elimination data (case notification, case investigation, case classification, focus investigation, and response), iDES, vector control interventions, and entomological surveillance.

Figure A-11. Preliminary results from 1-3-7 follow-up rates in seven provinces of Lao PDR (January–December 2020)



*Laos PDR had 3,501 confirmed malaria cases in 2020 (WHO MME, Vol 12 December 2020). Elimination provinces include Vientian Cap, Luangnamtha, Luangprabang, Huaphanh, Xayabury, Borikhamxay, and Khammuane and reported 203 cases during this period.

Source: CMPE.

Key Question 4

Are there any other considerations that impact your funding allocation in this category (e.g., strategic information or capacity-building in-country)?

N/A

Supporting Data

N/A

Conclusions for Surveillance, Monitoring, and Evaluation Investments

Thailand

- Thailand has been scaling up its 1-3-7 strategy nationally with significant improvements noted. Although data reporting has high rates of completeness, the quality of the data needs to be ensured, especially as malaria services transition from being provided and reported by vertical malaria clinics/posts to integrated health promotion hospitals providing broader services. PMI will provide TA support on mHealth tools to improve M&E and supervision and online training tools.
- PMI will strengthen support on effective integration of malaria services and reporting from the general health services (e.g., health promotion hospitals).
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

Lao PDR

- PMI will continue to strengthen implementation of 1-3-7 and support use of DHIS2 data to inform decision-making at all levels, particularly capacity strengthening at district level.
- PMI will explore a digital landscape analysis in Lao PDR to improve reporting and response in remote communities.
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding.

3.3. OPERATIONAL RESEARCH

NMCP Objective

Thailand

To support the vision of a malaria-free Thailand by 2024, DVBD aims to conduct research to develop knowledge, technology, innovation, interventions, and guidelines for surveillance, prevention, and elimination of malaria to fit with local situations.

Lao PDR

The Lao National Strategic Plan for Malaria Control and Elimination 2021–2025 aims to eliminate malaria by 2030 and includes a strategic intervention area to expand OR to guide strategic decisions, to use technology to address bottlenecks, and innovative ways to address residual malaria transmission and effectively deliver services to hard-to-reach populations.

NMCP Approach

Thailand

The National Malaria Elimination Strategy, 2017–2026, identified several research priorities related to malaria elimination (e.g., detection of asymptomatic cases, use of primaquine and pharmacovigilance, prevention of outdoor transmission, drug safety and drug resistance, development of an information technology system and applying it to drug resistance, insecticide resistance, etc.). DVBD identified research topics around reactive case detection, highly sensitive RDT, and long-lasting insecticide jacket nets as short-term research priorities.

Lao PDR

CMPE's approach includes an annual review of available and relevant national and regional research findings convened by CMPE and WHO. Their current prioritized topics include utility of targeted drug administration within elimination-targeted provinces, intermittent preventive treatment for forest-goers, potential opportunities for more sensitive diagnostics, and strategies for expanding G6PD testing and improving adherence to radical cure for *P. vivax*.

Annual technical reviews of research findings will be conducted by the Technical Working Group. Regular meetings between CMPE representatives and research partners will ensure a coordinated national approach.

PMI Objective in Support of NMCP

PMI keeps abreast of the evolving country and regional OR priorities, OR results from studies in the region, and development of promising highly sensitive point-of-care diagnostics or outdoor transmission measures to plan accordingly. In addition, PMI participates in the Global Fund's RAI3E OR subcommittee to guide its OR investment decisions for the region.

PMI-Supported Recent Progress (2020 and 2021)

- There were no PMI-supported OR activities in Thailand or Lao PDR during the last 12–18 months.

PMI-Supported Planned Activities (2022)

- No PMI-supported OR activities will be undertaken in Thailand or Lao PDR in the next 12 months.

PMI Goal

PMI will conduct PE/OR that helps to evaluate coverage of population at-risk, intervention quality, or delivery efficiency; study reducing malaria transmission and disease burden; test effectiveness of new or evolved priority interventions and strategies; or explore new metrics and mechanisms to assess intervention impact.

