

**National Strategic Plan
for
Malaria Control and Elimination
in THAILAND**

2011 - 2016



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LIST OF ABBREVIATIONS

ACD	Active Case Detection
ACT	Artemisinin-based Combination Therapy
AMT	Artemisinin-based monotherapy
API	Annual Parasite Incidence
APMEN	Asia Pacific Malaria Elimination Network
BCC	Behavior Change and Communications
BMGF	Bill & Melinda Gates Foundation
BMIF	Bi-Regional Malaria Indicator Framework
BVBD	Bureau of Vector-Borne Disease
DDC	Department of Disease Control
ODPC	Office of Disease Prevention and Control
G6PD	<i>Glucose-6-phosphate dehydrogenase</i>
GMAP	Global Malaria Action Plan
GMI	Global Malaria Indicators
GMS	Greater Mekong Subregion
GPARC	Global Plan for Artemisinin Resistance Containment
ITN	Insecticide Treated Net
LLIN	Long-lasting insecticide-treated net
MC	Malaria Clinic
MDG	Millennium Development Goals
M&E	Monitoring and Evaluation
MHV	Migrant Health Volunteer
MMR	Malaria Mortality Rate
MOL	Ministry of Labour
MoPH	Ministry of Public Health
MPW	Malaria Post Worker
NMCP	National Malaria Control Programme
PCD	Passive Case Detection
PHO	Provincial Health Office
RAP	Regional Action Plan

RBM	Roll Back Malaria
RDT	Rapid Diagnostic Test
SCD	Special Case Detection
SSA	Sub-Saharan Africa
USAID	United States Agency for International Development
VBDC	Vector-Borne Disease Center
VBDU	Vector-Borne Disease Unit
WHO	World Health Organisation

INTRODUCTION

The National Malaria Control Programme (NMCP) has significantly reduced the annual parasite incidence (API) and the malaria mortality rate (MMR) during the past five decades, through intensive malaria control measures and a large network of malaria clinics providing early diagnosis and treatment. The sustainability of the NMCP, however, is threatened by a significant reduction of specialized field malaria staff and budget due to a reform of governmental organizations, and by the potential emergence of artemisinin - resistant malaria. In addition, it is very challenging to control malaria in unrest southern provinces and in mobile migrants residing along the international border areas.

As the API decreases and Thailand's forward thinking of malaria elimination, a monitoring and evaluation (M&E) system becomes even more critical in early detecting malaria cases so that adequate treatments can be given to prevent the spread of malaria. With an effective monitoring and evaluation, the NMCP will be able to measure its progress and make appropriate adjustment of their programme activities in terms of allocating scarce human and financial resources to the most needed areas. Moreover, the M&E system helps the NMCP evaluate different implementation strategies and the impact of their investment.

The Bureau of Vector-Borne Disease (BVBD), within the Department of Disease Control (DDC) at the Ministry of Public Health (MoPH), is the programme manager of the NMCP and is responsible for establishing the M&E framework and comprehensive surveillance system to be used at all levels. Data collected through the surveillance system should not only be able to address needs domestically, but address different reporting requirements required by international donors providing funds to the BVBD to implement the malaria control and prevention activities.

