

Programmatic Review of the National Malaria Programme in Thailand

31st August – 11th September 2015

Summary Report

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Disclaimer

Opinions and views expressed in the report are only those of the review team members.

Acronyms and abbreviations

A1	Perennial transmission area
A2	Seasonal transmission areas (less than six months)
ABER	Annual blood examination rate
ACD	Active case detection
ACT	Artemisinin-based combination therapy
ACT Malaria	Asian Collaborative Training Network for Malaria
ADB	Asian Development Bank
AFRIMS	Armed Forces Research Institute of Medical Sciences
AMI	Aide Médicale Internationale
AMT	Artesunate monotherapy
AP	Atovaquone-proguanil
API	Annual parasite incidence
ARC	American Refugee Committee
B1	Area with no local transmission but presence of malaria vectors (high to moderate receptivity)
B2	Area with no local transmission without malaria vectors (low receptivity)
BCC	Behaviour change communication
BIOPHICS	Center of Excellence for Biomedical and Public Health Informatics, Faculty of Tropical Medicine, Mahidol University
BMGF	Bill & Melinda Gates Foundation
BMP	Border Malaria Posts
BoE	Bureau of Epidemiology

BPS	Bureau of Policy and Strategy
BVBD	Bureau of Vector Borne Diseases
CBO	Community-based organization
CCM	Country Coordinating Mechanism
CCSDPT	Committee for Coordination of Services to Displaced Persons in Thailand
CHW	Community health worker
CIS	Case investigation survey
CSO	Civil society organizations
DDC	Department of Disease Control
DFID	Department for International Development
DHO	District health office
DHSS	Department of Health Services Support
DMS	Department of Medical Science
DOT	Directly Observed Therapy
ECHO	European Commission Humanitarian Aid Office
EU	European Union
FDA	Food and Drug Administration
FHI	Family Health International
GDP	Gross domestic product
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHS	General Health Services
GMAP	Global Malaria Action Plan
GMP	Global Malaria Programme
GMP	Good manufacturing practices
GMS	Greater Mekong Subregion
GPO	Governmental Pharmaceutical Organization (in Thailand)
HC	Health centre

HIS	Health information system
HPH	Health Promotion Hospital
HR	Human resources
HSS	Health systems strengthening
HV	Health volunteer
IEC	Information education and communication
IOM	International Organization for Migration
IPR	Intellectual property rights
IPSR	Institution for Population and Social Research, Mahidol University
IRC	International Rescue Committee
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito nets
JICA	Japan International Cooperation Agency
K.I. Asia	Kenan Institute Asia
KAP	Knowledge, attitudes and practice
LAO	Local administration office
LFA	Local fund agency
LLIHN	Long-lasting insecticide treated hammock net
LLIN	Long-lasting insecticide treated net
M&E	Monitoring and evaluation
M.Sc	Master of Science
M1	Non-Thai citizen living in Thailand for more than six months
M2	Non-Thai citizen in Thailand for less than six months (highly mobile population)
MBS	Mass blood survey
MC	Malaria clinic
MC Asia	Malaria Consortium Asia
MCU	Mahachulalongkornrajavidyalaya University

MDG	Millennium development goals
MDR	Multi-drug resistance
MESST	Monitoring and evaluation system strengthening tool
MHV	Migrant health volunteer
MIS	Malaria information system
MLO	Migrant liaison officer
MMC	Mobile malaria clinic
MMFO	Management of malaria field operations
MMW	Mobile malaria worker
MoE	Ministry of Education
MoL	Ministry of Labour and Social Security
MoPH	Ministry of Public Health
MP	Malaria post
MPH	Master of Public Health
MPW	Malaria post worker
MORU	Mahidol Oxford Research Unit
MW	Migrant worker/s
NA	Not available
NESDB	National Economic and Social Development Board
NGO	Nongovernmental organization
NHSO	National Health Security Office
NMCP	National Malaria Control Programme
ODPC	Office for Disease Prevention and Control
OFDA	Office of U.S. Foreign Disaster Assistance
OR	Operational research
ORSC	Operational research steering committee
PA	Planning and administration
PATH	Program for Appropriate Technology in Health

PCR	Polymerase chain reaction
PFD	Partners for development
PHD	Provincial health department
PHO	Provincial public health office
PK	Pharmacokinetic
PR	Principal recipient
PSM	Procurement and supply management
QA	Quality assurance
R2	GFATM Round 2
R7	GFATM Round 7
R9	GFATM Round 9
R10	GFATM Round 10 (SSF)
RBM	Roll back malaria
RDMA	Regional Development Mission–Asia
RDT	Rapid diagnostic test
RTF	Raks Thai Foundation
RTIC	Rajanagarindra Tropical Disease International Centre
SCD	Special case detection
SDA	Service delivery area
SEARO	WHO South-East Asia Regional Office
SME	Surveillance, monitoring and evaluation
SMRU	Shoklo Malaria Research Unit
SOP	Standard operational procedures
SPR	Slide positive rate
SR	Sub-recipient
SSF	Single streaming funding (of the GFATM)
SSR	Sub-sub recipient
SSS	Social security scheme

TA	Technical assistance
TAO	Tambon Administration Organization
TB	Tuberculosis
TOR	Terms of reference
TRP	Technical review panel (of the GFATM)
TUC	Thai MOPH–US CDC Collaboration
TWG	Technical working group
UHC	Universal health care
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
USP PQM	U.S. Pharmacopeia Promoting the Quality of Medicines Program
VBDC	Vector borne disease centre
VBDU	Vector borne disease unit
VHV	Village health volunteer
VMW	Village malaria worker
VPP	Voluntary pooled procurement
WB	World Bank
WHO	World Health Organization
WPRO	WHO Western Pacific Region

Executive Summary

The last malaria programme review as per WHO recommendations and guidance was conducted in 2011 in close collaboration with the Ministry of Public Health (MoPH) in Thailand and partners. Several recommendations in critical domains were put forward by senior experts for consideration by the national control programme to improve programme performance. The summary of progress made against all 2011 recommendations is described in Annex 4 of the core report and discussed in details in relevant sections of the review report.

Building on the recent East Asia Summit Declaration for a malaria free Asia Pacific by 2030, and given the pivotal role of Thailand in these multi-country efforts, an in-depth review of the Thai Malaria Programme was considered timely and appropriate to reorient the current control interventions in line with the Greater Mekong Subregion (GMS) malaria elimination (2016-2030) initiative supported by WHO and partners.

It was also considered helpful for the programme to explore domestic and alternative financing resources to the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM), which is expected to withdraw its support to the national malaria programme by 2017.

Three major thematic papers on: a) Epidemiology and malaria strategy, b) Programmatic performance, human resources and financing and c) Vector control and prevention, have been finalized and made available to expert members of the review team as well as relevant published, unpublished documents and reports, with more than 70% of them translated from Thai into English. Members of the review could access those files through a cloud Dropbox® resource that was set up one week before the review.

Four field visits were carried out in four different malaria endemic regions of Thailand bordering neighbouring countries, namely Tak, Ubon Ratchathani, Chantaburi and Songkla provinces. Screening interview schedules adjusted to health care and malaria facility level and communities were used during field visits.

Consensus on findings from field visits were consolidated from 6 September to 10 September 2015 through intensive internal discussion and several individual meetings with MoPH experts and relevant experts outside the MoPH (national institutions, academia, NGOs etc.)

Main interim recommendations were also presented to and discussed with senior management officials of the MoPH during individual sessions. Main action points were presented and discussed with national malaria control experts on 10 September and presented in plenary on 11 September with representatives from the MoPH, non-health sectors, nongovernmental organizations and stakeholders.

Members of the review team acknowledged the fact that the national malaria programme (the Bureau of Vector Borne Diseases, or BVBD) has already drafted and budgeted a five-year malaria elimination strategic plan. In that context, recommendations proposed by reviewers could be taken into account in the finalization of the Thailand Malaria Elimination Strategy and its operational plans until 2024,¹ in which all potential stakeholders might endorse and acknowledge their roles, functions and responsibilities.

1 The draft Thailand Malaria Elimination Strategy available at the time of this review was for the period 2015–2024. In April 2016, the final endorsed strategy was for the period 2017–2026.

Section 1

Background

1.1 Rationale of the MPR in Thailand

The Sixty-fourth World Health Assembly passed Resolution WHA64.17 on malaria in May 2011. It urges Member States to undertake regular comprehensive reviews of malaria programmes as essential steps in developing or reviewing strategic orientations and operational plans to achieve and maintain universal coverage of evidence-based malaria interventions. It requests the Director-General of the World Health Organization (WHO) to monitor global progress in the control and elimination of malaria and to provide support to Member States in their efforts to collect, validate and analyse data from malaria surveillance systems.

The Ministry of Public Health (MoPH) in Thailand in collaboration with WHO and partners conducted an in-depth review of the national malaria control programme in August 2011.² The review, carried out by experts, identified strengths, gaps, issues and challenges in different areas including diagnosis, treatment and follow-up, vector control and prevention, surveillance and response and monitoring and evaluation, information, education and communication (IEC)/BCC, data flow and management and programmatic challenges. The review recommended several key actions in all critical areas to be undertaken to improve programme performance. A summary of recommendations made in 2011 and progress made against each of them is given in Annex 10 for ease of reference.

In line with the WHA Resolution and concurred by MoPH, the current malaria programme review (MPR) 2015 has been coordinated by WHO in collaboration with the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). Findings and action points expressed by the reviewers would be useful to be considered by the programme and partners to achieve malaria elimination goals by 2024.

² WHO (2012): Report of the Programmatic review of the National Malaria Control Program in Thailand. SEA-MAL 269.

Building on the recent East Asian Summit (EAS) Declaration for a malaria free Asia Pacific by 2030, and given the pivotal role of Thailand in these multi-country efforts, an in-depth review of the Thai malaria programme 2015 was considered timely and appropriate to re-orient the current control interventions in line with the Greater Mekong Subregion (GMS) malaria elimination (2016–2030) initiative. Recommendations expressed by reviewers can be integrated into annual operational and strategic malaria elimination plans to re-orient or fine-tune the strategy and raise support from policy-makers, partners and stakeholders. It was also considered helpful for the programme to explore domestic finance and alternative resources to the GFTAM, which is expected to withdraw its support to the national malaria programme from 2017.

1.2 Objectives

In the context of the health system and the national development agenda, progress made from the last MPR, and programme orientation towards elimination, the objectives of this programme review are as follows:

Objective 1: Epidemiology assessment

- Review on malaria epidemiology, level of endemicity, disease trends, age and gender distribution, malaria among migrants, seasonality, parasite prevalence, vector and parasite status through analysis of national and sub-national programmatic data including surveys.
- Identify achievements of the national malaria programme outcomes and impacts, best practices and lessons learnt, critical issues, problems and the causes of the problems on the basis of the number of reported malaria cases and deaths as well as the prevalence of asymptomatic malaria.
- Assess the magnitude of problems in the areas affected by artemisinin resistance along the international borders.
- Assess the determinants that contribute to the persistence of malaria transmission in different ecotypes.
- Assess the factors that may have contributed to the resurgence of malaria. Review the response to outbreaks and the lessons learned.

Objective 2: Case management

To assess:

- Current mechanisms in place for antimalarial drug policy revision and options for change.
- Integration of malaria posts and malaria clinics into services of the health promotion hospitals to ensure early diagnosis and treatment at the hospitals.
- Feasibility of introducing G6PD testing at the point of care.
- Implementation of quality assurance on slide microscopy and rapid diagnostic tests (RDTs) of public and private sectors.
- Feasibility of using polymerase chain reaction (PCR) for confirmation of asymptomatic parasitaemia in the context of elimination.
- Directly observed therapy or other strategies (including IEC and BCC) for improving treatment adherence for *Plasmodium falciparum* and *Plasmodium vivax*.
- Effectiveness of patient referral system.
- Procurement and supply chain management for pharmaceuticals, health products and health equipment.
- Case management practices and reporting in the public sector by type of facilities and in the private sector, including nongovernmental organizations (NGOs).

Objective 3: Vector control and prevention

To assess:

- Current strategies for prevention of transmission, community engagement and BCC, use of insecticides and repellency effect.
- Insecticide treated net (ITN) distribution, indoor residual spraying (IRS) through specifications and quality control of commodities, adequacy of training, support and supervision of health workers.
- Coverage and utilization of ITN among the populations at-risk, magnitude of insecticide resistance and strategies to mitigate, stratification of areas for better targeting of vector control interventions.

- Human resources and their capacities in entomology and vector control.
- Current state of knowledge and the gaps with respect to malaria vectors and vector control.
- Generation of strategic information to support vector control.

Objective 4: Monitoring and evaluation system

To assess:

- Coverage (public, private), comprehensiveness, effectiveness of surveillance system and response.
- Strategies to integrate malaria surveillance activities into routine health services and to sustain those in the long run.
- Surveillance system for mobile populations, especially in high-risk occupations.

Objective 5: Programme management, strategy and policy

- Review the programme structure, functions and human resources at national and sub-national levels. Assess the strengths and the key areas for improvement in the context of public health system development to accelerate malaria control towards elimination and prevention of reintroduction of transmission.
- Review coordination mechanism and identify opportunities for strengthening it to support malaria elimination.
- Review the draft of the National Malaria Elimination Strategy as well as the policy and governance structures proposed for Thailand's elimination plans and provide recommendations, especially with respect to mechanisms for enhancing subnational commitment/s.
- Assess progress and lessons learned in cross-border collaboration. Identify cross border issues and implications for policy and technical feasibility from the ASEAN Economic Community and Greater Mekong Subregion's regional investment framework.
- Assess strategic interventions for conflict-affected provinces in the south.
- Review the current operational research activities and their contribution to evidence-based policy decisions, future operational research plans and recommendations in the context of malaria elimination.

Objective 6: Financing and sustainability

- Review the financial support from all sources in the last three years and the budget required for the next three to five years.
- Provide recommendations on financing for elimination to meet targets by 2024.
- Provide recommendations to ensure sustainability and transition of malaria financing to domestic and other external sources after closure of the GFATM programme in the context of the national health-financing plan.

1.3 Responsibilities

Members of the team that conducted the MPR included independent international and national experts in the respective areas as per programme review objectives, as well as stakeholders and partners who were engaged in and familiar with malaria control activities in Thailand. Team members were briefed over one day prior to the commencement and had a common understanding of the purpose and schedule of the review. They were also made aware of the roles of each member and the functions of facilitators from the participating organizations. National staff from the national malaria programme and the GFATM Principal Recipients office facilitated the review by providing relevant documents and clarifications and by participating in field missions.

1.4 Methods

MPRs, as described in the WHO guidelines,³ use a mixture of methods/tools as follows:

- Background thematic papers (epidemiology, programmatic performance and vector control and prevention) as well as any relevant published and unpublished documents and reports that have been made available (and regularly updated) to reviewers through Dropbox® at least one week before the review.
- Follow up assessment on the implementation of recommendations coming out from the previous programme review in 2011.
- Regarding joint field visits, briefings and team building were carried out between internal and external reviewers alongside WHO staff on 30 August

³ WHO (2010) *Malaria Program Reviews: a manual for reviewing the performance of malaria control and elimination programs*.

2015, including presentation of screening questionnaires to be used during field visits. Findings both from internal thematic desk reviews and from field visits were consolidated on Saturday, 6 September, and Sunday, 7 September 2015.

- Agreement was obtained from reviewers and WHO concerning national institutions, central level organizations and individuals to be visited during and after field visits (provincial, district, community levels, MoPH and partners).
- Main action points were discussed with national malaria control experts on 10 September 2015 in order to clarify remaining issues and findings. The salient results of the review with main recommendations were then presented and discussed on 11 September 2015 in plenary with representatives from the MoPH, non-health sectors, NGOs and other relevant stakeholders.
- Interim recommendations were also presented to and discussed with senior management officials of MoPH during individual sessions.

1.5 Expected outputs

The outputs of MPR include:

- A review of three background thematic papers.
- Four summaries of field trips.
- Executive summary report.
- Slide presentations during plenary debriefing.
- One comprehensive report.

The list of national and international experts who participated in the review are given in Annex 1.

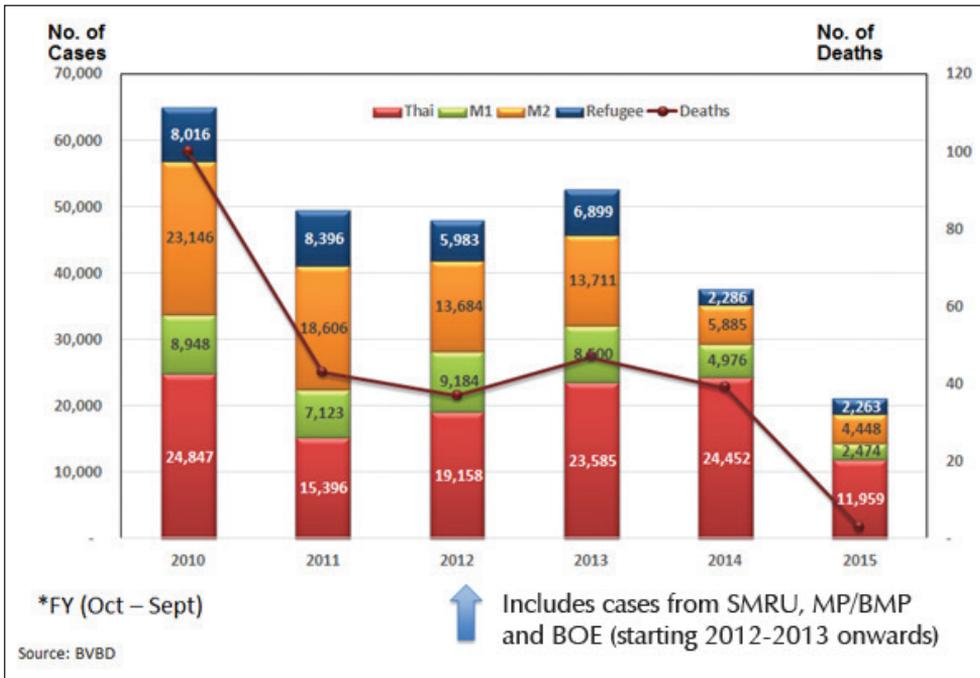
Epidemiology: Malaria situation, disease burden, trends, indicators and targets

2.1 Malaria situation, trends and village/hamlet stratification

2.1.2 Malaria trends

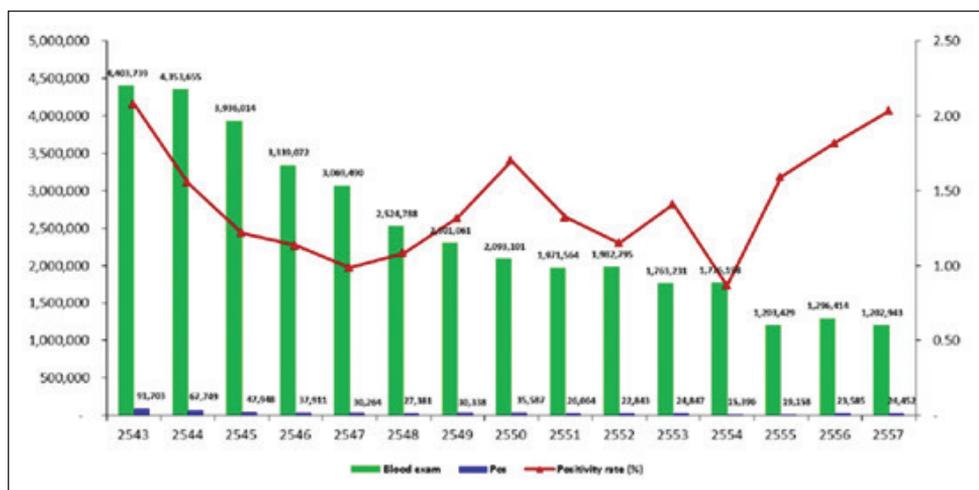
As per malaria data available from existing reliable sources from the MoPH-BVBD, an overall 20% reduction of all malaria cases (Thais and non-Thais) is noticed in 2014 as compared to 2010 (see *Fig.1*). Malaria was passively or actively detected in 32,953 cases in 2014 as compared to 41,783 in 2010 countrywide. The highest impact of interventions is noted on the Thai-Myanmar border showing more than 50% reduction of all malaria cases in 2014 as compared to 2010. This decline is highest in the Thai-Myanmar border with more than 60% reduction in non-Thai citizen. Malaria in the Thai population has remained stable over the last 5-years while the non-Thai population with malaria seeking treatment in Thailand has been declining steadily (50% to 25% of total cases in 2010 and 2014 respectively). This is probably the result of recent intensive malaria control interventions on the Myanmar side during respective period of time. While the overall decline in 2015 thus far appears to be encouraging, it is still early to comment if this is a sustained trend. These results also do not translate enough into a parallel decline among Thai citizen. BVBD with concerned ODPCs should explore factors contributing to that situation.