Key Question 1

In consultation with the NMCP, have technical challenges or operational bottlenecks in program interventions been identified that require PE/OR? How have they been prioritized?

Supporting Data

Table A-19. Ongoing program evaluation and operational research in Thailand

Funding Source	Implementing Institution	Research Question/Topic	Status/Timeline
RAI2E (Regional)	UCSF	Targeting high-risk populations with enhanced reactive case detection: A study to assess the effectiveness and feasibility of reducing *P. falciparum* and *P. vivax* malaria in Southern Lao PDR and Thailand	Extended through Dec 2021
MMV	PATH	Feasibility study to assess introduction of G6PD testing before tafenoquine administration	Planned for 2021

Lao PDR

According to the NSP, the priority topics for operational research include the following:

- Preventative tools to tackle outdoor transmission among forest-goers
- New tools for *P. vivax* radical cure

- Improving patient compliance to paraquat
- Improving quality of SBC activities to ensure uptake by at-risk populations
- Approaches to address high-risk groups including cross-border and internal migrants

Table A-20. Ongoing program evaluation and operational research in Lao PDR

Funding Source	Implementing Institution	Research Question/Topic	Status/Timeline
RAI2E (Regional)	UCSF	Targeting high-risk populations with enhanced reactive case detection: A study to assess the effectiveness and feasibility of reducing *P. falciparum* and *P. vivax* malaria in Southern Lao PDR and Thailand	Extended through Dec 2021
US Department of Defense	AFRIMS	Evaluation of permethrin-treated uniforms and spatial repellents in the military population	2021

Table A-21. Ongoing regional program evaluation and operational research

Funding Source	Implementing Institution	Research Question/Topic	Status/Timeline
RAI2E (Regional)	MORU	Minimizing the risk of malaria among forest-goers in the Greater Mekong Subregion (Cambodia, Thailand, Lao PDR)	June 2021
RAI3E (Regional)	MORU, APMEN, UCSF, AHEAD	Sustaining village health worker programs with expanded roles in the GMS (Cambodia, Thailand, and Vietnam)	Jan 2021–Dec 2022
RAI3E (Regional)	Institute Pasteur Cambodia, AFRIMS, PATH	Plasmodium vivax elimination in the GMS: targeting the hypnozoite reservoir, expanding access to radical cure treatments, and enhancing safe and effective case management (Cambodia)	Jan 2021–Dec 2022
RAI3E (Regional)	Burnet Institute, HPA	Personal protection packages for reducing residual malaria transmission in forest-going mobile and migrant populations in the Greater Mekong Subregion (GMS): Stepped-wedge trials with nested mixed methods study (Myanmar, Cambodia, Vietnam, and Lao PDR)	Jan 2021–Dec 2022
RAI3E (Regional)	Burnet Institute, HPA	Optimizing 1-3-7 surveillance and response strategies to achieve malaria elimination across the Greater Mekong Subregion (Myanmar, Cambodia, Lao PDR, Thailand, and Vietnam)	Jan 2021–Dec 2022

Key Question 2

Are there specific challenges in any intervention areas that merit further exploration or research with the potential of establishing strategies or interventions applicable in the near future?

Supporting Data

Outdoor transmission for forest-goers including the role of spatial repellents and ivermectin, point-of-care G6PD tests, rollout and safe use of tafenoquine, and chemoprevention measures such as targeted drug administration and intermittent preventive treatment for forest-goers are topics that warrant further exploration and/or research.

Key Question 3

Are there any other considerations that impact your funding allocation in this category?

There are no other areas for further considerations at this time.

Supporting Data

N/A

Conclusions for Program Evaluation and Operational Research Investments

- Key OR questions for Thailand and Lao PDR are currently supported through RAI3E and BMGF funding. PMI will monitor closely the outcomes of these OR projects to inform potential rollout in the near future.