BACKGROUND

COUNTRY PROFILE

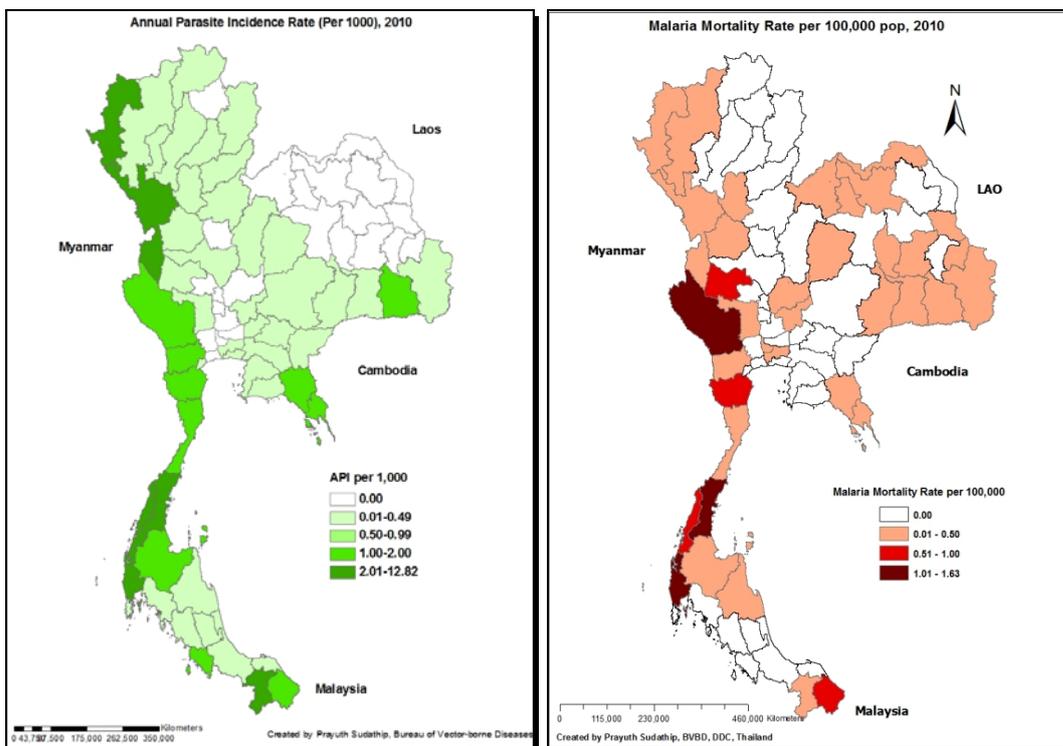
Thailand is located in the continental Southeast Asia and just above the equator. It is bordered with Myanmar (North and West), the Lao People's Democratic Republic (North and East), Cambodia (East), and Malaysia (South). Its area covers about 514,000 km², which is the third largest country among the Southeast Asian nations. Its topography includes the plains, the highlands, and the mountains. Its climate includes tropical rain, tropical monsoon, and seasonal tropical grassland or savannah.

Thailand consists of 76 provinces which are geographically grouped into 6 regions and are subdivided into 877 districts. Its population is 63.45 millions in 2009 and almost all residents (98.1%) are of Thai nationality and the rest being other nationalities such as Chinese, Burmese, and Lao. Most of Thai people are Buddhists (94.5%), followed by Muslims (4.5%) and Christian (0.7%).

MALARIA EPIDEMIOLOGICAL PROFILE

Since its inception in 1949, the malaria control programme in Thailand, relying on vertically driven operations, has been able to drastically reduce the malaria burden. Referring only to recent efforts, confirmed malaria cases dropped from 140,500 in 2000 to 67,263 in 2009 and malaria deaths from 826 in 1996 to 70 in 2009. The majority of confirmed cases are reported from and confined to provinces bordering neighboring countries especially on the Thai-Myanmar border where there is a continuous influx of migrants who are not yet fully taken into account in official statistics. In areas still receptive for malaria, the surveillance system has been strengthened to detect and investigate any introduced cases and take prompt adequate measures to deal with any hot spots (including indoor residual spraying).

Malaria Situation. In FY 2010 most of the cases of malaria were in the 30 provinces with international borders. In that year, 22,342 cases of malaria were in the 30 border provinces, or 89.9% of the national total. The number of cases in border areas in 2010 increased by 1,585 or 7.1% over the total in FY 2009. The annual parasite incidence measure (API) in the 30 border provinces was 0.99 per 1,000 population, and this was under the target threshold of 2.8 as specified for the end of FY 2011. A total of 15,181 cases were in the ten provinces along the Thai-Burmese border (68% of the national total); 2,437 cases were in the six provinces along the Thai-Cambodian border (11%); 4,269 cases were in the four provinces along the Thai-Malaysia border (19%); and 455 cases were in the ten provinces along the Thai-Lao border (2%).



Malaria Species. During FYs 2002 – 2010, the prevalence of *P. vivax* was greater than that for *P. falciparum*. In FY 2010, 10,199 cases of *P. falciparum* and 14,460 cases of *P. vivax* were detected (41% and 58% respectively). In addition, *P. malariae* was detected (0.1%) as well as mixed infection of *P. vivax* and *P. falciparum* (0.7%). Twenty-five percent of reported cases were amongst foreigners, mainly from Myanmar (94 percent) and Cambodian (3 percent) borders. Although the malaria burden has decreased significantly, the emergence of artemisinin resistant *P. falciparum* parasites may challenge or even reverse this trend. Furthermore, the recent detection of *P. knowlesi* among 4 individuals in 2009 warrants more epidemiological research into the extent of distribution of this parasite species.

Migrant populations. The number of non-registered cross-border migrants and refugees is increasing due partly to the unpredictable political situation in Myanmar but also due to economic migrants from other neighboring countries searching for job opportunities in Thailand. Many patients from Myanmar also cross the border to seek health care in Thailand - more than 240,000 migrants were screened for malaria last year at Thai health facilities.