Figure 1: Confirmed malaria cases and deaths (FY 2010 – July 2015)



Malaria cases (Thai citizen) have steadily declined in Thailand over the last 15 years to remain almost constant (around 20 000 Thai cases) from 2012 (See Fig. 2). The positivity rate is increasing from 2012, perhaps indicating that microscopy/RDTs are used in a more specific way through a narrower definition of so-called malaria suspect.

Figure 2: Blood/RDT examinations and confirmed malaria cases in the Thai population (countrywide) since 2000



Source: BVBD

2.1.3 Malaria data by administrative level (district)

Malaria is currently confined to international forest borders with the highest proportion (>40%) of malaria cases (Thai and non-Thais) recorded on the Thai–Myanmar border (See Table 1).

Table 1: Malaria situation in international border areas, 2010–2014

Border area	2010		2011		2012		2013		2014	
	Thai	Non-Thai								
Thailand-Myanmar (10 provinces)	14 431	19 283	10 970	17 232	11 853	13 879	10 851	13 511	6 429	7 719
Thailand-Lao PDR (10 provinces)	336	9	308	10	867	101	850	179	7 206	154
Thailand-Cambodia (6 provinces)	1 845	614	1 678	561	2 656	623	2 556	242	1 994	145
Thailand-Malaysia (4 provinces)	3 992	135	1 361	87	1 148	132	5 901	145	6 772	89
Others	0	1 135	0	716	2 638	946	3 424	698	2 135	310
Total	20 604	21 179	14 317	18 606	19 162	15 681	23 582	14 775	24 536	8 417

Source: BVBD

Of note is the 2014 epidemic in Ubon Ratchathani bordering Lao PDR, which seriously affected the Thai population. Without taking into account such epidemic figures, malaria cases in the Thai population in 2014 represent around 60% of the total confirmed malaria patients recorded countrywide. Of note as well is the increasing number of people affected by the disease outside border areas, probably reflecting foci outbreaks in non-endemic villages (See Section 5 on SME).

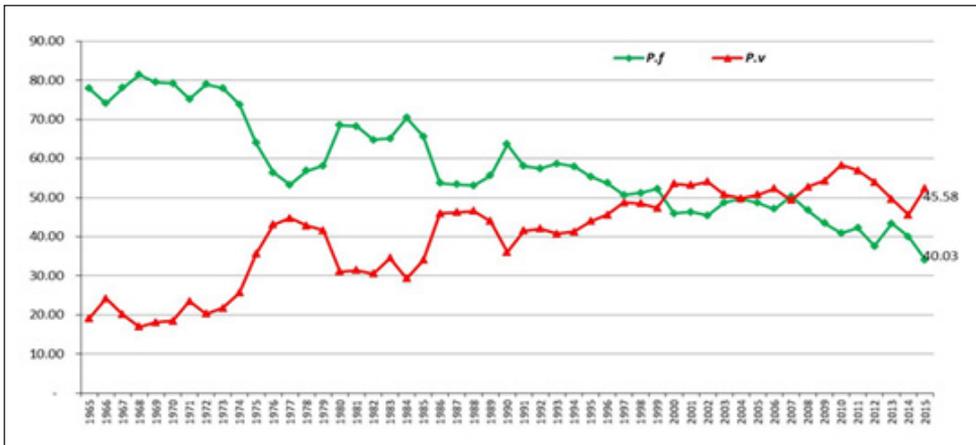
2.1.4 Malaria species and trends by species from 1965 until current

Figure 3 below shows the declining trend of *P. falciparum* infections over time among all malaria cases with *P. vivax* infections becoming more predominant as part of the malaria species landscape from 2000 onwards. This is in line with records from endemic countries that are successfully controlling malaria by scaling up diagnosis tools, artemisinin-based combination therapy (ACT) and vector control (C) measures.

P. falciparum infections have, however, remained highly pre-eminent during the recent epidemics documented in Ubon Ratchathani and in the southern part of Thailand (ODPC 12), where malaria does not seem to be under control, especially in the highly forested Yala province.

P. falciparum cases appear to be highly prevalent in most southern provinces affecting younger age groups and where several outbreaks during the past two years have been reported; whereas, in Tak province bordering Myanmar, *P. vivax* infections are becoming more prevalent than *P. falciparum* infections, thanks to intensive control measures both in Thailand and Myanmar during the last five years.

Figure 3: *P. falciparum*–*P. vivax* malaria species trends (%) from 1965 up to August 2015

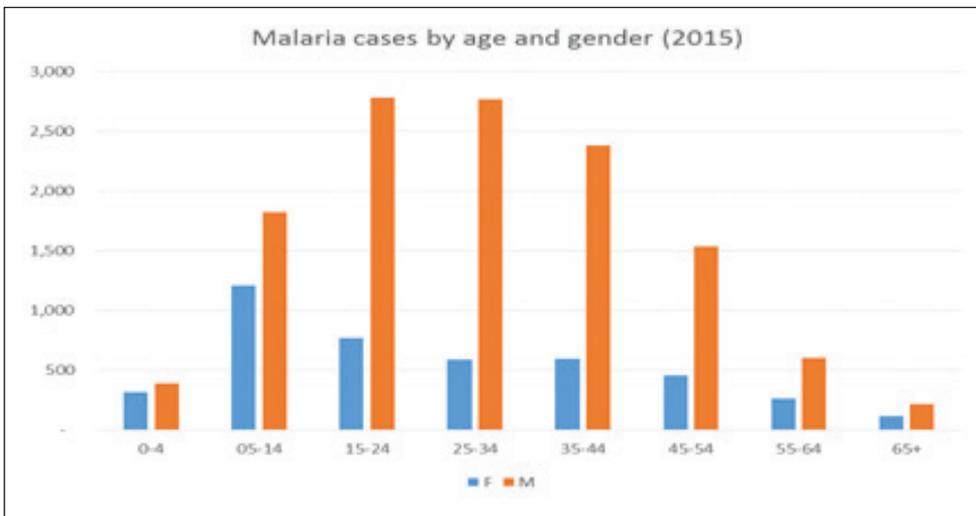


[Source: BVBD]

2.1.5 Malaria patients by age and gender

Confirmed malaria cases are more predominant in males from 15 to 44 years old, probably linked to activities in forest and forest-fringe areas where malaria vectors are present (See Fig. 4).⁴ It is interesting to note that malaria cases peaked among adolescent females (5–14 years of age), which might be associated with secondary forest-related activities such as mushroom gathering.

Figure 4: Malaria cases by age and gender (January–August 2015)



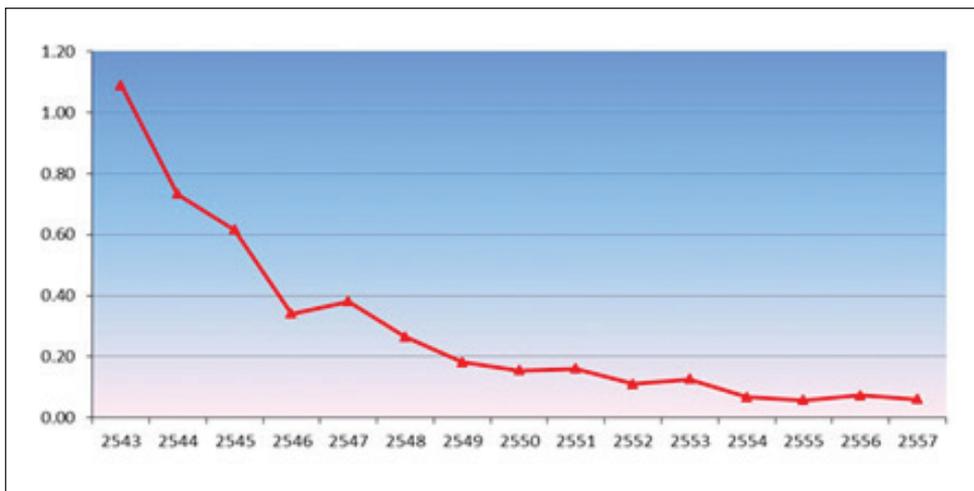
Source: BVBD

⁴ Data should ideally be presented / incremented by same age groups (5 or 10-year)

2.1.6 Malaria deaths

Malaria attributed deaths (generally hospital-based) are declining over time and 38 were reported countrywide in 2014 among the Thai population (See Fig. 5). Death-audit exercises are conducted in some hospitals with a senior doctor assigned to review and crosscheck the death records.

Figure 5: Malaria-attributed deaths in Thailand (Thai citizens) from 2000



Source: BVBD

2.1.7 Importance and relevance of asymptomatic malaria cases towards malaria elimination

The proportion of asymptomatic (malaria) cases versus symptomatic carriers varies from region to region and the role of asymptomatic parasite carriers in maintaining or restarting transmission is still unclear. Below are some results obtained from recent studies conducted on the Thai–Myanmar border and in the Mekong Subregion:

- A study conducted on human-to-mosquito infectivity among asymptomatics in Thailand also found persons harbouring submicroscopic gametocytemia that were infectious to mosquitoes, but these were among microscopically positive infections. Village-wide screening by microscopy in western Thailand (RE Coleman et al., 2014), (Jessica T Lin et al., 2014).

- A study comparing expert microscopy and real-time PCR was conducted in Borai district, Trat province (border with Cambodia), following detection of a malaria case in mid-2011. A total of 187 residents (E.T. Rogawski et al., 2012).
- A study on mass blood surveys was conducted along the Thai Myanmar border during July and December 2011, and May 2012. In total, 55 *P. vivax* and 20 *P. falciparum* cases (out of 547 participants) were detected through PCR, compared to six and two cases, respectively, detected by field microscopy. This research indicates that many cases of malaria remain undiagnosed in the region. While it is possible that malaria is imported to Thailand from Myanmar, the existence of undetected infections, coupled with an ecological setting that is conducive to malaria transmission, means that indigenous transmission could also occur on the Thai side of the border. Improved, timely and active case detection is warranted (D.M. Parker et al., 2015).
- Mass surveys were carried out in Thai villages in Muang district, Mae Hong Son province to identify people with Plasmodium infections and with fever. It was found that 39 out of 4681 villagers (0.8%) who do not have fever carry parasites (*P. falciparum* or *P. vivax*) (Aree Pethleart et al., 2004).
- A study was conducted using pooling/PCR-based molecular detection strategy for screening malaria infection in residents from areas of Myanmar where malaria is endemic. Blood samples (n = 1552) were collected from malariometric survey among residents in three areas of malaria endemicity (Kayin State, Bago and Tanintharyi regions) of Myanmar (the first and last lie along the Thai border). Two nested PCR and real-time PCR assays showed that asymptomatic infection was detected in about 1.0% to 9.4% of residents from the surveyed areas (Bo Wang et al., 2014).

2.1.8 Strategy to classify villages (foci) by level of endemicity and village/foci investigation and response strategy (See also Section 4 on vector control)

Stratification by (of) village and control interventions by stratum

All sub-villages (hamlets) or villages matching foci definition (active/non active/active again) are (re)classified on an annual basis by district and sub-district staff using the below definitions:

- A1 villages or hamlets (sub-villages) with perennial transmission (confirmed cases are recorded each month for more than six month).
- A2 villages or hamlets with seasonal transmission (≤ 6 month).
- B1 villages or hamlets where transmission is interrupted (no indigenous case(s) at least during the last three years) but malaria vectors are present (high to moderate receptivity).
- B2 villages/hamlets with no transmission and no malaria vectors documented (low receptivity).

Control activities in each stratum are given in a guideline by BVBD, 2009.

The newly drafted elimination strategy is building on the previous so-called foci classification by village and is introducing the so-called district stratification in order to classify districts against progress towards countrywide malaria elimination by 2024.

The health district (DHO) is de facto becoming the managerial unit expected to be accountable on progress made. This is where elimination operations are planned, technically supported, budgeted and carefully monitored under DDC/ BVBD leadership alongside GHS under the PS (See *Fig. 12 and 13*).

Stratification by district

C1: District with indigenous cases and $API > 1/1000$ pop.

C2: District with indigenous cases less than $1/1000$ pop ($API < 1/1000$); further divided into two sub areas:

- (1) Low transmission district, engaging malaria elimination level 1 (Pre-elimination area – C2.1) – the district has more than 10 or more malaria transmission villages
- (2) Low transmission district, engaging malaria elimination level 2 (Pre-elimination area – C2.2) – the district has fewer than 10 malaria transmission villages.

E1: District with no transmission for at least one year (elimination area) – district without an indigenous case during past one to three years.

E2: District with no transmission for at least three years and is certified for malaria elimination – the district has had no indigenous case for three years or more and is further divided into two sub areas:

- (1) District awaits certification (Pre-certified area – E2.1) – the district has not been certified by the Provincial Committee.
- (2) District certified for malaria elimination (Certified area – E2.2) – the district has been certified by the Provincial Committee.

Imported cases are excluded but secondary cases documented through active foci investigations are included.

The proposed control and elimination strategy interventions, indicators and forms by category of villages/hamlets are similar to those fully described according to foci classification in the guideline to control malaria in Thailand released by BVBD in 2009. The new elimination strategy is making the district the most peripheral managerial unit expected to plan, budget, implement, measure and monitor malaria elimination interventions. In 2014, 660 districts out of 928 were considered by the national programme as being so-called malaria free, with no recorded indigenous cases.

2.1.9 Summary of inputs from the MPR team

- Confirmed malaria cases (mainly by QA/QC microscopy) reported from BVBD and GHS reasonably reflect the true malaria situation by village and hamlet in Thailand. There is still missing information from case investigations from GHS, private hospitals and NGO-driven health care facilities that are not reporting yet or partially to DDC-VBDC-VBDU managed malaria facilities. In GHS, Form 506 is used to report diseases including malaria to BoE. However, case investigations are not conducted on these cases due to limited staff and time at hospitals.
- Currently, effort is ongoing to progressively engage GHS (particularly the HPH) starting in free-malaria provinces to manage and properly record malaria cases via the Malaria Online system. Recorded cases in hospital as yet do not trigger subsequent active investigations from the general services but in provinces where VBDU teams are operating, malaria data are also sent to

the VBDU in charge of ensuring patient follow-up and further investigation at community level.

- As a general remark, significant progress has been made in consolidating data from the two sources (BoE and BVBD) into a single malaria database. However, the review team noticed that data generated in the field by the most peripheral malaria services are not critically analysed by district field teams and not used enough by local teams to improve the local understanding of the malaria situation nor to trigger action.
- Analyses currently generated through the Malaria Online database are largely focused on monitoring of trends and reporting of indicators. The system does not seem to be used to guide, update and monitor the strategy or support decision-making procedures (See further Section 5 on SME). For example, it was observed in one region that farmers, forestry workers and students were most affected by the disease and this trend could have provided a basis for further action. The system was able to track the increasing trend of malaria in Ubon Ratchathani in 2014 but lacked the ability to trigger a response to the situation.
- In addition, there appears no clear malaria strategy (what to do and how?) in B1 or even B2 villages where malaria epidemics are identified too late⁵ (See further the epidemic section and Ubon Ratchathani trip report) and hence, not well controlled. In 2014 and 2015, respectively, 35 and 21 villages experiencing malaria epidemics have been reclassified by BVBD as endemic (active foci again).⁶ In light of the increasing number of B1 villages over the years and also increasing vulnerability in B2 villages, it is questionable how the programme could perform vector surveillance and mapping as mentioned in the BVBD guidelines (See also Section 4 on VC and Section 5 on SME).
- That proportion varies from 2 to 10 depending on several factors such as endemicity, the presence or not of clinical symptoms and level of microscopy expertise, especially at the periphery. The impact on transmission from parasites in asymptomatic carriers is still unclear and complex to study. PCR techniques used in different studies are not standardized and might lead to confusing results.

5 The BVBD strategy in B1 and B2 areas seems to exist but is no longer implemented or monitored possibly due to the huge reduction of malaria cases over the last 10 years and retirement of experienced staff.

6 From field visits, VBDC and VBDUs' staff have no clear understanding when/how to reclassify B1 to A2/A1 stratum. Some said a three-year wait was necessary, whereas the reclassification should actually be made immediately.

2.1.10 Recommendations

- Train peripheral staff at district level (which is expected to be the malaria elimination management unit) in basic epidemiology/entomology to analyse field malaria data better and monitor their performance. Training should include the set-up of epidemic detection thresholds (absolute cases or deviation from the mean) where suitable.
- Explore any reasons why, in spite of intensive measures taken, malaria cases remain high in the (resident) Thai population while declining more rapidly in the non-Thai population.
- Explore tools already used or to be used for protection against mosquito bites by farmers or forest workers regularly spending nights in forest areas, as well as methods to access delivery services especially in districts/provinces where malaria remain highly endemic (See vector section).
- Carry out an investigation as to why students are among the most at-risk groups in southern provinces.
- Provide training for general health services staff to record malaria cases through standardized forms and report to DHO/PHO.
- Ensure QA/QC microscopy mechanisms are in place in general health services and RDTs are available in facilities with absence of microscope/microscopist or available outside lab working hours and during weekends.
- BVBD to continue to scale up bivalent RDTs in endemic villages to be used in malaria clinics, posts and BMPs in such a way that all malaria suspects can easily access prompt malaria diagnosis (and treatment). Quality RDTs to be made available (stocked) in non-endemic areas to be used by SRRTs to quickly identify clusters of malaria cases. PCR to be used to cross-check RDT and microscopy results as part of QA/QC mechanisms.

2.2 Impact and outcome indicators

2.2.1 Core indicators

The below core indicators (See Table 2) remain in use by the programme with less emphasis on ABER, declining over time in a context of almost zero transmission/prevention of malaria reintroduction and integration of vertical malaria services within GHS.

Table 2: Key indicators as part of the malaria control programme in Thailand

API = Annual Parasite Incidence	$\frac{\text{No. of new cases in a year} \times 1000}{\text{No. of population}}$
SPR = Slide Positivity Rate	$\frac{\text{No. of positive blood film} \times 100}{\text{No. of total blood film examined}}$
ABER = Annual Blood Examination Rate	$\frac{\text{No. of blood films from all activities} \times 100}{\text{No. of population}}$
Malaria Mortality Rate	$\frac{\text{No. of malaria deaths} \times 100,000}{\text{No. of population}}$
Case Fatality Rate ⁸	$\frac{\text{No. of malaria deaths} \times 100}{\text{No. of malaria cases in the same period}}$

The 2011–2016 National Strategic Plan (NSP) for malaria aims to reduce morbidity and mortality and move towards malaria elimination by 2016.

Targets were by 2016:

- To eliminate malaria in 60% of area and prevent reintroduction of transmission.
- To reduce morbidity to not more than 0.2/1000 and mortality to not more than 0.05/100 000.

In 2014, the annual parasite incidence was 0.51/1000 population with a total of 660 out of 928 (71.12%) districts considered free-malaria districts (no local transmission documented in all villages/hamlets of those districts).

In the draft malaria elimination strategy currently circulating, districts are considered as the geo-administrative, managerial and accountable unit for planning, implementing and monitoring progress towards zero malaria transmission.

2.2.2 Supplementary indicators

GFATM R7 and GFATM R10 grants are providing additional funds to target the non-Thai population at-risk, mainly M1, M2 people and displaced people in camps. Some supplementary indicators used by the programme in addition to core indicators are shown in Table 3 below.