3.4. SOCIAL AND BEHAVIOR CHANGE (SBC)

NMCP Objective

Thailand's national malaria elimination strategy (2017–2026) includes an objective to promote and empower communities to prevent and control malaria themselves. To this end, the national strategy calls on communities and individuals to participate in malaria control activities.

The Lao NSP (2021–2025) supports a comprehensive SBC strategy and includes a strategic objective calling for the implementation of a comprehensive SBC approach for malaria elimination of malaria through comprehensive behavior change communication, community mobilization, and advocacy. The program will work with the national MOH Centre for Information, Education, and Health and implementing partners and communities to educate target groups on malaria and its prevention and support improved access to malaria services.

NMCP Approach

Thailand

With Global Fund support, Thailand provided comprehensive SBC, community mobilization, and access to health services for both Thai people and migrants residing in malaria transmission zones in the 44 provinces in Thailand that border neighboring countries. DVBD developed a framework for SBC for the Thai population that encourages acceptance of IRS, prompt care-seeking behaviors for forest-goers and pregnant women, treatment

adherence, use of ITNs, and use of insecticide-treated hammock nets when staying outdoors. SBC activities targeting displaced Burmese MMPs along the Thai–Burma border and other migrant populations in Thailand along border provinces are implemented by nongovernmental organizations (NGOs).

Thailand attracts migrant workers from neighboring countries, particularly from Burma, Cambodia, and Lao PDR. Approximately half of the malaria cases in Thailand are among migrant workers from neighboring countries. The majority of these workers are laborers in farms, fruit orchards, and rubber plantations. Their employers are important gatekeepers for their movement, disease prevention, and access to services. Access to prevention and treatment services has been improved through ITN distribution and community-based services provided at malaria posts along border areas. In integrated areas (where malaria clinics are no longer present), health promotion hospitals are expected to provide malaria services along with health education and prevention.

Lao PDR

The Lao NSP (2021–2025) ensures at-risk populations gain access to and utilize interventions to prevent and/or treat malaria by increasing the populations' understanding of malaria through targeted messaging and appropriate media, including specific SBC for malaria during pregnancy. To this end, CMPE works with the National Center of Information and Education for Health and key stakeholders to develop a national communication and advocacy plan in line with the NSP and informed by community surveys. There is a Technical Working Group for SBC, which involves key stakeholders, such as the Ministry of Forest and Agriculture, the Ministry of Education, Ministry of Labor, Ministry of Defense, Ministry of Information and Culture, Lao Women's Union, and relevant youth organizations.

The NSP targets both static and mobile populations for malaria SBC activities. Static populations are defined as people who live in at-risk villages (mainly ethnic minorities) and who live in formal settlements in large-scale development, construction projects, plantations, or army camps. MMPs are defined as any Lao or foreign worker or their family members who migrate or reside for less than six months (mobile people) or between six to 12 months (migrant people) for economic or labor-related reasons within Lao PDR or across borders in neighboring countries. They are a high-risk group for malaria infection due to their heightened exposure in remote or forest areas and lack of access to quality public health services, among other reasons.

Under the Global Fund RAI3E, CSOs and local NGOs assist CMPE with implementing the SBC strategy in Lao PDR. Their activities include annual campaign planning meetings concerning messaging content and means of transmission and ensuring the successful development of SBC messages for malaria control and elimination targeting relevant at-risk populations. Mass communication campaigns for malaria include posters, pamphlets, radio advertisements, signs, billboards, and social event involvement. Community mobilization to improve awareness about malaria risk, prevention, diagnosis, and treatment are conducted through meetings for community engagement and World Malaria Day annually. CMPE and partners conduct site visits for supervision and monitoring of SBC activities at provincial and district levels.

PMI Objective in Support of NMCP

In both Thailand and Lao PDR, PMI provides limited and targeted TA support for SBC to improve access to and use of malaria interventions. PMI supports translating SBC materials into the appropriate languages of the targeted populations and integration of SBC messaging with malaria case management services, including for pregnant women and forest-goers.