Migrant and mobile populations are classified into two categories: “M1” is the designation given by the Ministry of Public Health to migrants who have been residing in Thailand for six months or more, the majority of whom are presumed to have registered with the Ministry of Labour (MOL), registration gives them the right to remain in Thailand for a prescribed period of time (typically 1-2 years) and enables them to access the formal Thai healthcare system.

“M2” is the designation given to migrants who have been residing in Thailand for less than six months, these “mobile migrants” are usually not registered with the MOL. As a result, they are residing in Thailand illegally, and do not have any claim to utilize the Thai healthcare system (other than the services provided by malaria clinics) and can be arrested and deported at any time.

To consolidate recent gains and to further reduce the malaria burden particularly in unregistered migrants (estimated to range between 1.2 – 2.4 million in Thailand as a whole and around 270,000 as conservative figure in endemic areas), the programme aims to be more proactive by exploring and validating innovative outreach strategies, most of them relying on interventions planned and driven by communities using suitable tools adjusted to the poor education and socio-economic status of the target groups. Despite showing tremendous progress in reducing the annual parasite incidence (API), malaria morbidity and mortality remain highest along the Thai-Myanmar border. Coupled with the emergence of artemisinin resistance along the Thai-Cambodia border, the highly mobile populations in this region pose a significant threat to the progress achieved in the reduction of malaria burden.

THAILAND NATIONAL MALARIA PROGRAMME

The Ministry of Public Health (MoPH) is the core agency in the Thai public health system and has played a role as the manager of the Thai health care programmes. Under the

Reorganization of Ministries, Sub-Ministries and Departments Act of B.E. 2545 (2002), the Ministry of Public Health has “powers and responsibilities related to the promotion of health, prevention/control and treatment of diseases, and rehabilitation of people’s health, as well as other official functions as provided by laws which indicate that such functions are under the responsibility of the Ministry of Public Health.”

The Thai Malaria Control Programme has been a vertical programme from its inception in 1949 until 1996. In 1996, it was partially merged with other vector-borne disease programmes (Dengue fever and Filariasis). It is now called the Bureau of Vector-borne Disease within the Department of Disease Control in the Ministry of Public Health. It is responsible for malaria-related research, generating policy for malaria control, and evaluating the programme. At the regional level, the organization is consisted of 12 Disease Prevention and Control offices. Throughout the country, there are 39 Vector-borne Disease centers at the provincial level and 301 Vector-borne Disease units at the district level that are responsible for the prevention and control of malaria as well as other vector-borne diseases. There are currently 329 malaria clinics throughout the country. Additionally, village malaria volunteers are actively involved in prevention and control activities in each community. Currently, the malaria control programme is undergoing decentralization to the general health service reducing the number of specialized field malaria officials and funds.

Malaria clinics played a significant role in providing early diagnosis and effective treatment in Thailand. Malaria patients detected by malaria clinics accounts for more than 70 % of total reported cases in Thailand. “Malaria clinics” (MC) are specialized clinics operated by the National Malaria Programme. MCs are equipped with light microscopes, a minimal set of laboratory supplies and a well-trained microscopist who can take blood smear and examine blood film and provide free of charge effective treatment. In 2010, there are 329 malaria clinics providing services in malaria endemic areas throughout the country, most of which located along international borders. In addition, “community-based malaria clinic” (or malaria posts) has been introduced to manage malaria in remote areas. It is operated by villagers using light microscope or rapid diagnostic test kits (RDTs). These malaria posts were established to serve vulnerable populations and foreign nationals along the international borders. The establishment of malaria posts has increased access to malaria early diagnosis and effective treatment among vulnerable people and also strengthened community capability in management of malaria. The improved health infrastructure and actively abundant of village malaria volunteers, and effective national drug policy are also keys contributing to this success.

Under Global Fund R7, Migrant Health Volunteers (MHV) were introduced to complement the roles and functions of Malaria Post Worker (MPWs) operating in endemic A1 villages. Building on malaria R2 achievements, 460 malaria posts were established covering all villages classified as A1. Free LLINs were also provided to unregistered migrants presenting with confirmed malaria at health facilities. Since 1995, Thailand has banned the sale of antimalarials in the private sector, which is one of the key strategies to controlling the

unregulated use of antimalarials and reducing the selection pressure for development of drug resistance.