⁷ Usually *P. falciparum* case fatality rate with *P. falciparum* cases as denominator

Table 3: Supplementary indicators as part of malaria interventions supported by the GFR7, GFR10 (targeting 27 provinces)

Indicators	
Impact	API/1000 among Thai and Non-Thai M1 migrants
	API/1000 among refugee in camps
	No. of deaths due to malaria
Outcome	% of target villages in which malaria transmission is interrupted at least three years
	% of population (Thai, M1 migrants and camp residents) in target areas that slept under ITN/ LLIN the previous night
	% of households at-risk of malaria (A1A2) with at least one LLIN/ITN and/ or sprayed by IRS in the last 12 months
	Number of LLINs and LLIHNs distributed to Thai and M1, M2 migrants and refugee in camps

2.2.3 Summary of inputs from the MPR team

It has been difficult for the team to access the current consolidated strategy document 2011 to 2016, guidelines and reports in English (malaria control, elimination and prevention of its reintroduction). During the last 10 years, serious efforts have been made to control the disease on international borders and make non-Thai populations access malaria services and information. Those populations are currently part of the information system and monitoring is carried out to measure interventions targeting them, which was not the case before.

The MPR team also note that the malaria burden in Thai citizens has remained stable over the last five years while significant progress in morbidity reduction has been observed in non-Thai people. Overall malaria mortality in Thai citizens has declined over time, reaching less than 40 malaria-attributed deaths nationwide over the last two years. Of positive note as well is the effective set-up of a more solid malaria data management system with the capacity to consolidate all malaria data from various sources, even if some data may still be missing from faith-based organizations and some private health care facilities (See Section 5 on surveillance).

A big challenge is accelerating the elimination agenda while integration of vertical malaria services into general services is progressing but GHS staff is unaware of critical interventions to be supported by them, while skilled and successful vector-

borne disease staff is seriously declining over time (See Section 6) and while the country is expected to face more malaria epidemics (See surveillance in Section 5) in a context where malaria vectors are still efficient in most places. Overall specific updated guidelines are missing or incomplete or doubtful, requiring more careful attention and guidance from central staff to all levels starting with PHO and DHO teams expected to do the job.

2.2.4 Recommendations

- BVBD and partners should finalize a comprehensive malaria elimination/prevention of reintroduction strategy document including SOPs clearly spelling out what to do, how to do, where, when and by whom at each health and non-health care levels. The unique and consolidated document will serve as key reference for Thai and non-Thai experts engaged in such an ambitious country and multi-country time-bound goal.
- The strategy has to include few but consistent over time nationally and regionally driven measurable and across sectors impact and outcome indicators (elimination and prevention of reintroduction). All existing forms, especially EP3, have to be adjusted accordingly so that they can easily be used by health staff and taken within the e-malaria system (See further Section 5 on surveillance).
- HR to be planned accordingly with the above with an adjusted skills and training curriculum (See HR Section 6).
- Finalizing and/or updating concomitantly technical guidelines to be used in the field across sectors and partners and to be used as unique reference during training and supervision sessions.
- Firmly engaging all non-health sectors and government as the lead body into the comprehensive elimination agenda.
- Carrying out a cost-benefit exercise of malaria elimination in Thailand expected to mobilize decision-makers, partners and needed funds towards national time-bound elimination goals.

Malaria case management

3.1 Current malaria diagnosis and treatment strategy

The policies and strategies for case management of malaria have been revised and updated over the years since 1995 when artemisinin-based combination therapies (ACTs) were adopted for the first time. A recent review and update was undertaken in May 2015. The finalization of this is still in process. However, this review took into account the current case management policies and strategies prior to the ongoing update that commenced in the May 2015 review. This is outlined below.

3.1.2 Diagnosis and treatment policy

Universal free access to prompt diagnosis and treatment services for both Thai citizens and non-Thais.

Malaria diagnosis

All suspected malaria cases should have prompt access to confirmatory diagnosis based on microscopy, or by rapid diagnostic test (RDTs). Microscopy is deployed at the hospitals and malaria clinics including the health clinics that were recently upgraded to Health Promotion Hospitals, while RDT-based diagnosis is deployed at malaria posts.

Treatment:⁸

Uncomplicated *P. falciparum* malaria

Treatment with an ACT. The first-line drug is artesunate plus mefloquine. This is dosed as artesunate 12mg/kg over three days and mefloquine 25mg/kg over two days (A3M2).

⁸ According to the existing guideline in the process of revision.

A single dose of primaquine (0.5mg/kg) is given on day 2 to kill the gametocytes. G6PD testing is not required.

In the first trimester of pregnancy, the treatment is a seven-day course of quinine plus clindamycin. Primaquine should not be used during pregnancy.

The second-line medicine for uncomplicated *P. falciparum* malaria is a seven-day course of quinine, plus tetracycline/doxycycline/clindamycin.

Uncomplicated *P. vivax* malaria

The first-line treatment is chloroquine (25 mg base/kg over three days) with primaquine 0.25mg/kg daily for 14 days (except in pregnant women and children less than one year of age). All patients should be screened to determine G6PD status (where possible) before the use of primaquine. Patients who are G6PD deficient should receive an alternative dose of primaquine at 0.45mg/kg weekly for eight weeks. In situations where G6PD screening is not possible, counsel the patient on the adverse effect of primaquine and then dose at 0.25mg/kg daily for 14 days.

Severe malaria

The first-line medicine is artesunate IV; this is followed by a complete course of the first-line ACT orally after per-os status is regained.

Post-treatment follow up schedule

The following schedules are recommended as follow-up post treatment of *P. falciparum* malaria – days 3, 7 and 28 – and for *P. vivax* malaria – days 14, 28, 60 and 90. Clinical and microscopy tests to detect parasites are undertaken at these visits.

Case management among migrant populations

No specific strategy recommendation or policy; case management based on the standard policy. This is applicable to both Thai and foreign (non-Thai) migrants.

Artemisinin resistance containment

There is currently no specific strategy or guidelines.⁹

⁹ During the bi-country artemisinin resistant containment project from 2009 to 2012, atovaquone-proguanil has been used as first line antimalarial treatment (in spite of A+M) in the seven provinces bordering Cambodia.

Elimination scenario

- Active Case Detection (ACD) is undertaken in Strata A1 and A2, at least once a year and the objective is to detect asymptomatic parasitaemias by screening using microscopy. When there is an increase in malaria cases, target villages may be visited up to four times a year as necessary. All positive cases are treated with the first-line ACT and single dose primaquine.
- Reactive Case Investigation is undertaken in Strata A1 and A2 and new foci in Strata B1. All malaria cases are investigated to detect any foci and/or interrupt any potential transmission.

3.1.3 Summary of inputs from the MPR team

Based on the documentation on malaria case management available to the team, the outcome of the field visits to four provinces and consultations with key institutions and individuals, the team came out with the following observations:

Strategy

The extent of implementation of current case management policy was evaluated, and at all levels of the health care delivery system (hospitals to malaria post) there is general compliance with the current national policy recommendation on case management. There was, however, a research institute (Shoklo Malaria Research Unit and an NGO hospital affiliated to the unit) which had a modified guideline for treatment.

The following are some of the main challenges on the implementation of the current strategy:

- AS3MQ2 loose tablets¹⁰ are still the antimalarial drug used for first-line treatment.
- The national guidelines are not widely available at health facilities and to health workers.
- Absence of specific case management guidelines for management of artemisinin resistance and migrant population.

¹⁰ There is a possibility that either artesunate tablets are used without mefloquine or artesunate tablets are being leaked to the market.

- Therapeutic efficacy studies (TES) not regularly or consistently conducted, especially in the light of drug resistance. (Related to absence of guidelines for management of artemisinin resistance.)

Diagnosis

Confirmatory laboratory diagnosis with either microscopy or RDT was available and used in all settings and used to guide treatment.

G6PD testing (qualitative fluorescence spot test) was available at provincial, district and some health promotion hospitals and used to guide primaquine treatment for *P. vivax* patients.

The following are some of the main challenges observed with respect to diagnosis:

- Though malaria specific microscopy QA system was in place both at the vertical programme units and in some hospitals, the system is not standardised in terms of SOPs, bench aids, protocols, or policy in place as part of QA monitoring.
- There was also no corrective follow-up action based on QA activity results, for instance, proficiency testing, or on-site assessments/visits by DMSc.
- G6PD qualitative test mainly used on doctor's request for haematologic disorders and newborn screening; but not routinely requested to test *P. vivax*¹¹ cases prior to giving primaquine, and it is not always free of charge.¹²
- There were reports of shortage of RDTs during the recent malaria outbreak in Ubon Ratchanthani province due to a lack of buffer stocks.

Treatment

Artesunate is available in blister packs and dosed at 12mg/kg body weight over three days (A3), while mefloquine is available as loose tablets dosed at 25 mg/kg over two days (M2). Primaquine is available as 7.5mg and 15mg tablets.

Artesunate for intravenous injection for the treatment of severe malaria was available in the hospitals where treatment for severe malaria is part of the services.

11 *P. vivax* infections are mostly treated at malaria clinic level where current G6PD lab tests cannot be performed.

12 BVBD has launched a new guideline on G6PD testing in June 2015 – waiting for endorsement from Royal College of Internal Medicine.

The primaquine tablets are so small that it is not possible to split them for smaller children. There were adequate stocks and storage facilities, and good storage practices for antimalarial medicines were followed.

The following are some of the main challenges observed with treatment:

- Artesunate and mefloquine still available only as individual tablets with implications for patient compliances.
- In facilities where DOT is practised, it is mainly focused to *P. falciparum* malaria, not *P. vivax*.
- HPH and malaria post: treatment of uncomplicated malaria available at this level only in one of four provinces visited (Tak province). Others only screen with RDT/microscopy and refer malaria cases to DH for treatment.
- Severe malaria treatment not available in district hospital except in Tak and Ubon Ratchathani. In the other provinces, severe malaria cases are referred to the provincial hospital for treatment.
- Clinical recognition of severe malaria especially in areas with no more malaria: pre-referral treatment not available to these patients at the district hospital.
- There were reports of shortage of RDTs during the recent malaria outbreak in Ubon Ratchathani province due to a lack of buffer stocks.
- NGOs and CSOs are struggling to advocate malaria RDT by their volunteers, which is restricted by current policy. Case finding is conducted by trained volunteers and they are directly responsible for monitoring adverse events. As not all CSOs/NGOs have registered medical practitioners, this issue should be brought to higher policy decision levels by BVBD. The MPR team did not have time to investigate this issue further.

3.1.4 Recommendations

The recommendation and action points provided below are aimed at improving programming.

Strategy

- Establishing a Technical Committee on malaria case management with a role to provide clear and timely evidence-based technical guidance and recommendations to BVBD on case management issues.
- Finalise the malaria treatment policy/guidelines adopted in May 2015, incorporating findings from this MPR. Some specific areas to address:
 - QA requirements for laboratory diagnosis in all public and private facilities at all levels.
 - Pre-referral treatment for all severe malaria patients being referred to higher centres.
 - Guidance for case management among migrant population.
 - Case management in cross-border areas.
 - Management of drug resistance.
 - Malaria case management in an elimination setting.
- Develop a plan to implement the new guidelines – (health worker training/ orientation; drug registration; procurement supply management (PSM) plans, etc.)
- While the current policy in Thailand is to use G6PD results to guide primaquine treatment for *P. vivax* and this is being practised in the hospitals where facilities are available, this practice will need to be strengthened once a point of care test becomes available.

Capacity building

- Design a training package/standard curriculum for diagnosis and treatment guidelines for public and private (1) outpatient health facilities/clinics, (2) hospitals at different levels, based on the revised national treatment guidelines (2015).
- Conduct training and refresher courses for case management annually for doctors and other health workers; consider a severe malaria case registry.
- Collaborate with universities and other training institutions and medical/ health professional societies.
- Conduct regularly and systematically drug resistance monitoring and analysis of results.

3.2 IEC/BCC strategy to support malaria case management

3.2.1 IEC/BCC strategy

Though the need for IEC/BCC is alluded to in the current strategic plan and in the treatment guidelines, there is, however, no clear specific strategy or guidelines on IEC/BCC.

3.2.2 Inputs from the MPR team

- Due to the lack of proper guidance from BVBD, there was a wide variation in the IEC/BCC implementation and practices observed during the field visits. Overall, there were a lot of materials seeking to improve patients' adherence to treatment in the form of posters and charts with information on malaria posted on the walls of health facilities and through special envelopes with dosage information for dispensing ACT treatment (GFATM-supported provinces). Primary tasks from community volunteers, malaria clinic and malaria post staff were to provide malaria education and information and follow-up, but the easy-to-use material to guide them or to be used during community education sessions was not found. Efforts have, however, been made in some centres to make these materials available in the Burmese language along the Thai–Myanmar border.
- One HPH in Ubon Ratchathani produced its own IEC/BCC pamphlets and in the south some advice is given during mosque gatherings (by religious leaders) but it was unclear what kind of guidance materials were used.

The following are some of the main challenges observed:

- No definite outreach activities to reach the community, especially with the decreasing levels of malaria transmission that makes a continuous community involvement essential to sustain the gains and progress towards elimination of vital importance.
- There was lack of a formal channel of communication between government and CSO where its advocacy, BCC, LLIN distribution and *P. falciparum* case referral home visit services appeared targeted to only M1 population in Strata A1/A2 areas. Ideally this could also be extended to cover the local Thai population.

- The MPR team noted that one of the key messages for BCC under the malaria GFATM SSF grant was: “Seeking early treatment and complete drug regimen for malaria”. This is one of the top priorities of the malaria GFATM SSF grant, and conforms to national drug policy and regimen to contain artemisinin resistance. It is timely to review the BCC content and activities since the last BCC Review and Strategy Development meeting was conducted in March 2012 (GF-SSF). For example, the messages on treatment compliance should also be added in the IEC materials. Many of the migrant workers do not complete the malaria treatment course and stop the medicine when they feel better. They keep the half treatment course for a future malaria episode(s). Attention should also be focused on how these messages are best delivered, especially for the populations at highest risk.

3.2.3 Recommendations

The following action is recommended to strengthen the IEC/BCC strategy:

- A strategy and accompanying implementation Guideline on Advocacy and behaviour change communication should be developed. The guideline should:
 - Be context-specific with appropriate consideration of languages to meet the need of the migrant population.
 - Incorporate cross-border harmonization of BCC strategies of neighbouring countries.
 - Be inclusive of all Thai and non-Thai mobile migrant populations regardless of malaria transmission area.
- With the planned switch to DHA-PIP, the issues with compliance to loose formulation AS-MQ tablets could potentially be improved. While it is apparent that implementation of a DOT strategy in the treatment of malaria (more so for *P. vivax*) at this stage is not possible, the programme should concentrate on improved BCC activities and education of patients to help improve compliance. DOT alone cannot be a useful strategy for this.

3.3 Research strategy on case management

3.3.1 Research strategy

There is no priority list, specific strategy nor guidelines on research for malaria case management.

3.3.2 Summary of inputs from the MPR team

- There are ongoing therapeutic efficacy studies in two sites – dihydroartemisinin-piperaquine and artesunate+mefloquine, and chloroquine for *P. vivax* malaria.
- Four more sites are planned to start by Q4 2015 or early 2016, pending approval by the MoPH ethics committee.
- The one area of challenge is the non-regularity of undertaking these studies due to HR issues.

3.3.3 Recommendations

- Therapeutic efficacy studies to monitor efficacy of first- and second-line antimalarial medicines in use should be undertaken periodically.
- Test alternative ACTs such as artesunate-pyronaridine, and other antimalarials such as atovaquone-proguanil in areas where currently used ACTs are failing.
- Mapping of the G6PD prevalence in Thai population and G6PD status of migrant workers in Thailand.
- Operational research to optimize context specific IEC/BCC tools for maximal effectiveness.

Section 4

Vector control and individual protection measures

4.1 Current entomological strategy

4.1.1 Current strategy to stratify malaria transmission risk (receptivity)

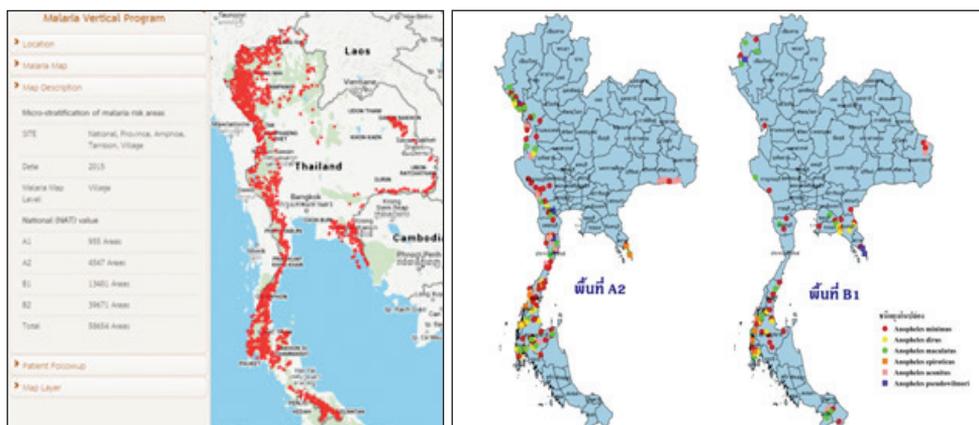
Refer Section 2.

4.1.2 Summary of inputs from the MPR team

- A combination of entomological methods – human landing and larval collections – is usually performed, but due to low density of adult numbers, staffing and financial constraints at VBDU level, BVBD relies mainly on larval collections. The standard human landing collection is indoor and outdoor man biting catches. Larval collections consist of 100 dips in a sub-village (or hamlet) made in slow running streams (Priority 1) and stagnant non-flowing streams (Priority 2) where a maximum of 20 ground pools per stream and up to five dips per pool are made. One of the MPR team who visited Tak province observed larval surveys performed by staff from VBDU 9.3.5. This shows the adherence of current guidelines that required VBDU staff to send larval samples to VBDC for species identification as part of the entomological investigations in B1/B2 areas.
- In a two-year entomological and transmission study supported by SMRU, BVBD is monitoring 875 indigenous foci in A2 areas using human landing and larval collections to confirm the presence/absence of vectors and transmission rate. Figure 15 shows current vector species distribution in Tak, Kanchanaburi, Ratchaburi, Surat Thani, Ranong, Chumphon, Krabi and Petchaburi.

- Currently RAI is supporting an entomological surveillance programme in B1 areas; the objective is to confirm the presence of malaria vectors, and provide a decision-making process for classification of B1 to B2 areas in the absence of vectors. The provinces under surveillance are Sri Saket, Ubon Ratchathani, Rayong, Chanthaburi, Sa Kaeo, Mae Hong Son and Tak (See Fig. 6).

Figure 6: Distribution of malaria vectors in A2 and B1 areas [Source: BVBD]



- Given that the entomology unit in BVBD was not involved in the design of the two vector mapping projects funded by RAI and SSF in Thai–Myanmar border area (A2) and other (B1) areas (See Fig. 6), there is limited information on vector distribution outside the survey sites. Surveys conducted by VBDC staff at the malaria centres in PHOs were conducted without technical guidance and support from the entomology group in BVBD.
- As there is limited data on vector distribution outside the current Thai–Myanmar and Thai–Cambodia border areas, there is an opportunity to enhance current efforts to develop comprehensive maps showing the countrywide geographical distribution of primary and secondary malaria vector species. The maps that do exist are typically restricted to specific areas in the Thai–Myanmar and Thai–Cambodia border areas and do not reflect the larger B1/B2 areas. Entomology staff will receive training in PCR of *Anopheles* mosquitoes by Kasetsart University in 2015/2016 and this expertise will strengthen technical expertise of BVBD. Kasetsart University has produced the first update on the distribution maps of selected species¹³

13 Tainchum K et al. (2015). *Anopheles* species diversity and distribution of the malaria vectors of Thailand. *Trends in Parasitology* 31: 109-119.

published by Rattanaarithkul et al. (2006)¹⁴ based on methods other than morphological identification alone, including cytogenetic and molecular-based techniques. Collaboration between BVBD, BIOPHICS and Kasetsart University will enhance the completion of the anopheline map of Thailand, which will provide a valuable resource for operational and academic workers.