PMI-Supported Recent Progress (2020 and 2021)

- In 2020, Thailand conducted a KAP survey, for which PMI provided TA on social and behavioral change questions. The final report from this survey is still pending due to delays from the COVID-19 pandemic.
- PMI has provided TA for SBC to both DVBD and CMPE. Past support included translating SBC materials into the appropriate languages of the targeted populations and integration of malaria case management services, including for pregnant women, into routine health services in Thailand. Health promotion hospitals now provide malaria testing and treatment services, as well as ANC, with MIP-specific SBC integrated.

PMI-Supported Planned Activities (2022)

- No specific funding is planned for support of SBC activities in the next 12 months; however, PMI RDMA staff continue to stay engaged at the national level and provide TA and support to the DVBD and CMPE for their SBC efforts as needed.

Key Goal

Through the use of SBC interventions and in alignment with a country's national malaria control communication strategy, PMI supports the uptake and correct and consistent use of malaria interventions, thereby improving the overall quality of malaria control efforts that will contribute to reductions in malaria.

Key Question 1

What behaviors is PMI proposing to prioritize through its SBC programming? What data support this prioritization? Will support be geographically targeted or national?

Supporting Data

PMI is not currently planning to support any SBC activities in Thailand or Lao PDR with FY 2022 funds. Rather, SBC activities will be implemented by CSOs and NGOs as part of the Global Fund RAI3E grant, with emphasis on prompt care-seeking among migrant and at-risk populations. However, PMI/RDMA staff will continue to provide SBC TA to the DVBD and CMPE as needed.

Key Question 2

For prompt care-seeking for febrile illness in Thailand and Lao PDR, what gaps exist in understanding the barriers to the adoption and maintenance of malaria prevention and treatment behaviors?

Supporting Data

Further information is needed to understand decisions guiding timely care-seeking for febrile illnesses among at-risk populations, including forest-goers and MMPs. To the extent possible, PMI staff will provide technical support to NMCPs to facilitate further investigations, as well as the use of appropriate SBC approaches for reaching migrant and mobile populations in Thailand and at-risk populations in Lao PDR. However, at this time, no specific funding has been allocated for such activities.

Key Question 3

What is the country's capacity to design, implement, and monitor SBC interventions at the national and subnational level?

PMI is not currently planning to support any SBC capacity-building activities in Thailand or Lao PDR with FY 2022 funds. SBC capacity at national and subnational levels in Thailand and Lao PDR are supported through the Global Fund RAI3E grant.

Conclusions for SBC Investments

- No SBC-specific activities are planned with FY 2022 MOP funding. However, PMI in-country staff will support DVBD and CMPE with their SBC strategies and implementation.

3.5. OTHER HEALTH SYSTEMS STRENGTHENING

NMCP Objective

Thailand

To address human resource challenges as malaria continues to decline, one of the strategies of the Thailand National Malaria Elimination Plan is to promote and empower communities as part of the effort for decentralization. Integration of malaria services with the general health system is considered a priority for the malaria program.

Lao PDR

The Lao PDR Government's malaria mission is to collaborate with all related line ministries and departments as well as key implementing partners to empower the health staff at all levels and communities to wage a rigorous battle against malaria until its elimination from the country.

NMCP Approach

Thailand

Among other strategic initiatives, DVBD proposes the following:

- Development of staff capacity on malaria diagnosis in the following areas:
  - Develop/revise training curriculum on malaria diagnosis
  - Develop staff capacity in malaria microscopy
  - Conduct refresher training for microscopists and develop their capacity/proficiency to reach international standards
  - Develop staff capacity in using malaria RDTs
  - Develop staff capacity in testing of G6PD deficiency
- Formulation of a policy for Malaria Elimination as a national agenda and set mechanisms for collaborative implementation

Lao PDR

Much progress has been made in Lao PDR with overall life expectancy of Lao citizens reaching 67.6 years. However, government investments in the health sector remain low at 5.6 percent of total government expenditure and out-of-pocket expenditures accounted for 45.1 percent. Compared to its neighboring countries, Lao PDR has one of the lowest rates of health providers per 1,000 population (0.24 doctors, 0.82 nurses, and 0.09 midwives per 1,000 population).