4.1.3 Recommendations

- In order to finalize an extensive review of vector mapping for the elimination strategy, the entomology group should initiate a comprehensive plan using epidemiological information to identify new or active foci in collaboration with the monitoring and evaluation unit and work collaboratively with the offices of disease control, VBDC and PHO. Vector mapping using GPS should be updated and cover potential transmission sites in B1 and B2 areas, including A1 areas. Given limited human resources and the scope of vector mapping, BVBD should pilot and adapt cost-effective trapping methods to local, longitudinal application by resident villagers.
- Updating the status of B areas requires BVBD to use current larval survey guidelines, which should be validated against human landing collection data from the same sites. Side-by-side comparison of larval and adult density data should include correlation analysis of *An. minimus*, *maculatus*, *aconitus* or *pseudowillmori*.
- BVBD should formalize a collaborative agreement with the Kasetsart University to integrate updated maps and tables of anopheline species distribution in the national malaria database (currently managed by BIOPHICS) in order to update / inform the operational malaria stratification system.

14 Rattanaarithkul R et al. (2006). Illustrated keys to the mosquitoes of Thailand. IV. Anopheles. Southeast Asian J Trop Med Public Health 37 (Suppl 2), 1-128.

4.2 Current vector control strategy by malaria stratum

4.2.1 Current vector control strategy by area stratification

Table 4: Summary of malaria control strategies/asures by area stratifications [2009, Source: BVBD]

Measures	Area stratification			
	A1	A2	B1	B2
Vectors control measures				
IRS				
Routine/regular IRS	+	+	-	-
Supplement/special IRS	+	+	+/-	-
IRS in selected area(s) or focal spray	-	-	+	+
Impregnated mosquito nets	+	+	-	-
Usage of LLN	+	+	-	-
Fogging	+	+	+/-	-
Biological control	+	+	+/-	-
Environmental control	+	+	+/-	+/-
Reduce human exposure to malaria vectors	+	+	+/-	-

4.2.2 Summary of inputs from the MPR team

- Malaria vector surveillance activities of the country were conducted by: a) Investigation and entomology teams from VBDCs twice a year in A1/A2 areas and in areas where malaria deaths were reported (routine), and b) BVBD team in three villages in outbreak areas.
- Mosquito species composition, numbers and transmission potential are not only affected by IRS or ITN/LLIN but can vary dramatically geographically and seasonally. It is, therefore, difficult to imagine how conventional, centralized mosquito surveillance teams could capture such spatial and temporal patterns in a representative manner on national scales because of manpower constraints. Decentralized systems that adapt cost-effective trapping methods to local, longitudinal application by resident community-based staff might represent an alternative.

- Targeting insecticidal vector control methods based on malaria transmission potential and population at-risk at the household level will have an impact on mosquito density and greatly reduce man-vector contact.
- Focal spraying with IRS in A1/A2 areas will ensure that remaining pockets of malaria cases that have the potential to multiply rapidly as a result of vector proliferation in the transmission season will be reduced steadily over time. It is envisaged that, during the next five years, IRS and LLINs in the high-risk foci will work synergistically in removing all but sporadic and transient cases within low-risk areas. IRS is more suitable for this transmission setting as it will be deployed on a needs basis after review of surveillance data from the previous year and will also cover areas that are deemed epidemic prone, so as to contain any epidemic flare-ups. In areas where IRS is not popular or acceptable to the local communities (as reported by BVBD), ITN/LLIN and/or personal protection would be an alternative.
- Thailand has set a target for interruption of malaria transmission in 60% of districts by the end of 2016.¹⁵ This could be achieved with universal coverage of LLIN or IRS fully implemented targeting all populations in areas of malaria transmission and by carrying out supplementary measures where appropriate.¹⁵
- While these strategies are appropriate in transmission-reduction phase (control A1/A2 areas; see *Table 6 above*), universal coverage of at-risk populations with vector control in all areas in which malaria transmission (B1/B2 areas) has been interrupted must be maintained. Hence, the strategies listed in *Table 6* need to be reviewed to fit in with foci-based stratification (that is, active and potential foci) as required in the elimination phase.
- According to the recent Cochrane review on larvivorous fish for preventing malaria transmission,¹⁶ there is insufficient evidence to determine whether or not larvivorous fish reduce the density of *Anopheles* immature stages (from nine studies).

15 WHO (2015). Strategy for malaria elimination in the Greater Mekong Subregion (2015-2030); pg viii.

16 Cochrane Review on Larvivorous fish for preventing malaria transmission, 2013.

4.2.3 Recommendations

- BVBD to realign vector control strategies to the elimination phase and universal coverage of at-risk populations with vector control in all areas in which malaria transmission (B1/B2 areas) has been interrupted must be maintained.
- MoPH/BVBD to build a new generation of public health staff (with basic entomological skills) to perform the following tasks:
 - Coordinate and supervise a community-based passive mosquito surveillance network based on submission of mosquito specimens by citizens. A study in Zambia estimates US\$1.36 per person-night of sampling using light traps (Zambia project involves IVM principle of advocacy, social mobilization and legislation).
 - Benefit dengue, LF, JE, chikungunya control or elimination programmes (IVM principle of integrated approach).
 - Evaluate and test innovative sampling tools for adult mosquito vectors (IVM principle of evidence-based decision making).
 - Participate in stratification and decision-making (IVM principle of evidence-based decision making).
 - Advise through appropriate guidelines and IEC/BCC materials Thai and non-Thai communities how to re-treat nets (for instance, through bundling scheme), to repair damaged nets and strengthen self-protection (by using IVM principle of advocacy, social mobilization and legislation).
 - Monitor and assess community acceptability and behaviour changes (IVM principle of evidence-based decision making).

4.3 Current insecticide-treated net distribution, IRS and repellent strategy

4.3.1 Current strategy

As stated in the Thailand National Strategic Plan (2011–2016), the Strategic Framework made a broad reference to “uptake of vector control measures and BCC/IEC and community mobilization, particularly for vulnerable populations”. Specific strategies are listed in Table 3 in Section 2.

4.3.2 Summary of inputs from the MPR team

4.3.2.1 ITN/LLIN coverage

- Currently, ITN/LLIN distribution to 27 provinces in A1/A2 areas is the primary intervention available in the programme for vector control. LLIN coverage as reported by BVBD varies from 22% (Sra Keaw province) to 1132%* (Mukdahan province), with eight provinces (29.6%) reporting in excess of 100% and 17 provinces (63%) reporting less than 80%.
- Coverage data exceeding 100% may be explained by the lack of an additional data-collection step during the so-called pre-census stage prior to distribution. Community leaders in the communities targeted for the campaign are usually requested to produce lists with the total number of households in their communities, the number of members in each household and their ages, sex and relationship with household head. These data are used, along with locally determined assumptions on sleeping patterns, to calculate an expected number of sleeping spaces. The household then receives a number of nets equal to the number of expected sleeping spaces. The use of the expected number of sleeping spaces differs from distribution strategies where data on the reported number of sleeping spaces are recorded during the pre-census stage. The lack of household data, particularly the proportion of the households covered with one net per two people, suggests that many BVBD staff did not conduct household surveys or were not trained in this procedure.

Partners' contribution to LLIN coverage varies and is somewhat confusing due to various factors:

- SMRU distributed LLIN to M2 migrants and have not provided data online but sent it to the PR only. The population protected is declared as 9160 but BVBD says this comes from another source and hence is not reliable.
- In 2014, IOM and RFT started online data entry for LLIN distribution for M1 migrants; data is incomplete.
- Re-treatment of nets (ITN) is the responsibility of ODCP and PHO (vertical system) but actual coverage data is not available at this point in time.

Table 5: Number of LLIN distribution in 27 provinces (Thai, M1 and Refugee in camp). [Source: BVBD, Sep 2015]

SR	2012	2013	2014	Total 3 years	Population in A area	Coverage LLIN	% coverage
BVBD	56 296	179 701	353 264	589 261	1 483 581	1 060 670	71%
SMRU	55 283	12 933	4 588	72 804	91 620	131 047	143%
IOM	6 001	13 124	23 388	42 513	NA	76 523	NA
RTF	0	0	1 980	1 980	NA	3 564	NA
ITN re-impregnated	NA	NA	58 624	58 624	NA	105 523	NA
Total	117 580	205 758	441 844	765 182	1 575 201	1 377 328	87%

NA: not available.

4.3.2.2. ITN coverage

- Bioassay tests showed good efficacy of conventional ITN as the 24h mortality of *An. dirus* and *An. karwari* were 100% and 93.3% up to six months. No data on bio-efficacy of LLINs is currently available.
- ITN distribution and retreatment is the responsibility of VBDU and VBDC. However, planning of ITN distribution and retreatment programme was not conducted in 2013 to 2015, probably due to poor coordination (See Table 6).
- As decentralized regions procure their own insecticide for IRS and ITN, disaggregated data (and reports of) for IRS and ITN coverage is only partially available to BVBD, which is then not in a position to provide a consolidated picture of coverage. The planning division of MoPH is responsible for the overall funding to and salaries of VBDU/VBDC staff. The planning division receives activity reports and discusses technical and financial issues in consultation with BVBD entomologists regarding pesticides and supplies. However, the planning division does not receive consolidated data from all implementing partners pertaining the coverage rate of vector control operations (such as IRS or LLINs or ITNs).

Table 6: Planning and operational data for ITN distribution, 2012–2015
 [Source: BVBD, Sep 2015]

Year	Population protected by ITN (A1/A2)		No. of households		No. of ITN distributed (A1/A2)	
	Planned	Implemented	Planned	Implemented	Planned	Implemented
2012	21 013	20 231	4 618	4 668	4 992	3 938
2013	44 053	45 082	NA	NA	8 512	8 608
2014	40 637	40 671	NA	NA	9 435	9 293
2015	21 773	25 400	NA	NA	4 313	4 198

4.3.2.3 IRS coverage

- VBDC and VBDU provide technical advice pertaining to IRS but LAO might use their local funds to proceed with any spraying operations independently of VBDC or VBDU.
- During the visit to Ubon Ratchathani and Chanthaburi provinces the following practices were noted:
 - IRS and fogging were used for both malaria and dengue control
 - IRS is implemented in A1 areas including fogging at the request of the military command or forestry officials
 - fogging is done for dengue control for malaria control in villages of Bx, By groups
 - lack of geographical reconnaissance (GR) prior to IRS operations and/or lack of training in GR. Spraying was conducted on seasonal farm huts and in areas where Bx, By and Bz cases are found. Huts with a roof and no walls are sprayed. No study was conducted to evaluate the effectiveness of IRS in huts with complete versus incomplete walls
 - in A1 and wherever low acceptance of IRS is anticipated, ITN is applied in these areas
- The impact of IRS is lacking due to near universal coverage with ITN/LLIN and very limited mass preventive or focal responsive spraying operations. During the period from 2012 to 2015, IRS coverage was high for one round applied before the transmission season (See Table 7). High coverage in excess of 100% may be explained by the lack of GR prior to IRS operations or lack of training in GR. However, IRS is considered as an effective measure

for outbreak situations provided it is done in a timely and efficient manner and the operational and resource feasibility are considered in policy and programmatic decisions.

- Reporting of ITN/IRS coverage and distribution by ODPC is incomplete and untimely and there is a need for BVBD to follow up this issue.

Table 7: Population protected by IRS from 2012 to 2015

[Source: BVBD, Sep 2015]

Year	Population protected by IRS (A1/A2)		No. of households sprayed		% coverage	
	Planned	Implemented	Planned	Implemented	% pop	% hh
2012	2 796	2 695	2 610	2 698	96.4	103.4
2013	5 717	5 735	5 296	5 185	100.3	97.9
2014	6 440	6 386	5 939	5 835	99.2	98.2
2015	3 266	3 356	3 149	3 085	102.7	97.9

4.3.2.4 LLIHN coverage

- The observation in Ubon Ratchathani and Chantaburi province, LLIHN are used for people who go to work in the forest. Due to insufficient census or demography data, LLIHNs are very limited for forest workers and probably a limited supply is received from partners. According to DHO and PHO officers, Cambodian people preferred LLIHN than the ITN whereas the Thai population along the border areas show a low uptake of hammock nets.
- There appears to be a policy (Ubon Ratchathani) of providing hammocks/LLIHN or repellents for people who go to the forest, and LLIHN for the military. Hammock nets are also available in the commercial market at THB500 per unit, which is prohibitive for the local communities.
- Access to LLINs/LLIHNs for hard-to-reach populations, especially mobile and migrant populations, is promoted by the NMCP. Thailand's estimated population and LLIN needs cover all Thai and long-term populations in A1 and A2 areas. The NMCP calculations do not cover M2 (temporary migrants), refugee populations in nine camps along the Thai-Burma border, and soldiers who are deployed to the border areas (near forest and forest fringes). The M2 populations included in *Table 8* below are only those estimated to present themselves for malaria testing at health facilities. According to the NMCP, the estimated numbers of M2 populations are around 150 000.

Table 8: Number of LLIHN distributed in 2012 to 2015

[Source: BVBD, Sep 2015]

year	Population protected by LLIHN (A1/A2)		No. of LLIHN distributed (A1/A2)	
	Planned	Implemented	Planned	Implemented
2012	NA	0	NA	0
2013	4 980	1 699	NA	1 699
2014	5 241	8	NA	8
2015	7 456	152	NA	152

4.3.2.5 Personal protection measures

- The use of repellents has been promoted by VBDC to prevent malaria among forest goers/workers, risk groups and migrants in Chanthaburi. Repellents (several brands) are available over the counter in some stores, local shops in the community and as part of malaria volunteers'/workers' stocks (with RDT and ACT). Given the paradoxical results of DEET 20% and picaridin 20% in Cambodia, field evaluation shows that repellents can provide additional personal protection against early and outdoor biting malaria and arbovirus vectors, with excellent protection up to five hours after application.¹⁷
- The MPR team noted that guidelines for vector control and personal protection were unclear such as: a) control of outdoor transmission; b) treatment of personal clothing (for instance, bifenthrin and adverse events reported in Na Chaluai district); c) bioassays do not take into account community practices such as the number of washes of ITN/LLINs and drying practice; d) replacement strategy of ITN/LLINs; e) enumerating household census prior to IRS and LLIN/ITN distribution.

17 Van Roey K et al. (2014). Field evaluation of picaridin repellents reveals differences in repellent sensitivity between Southeast Asian vectors of malaria and arboviruses. *PLoS Negl Trop Dis* 8(12): e3326. doi: 10.1371/journal.pntd.0003326.

4.3.3 Recommendations

- MoPH to re-establish the national insecticide committee to review public health insecticide policy and provide updated guidelines to PHO and ODPC and local administrations.
- Entomology and Vector Control Group to develop criteria and comprehensive plan for micro-stratification using migrant demography, entomology and epidemiology data in collaboration with the surveillance and M&E unit, DDC, VBDC and PHO. Vector mapping should be updated and cover A1/A2 and B1.
- Entomology and Vector Control Group to review and develop specific VC strategies for epidemic-prone areas (B1 and B2).
- BVBD should provide technical support and coordinate the planning/budget of VC activities with ODPC, PHO, VBDC and ensure compliance to guidelines with the following activities:
 - Strengthen accurate and timely reporting of VC activities (ITN/LLIN, IRS, other VC measures) by VBDC and VBDC. ODPC is required to submit summary and timely reports to BVBD.
 - Joint planning between ODPC and BVBD for entomological activities, vector control operations and special surveys or studies.
 - VBDC (DHO) should ensure timely report of new foci (maximum three days) through malaria online for immediate action by SRRT/DHO/PHO.
- BVBD should review SOPs and guidelines for vector control and personal protection such as: a) treatment of personal clothing; b) bioassays that take into account community washing and drying of insecticide-treated materials; c) replacement strategy of ITN/LLINs; d) enumerating household census prior to IRS and LLIN/ITN distribution; and e) repellents for outdoor protection of malaria and arboviruses.
- BVBD should review the functions and TORs of the National Committee on the Use of Public Health Pesticides to ensure effective and safe use of these chemicals, including equipment for vector control.
- There is a need for greater collaboration between ODPC and BVBD in planning vector control operations and entomological activities, including IRS training for spray operators and supervisors, and preparing the community for spraying.
- Review current repellent guidelines in view of recent findings, including messages in the IEC/BCC materials displayed at malaria clinics, malaria posts, border posts and volunteers' premises at community level.

4.4 Vector Control: Human resource and capacity building

4.4.1 Current strategy

This includes an approach for malaria and all vector borne diseases.

As stated in the Thailand National Strategic Plan 2011–2016, the strategy is as follows:

- Review the organizational structure and direction of personnel development for controlling malaria in ODPC, VBDU and PHO levels.
- Designate responsible persons and create a human resource development plan and database for systematically planning human resource development.
- Develop teaching and learning opportunities about malaria control in the vector borne disease training centre, institutions training physicians, nurses, lab technicians, and other public health professionals at provincial and local levels concerned with disease control.
- Train personnel in the various occupations relevant to malaria control in sufficient numbers and quality to conduct the work.
- Conduct international level malaria trainings.

The specific technical and operational units that are responsible for vector control strategies and activities in endemic and non-endemic areas are the VBDU and VBDC (BVBD Guidelines for Malaria Control for Health Personnel (2009).

4.4.2 Summary of inputs from the MPR team

4.4.2.1 Human resource, capacity building

- The national malaria control programme is now in transition from its previous National Strategic Plan (2012–2016) to a new strategic plan for elimination.
- The major change is that the new strategy fully incorporates an elimination approach, and increases the percentage of districts achieving interruption of malaria transmission (no indigenous cases of malaria for the last three years) to 80% by 2020. In line with this target, the roles of entomology and vector control would need to be reviewed and adjusted based on elimination-based vector control approach and strategies.

- As A1/A2 areas will be gradually reduced, the number of B1/B2 areas will increase, which requires a universal coverage of at-risk populations with vector control. At the same time, entomological intelligence is also useful to evaluate risk of reintroduction where malaria-free status has been achieved recently.
- Table 9 below show human resource in entomology in each level of the DDC. In addition, there is an investigation team in each VBDC (38 VBDC). The team consists of a team leader and four insect collectors. This team is responsible for case investigation and entomological studies.

Table 9: Number of entomologists by region and qualification

[Source: BVBD, September 2015]

Region	Position		Qualification			Total	Investigation teams/ persons
	Permanent	Temporary	PhD	M.Sc.	B.Sc.		
BVBD	9	-	2	5	2	9	-
DPCO 1	2	1	-	-	3	3	-
DPCO 2	-	1	NA	NA	NA	1	-
DPCO 3	3	6	1	-	8	9	5/4 to 5
DPCO 4	3	8	-	-	11	11	4/4 to 5
DPCO 5	2	5	-	2	5	7	4/4 to 5
DPCO 6	2	3	1	-	4	5	3/4 to 5
DPCO 7	1	3	-	-	4	4	3/4 to 5
DPCO 8	1	4	-	1	4	5	3/4 to 5
DPCO 9	0	6	NA	NA	NA	6	3/4 to 5
DPCO 10	3	10	1	1	11	13	5/4 to 5
DPCO 11	3	10	-	1	12	13	5/4 to 5
DPCO 12	3	8	-	3	8	11	4/4 to 5
Total	32	65	5	13	72	97	38-50

- The post of new entomologists at the VBDC and some at the BVBD are government employees (GE) who are temporary and hold four-year contracts. Most of them have agricultural entomology background with very limited skills and knowledge in vector borne diseases and control/elimination.

- Limited induction or orientation training was provided and the entomology and vector control group at the BVBD central office has a very limited role in providing training and technical support for new entomologist recruits at regional/provincial levels, since the latter are under the responsibility of ODPC.
- It is observed also that there was high turnover of these entomologists due to the temporary nature of the post, limited benefits offered by the current government policy for short term employees and lack of a clear career path, as compared to government officers.
- Pre-service training for young staff requires basic training on vector borne diseases and their control on malaria elimination and public health entomology, including in-service training for the existing work force. It is imperative for them to understand current strategies toward malaria elimination.

4.4.3 Recommendations

- BVBD should establish a working group to develop specific course curriculum for induction or in-service training of new entomologists recruited at VBDC or VBDC level. A two-month induction training is required to cover all aspects of public health entomology including epidemiology apart from medical entomology. Experts from academia such as Department of Entomology, Kasetsart University, and Department of Medical Entomology of Faculty of Tropical Medicine, Mahidol University, and other universities should be invited to form the working group and design the curriculum course.
- BVBD should organize a training course on IVM in collaboration with ODPC and PHO. According to the draft five-year strategic plan (2016–2020) for malaria elimination, the concept of IVM should be promoted and implemented. Entomologists should also be trained to be responsible for these activities
- As entomologists play an important role in malaria elimination, their suggested roles and responsibilities would be as follows:
 - To investigate presence of malaria vectors and other anopheline mosquitoes in B1 and B2 areas.
 - To investigate and classify foci according to malaria transmission and recommend appropriate measures.
 - To investigate potential malaria outbreak as a member of the SRRT.
 - To assess impact of vector control operations.
 - To conduct entomological studies and operational research related to transmission dynamics and control operation.
 - To collaborate in the implementation of IVM strategy and evaluate the impact and sustainability of this activity.

4.5 Vector control: Research strategy in entomology and vector control

4.5.1 Current strategy

As stated in the Thailand National Strategic Plan 2011–2016, the strategy is to create a conceptual framework and support guidelines for personnel conducting operational research for developing malaria control methods.

4.5.2 Summary of inputs from the MPR team

- Since the introduction of IVM into malaria elimination strategies, good progress was made in operational research related to outdoor transmission and its control. The entomology and vector control group (BVBD) collaboration with M&E (SMRU and SSF-funded project) to conduct entomological surveillance among 875 villages in border areas with Myanmar and Cambodia will increase knowledge of vector distribution and contribute to stratification in A2 or B areas where case investigations are conducted. As part of the SMRU-BVBD collaboration, entomology staff will receive training in PCR of *Anopheles* mosquitoes by Kasetsart University in 2015/2016 and this expertise will strengthen technical expertise of BVBD.
- As more research and mosquito faunistic surveys are performed using non-morphological methods for definitive (and confirmatory) species identification, experienced molecular-trained BVBD staff will play an increasing role in the malaria elimination programme.
- Current operational research included:
 - (a) evaluation of long lasting insecticidal net jacket (LLINJ) for malaria vector control in rubber tapping population in southern Thailand (RAI-funded) by VBDC. The results will contribute to new strategy of personal protection in prevention of outdoor transmission. The project is currently eight months in progress. (b) vector behaviour studies in Mae Ra Mat district, Tak province, ongoing and expected to be completed by December 2015. (c) expanded coverage on insecticide resistance monitoring every two years by increasing sentinel sites in S, N, W, and E in A1/A2 areas to public health insecticides in collaboration with Kasetsart University.
- There is limited data validating to larval surveys against human landing collections from the same collection sites.

4.5.3 Recommendations

- BVBD to organize a national malaria research meeting to exchange results from recent research studies, review gaps and findings especially from the field, identify research needs and prioritize research studies. Such meetings to be organized every one to two years according to advances in technology and their applications to vector control.
- Potential grey areas/pending questions requiring further research conducted by BVBD/or academic institutes that will impact on national programmatic performance are listed below, but not limited to:
 - (1) Collaborate with research institutions to define and execute research projects relevant to outdoor malaria transmission control, such as trials of new spatial repellents, the role of reforestation and rubber plantation in outdoor malaria transmission,
 - (2) Evaluate a mixed model of ITN/LLIN distribution using Insecticide Treatment Kit (ITK)-net bundling and social marketing. Analysis of the attrition rate of the LLIN durability study should also be included in the current project.
 - (3) Collaborate with ODPC to pilot IVM projects for the control of malaria/lymphatic filariasis/dengue/Japanese encephalitis/chikungunya.
 - (4) Collaborate with Kasetsart University to pilot and test GIS technology to map malaria risk areas using land-use, ecological, human population and anopheline species data for malaria micro-stratification.
 - (5) Study preference and acceptability of ITN, and two LLINs (for instance, softer polyester and the stiff material of polyethylene fabrics).

4.6 IEC/BCC and community strategy to support entomology and vector control

4.6.1 Current strategy

Measures applied for malaria control and elimination in different malaria prone areas are summarized in *Table 10* below. These were applied in all 47 provinces under GFATM project funds. Messages were developed based on results from community assessments with target (or study) population. Different cultural-related IEC/BCC approaches and materials were developed and implemented through interpersonal communication by volunteers.

Table 10: IEC/BCC measures by area stratifications (2011) [Source: BVBD]

Measures	Area stratification			
	A1	A2	B1	B2
Information, education and communication (IEC) and BCC				
1. Public relations				
Mass communication	+	+	+	+
Community radio channel	+	+	+	-
Poster and other printing materials	+	+	+	+
2. Health education				
Villages	+	+	+	-
School	+	+	+	-
Malaria clinic	+	+	+	+
Tourist areas	+	+	+	-
Hill tribes/ethnic minorities	+	+	-	-
Campaigns	+	+/-	-	-
3. Community participation				
Establish village (health /malaria) volunteers	+	+	+/-	-
Self-protection	+	+	+	-
Self-reliance villages	+	+	-	-

4.6.2 Summary of inputs from the MPR team

- Community preparation was conducted prior application of IRS and impregnation/re-impregnation of insecticide on conventional nets to ensure compliance after implementation. Moreover, the manual on the use of IEC/BCC materials and media was made available for PHO/DPCO/ VBDC and VBDU to guide village health volunteers (VHV) to deliver health education in the communities. In addition, bilingual IEC/BCC materials were jointly developed with neighbouring countries (such as Cambodia and Myanmar) for migrant population living and working in Thailand.
- Posters and pamphlets were distributed to communities where IRS, ITN and LLIN measures were implemented in the target sub-villages, malaria clinics, malaria posts and border posts. Posters on personal protection by repellents, mosquito coils and mosquito nets were placed in villages and VBDUs. VHV and village malaria volunteers (VMV) were engaged and trained for this activity. However, their skills on delivering malaria messages are still limited.
- Villagers preferred active communication or IPC to obtain answers for their inquiries. There are approximately 2300 VHV who are closely supervised by PHO with an additional incentive of THB300 from the GF project. These VHV are responsible for providing health education to villagers in A1 and for assisting in preparing the community for IRS, ITN and LLINs distribution.
- The MPR team noted that the key messages for BCC under the malaria SSF grant were 'Regularly sleeping under insecticide-treated nets (ITNs), long-lasting insecticide-treated nets (LLINs)'.
- BCC/IEC plays an important role in the new Thailand Malaria Elimination Strategy 2016–2025, which targets B2/B1 areas without active transmission but probable presence of vectors.

4.6.3. Recommendations

- As VHVs will become increasingly important to provide health education, there is a need to enhance their IEC/BCC capacity.
- BVBD should develop a sustainability plan that includes a review of the roles of VHV and their continuing support to elimination (*See also Section 6*). Government funds to support this activity should be available to maintain current efforts made by the VHVs and CSOs. The plan should also include a formal mechanism for CSOs to communicate with government agencies and the health sector (*See also Section 6 on programme and human resource*).
- BVBD should review BCC activities and strategies every two or three years to ensure that the messages are relevant and adjusted to the knowledge base of the population. A re-design or modification of culturally appropriate IEC/BCC messages, materials, communication channels and media for Thai communities and migrant/mobile populations may be necessary, as it is important to respond to motivational aspects of the highest risk population.
- The collaboration between PHO and VBDC is maintained so as to ensure that communities are prepared for vector control interventions.
- VHVs and CSOs have made significant contributions in community and family care, and preventive practices, and these should be maintained through a sustainability plan for BCC/IEC. Whilst health education and community participation can greatly facilitate the elimination work, the clear benefits are cost reductions and ensuring success.
- VHV and VMV require further training to enhance their capacity for effectively delivering health education for at-risk population.
- Key messages for BCC should emphasize net maintenance in order for nets to last longer and the use of LLIHNs when staying outdoors overnight.

Surveillance, monitoring and evaluation (SME)

5.1 SME strategy

5.1.1 Surveillance strategy

There are two primary sources of malaria data in Thailand. The majority of malaria reporting comes from the vertical programme (BVBD) which consolidates data from MCs, VBDUs at district level and VBDC at provincial level. In parallel, at district and provincial levels, there exists Health Promotion Hospitals (HPH, formerly referred to as Health Centres) and District/Provincial Hospitals (DHO/PHO), respectively. In addition, MPs and border malaria posts (BMPs) were established to provide malaria services in remote areas, particularly focusing on migrant and mobile populations.

Consolidation of data between BVBD and BoE

Since 2012, there has been much progress in transitioning the BVBD's EP1 and EP3 forms from paper-based to electronic-based using the Malaria Online (using the business intelligence or BI) platform. With support from GFATM, the Malaria Online system was initially implemented in 22 malaria endemic provinces, and was further expanded to cover all 77 provinces. The Malaria Online platform also includes financial and programme management and reporting tools.

At the national level on the BI platform, data from both the BoE and BVBD is consolidated using a software program, called Fuzzy Logic, to reconcile duplication of malaria data. Duplication occurs when data from the same malaria patient is entered into both the BoE's 506 as well as the BVBD's Malaria Online. Sensitivity analyses (at an 80% cut-off threshold) of the consolidated data indicate that approximately 17–20% of the data are redundant.

5.1.2 Monitoring and evaluation strategy

A National Monitoring and Evaluation (M&E) Plan for Malaria Control and Elimination (2011–2016) exists and is being implemented by BVBD. This National M&E Plan supports the vision that 80% of the country will be free from locally acquired malaria transmission by the year 2020. The Malaria Online system is currently able to track key outcome indicators from the National M&E Plan, namely: (1) Annual Parasite Incidence (API) (all species) per 1000 mid-year population; (2) Annual Parasite Incidence (API) (all species) per 1000 mid-year population among refugees in camps; (3) Malaria Mortality Rate; (4) Percentage of target villages in which malaria transmission is interrupted within the past year (nationwide); (5) Malaria test positivity rate (all species) (nationwide).

However, in line with the new targets and timeline from WHO's Malaria Elimination Strategy in the Greater Mekong Subregion (GMS), a new National Malaria Elimination strategy and M&E plan are currently being developed taking into account new interventions and targets.

It is recommended that this M&E plan includes essential elimination and prevention of reintroduction indicators that can be routinely and accurately collected by community volunteers, peripheral malaria facilities and by general health facilities, and that district offices are in a position to consolidate and to report to higher levels in a consistent and harmonized way. It is also important that indicators, which are not routinely or accurately collected through existing surveillance mechanisms, are included in well-designed survey methods and budgeted adequately. These could include, for example, ITNs/LLINs distribution and coverage, population knowledge and practices or measurement of the capacity of peripheral workers to perform expected tasks.

5.2 Surveillance as an intervention

5.2.1 Summary of inputs from the MPR team

- Although fairly comprehensive, Thailand's surveillance system is currently focused on reporting, monitoring of trends, and indicators. For the most part, the system adequately captures confirmed malaria cases, treatment and follow-up; however, it does not particularly emphasize (and facilitate) response and action.

- Thailand's Malaria Elimination Strategy aims to implement the 1-3-7 approach (similar to China's web-based surveillance and response mechanisms). This approach emphasizes that every malaria case must be detected and/or notified within 24 hours (one day); case investigations conducted within three days; and appropriate response mounted within seven days. The use of these time-bound activities and targets can be a useful measurement tool for M&E.
- Malaria is currently not a notifiable disease. Discussions are underway to include malaria as a notifiable disease (within 24 hours), but how this would be implemented in the field remains uncertain.

5.2.2 Recommendations

- Surveillance as an intervention to trigger appropriate, focused and timely response. The surveillance system should be updated (and re-orientated) to detect and trigger a response to each and every confirmed malaria case. The surveillance system should also enable adequate monitoring of these actions.
- The National Programme could consider mHealth tools and technologies (such as SMS alerts/reminders and apps for reporting and monitoring) to generate automated notifications, track case investigations, and monitor follow-up.
- BVBD/BoE should consider improving linkages of IT systems to case management (compliance and follow-up), supply chain management, initiation and completion of case investigations, SRRT response, and outbreak detection.
- As with the dengue program, political commitment is needed to elevate malaria as a priority disease and to ensure that adequate resources (human and financial) are available to respond to each and every malaria case.

5.3 Case investigations

5.3.1 Summary of inputs from the MPR team

- Proper case investigations for each individual are critical to move towards malaria elimination. It is essential to determine where the transmission is likely to have occurred, whether it was locally transmitted or acquired elsewhere. The case classification based on the probable source of infection will determine the set of activities required.

- Currently, case investigations (using the EP3 form) are not conducted on all confirmed cases, especially for hospital-based cases and among M2 populations and hospital-based cases. Malaria cases that are detected through GHS (that is, district and provincial hospitals) are generally not investigated; particularly in areas where there is no vertical programme to do this work. Nationally, approximately 60% of cases are investigated. The shortfall is due to workload, lack of human resources, budget constraints, and tendency to think that it is difficult to investigate migrants.

5.3.2 Recommendations

- Individual case investigations (EP3) of all malaria cases must be conducted and prioritized.
 - Consider review and update of case investigation forms to capture only relevant information useful for case classification (for example, a simplified EP3 for general health services).
 - Case classification criteria (for instance, A vs Bx) should be reviewed, standardized and applied consistently.
 - BVBD should consider implementation of a data quality assurance system to ensure that cases are investigated completely and classified correctly.

5.4 Outbreak detection and response

5.4.1 Summary of inputs from the MPR team

- As the malaria incidence and resources for prevention activities in areas without malaria transmission (B1 and B2 areas) decline, the risk for malaria outbreaks will ultimately increase. For example, recent focal outbreaks along Thai–Lao border largely related to unregulated deforestation were observed as well as in the south where limited access (remote forest areas) and insecurity issues persist in areas of insurgency.
- There seems to be a lack of a functioning early warning system for outbreak detection and response (example seen in Ubon Ratchathani, 2014). It appears that epidemic/outbreak thresholds are not available at peripheral levels (or at least not functioning) to detect and respond to increased numbers of malaria cases.

- Following the outbreak of avian influenza, Surveillance and Rapid Response Teams (SRRT) have been present since 2004 in every district and sub-district. These SRRT teams are responsible for detection and response to more than 60 diseases (14 of which are notifiable). Currently, the scope of the SRRT teams does not include malaria, other than responding to malaria outbreaks in areas where there has not been recent malaria transmission.
- In the case of the outbreak in Ubon Ratchathani, the establishment of local War Rooms (which included local government authorities, military and other non-health stakeholders), for planning and response to the malaria outbreak contributed to the coordinated response.

5.4.2 Recommendations

- BVBD/BoE should consider adjusting Malaria Online/Business Intelligence System (BIS) to include epidemic thresholds (based on percentage deviation from the median in endemic villages and absolute cases in B villages) for (sub) district monitoring and analysis of weekly trends.
 - More emphasis should be placed on increasing the skills and competency of programme staff (VBDO and DHO) in epidemic detection, analysis and response.
 - Use information systems to activate SRRT response (for example, outbreak thresholds, automatic text messages to responsible officers in VBDC/VBDO/PHO lines).
 - Consider phased approach to integrate malaria into SRRT response.

5.5 Area stratification

5.5.1 Summary of inputs from the MPR team

(See also Section 2 on malaria epidemiology)

- Thailand current stratifies each village annually based on case investigations, epidemiological and entomological data. The area stratification for each village determines the specific set of activities [for instance, LLIN distribution, active and passive case detection (ACD and PCD, respectively), foci investigations etc.].
- In A1/A2 villages where malaria transmission persists and in areas still considered to be receptive to transmission with potential for reintroduction,

control activities remain exceptionally managed through vertical programme structures. In other areas, malaria diagnosis, treatment and case investigation are fully integrated into and managed by routine health care services.

- With limited resources available, Thailand has had to prioritize and target its strategy and (external) resources to control malaria in A1 and A2 areas. This dependency on project funding may have contributed to the lack of attention in B1 and B2 areas, and as demonstrated by the outbreak in Ubon Ratchathani in 2014, B1 and B2 areas remain vulnerable to malaria resurgence.

5.5.2 Recommendations

- As Thailand moves towards elimination, attention to B1 and B2 areas (prevention of reintroduction) will be increasingly crucial. The National Programme should consider more flexible funding sources and assess its strategies in B1 and B2 areas to address potential outbreaks.
- Intensified malaria control activities are still required in A1/A2 areas.

5.6 Data flow, management and use

5.6.1 Summary of inputs from the MPR team

- There has been significant progress in moving the surveillance system from a paper-based to an electronic platform in the past few years. Current effort is now focused on merging the two databases for malaria (BoE's 506 and BVBD's EP1/EP3) and to address the duplication of reported malaria cases from the two systems (~17–20%). However, the consolidation of data at national level is not adequate or timely enough for the purposes of malaria elimination.
- The current Malaria Online system adequately captures Thai cases, but further work is needed to improve capturing case load, investigation and follow-up of non-Thais (M1 and M2) especially. There appear to be some inconsistencies in some provinces using these classifications. Furthermore, there may be some gaps with regard to data from private sectors, NGOs, and non-health sector sources (for instance, the military). There has been progress in incorporating data from the SMRU clinics; however, more effort is needed

to ensure that all NGOs providing case management of malaria are reporting routinely to Malaria Online by using updated simplified standardized forms.

- There is reliance on externally supported IT and M&E (contracted) staff to manage data, but limited analysis and use of data by programme staff. There appears to be inadequate routine data analysis conducted at all levels to monitor malaria trends or to detect malaria outbreaks.

5.6.2 Recommendations

- BVBD and BoE should consider a review of the different software systems in use (hospitals, HPH, DHO, VBDU etc.) and determine how to ensure interoperability of these systems for malaria data.
 - Explore linkages with National Health Security Office (NHSO) data similar to HIV/AIDS for patient registry, tracking and reimbursement.
 - Consider lessons learned and processes used for the integration of the Measles Elimination Programme with GHS.
- BVBD should take proactive steps to include malaria reporting (notification) from private sectors, NGOs and other non-health sectors.
- District level staff (VBDO, DHO) should be trained intensively and empowered to conduct data analysis, interpretation and presentation of their data using the Malaria Online System with clear roles and responsibilities for each staff.
 - Feedback and supervision systems should be strengthened with clear accountability, roles, and responsibilities.
 - More local cross-border information sharing strategies should be encouraged and implemented (for example, Mae Sot/Tak) to monitor the malaria situation better.

5.7 SME: Sustainability and capacity strengthening

5.7.1 Summary of inputs from the MPR team

- Data entry at district level is currently performed by contracted IT and M&E staff at VBDO and DHO, respectively. These positions are occupied by temporary contract staff who are supported from external funding that is

project-specific. With both Global Fund SSF and RAI projects phasing out by the end of 2016, there is a potential gap regarding who will take responsibility for data entry (and analysis) going forward.

- As Thailand moves toward malaria elimination, it will be essential that district level staff are equipped with the necessary skills and capacity to analyse and act on the data reported from the district. District Data Centres under the supervision of BoE have the mandate to consolidate and analyse reportable diseases. Strengthening the capacity for data management, analysis and use at the District Data Centre (in coordination with the technical expertise from the vertical programme) could be useful.
- Furthermore, the server for the Malaria Online/ BIS will be transitioned from BIOPHICS, Mahidol (an entity outside the ministry) to the BoE in the near future. There may be potential gaps for BoE to manage the malaria data and/or make adjustments to the system and additional technical support may be required.

5.7.2 Recommendations

- BVBD and BoE should strengthen the District Data Centres capacity to consolidate, analyse and disseminate malaria data for responsible parties. Additional training opportunities in epidemiology and/or biostatistics should be prioritized.
- In the longer term, malaria epidemiological skills are needed at each district; in the shorter term, BoE may require additional staff (that is, malaria epidemiologist) to be responsible for overseeing the transition and management of data from BVBD to BoE.

Policy and malaria programme management: Health systems challenges towards malaria elimination

Introduction

As the prevalence of malaria declines, the rationale to progressively integrate vertically driven malaria operations into health systems increases – partly because it will become uneconomic to keep teams of workers dedicated to a single disease (malaria) that in terms of lives lost is no longer a problem and partly because standalone malaria clinics and providers would be unable to provide access and quality of care needed.

Integration occurs in each of the six dimensions – or components – of health systems:

- Human resources strategy.
- Organization of service delivery.
- Financing.
- Logistics of drugs and diagnostics for ensuring access to technologies.
- Health information and health information systems.
- Management and leadership – which includes monitoring and the distribution of power, functions and accountability amongst implementing institutions.

The review team examined each of these areas and presents its findings and recommendations. In each of these areas, we would identify sub-areas where malaria-specific actions and actors need to be maintained; but for the most part, they would have to fit into the organization of GHS without losing the priorities and conditions that are mandatory requirements for the goal of eliminating malaria and preventing its reintroduction.