The health management information system has been transformed, shifting from Excel and paper-based with poor data quality to a web-based system with real-time data for decision-making. Nonetheless, the capacity to use such technology remains a challenge among health personnel.

Malaria related and integrated health system strengthening have been incorporated into the DHIS2 recently. Where data from village health workers, health centers, district and provincial levels can be used for planning and decision-making.

The Lao Government has committed to strengthening the health system through focusing on the following five priorities of the Health Sector Reform Framework:

1. Strengthening human resource capacity
2. Improving health sector financing
3. Improving the governance, organization and management of the health system
4. Improving health service delivery and hospital management
5. Improving the overall monitoring and evaluation framework and the health information system

Among other strategic initiatives, the following have been proposed:

- CMPE proposes to arrange external quality control evaluations for all microscopists at CMPE and Provincial and District Malaria Control Stations to measure the staff skill level and identify microscopists who need additional training support.
- CMPE will establish a national malaria slide bank and maintain slides for reference and training.

PMI Objective in Support of NMCP

Building capacity and strengthening health systems is identified in the PMI Strategy 2015–2020 as a core area of strategic focus, which states that successful country-owned and country-led malaria control programs are only possible when country programs possess appropriately-skilled human resources and the necessary infrastructure to plan, implement, and monitor progress of their malaria control activities.

PMI-Supported Recent Progress (2020 and 2021)

- Due to the COVID-19 pandemic, several planned national and regional trainings were postponed. The entomology workshop, in coordination with Kasetsart University in Thailand and APMEN VCWG was cancelled because of the complications of holding a face-to-face training with fieldwork due to COVID-related travel restrictions for both the hosting country and participants, but the plan is to shift this to a virtual training in late 2021.

PMI-Supported Planned Activities (2022)

- PMI will support a broad array of HSS activities that cut across intervention areas (described in earlier sections), such as training of health workers on microscopy, supply chain management, and health information systems strengthening, as well as NMCP capacity-building through regional and in-country trainings.
- PMI will support one subnational in Lao PDR and one international/regional training workshop on malaria elimination. PMI will also support the second regional training on malaria vector surveillance for elimination, which will be conducted in Thailand.

Key Goal

Support programs to transition donor supported activities and systems to a more integrated program supported by domestic resources to sustain the malaria elimination efforts.

Key Question 1

In order to sustain gains toward malaria elimination, what key health system strengthening areas should be prioritized for support by DVBD and CMPE?

Supporting Data

As both Thailand and Lao PDR pursue elimination, integration of malaria services and malaria reporting and response activities are critical areas of focus. In addition to PMI support, increased domestic support and support from other donors and partners have supported integration, sustainability, and transition efforts in the region. As an example, Lao PDR stood up an Emergency Operations Center to both accelerate malaria elimination and prepare for future public health emergencies furthering malaria integration and elimination sustainability. In Thailand, to support local engagement and sustainable financing of malaria activities, DVBD and partners have provided technical support for advocacy and training health officials and subdistrict local administrative organizations in provinces with ongoing malaria transmission. This support has resulted in an increased local administrative organization contribution to malaria from 1.6M Baht ($53,300) in 2017 to 5.1M Baht ($170,000) in 2020. A multi-stakeholder, Transition Readiness Assessment for Malaria with support from BMGF has been conducted to identify action areas to prepare for reductions and the eventual end of donor financing. The findings of the assessment were incorporated into RAI3E activities.

Conclusions for Additional Health Systems Strengthening Investments

- Strengthening national program capacity is a critical area of strategic focus within the PMI strategy. Depending on need and evolving epidemiology, PMI will continue to support national and regional capacity-building and training efforts on program management, malaria elimination, quality assurance/quality control for diagnostics, supply chain, SM&E, and entomology.
- Please see FY 2022 PMI budget tables for a detailed list of proposed activities with FY 2022 funding