6.1 Human resources strategy

6.1.1 Summary of inputs from the MPR team

There is an enormous health workforce in Thailand who could be mobilized towards malaria elimination goals with clear guidance and support.

In malaria endemic villages, Health Volunteers contribute a major part of the work in early case detection and health communication at the inter-personal level. There is a sub-set of these volunteers, paid an additional sum and living in A1 and A2 villages, known as malaria village health volunteers who have additional tasks related to behavior change communication in these villages. In malaria posts including border posts there are contractual staff who are using RDTs but not providing treatments except in one district in Tak province where those volunteers are also allowed to administer treatment for uncomplicated cases. The network of village volunteers has been very useful in malaria control and is still of added value in many endemic countries including for example neighboring provinces of Tak province in Myanmar where prompt diagnosis and treatment is mostly provided by trained village volunteers. The main concern is to maintain them or find alternative options where needed after the GF funding ends.

6.1.2 Recommendations

Health volunteers (HV)

- Ensure better outcomes by providing better role clarity along with a system of reporting on achievement. Their primary accountability should be for effective utilization of (impregnated) bed nets. Their second primary accountability is for prompt referral of fever cases. They would have a secondary or contributory accountability for source reduction strategies targeting all vector borne diseases (the local administration has the primary accountability for this).
- There is no need to maintain a separate category of malaria village health volunteer. All HVs in A1 and A2 villages must be provided with additional training and support inputs through regular village level meetings to ensure progress with respect to the above three activities (effective use of impregnated nets, prompt referral and transmission source reduction strategies).
- The MPs and BMPs should be continued as outreach activities of the HPHs and be closely linked to them. In terms of the services they provide, the malaria posts should also provide the recommended antimalarial treatment so that there is no gap between a positive diagnosis and the immediate initiation of treatment. These are, therefore, part of the HPH workforce.
- MoPH, Department of Health Services Support should articulate a clear long-term strategy on HV that clarifies roles and functions in different contexts: how to select, how to replace, how to train, and the support mechanisms required. The investment of close to THB8 billion annually on this workforce requires to be backed by such a clear strategy.

Public Health Officers/Workers

- A clear HR policy for public health workers, which specifies mechanisms to standardize and make more relevant their pre-service training, mechanisms of in-service training and professional support, and an encouraging career path for them.

6.2 Skill building, skill retention and upgradation in service providers

This concerns capacity building and career pathways for doctors, nurses and public health officers.

6.2.1 Summary of inputs from the MPR team

- As the number of malaria cases decline, it is a serious challenge to keep alive the skills and confidence that health care professionals need to identify and manage malaria cases, especially severe malaria that requires in-patient care and malaria with complications requiring tertiary care support such as dialysis or ventilation.
- In many sites visited, district hospitals were losing skills in managing severe malaria and HPHs were referring away even simple malaria. It was also a challenge to update the large numbers of health care professionals in minor and major changes in treatment guidelines and management protocols – and such updating is required from time to time (See case management and follow-up in Section 3).
- The other major cadre involved in malaria control are the Public Health Officers (PHOs) - mostly diploma or degree holders in public health. Despite their large active presence at operational levels, as service providers in Health Promotion Hospital (HPH) and as the main cadre in VBDUs and DHOs, the focus on their capacity building and contribution is weak.

6.2.2 Recommendations

- Periodic (re) training sessions accompanied/supported by updated training materials and guidelines by both the BVBD and BoE would remain a key strategy for skill building and awareness.
- To involve PHOs into the malaria elimination agenda for which more training and support through updated guidelines are needed as well as clarity on their career path;
- There is a need to build up and institutionalize an online distance mode dissemination, learning and certification approach – such that whenever there is a need to incorporate a change in SOPs, the entire workforce could go through the revised SOPs and get certified online as having gone through and understood it. This would also be useful for building skills using case simulations for both individual case management and the management of outbreaks and a more general data analysis and response (*See also Section 5 on surveillance and response*).
- For BVBD and PHO to consider, especially in remaining remote highly endemic areas, allowing treatment for uncomplicated cases by trained volunteers in addition to RDTs under close monitoring and supervision or to set-up health centers properly staffed in these areas..

6.3 Human resources specific to malaria interventions in the context of malaria elimination and prevention of reintroduction

The strategy is focusing on epidemiologists, entomologists and microscopists (See other sections on epidemiology, vector control and surveillance).

6.3.1 Summary of inputs from the MPR team

- Epidemiology: Qualified epidemiologists are operating at the VBDC (province level) and public health workers are playing epidemiology roles at the district health office and VBDC levels. The BoE plans an induction training for all epidemiologists by qualification and those required to play this role with subsequent interim trainings. As part of the launch of the SRRT, the BoE team has conducted three-day training programmes in each province, a process that took close to two years to complete. The malaria epidemiology inputs

are learnt largely on the job as part of the regular process of supervision and reporting.

- Malaria microscopy: The same holds true for microscopist training and for some it has been five to 15 years since they have had any refreshers. Since malaria cases have dropped to almost zero, there are few opportunities to see positive slides. A good QA/QC programme compensates to some degree but as the so-called old-timers who have learnt on the job retire, and there is a noticed shift to RDT in HPHs, there is a need for a policy to decide how many would be needed in the coming decade, how to close the gap and how to integrate with the regular system.
- Entomology: Entomologists are posted in every VBDC and to regional and national BVBD offices. There are in all about 97 entomologists in the public health system of which the greatest number are in the VBDCs – about two per each of 35 VBDCs. Here the first challenge is to move on from malaria to cover all vector borne diseases (dengue, scrub typhus, encephalitis, leishmaniasis, filariasis, Japanese encephalitis, chikungunya). The second challenge is to upgrade and adequately equip them with new tools (such as PCR) and new demands on the outputs required of them for malaria and its elimination. Currently they provide three outputs: [1] an updated map of which are the common vectors in each tambon or VBDC area, [2] a collection of mosquitoes for PCR testing to rule out indigenous transmission in new B1 areas, prior to their designation and [3] insecticide resistance testing in endemic areas. The BVBD is in charge of their training and skills upgradation.

6.3.2 Recommendations

- A HR strategy for each of these cadres has to be finalized. It includes the following concerns:
 - **For microscopists** (*See also Section 3 on case management*): [1] refresher trainings where microscopists can examine and comment on a mix of negative and positive slides from an updated webcam library of recent cases (slide-bank); [2] a decision to strengthen district hospitals with at least two laboratory technicians who have updated microscopy skills, so that when malaria clinics cease and microscopists retire there are good quality skills in microscopy left in the districts, not only for malaria examination, but for other blood smear examinations as well.
 - **For epidemiologists**: [1] enabling some (based on criteria), public health workers to upgrade to higher level of epidemiology skills required for district and provincial work; [2] encouraging some (based on criteria) community doctors/medical professionals to specialize in epidemiology for provincial and regional and national offices; and [3] ensuring malaria epidemiology as part of malaria elimination and prevention of its reintroduction are part of the skills required for all disease control under the 60 diseases of the SRRT program (*See Section 5 on surveillance*).
 - **For entomologists**: Greater clarity on skills required and outputs required for malaria as well as for all other vector borne diseases (*See Section 4 on vector control*).
- As the direct result of the currently developed malaria elimination and prevention of reintroduction agenda in Thailand, additional challenging tasks are required to be carried out by the national malaria programme (currently integral part of BVBD as a vector borne disease). Re-profiling of BVBD and increasing accountability may be required based on the new ambitious malaria elimination goals and mandatory tasks required at each level.

6.4 Integration in general service delivery

The GHS at the periphery consists of 776 DHs and 9768 health promotion centres at present. They draw their funds through the NHSO-UC scheme. All of them play

a major role in passive case detection. In addition, there are 327 MPs and 25 BMPs at work mainly contributing to passive case detection and follow-up. These are currently funded by the GFATM.

6.4.1 Summary of inputs from the MPR team

- While progressing towards malaria elimination, the other major changes relate to integration of malaria vertical services at the level of service delivery. Most case detection work remains dependent on the malaria clinics and malaria posts. But there is a need for this work to move to the general health services and clarify what the semi-vertical approach exactly means towards malaria elimination AND prevention of malaria re-introduction.
- HPHs are not making the level of contribution they possibly could make in case detection (passive and reactive), in surveillance (case investigation) and uncomplicated case management even in endemic areas (all active case detection depends on the 327 MPs and the microscopists posted there who not only do the blood smear examination for both reactive and proactive blood slides collected but also handle about one third of all passive case detection work. As malaria declines and slide positivity rates become less than 1 per 100, there is less and less reason/incentive for so-called malaria suspects to come to these clinics for testing as there is no diagnosis and treatment available for all the other 99 causes of fever). This requirement is urgent where the villages and even districts enter the B1 category as the malaria clinics and posts would cease to attract suspect cases.
- HPHs are already expected to work in passive case detection and investigative case detection but in practice only a small proportion of fevers are being tested for malaria and only a very small number of HPHs (about 128) may be directly supervised by VBDU on this activity.
- Another aspect is that complicated cases are all being referred to the provincial hospital since district hospitals are only managing patients with uncomplicated malaria.

6.4.2 Recommendations

Integration of malaria services

- The HPH should emerge as the main site of passive case detection, blood testing for surveillance purposes and reactive case detection backed up by VBDC and operational SRRTs. Malaria clinics would remain the main sites for active case detection and the only sites for proactive case detection where and when necessary. This requires not only training and support, but a strategy of monitoring using appropriate indicators and a matching financing strategy.
- In B1 areas, HPHs would have to take on the much larger burden of passive case detection that is needed for an effective surveillance (and response) to prevent the reintroduction of the disease and HPHs will also be needed to support the reactive case detection in these areas. Malaria clinics in B1 tambons and districts could shift and be co-located in HPHs, eventually merging with them. MPs and BMPs may continue as long as A1 and A2 exists but as outreach sites for HPH, but as they become B1 would also for the same reasons get absorbed into the HPH.
 - All existing VBDC functions should continue (they would [1] lead the BCC and source reduction activity in coordination with the local health funds of the local administration office, assisted by HPHs and HVs; [2] undertake the distribution of LLINs and retreatment of ITNs, assisted by the HVs (and, therefore, the HPH); [3] undertake focal IRSs by themselves with information to the others; [4] the malaria clinics would continue to report to them) BUT with addition of the following dimensions – co-location and close coordination with district health offices, coordination and integration with all SRRT functions, and coordination with the local administration to maximize adequate use of local health funds.
- The main site of case management for uncomplicated malaria will be HPHs and DHs. In case of severe malaria, DHs could undertake much of the work with mandatory referral of severe malaria with suspicion of organ damage to the nearest well-equipped provincial hospital. Identification of these complications requiring referrals will also need constant refresher trainings (*See also Section 3 on case management and follow-up*).
- BVBD and MoPH to develop guidelines on expected tasks to be performed by General Services Staff (e.g. peripheral health centers and promoting hospitals) to contribute to support malaria elimination interventions (endemic and non-endemic areas) including data management and reporting.
- MoPH to consider upgrading some malaria posts to health centers following access criteria such as distance and cultural barriers.

6.5 Integration in financing

The description in this section includes aspects of logistics as well.

6.5.1 Summary of inputs from the MPR team

- Global funds currently finance close to four fifths (around 80%) of all malaria control operations. As GFATM supports ends in 2016, the immediate challenge over the next two years is exploring doable mechanisms, mainly from national budgets to support most, if not all, mandatory strategic interventions to achieve malaria-free Thailand by 2024 and prevent reintroduction of the disease.
- The cessation of global funds is actually to be seen as a mark of achievement for Thailand, the nation being no longer seen as a low income but as a middle income nation. Even now, extra financing for malaria is seen as responding to the challenge of non-local malaria cases.
- Malaria elimination in Thailand represents a challenge as there is a need to raise the necessary funds for elimination without losing the focus or grip on the problem while progressing to the last mile. It is not the usual calculation of the cost of the burden of disease that would be the driver, since malaria is no longer perceived as a public health concern, but as a contributing benefit for trade, investment and tourism among others.
- Outpatient care for malaria is to some extent covered by NHSO-UC as outpatient care is paid on a capitation basis. This, however, would not reflect (1) the higher prevalence of fever in A1 and A2 villages; (2) the need to do RDTs on a substantial proportion of fever cases as part of (active) surveillance needs in all malaria prone districts, even if not required on clinical grounds alone and even if the district is declared free of malaria; (3) the costs of outreach centres (the MPs and BMPs); and (4) the needs of reactive case detection activity that could be seen as akin to outpatient loads.
- It is not clear how the work of migrant volunteers and migrant health workers and their support systems that are built around NGO presence would continue. Having discussed this with stakeholders, the review team finds that there is agreement both in GF and in the MoPH that this work should continue, but both find themselves limited in their ability to support it.

- Procurement and logistics with respect to case management of malaria patients and diagnostics for case detection are best integrated into the robust system already in place. The district contracting units are able to cast their requirements based on the offtake experience of the previous year, and use it to ensure that at all times they have enough stocks. The trigger for a fresh procurement is when stocks fall below the three-year expected offtake. Procurement and distribution is through a centralized agency that provides benefits in terms of costs and quality assurance. There may be gaps in this system but they are best fixed within the same logic. The financing for these commodities is built into the package provided on a mix of capitation and reimbursement and caseloads provided to each district contracting units. Warehousing and stock inventory management are adequate for these commodities.
- Procurement and logistics with respect to insecticides and bed nets have to be examined separately and the review has not undertaken that. Nor has it undertaken studies of national level constraints, if any, related to multiple suppliers being available for competitively and fairly priced procurement of new drugs and diagnostics by the centralized agency that manages this.

6.5.2 Recommendations

- Commission an in-depth economic study that is able to set out the cost-benefit relationship of malaria elimination and prevention of its reintroduction in Thailand.
- Manage expenses for malaria diagnosis and treatment, including the different complications, so that they are adequately covered under the NHSO-UC scheme and other different social security schemes and need not be separately provided for. This arrangement, however, would be applicable only to Thai nationals and M1 – others would have to pay for it. M2 cannot be covered under UC as per law. Either a separate fund has to be created for it or a separate insurance scheme (See Section 6.6).
- This additional burden of work in elimination areas should be reflected in the UC repayment formula in a manner similar to what has already been provided for TB and HIV under the disease management subheads. The NHSO officials see this as a both feasible and desirable option and so does the BVBD and DDC and a small task group can estimate the costs and put the financing guidelines in place. This, along with the indicators proposed, would be essential for repositioning HPH in malaria control strategy and absorbing much of the budgetary requirements subsequent to GF withdrawal.
- The activities of the VBDUs with respect to other aspects of malaria control currently flow in parallel with the BoE financial flows. Learning from the problems of MDR-TB, it has been suggested that there are good reasons for not pushing a full merger too prematurely. These include the costs of the malaria clinics, proactive case detection and response, and the bed nets and spraying interventions. Essential IEC/BCC work at the local community level and source reduction measures can, however, draw much more on the local health funds of the community.
- Issues of migrant volunteers and migrant health workers would need to be resolved, perhaps with the establishment of a cross department and cross ministry migrant and mobile populations unit under the Permanent Secretary (See Section 6.8).

6.6 Integration of malaria information systems

6.6.1 Summary of inputs from the MPR team

(See Section 5 on surveillance and response)

6.6.2 Recommendations

(See also Section 5 on surveillance and response)

- District health office teams and VBDCs also need to have the skills and support to draw in information from multiple platforms – the HospXP systems that support the district hospital and the HPHs; the BoE's different information systems; and the online malaria reporting system – to be able to use epidemiological information contained in these systems for both epidemic alerts and for annual planning, and for risk categorization of sub-villages, villages and tambons.
- The General HMIS and the disease-specific systems and the SRRT systems could be enabled to talk to each other through shared semantics (data dictionaries), technical standards and institutional arrangements. This is required at the regional level, provincial levels and district level. Data warehouse/portals/information exchanges that allow multiple formats of entry and different users to access the information could help.
- Data quality checks are present but could be strengthened by inclusion of digitalized completion and timeliness of reporting, by validity checks on reporting (recording and reporting concordance) and triangulation with evaluator information and across systems.
- There is a need to provide for a regular health informatics cadre for the purpose of data entry, data management and data analysis. This is required at HPH and district hospitals, and at many places this is already in place. A separate IT person in the malaria clinic [feasible? Cost implications? Role instead of BoE at district?] has to be supported for as long as the malaria clinic continues and this should not stop with the cessation of financing from GF.
- The current online malaria reporting system needs more features to be able to function as an adequate system of early warning of outbreaks at the district and province level. One IT specialist (only in areas supported by GFATM) is currently working in each VBDC and a few are working at VBDC level to run the system but this needs to be sustained (See *human resources section*).

6.7 The Local Administration Health Fund and its potential

6.7.1 Summary of inputs from the MPR team

- An important area for coordination is with the local administrative offices and the municipalities. Every municipality and local administrative office (LAO) has a local health fund and a local health plan, which is part of its annual plan. It is part of the legal and constitutional mandate of local bodies to address the spread of communicable disease and to support health services. This is enshrined in the Municipality Act 1953 (amended 2000) and in the Sub-district Administrative Organization Act, 1994, and in the Decentralization Act 1997. There has been some policy level discussion on transfer of health centres to the local bodies and about 43 such centres have been transferred. However, it has not been considered feasible to transfer the rest for reasons of institutional capacity. The decision to upgrade local health centres as HPHs also reiterates the need and policy direction of keeping these centres under the provincial and district health offices.
- The local health fund draws part of its funding from the NHSO UC, which currently finances THB45 per capita. The NHSO mandate is to earmark 4.5–5% of its funds for transfer to local bodies for health promotion work and this, after various expenses along the way, works out to THB45 per capita currently. The local body is expected to raise a matching amount and the reports from key informants and from the visits of the review team are that many local bodies, especially municipalities, raised even more funds. At about THB1 million annually per sub-district, the system potentially has an estimated THB5 billion-plus as local health funds that could be dedicated to health promotion work at the community level. This is apart from the amounts that flow for health promotion work at the family and individual levels through the HPHs.
- LAOs make an annual plan for local health funds and the provincial administration provides some guidance for this. Health volunteers play an active role in the planning implementation process, often coordinated through some representative members from that group. Local administration spends on a wide range of activities: vector control especially for dengue; disability; residual pesticides; safe food; nutrition survey; solid waste; World AIDS Day; prevention of accidents; school health; child health; hypertension

and NCDs; the elderly; and promotion of exercise. Amounts spent on each category would typically be limited from THB10 000 to THB60 000 per item. Malaria used to be a major item, but as its presence decreases there is a sharp reduction in funds allocation for malaria by local bodies; the funds, are however spent on other local health priorities. The technical choices made about how to spend the money could be very sub-optimal, for example, fogging being prioritized over all other forms of prevention.

6.7.2 Recommendations

- District Health Offices (which would have VBDUs integrated with them) could be made responsible and skilled to provide the required technical assistance that local bodies need to use their local funds optimally while respecting their choices and priorities. This can be achieved by five principles for the better use of local health funds for the elimination of malaria and for ensuring their participation:
 - Sharing technical information and options with local bodies about what solutions work best for specific problems and how best to address environmental and social determinants of health.
 - Addressing uneven capacity – some local bodies may be performing poorly, failing to raise funds or more often failing to spend the funds they have raised– and intervention to address this is required.
 - LAOs to share learnings and best practices so that they gain in both knowledge and confidence. Platforms to assist sharing to be created. Giving only technical advice externally can undermine LAOs' confidence in their own ability to be innovative and make them dependent on the external expert, a situation that has its own set of problems.
 - Ensuring that they share equity concerns.
 - Making them partners in the quest for elimination of malaria so that they understand its underlying rationale and are willing to invest their resources in it.

6.8 Addressing malaria in mobile and migrant populations (MMPs)

6.8.1 Summary of inputs from the MPR team

- The challenge of addressing malaria in migrants and mobile populations is central to any strategy of elimination in malaria. It would become even more of a challenge as malaria specific funding reduces and service delivery and financing integrates with GHS. Though Thailand has one of the most robust provisioning and financing strategies for GHS among all low and middle income countries, it is by law limited to Thai nationals and foreigners accessing Thai IDs. Further, much of the work among migrants was done with GFATM support and through NGOs that were willing and had the capacity to work cross border.
- The government of Thailand proceeds to makes GHS available to migrant workers, recognizing that their work makes a substantial contribution to the Thailand GDP and that labour productivity is going to be important, irrespective of whether it is migrant labour or not.
- Access to GHS while keeping to constitutional and legal provisions and while taking care of financial burden, is based on three forms of extending insurance coverage:
 - Insurance for the stateless. Those who have no formal Thai citizenship, or papers from any other nation, having come over as refugees or migrants over long periods and who have been working as labour in the Thai economy for an extended period. This insurance scheme has been initiated in 2014 and is in the process of implementation and it is under MoPH directly as the NHSO Act applies only to Thai nationals.
 - Insurance for the formal migrant – the M1 – who has a legal work permit and stays most of the year. These have formal employers who bring them over and it would be required for the employers to pay the insurance premium for their coverage. Most would be formal workers. Where they are formal sector workers they could be taken into the SSS and, where unorganized or informal sector, into the scheme described below.
 - Insurance for other informal short duration migrants – the M2 – with unclear legal status and often staying less than six months. This could be provided on the payment of a contribution of THB1600 annually – which

is just about one fourth of all public health expenditure per capita that Thailand spends on its nationals – but the latter is inclusive of tertiary care, whereas this would largely be for primary care. Of this THB1600, about THB300 would be sent to the centre for administrative expenses and the rest retained in the district CUP where the migrant is enrolled. If the migrants were seasonal, the rate would decrease to about THB500 per quarter (three months). This scheme has been announced very recently and its roll out is just beginning. Taken forward this could be an exciting example for Thailand, for ASEAN and indeed for the whole world. Registration would be at the district level under the supervision of the provincial office.

- Adopting Health-in-All Policies (HiAP). Instead of concentrating on national security concerns only, adopting HiAP will help to address in a more comprehensive way health and non-health challenges among MMPs.
- Continuing NGO support to reach out to the vulnerable migrant remains a challenge. This would be required irrespective of the access to general services and is an equivalent of the health volunteer strategy and the MP worker. The difference will be peer volunteers who can cross the border, who freely associate and mingle in migrant aggregations and who, therefore, are able to promote timely referrals for fever, adequate follow-up on those out on treatment (a major gap currently) and the use of ITNs.
- Most of what is written above is still in the area of policy intent and so-called fragile policy. A clearly articulated policy is required. An ASEAN summit (discussed later) would help reinforce the policy and its implementation and provide Thailand with a leadership role in public health in this region.

6.8.2 Recommendations

- Setting up a migrant and mobile population unit in the MoPH under the Permanent Secretary to perform the following tasks:
 - To finalize a clearly articulated policy to be formally adopted and implemented to support an “integrated approach to healthcare for migrants made in the context of malaria elimination and the urgencies in TB and HIV control”. This policy should have:
 - (1) Measures to improve access to GHS with payments either by employer or service users and to improve such access to the stateless.
 - (2) An additional peer educator/volunteer and peer health worker approach to reach out to vulnerable sub-groups of migrants, supported through NGOs that have cross-border presence.
- Continuing NGO support would be required with peer volunteers who can cross the border, who freely associate and mingle in migrant aggregations and who, therefore, are able to promote timely referrals for fever, adequate follow-up on those out on treatment (a major gap currently) and the use of ITNs. If the political will to do this is generated both in donor agencies and in the border nations, it would be one of the most important measures for prevention of reintroduction in the future since the timelines for elimination in three of the border states – Cambodia, Laos and Myanmar – are much behind that for Thailand.
- A clearly articulated policy is required. An ASEAN summit would help reinforce the policy and its implementation and provide Thailand with a leadership role in public health in this region.

6.9 Cross-border malaria elimination strategy and challenges

6.9.2 Summary of inputs from the MPR team

- **ODPC12:** Annual cross border meetings are organized with Malaysian counterparts to exchange data and discuss mutual challenges. Resorts and entertainment places in Songkla province are used mainly by citizens from Malaysia and Singapore, where malaria is not endemic. Migrant workers

mainly from Myanmar are employed officially and not officially in rubber and forestry activities.

Malaria data in Malaysian provinces bordering Thailand was not presented at the time of this review. There is no strategy developed to prevent malaria in mobile and migrant populations within and from outside Thailand as well as no strategy to increase access of those groups (tourists and MMPs) to malaria services and information.

- **Chantaburi:** There is a large migrant movement across the Thai–Cambodia border. More than 5000 people are estimated to be crossing the official checkpoint every day. More official checkpoints are opening up. Most people crossing the border are M2, coming to work as seasonal/temporary workers in farms. The BMP at the check point allows people on a voluntary basis to be tested (and treated) for malaria. Some NGOs are active on the border and formal linkages are established between the BMP and NGOs to ensure cross-border follow-up of any positive case.

At the time of this review, malaria data in Cambodian provinces bordering Thailand was not available and there is no official mechanism in place to exchange information and action. Cross-border malaria initiatives are led by one NGO funded by IOM to work in M1 migrants and another NGO, CAP-Malaria (funded by PMI), targeting seasonal migrants. However, the effectiveness of this strategy (not available on paper) could not be assessed, and there is no collection of data on this. Some migrants with malaria were still blood smear positive on day seven, but are then lost to follow-up. Traders looking for gems from or visiting Africa, especially Mozambique, are a specific niche area of concern since a fever-related death attributed to malaria happened in this sub-group.

- **Ubon Ratchathani:** A 10-fold increase in malaria cases in the Thai population was reported from five districts bordering Lao PDR, which also coincided with a threefold increase in Champasack province in Lao PDR, during the first six months of 2014. Both sides acknowledged the contributing factor of the epidemic was unusual movements of populations to the forest to cut precious rosewood and related forest products in Lao PDR. According to ODPC, 88.5% of recorded positive cases were classified as Bf, meaning that infections originated from outside the country.

At a cross-border data sharing workshop attended by both countries on 13–15 October 2014, the following consensus points were agreed:

- Data sharing platform between Ubon Ratchathani and Champasack provinces – use of an online/cloud platform with GIS capability; identification of focal points at provincial/district and central levels; set up a working group with technical experts from both sides and TORs for the working groups and focal points.
 - Sharing of information on a monthly basis (initial phase).
 - Definition of imported case.
 - Official cross-border crossing points on both sides of the border (initial phase).
 - Drafting of a surveillance and response action by both sides, with the inclusion of Lao and Thai plans in the planned GFATM reprogramming of the RAI country grant exercise in November 2014.
- **Tak:** More than 130 000 so-called displaced people from the Karen ethnic group have been living in several camps in five districts (50 000 in Maela camp) bordering Myanmar for more than three decades. Some migrants are living in communities together with Thai citizens and have found jobs accessing them a specific ID card being classified as M1. Many NGOs are operating in camps and outside to improve access by M2 to health services, education etc. Pertaining to malaria, additional malaria posts (with non-Thai malaria volunteers) have been created since 2001 including BMPs to allow non-Thai citizens to access free malaria services. Tak province is a free-trade zone allowing traders, businesspersons and workers to settle and carry out any kind of business with minimum regulation. Cross-border malaria activities are boosted thanks to the twin-village concept managed by the Maesod district hospital's department of community medicine with technical advice from SMRU.

Malaria control data from the Myanmar side has been collected through the Shoklo Malaria Research Unit (SMRU), while significantly improving access by Myanmar patients to health and malaria services. As a result (including large use of LLINs and IEC/BCC), malaria incidence in Myanmar districts bordering Thailand has drastically decreased during the last five years. This has favourably impacted the malaria burden in Thai districts of Tak province bordering Myanmar.

6.9.3 Recommendations

- Specifically on the four sites visited:
 - **ODPC 12:** Develop cross-border plan with Malaysia and Myanmar to exchange data (export cases from Thailand to Malaysia, importation of malaria cases from Myanmar) and harmonize control/elimination interventions as well as increasing technical collaboration with Malaysian institutes.
 - **Chantaburi** (bordering Cambodia): Need to have a clear strategy and cross plan to guide/support NGOs working in cross-border districts and coordinate with them. Also to strengthen the migrant malaria volunteer and migrant malaria workers as a form of peer support and use them to address more vulnerable sub-groups within this migrant population.
 - **Ubon Ratchathani** (bordering Lao PDR): A clear malaria strategy is needed in B1 or even B2 villages where malaria epidemics are identified too late and not so well controlled. Cross-border mechanisms to be agreed upon between Thailand and Lao PDR to finalize cross-border plans and budget, mobilize funds, and monitor implementation of agreed-upon points in October 2014.
 - **Tak** (bordering Myanmar): Collaboration between the Royal Thai government and Myanmar government should be strengthened and to focus on the facilitation of district level joint programme to support the so-called twin villages malaria elimination programme. The National Health Security Organization should contribute to mobilize local tambon's health funds to sustain vector control and prevention activities both sides as well as bi-country IEC/BCC interventions in endemic and non-endemic villages.
- General recommendation is for WHO as the appropriate agency that must take the lead on cross-border surveillance/response (data collection, management, consolidation and regional response) and establish a platform for cross-border collaboration.

6.10 Malaria elimination in conflict-affected provinces

6.10.1 Strategy in conflict-affected provinces in the southern part of Thailand

- The malaria strategy in southern Thailand does not differ from other provinces in Thailand. ODPC 12 is implementing the national strategy in seven provinces out of which three provinces and four districts in Songkla province are managed by Muslim authorities. Those provinces and districts have been the most affected zones by armed conflicts since 2004. There is no correlation between the degree of violence and the malaria burden in southern provinces. Malaria is, as everywhere in the Mekong region, confined to villages/hamlets close to heavily forested mountains and dense forests, which are highly prevalent in districts bordering Malaysia. Malaria outbreaks have been documented in either conflict and non-conflict areas within or close by the forest where most farmers¹⁸ and villagers are regularly spending nights or even setting up on a longer-term basis with their families for economic reasons.
- The last epidemics recorded in Yala and Saba Yoi do not seem to be caused by movements of such unrecorded/illegal migrants. It has to be noted that malaria is almost absent in Malaysian provinces bordering Thailand but still endemic in many areas of Myanmar from where migrants are also coming.
- Pattani province, which is considered the epicentre of the cultural conflict, has not recorded any indigenous malaria case for decades mainly due to the absence of forest and forest-fringe zones, contrary to Trang province, which is free from armed conflict in the upper part but where sporadic outbreaks are documented. A significant proportion of health personnel in the deep south are Muslim under OPDC attending ODPC, VBDC and VBDC meetings and trained to implement malaria guidelines. Buddhist counterparts are generally acquainted to villagers and communities. Access to outbreak areas by control teams is not a major problem.
- It should also be noted that malaria control is persistently considered by local and provincial authorities as a high priority activity even in the most conflict

¹⁸ Agriculture (farming, plantations) and forestry activities are the main activities contributing most to the GDP in southern provinces.

affected province of Yala. Both, governors and local administrative authorities, are mobilized and provide fund to support control and preventive activities.

- However, there are certain endemic villages that are designated as so-called no-go zones. In such situations, the strategy, as suggested in all endemic villages all over Thailand, is to install local MPs managed by trained community staff who can operate, go in and out without any problem, being selected and supported by their own communities and being part of regular meetings organized by VBD services. However, as usual, installation and training of these MPs is decided mainly after the outbreak is almost over.
- Migrants and human trafficking have been always blamed to be the source of malaria transmission. However, the latest outbreak in the insurgent area (Janae) took place without these contributing factors being formally identified. Moreover, the fact that the disease has been relatively common among children (by age) and students (occupation) suggests that transmission is still ongoing within endemic villages since those young people are unlikely to go into the forest.

6.10.2 Summary of inputs from the MPR team

While VBDC 12 and teams there are fighting malaria very actively, there are challenges similar to what other malaria zones in Thailand are experiencing such as:

- Non-timely response to early outbreak (late detection).
- Lack of clarity in many standard definitions and operating procedures to tackle the problem, which are essential precursors to activate SRR teams in the short term and a plan for human resource deployment in the long term.
- Poor ability of local staff to critically look at data, to provide with clear explanations on some special situations and then investigate further if needed.

6.10.3. Recommendations

- As expressed in other sections of this report, improving the use of collected data is essential to identify where malaria is persisting and factors contributing to the persistence of malaria in the region.
- Working more intensively with/within communities will help to understand the local chemistry of malaria transmission and take appropriate/suitable decisions. This is especially important to explore/offer suitable preventive options targeting the large (local) population still involved in at-risk forestry activities.
- More efforts in engaging community members to access services providing malaria diagnosis and treatment and report all cases through appropriate health services.

6.11 Coordination at the level of programme management

6.11.1 Summary of inputs from the MPR team

- The review mission noted a number of strengths as well as gaps in the areas of coordination and programme management. In some areas, such as case management, there was continuity across levels and agencies. In others, such as vector control operations like LLINs and ITN deployment, it could be low. Coordination with NGOs could be particularly weak. Programme management as it stands now is largely concerned with VBDU and DHO functions and knows little about the effectiveness of partners such as the NGOs, local administrative bodies and mobile malaria units. Even with regard to coordination between VBUDs/VBDCs on the one hand and PHO/DHO on the other, much of it is unstructured and spontaneous, but these should become part of a well thought-out strategy.
- Each level of GHS is already occupied with many other priorities. There is also a need for clarity on what vertical structures have to remain and what they need to be doing in the coming elimination phase.

6.11.2 Recommendations

- At the national level, accountability and leadership for migrant health should be guided by a multi sectoral expert team from across relevant sectors, civil society bodies and NGOs to streamline and support a feasible national and district/community-led strategy to address the health needs of migrant and mobile populations, including malaria in the context of malaria elimination and in the control of HIV/AIDS (See Section 6.8).
- The national level needs a mechanism for coordination with and engagement of armed forces, forestry, trade (SEZs), labour and local administration for implementation in their domains. There is already a national committee in place and should ensure that it is structured and mandated to perform these functions.
- To review progress once in six months towards the targets set for elimination and undertake such validation as may be needed for this. This could be built into the existing national committee as a malaria elimination task force. This task force is built around a road map, which has clear annual milestones from now until 2024.

6.12 Malaria-free Thailand by 2024: the malaria elimination road map

6.12.1 Summary of inputs from the MPR team

The general principles of defining a road map with clear and simple guidance that has emerged could be defined as follows:

- The district is the unit of elimination.
- A district validated as having malaria eliminated has no village in the A category and no case categorized as A, Bx or By (zero documented local transmission).
- Based on these simple principles one could classify all existing 928 districts and build a baseline. The baseline as conveyed by the BVBD is that 789 districts, that is, 85% of the total, have already achieved elimination. Thus, only 139 districts remain as districts with active indigenous malaria transmission. This by the current road map announced by BVDB would drop

to 111 in 2016, 92 in 2017, 64 in 2018, 46 districts in 2019 and 18 districts in 2020 and no district in 2021. If this is retained until 2024, the national goal is achieved. This requires that even the last 18 districts, which are slated to achieve elimination only by 2021, must have a road map in place so that progress can be measured village-wise annually, and they can reach near elimination or elimination status a year in advance of the deadline.

6.12.2 Recommendations

- The existing road-map for elimination sets out the milestones in terms of districts that would be declared malaria eliminated each year. In implementing this, BVBD needs to better define:
 - The definition for elimination at the district level in terms of both risk categorization of villages, and case classification based on likely site of transmission – since these are the commonly used and understood indicators for measuring progress towards elimination.
 - Build a mechanism of internal validation (and acknowledgment), possibly under the Inspector General, to independently validate free-malaria districts and officially reporting to the Malaria Elimination Task Force.
 - A district plan for each district where malaria is currently not eliminated. These milestones should be made clear to all stakeholders and, in consultation with province administration, the provincial health office, the district health office, the VBDC and VBUDs and the district hospital, the timeline for each district to achieve near elimination and elimination and how they would go about it is decided. Every district should have its plan as approved by the provincial health office.

6.13 Elimination at supranational level: Mekong and ASEAN perspectives

6.13.1 Summary of inputs from the MPR team

- It is important to note that with the support of WHO and important segments of the global and regional donor community (See Section 6.12 on technical assistance and partnerships) the entire Greater Mekong Subregion has made a commitment to eliminate malaria by 2030. Most senior experts met during the

review have acknowledged that Thailand might achieve malaria elimination because other neighbouring countries are also taking the elimination path. This was not the case before.

- For Thailand, the vision could be that its malaria elimination efforts can set the example and motivate and provide leadership to the entire region. Malaria elimination gains new importance for trade and tourism, especially in the context of the ASEAN Economic Community. Cross-border movements of people will grow exponentially as trade improves and economies grow and these three diseases – malaria, HIV and tuberculosis – represent a threat to the peace and prosperity of this region if allowed to persist or scale.
- If Thailand makes a commitment to such a vision for ASEAN, it could lead towards a summit of the political and public health leadership by 2017, when the first set of milestones on its road map are achieved and the necessary policy, strategy and financing instruments are all in place and understood by all stakeholders. The national malaria programme Thailand should be better engaged in supranational activities by promoting its experience and knowhow in addressing elimination challenges.

6.13.2 Recommendations

- Thailand could engage nations in the region for greater commitment to elimination and for joint cross-border activities such as border villages survey; sharing of data between neighbouring districts on positive cases using the same data and meta data standards especially with regard to case categorization both for understanding epidemiology and for enabling follow-up; health insurance for migrant workers to ensure portability of health care entitlements across borders; joint bilingual health communication efforts and advocacy with international and private donors to provide extra support to low income nations; as well as fill in the gaps in service delivery to cross-border mobile populations.
- For Thailand to engage ASEAN bodies into regional elimination time-bound achievements.

6.14 Technical collaboration and partnerships

6.14.1 Strategy

The malaria programme is collaborating with several national and international agencies, institutions and national/international nongovernmental organizations in Thailand.

Table 11 provides an overview of current partners involved either technically or financially or both with the National Malaria Programme (BVBD).

Table 11: Stakeholders¹⁹

Government	NGOs	Academy	International agencies
BoE	ACTMalaria	AFRIMS	DFID
BPS	AMI	FTM, Mahidol	ECHO
FDA	ARC	BIOPHICS	EU
Hospital	CCSDPT	Kasetsart	GFATM
DMS	IOM (IGO)	University	JICA
Ministry of Agriculture	IRC	MORU	TUC, CDC
ODPC	K.I. Asia	WHO CC	UNICEF
MP	Mae Tao clinic		USAID-PMI WHO
PHO	Malaria Consortium		
VBDC	Raks Thai		
VBDU	SMRU		
	USP		

Collaboration with government agencies

BVBD is working closely with various government agencies within and among the ministries through routine day-to-day coordination and collaboration and through the committee/working group works.

Ministry of Interior – migrant issues, cross border collaboration.

Ministry of Agriculture – the use of insecticides, deforestation.

Ministry of Defence – malaria treatment in Ministry of Defence hospitals, research.

Ministry of Finance – budget to support malaria programme.

Academe/Universities – research, monitoring and evaluation.

¹⁹ Adjusted from thematic paper on malaria management (2015).

6.14.2 Summary of inputs from the MPR team

- Numerous donors, national and international institutions, NGOs, political bodies and actors are engaged in Thailand and in the region towards malaria control and elimination. Most of them are not connected to national programmes and have their own agenda, which do not serve to address technical and operational challenges to accelerate the malaria elimination journey in the country. This is not new and not only in this region.
- With the establishment in 2015 of the National Steering Committee on Malaria Elimination and the National Executive Committee on Malaria Elimination chaired by the deputy prime minister, it is expected that malaria will receive strong support from policy makers as well as closer collaboration between the programme and all line-ministries and agencies at all levels expected to contribute to implement the strategic malaria elimination plan.

6.14.3. Recommendations

- For BVBD to develop and finalize its official research agenda based on programmatic needs to be communicated and discussed with national and international academic and research institutions.
- Research activities to be funded either by domestic or external funds should be coordinated in a harmonized manner for the purpose of identifying new/innovative tools able to accelerate malaria elimination in Thailand and in the region.
- A suitable institutional mechanism should be established for partners to focus on technical and programmatic issues slowing down the elimination agenda and BVBD being receptive to critical gaps raised by partners and external donors.

Annex 1

Agenda of the 2015 Review

I. International and national experts involved

Thematic area	By expertise	National programme focal points
Epidemiology assessment and surveillance, monitoring and evaluation system	Professor Dr Virasakdi Chongsuvivatwong Dr David Sintasath	Dr Prayuth Sudathip
Case management	Professor Dr Polrat Wilairatana Dr Peter Olumese Dr Maria Dorina Bustos	Dr Sanchai Chasombat Ms Sunsanee Rojanapanus
Vector control and prevention	Dr Jeffrey Hii Dr Chusak Prasittisuk	Mr Boonserm Aumaung
Programme management: strategy and policy financing and sustainability	Dr Charles Delacollette (MPR team leader) Professor Dr Sundararaman Thiagarajan Dr Wiput Phoolcharoen	Ms Suteera Poolthin

II. International and national experts involved in field visits

Chantaburi province		
1.	Professor Dr T. Sundararaman	International external reviewer (team leader)
2.	Dr Chusak Prasithisuk	National external reviewer
3.	Professor Dr Polrat Wilairatana	National external reviewer
4.	Mr Boonserm Aumaung	Bureau of Vector borne Diseases (BVBD)
5.	Mr Pisal Fuxfair	Bureau of Vector borne Diseases (BVBD)
6.	Miss Amornrat Gunhawong	Bureau of Vector borne Diseases (BVBD)
7.	Miss Voranart Kaewkamthong	Bureau of Vector borne Diseases (BVBD)
8.	Miss Chitaporn Chitakom	Principal recipient administrative office (PR-DDC)
9.	Miss Sujitra Imjai	Principal recipient administrative office (PR-DDC)

Ubon Ratchathani province		
1.	Dr Jeffrey Hii	International external reviewer (team leader)
2.	Dr David Sintasath	International external reviewer
3.	Dr Maria Dorina Bustos	WHO Thailand
4.	Dr Prayuth Sudathip	Bureau of Vector borne Diseases (BVBD)
5.	Dr Rungrawee Tipmontri	Bureau of Vector borne Diseases (BVBD)
6.	Ms Siriporn Yongchaitrakul	Bureau of Vector borne Diseases (BVBD)
7.	Miss Suravadee Kitchakarn	Bureau of Vector borne Diseases (BVBD)
8.	Miss Sudawan Chotsuksangoun	Bureau of Vector borne Diseases (BVBD)
9.	Miss Thitima Phungkul	Principal recipient administrative office (PR-DDC)
10.	Miss Kanchana Yangtoon	Principal recipient administrative office (PR-DDC)
Tak province		
1.	Dr Peter Olumese	International external reviewer (team leader)
2.	Dr Wiput Poolchareoun	National external reviewer
3.	Dr Deyer Gopinath	WHO Thailand
4.	Dr Sanchai Chasombat	Bureau of Vector borne Diseases (BVBD)
5.	Dr Kanutcharee Thanissapong	Bureau of Vector borne Diseases (BVBD)
6.	Mr Rungnirund Sookaram	Bureau of Vector borne Diseases (BVBD)
7.	Dr Nakorn Prensri	Principal recipient administrative office (PR-DDC)
8.	Miss Krittika Kaewprapa	Principal recipient administrative office (PR-DDC)
9.	Miss Tassika Pomyai	Principal recipient administrative office (PR-DDC)
10.	Miss Chanapa Nakto	Principal recipient administrative office (PR-DDC)

Songkhla province		
1.	Dr Charles Delacollette	International external reviewer (team leader)
2.	Prof Dr Virasakdi Chongsuvivatwong	National external reviewer
3.	Miss Aree Mounsookjareoun	WHO Thailand
4.	Ms Suteera Poolthin	Bureau of Vector borne Diseases (BVBD)
5.	Miss Sansanee Rojanapanus	Bureau of Vector borne Diseases (BVBD)
6.	Miss Busaba Warakamin	Bureau of Vector borne Diseases (BVBD)
7.	Dr Tinzar Naing	Principal recipient administrative office (PR-DDC)
8.	Miss Kanittha Tantrajin	Principal recipient administrative office (PR-DDC)
9.	Miss Nithada Phanyafu	Principal recipient administrative office (PR-DDC)

III. Observers from GFATM

Mr Ryuichi Komutsu	Senior advisor, technical evaluation reference group (TERG), GFATM
Dr Rozina Merali	Specialist, health product management, high impact Asia department, GFATM
Dr Sandra Kuzmanovska	Senior public health and M&E specialist, GFATM

IV. Secretariat

Providing overall technical and administrative support to the MPR:

Dr Leonard Ortega	Regional malaria adviser, WHO SEARO
Dr Deyer Gopinath	Medical officer, malaria and border health, WHO Thailand
Dr Maria Dorina Bustos	Malaria technical officer, WHO Thailand
Ms Aree Mounsookjareoun	National professional officer, WHO Thailand
Ms Kallayane Laempoo	Programme associate, WHO Thailand

Brief historical background of the malaria programme in Thailand

Thailand Malaria Programme Review: Draft Briefing Programme: Monday, 31 August 2015 Ministry of Public Health, Thailand

Date/Time	Agenda	Lead person/agency	Venue
8.30	MPR team lead and team members assemble at WHO Thailand office, 4 th Floor, Permanent Secretary Building, MoPH	WHO	WHO Thailand office, MoPH
09.15-09.30	Courtesy visit to the MoPH Permanent Secretary	Ag. WR Team leader and team members	Office of the Permanent Secretary, MoPH
09.30-09.45	Welcome address	(1) Dr Sophon Mekthon, Director General, DDC, MoPH (2) Ag WR WHO Thailand	DDC meeting room, 1 st floor
10.00-10.15	Objectives of MPR 2015 Review and methodology	Dr Charles Delacollette MPR Team leader	DDC meeting room
10.00-10.30	Refreshments	BVBD	"
10.30-10.45	Organization and structure of health services in Thailand and overview of National Malaria Programme	BVBD	"
10.45-11.00	Malaria epidemiology in Thailand and in relation to neighbouring countries	BVBD	"

Date/Time	Agenda	Lead person/agency	Venue
11.00-11.30	National Strategic Plan for Elimination and challenges in the current context	BVBD	"
11.30-12.30	Q&A	BVBD	"
12.30-1300	Lunch		
13.00-13.15	Salient issues on malaria diagnosis and treatment	BVBD	"
13.15-13.30	Salient issues on vector control and malaria prevention	BVBD	"
13.30-13.45	Salient issues on malaria case surveillance	BVBD	"
13.45-14.30	Q&A		"
14.30-17.00	[Refreshments 15.00] Field team brief: (1) Team composition (2) TORs and individual team focus (3) Formats and expected outputs (4) Logistics arrangements	Dr Charles Delacollette, Team leader. BVBD	"

Thailand malaria programme review: Field schedule and appointments with key informants: 2–10 September 2015

◀ August 2015	~ September 2015 ~					Oct 2015 ▶
Sun	Mon	Tue	Wed	Thu	Fri	Sat
6 09:00-17:00 Team discussion (WHO SHOC Room)	7 08:00-09:00 Dr Wichai Satimai (BVBD 5th flr.) 9 :00 -17 :00 Presentation of key find out from field visit (WHO SHOC Room) 10:00-12:00 (flexible time) Dr Chuchai Sornchamni (NHSO Office) 13:00-13:30 Dr Sophon (DDC) 14:00 Dr Opart (DDC)	8 09:00-17:00 Team discussion (WHO SHOC Room) 08 :00-9 :00 Dr Supakit (WHO Office) 10 :00 Dr Nipon PM Professor. Dr Theerapab	9 09:00-17:00 Team discussion (WHO SHOC Room) 10:00-11:00 Mr Chaipat Chaisawas, Director, Bureau of การพัฒนาเศรษฐกิจ สังคมและการมีส่วนร่วม 10:30-11:00 Miss Sumalee Pornkijprasarn (Director Bureau of Cosmetic and Hazardous Substances Control) 10:00-11:00 Professor Pratap (WHO Office) – TBC on Mon 13:00-14:00 Dr Petchsi (WHO) 13:00-14:00 Dr Srivicha 13:30-14:00 Dr Nopporn Cheanklin, Managing Director GPO (GPO Rajjathewi)	10 09:00-17:00 Team discussion (WHO SHOC Room) 11:00-12:00 Dr Amnuay Gajeena 13:30-14:00 Dr Kamron Chisiri	11 9:30-16:30 Debriefing at Richmond Hotel	12 5 Field visit (TAK only) 14:00-17:00 Team discussion (WHO SHOC Room)
		1 Field visit	2 Field visit	3 Field visit	4 Field visit	

Tentative Programme
Debriefing of the malaria programme review, Thailand
11 September 2015, 9:00-16:30 hrs.
The Richmond - Stylish Convention Hotel
Nonthaburi, Thailand

09.00 – 09.30	Registration
09.30 – 09.45	Opening Remark <i>By Permanent Secretary, Ministry of Public Health</i>
09.45-10.00	Brief overview of the Thailand National Malaria Control Programme <i>By BVBD</i>
10.00 – 10.15	Presentation of the objectives, methodology of the malaria programme review, Thailand <i>By Dr Charles Delacollette, Team Leader</i>
10.15 – 10.30	Coffee/tea break
10.30-10.45	Presentation of keys finding for malaria epidemiology and surveillance in Thailand <i>By Dr David Sintasath, Regional Malaria Advisor USAID/PMI</i>
10.45 – 11.00	Questions and answers
11.00 – 11.15	Presentation of keys finding for malaria case management in Thailand <i>By Prof Dr Polrat Wilairatana Faculty of Tropical Medicine, Mahidol University</i>
11.15 – 11.30	Questions and answers
11.30 – 11.45	Presentation of keys finding for presentation of keys finding for malaria in Thailand <i>By Dr Jeffery Hii Senior Vector Control Specialist, Malaria Consortium</i>
11.45-12.00	Questions and answers
12.00 – 13.00	Lunch

13.00 – 13.15	Presentation of keys finding for presentation of keys finding for strategy, policy and program monitoring and evaluation <i>By Professor Sundararaman, Health Systems Expert</i>
13.15 -13.30	Questions and answers
13.30 – 14.00	Conclusion, key recommendations from the malaria reviewer team <i>By Dr Charles Delacollette, Team Leader</i>
14.00 – 14.30	Questions and answers
14.30 – 15.00	Perspectives from the National Malaria Control Programmes of Myanmar, Cambodia, Lao PDR and Malaysia [Plenary]
15.00 – 15.30	Questions and answers
15.30 – 15.45	Coffee/tea break
15.45– 16.00	Closing

Annex 3

Decree to establish the national malaria elimination committee



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พฤษภาคม ๒๕๕๘

คณะกรรมการอำนวยการกำจัดมalariaแห่งชาติ
และคณะกรรมการบริหารกำจัดมalariaแห่งชาติ
กรมควบคุมโรค
ถนนวิภาวดีรังสิต กรุงเทพมหานคร ๑๐๒๖๐๐๓

เรื่อง ขอแต่งตั้งและจัดตั้งคณะกรรมการอำนวยการกำจัดมalariaแห่งชาติและคณะกรรมการบริหารกำจัดมalariaแห่งชาติ

เรียน ผู้ดำรงการองค์การอนามัยโลกประจำประเทศไทย

ถึงที่ส่งมาด้วย คำสั่งสำนักนายกรัฐมนตรี ที่ ๓๓/๒๕๕๘ ลงวันที่ ๒๖ มีนาคม ๒๕๕๘
เรื่อง แต่งตั้งคณะกรรมการอำนวยการกำจัดมalariaแห่งชาติและคณะกรรมการบริหารกำจัดมalariaแห่งชาติ

ด้วยโรคมalariaเป็นปัญหาสาธารณสุขภาคพื้นทวีปของประเทศไทยกับประเทศเพื่อนบ้าน ซึ่งปัจจุบันมีการทำงานเพื่อลดโรคอย่างเข้มข้นโดยองค์การหลายภาคส่วนที่ได้รับการสนับสนุนงบประมาณที่ภายในและต่างประเทศ แต่ในบางพื้นที่ที่ยังมีการเคลื่อนย้ายของแรงงานต่างชาติหรือคนไทยที่ข้ามไปมาระหว่างประเทศเพื่อนบ้านสม่ำเสมอซึ่งส่งผลให้เป็นแหล่งแพร่ระบาดของโรคที่สำคัญ กรมควบคุมโรคจึงเสนอคำสั่งสำนักนายกรัฐมนตรี แต่งตั้งคณะกรรมการอำนวยการกำจัดมalariaแห่งชาติและคณะกรรมการบริหารกำจัดมalariaแห่งชาติ เพื่อแก้ปัญหาโรคมalariaและกำจัดการแพร่เชื้อมalariaเรื้อรังโดยคนไทยจากประเทศไทย ใต้ตามเป้าหมายการกำจัดมalariaแห่งชาติ (Malaria Elimination)

ในกรณี ขอส่งคำสั่งแต่งตั้งคณะกรรมการอำนวยการกำจัดมalariaแห่งชาติและคณะกรรมการบริหารกำจัดมalariaแห่งชาติติดต่อกัน ตามนี้ซึ่งไม่พบข้อพิพาท

จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

 (ภาคใต้) น.ส.รม
 อธิบดีกรมควบคุมโรค
 กรมการและผู้อำนวยการ

สำนักโรคติดต่ออุบัติใหม่
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ACT	HPD	RECEIVED WHL Thailand	ACT	HPD
WHO		28 MAY 2015	GEN	
AD			FBI	
PIA			FES	
BUKING			WVB	
BRUNDA			Swgth	
MOH/ST			NO	
SP/ST			NSP	
MOH/ST			TRG	
MOH/ST				
MOH/ST				

Progress made against the MPR 2011 review recommendations

Follow up of recommendations made during the review in 2011		
	Recommendation	Progress made
1	To streamline information flow on malaria in order that real-time malaria case reports constituted the basis of epidemiology-based plans for malaria control and elimination and build epidemiology capacity within a human resources framework, particularly at the district and provincial levels.	Substantial progress towards consolidation of malaria data from various sources into a single malaria case reporting system has been noted. However, the 2015 review team has noticed several issues to be considered by the programme while moving towards elimination. Strengthening epidemiological capacity within a human resources framework at district and provincial levels has not yet been comprehensively addressed since the 2011 MPR. (See <i>relevant sections in the report.</i>)
2	To develop work and financial plans, capacity building and advocacy plans, in collaboration with the Provincial Public Health Office (PHO) and partners, and in line with the implementation of the new National Strategic Plan for Malaria Control and Elimination and M&E Plan 2011–2016.	An HR plan has been drafted with Malaria Consortium technical collaboration but has been kept internal and not discussed in depth. This is a weak point to be addressed as part of the next elimination plan. (See <i>relevant sections in the report.</i>)
3	To improve and maintain technical supervision for quality assurance of services in malaria diagnostics (microscopy and ROT), implementation of updated treatment guidelines, vector control and surveillance (insecticide resistance monitoring and bioassays of LLINS or ITNS), procurement/distribution storage and inventory of supplies.	A performing QA/QC system is in place and implemented through BVBD/VBDCs and VBDUs. Questionable system is in use in GHS (hospitals) to be further corrected. (See <i>relevant sections on case management and surveillance in the report.</i>)
4	To review and revise current treatment policies to adopt: [1] an effective ACT for the treatment of <i>P. falciparum</i> in the context of decreasing efficacy of the current first-line ACT and emerging artemisinin resistance in border areas; [2] the systematic use of G6PD assays where feasible for <i>P. vivax</i> 14-day primaquine treatment as an antirelapse medicine in light of the increasing proportion of <i>P. vivax</i> infections and in achieving the elimination targets and [3] to implement countrywide the policy of a single dose of primaquine for <i>P. falciparum</i> for the purpose of reducing infectivity.	In May 2015, the BVBD revised the national treatment guidelines. This review comprehensively addressed the diagnosis and treatment of all species of malaria, with guidance provided on the use of the first- and second-line medicines. The guidelines is yet to be finalized and implemented. (See <i>case management in Section 3 for further details.</i>)

5	<p>To develop an integrated vector management (IVM) approach expected to: maintain a multi-disease vector control capacity that would ensure rational use of insecticides; define roles and functions for vector control personnel integrated into the GHS; build the evidence base to fine-tune strategy and monitoring; and improve accountability in a highly decentralized system to enable managers at different levels to track progress against targets for vector surveillance and to develop strong field entomology capacity among junior entomologists to address all vector borne diseases. Track LLN retention and use through surveys and, based on the results, review distribution strategies. With the recently established online database for entomological monitoring, ensure sufficient data are available for regular review of vector control approaches.</p>	<p>Progress made in IVM but proving challenging due to constraints in capacity – human resources, finances and the scope of activities. Entomological surveillance and vector mapping among 875 villages in border areas with Myanmar and Cambodia will contribute to stratification in A2 or B areas where case investigations are conducted. There is a need to establish a national insecticide committee to review public health insecticide policy and provide guidelines to PHO and ODPC and local administration. Limited induction or orientation trainings were provided for new entomologist recruits who are under the responsibility of ODPC. A working group to developed course curriculum for induction training of new entomologist recruits and in-service staff is needed. More efforts by BVBD to provide technical support and coordinate the planning and reporting of vector control activities with ODPC, PHO, VBDC, ensure compliance of guidelines, avoid duplication of control efforts and ensure high coverage of vector control operations. Current insecticide resistance monitoring in representative geographical areas are essential to planning vector control strategies and choosing the most effective methods. Whilst the use of larvivorous fish is part of the IVM strategy in malaria risk areas (A1, A2 and B1), there is insufficient evidence regarding their impact in the reduction of the densities of mosquito immature stages. A study of the acceptability of ITN/LLINs and analysis of the attrition rate of LLIN durability study will provide information for the procurement or resupply of preferred bed nets. A review of guidelines for vector control and personal protection is required. Maintaining the current efforts of VHV and VMV in advocacy, BCC activities, LLIN distribution and case referrals and home visits of <i>P. falciparum</i> cases for the M1 migrant population, will require government support and a formal mechanism for CSOs to communicate with government agencies and the health sector.</p>
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6	To directly address border-specific issues through innovative strategies related to malaria control among migrants and mobile populations who currently harbour the largest reservoir of malaria infection.	Innovation to the extent possible being planned through existing GF grants with NGOs and related partners mainly on the Thai–Myanmar border side and twin-cities project, for instance, under CAP-Malaria. Cross-border strategies are still unclear, even if some interventions (such as patient cards, exchange of data and interventions etc.) are successfully piloted on some borders.
7	To better engage the private sector (private industries, agricultural sector and the tourism industry) towards the achievement of disease elimination targets.	Currently limited to efforts of NGOs linked to programme strategic approaches. Private sector – private hospital physicians, commerce and business associations etc. – involvement is minimal. Tourism industry involved in to some extent in Phuket. Overall, more efforts need to be made in a more systemic, strategic plan.

The last malaria programme review in Thailand in August 2011. Significant progress has been made on key recommendations to improve programme performance. Building on the recent East Asia Summit Declaration for a malaria free Asia Pacific by 2030, and given the pivotal role of Thailand in these multi-country efforts, an in-depth review of the Thai Malaria Programme was considered timely and appropriate to reorient the current control interventions in line with the Greater Mekong Subregion (GMS) malaria elimination (2016-2030) initiative supported by WHO and partners. With concurrence by the Thailand MoPH, the malaria programme review (MPR) 2015 was coordinated by WHO in collaboration with the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM).

In the context of the health system and the national development agenda, progress made from the last MPR, and programme orientation towards elimination, the objectives of this programme review centred around six thematic areas: (1) Epidemiology assessment; (2) Case management; (3) Vector control and prevention; (4) Monitoring and evaluation system; (5) Programme management, strategy and policy; (6) Financing and sustainability.

Four field visits were carried out in four different malaria endemic regions of Thailand bordering neighbouring countries, namely Tak, Ubon Ratchathani, Chantaburi and Songkla provinces which included visits to health care and malaria facilities and communities. Intensive internal discussion and several individual meetings with MoPH experts and relevant experts outside the MoPH (national institutions, academia, NGOs etc.) were also undertaken.

Main interim recommendations were also presented and discussed with national malaria control experts and presented in plenary on 11 September 2015 with representatives from the MoPH, non-health sectors, nongovernmental organizations and stakeholders.

Findings and action points expressed by the reviewers would be useful to be considered by the programme and partners to achieve malaria elimination goals.



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