GLOBAL AND REGIONAL M&E FRAMEWORKS

GLOBAL MALARIA ACTION PLAN – ROLL BACK MALARIA

The Global Malaria Action Plan (GMAP) has been created by the Roll Back Malaria (RBM) Partnership, the global coordinating body for fighting malaria. The RBM Partnership comprises all malaria-endemic countries, bilateral and multilateral development partners, the private sector, nongovernmental organizations, community-based organizations, foundations, and research and academic institutions involved in malaria control as well as the RBM Secretariat, Working Groups, and Sub-Regional Networks. The purpose of the GMAP is to foster agreement among all partners around the goals, strategy, and activities that the RBM Partnership will pursue, and to clearly lay out those goals, strategies, and activities. The plan will maximize the impact of the malaria community's work by guiding the prioritization of resources and by strengthening the alignment across and effectiveness of various initiatives.

The Global Malaria Action Plan supports a vision of a world free from the burden of malaria. By 2015, the malaria-specific Millennium Development Goal (MDG) is achieved, and malaria is no longer a major cause of mortality and no longer a barrier to social and economic development and growth anywhere in the world. Beyond 2015, all countries and partners sustain their political and financial commitment to malaria control efforts. The burden of malaria never rises above the 2015 level, ensuring that malaria does not re-emerge as a global threat.

The targets of the GMAP are to:

- *Achieve* **universal coverage**, for all populations at risk with locally appropriate interventions for prevention and case management by 2010 and sustain universal coverage until local field research suggests that coverage can gradually be targeted to high risk areas and seasons only, without risk of a generalized resurgence;
- *Reduce* global malaria **cases** from 2000 levels by 50% in 2010 and by 75% in 2015;
- *Reduce* global malaria **deaths** from 2000 levels by 50% in 2010 and to near zero preventable deaths in 2015;
- *Eliminate* malaria in 8-10 countries by 2015 and afterwards in all countries in the pre-elimination phase today; and
- In the long term, *eradicate* malaria world-wide by reducing the global incidence to zero through progressive elimination in countries.

In the long term, global malaria eradication is achieved and there is no malaria infection in any country. Malaria control efforts can be stopped.

REGIONAL ACTION PLANS (2010 – 2015)

The Regional Action Plan (RAP) for Malaria Control and Elimination in the Western Pacific 2010-2015 was developed as a product from extensive consultations and forums among national programs and multiple stakeholders. This comprehensive RAP considered the lessons learned and available evidences gathered from the region and in July 2009 (Manila, Philippines) a draft plan was developed with performance indicators to monitor progress and evaluate outcomes and impacts. Endorsed by the Regional Committee Meeting (WPR/RC60.8) and Resolution (WPR/RC60.R5), this RAP is a “living document” subject to periodic review as necessary.

The overall goal of the RAP is to consolidate and build on the recent achievements in malaria control in the region and progressively eliminate malaria, where possible.

The Regional Action Plan for the Southeast Asia Regional Office is currently being developed.

RAP Objectives:

- (1) Strengthen malaria programme management, based on firm political commitment and strong partnerships
- (2) Ensure full coverage of the population at risk with appropriate vector control measures,
- (3) Maximize utilization of malaria services (through appropriate information, education and communication and/or behaviour change communication) and dramatically strengthen community mobilization efforts,
- (4) Ensure access for all to early diagnosis and affordable, safe, effective and prompt antimalarial combination treatments through active public and private sector initiative
- (5) Ensure comprehensive coverage of vulnerable, poor and/or marginalized populations at high risk of malaria with appropriate malaria control measures
- (6) Establish and/or strengthen the routine malaria surveillance system (all species) and ensure adequate outbreak response capability
- (7) Accelerate malaria (all species) elimination efforts in participating countries

RAP key performance indicators:

- (1) Deaths due to malaria (number and rate) reduced by at least 50% by 2015 compared with the 2007 baseline.
- (2) Confirmed malaria cases (number and rate) reduced by at least 50% by 2015 compared with the 2007 baseline.

- (3) Percentage of cases due to *P. falciparum* decreased compared with the 2007 baseline.
- (4) Admitted malaria cases (number and rate) reduced by at least 50% by 2015 compared with the 2007 baseline.
- (5) Malaria test positivity rate (for microscopy and rapid diagnostic tests) reduced to less than 5% in at least six countries by 2015.
- (6) At least seven countries have achieved interruption of malaria transmission in targeted areas by 2015.

BI-REGIONAL MALARIA INDICATOR FRAMEWORK

Despite the regional successes in malaria control, the presence of high-transmission foci and disproportionately affected subgroups within the Greater Mekong Subregion (GMS) are reason for concern. Additionally, recent evidence of prolonged parasite clearance times to artemisinin derivatives on the Cambodia-Thailand border has incited a global effort to contain artemisinin-resistant *P. falciparum* parasites and prevent the spread of naturally occurring artemisinin-resistant parasite strains. This coordinated regional approach for malaria prevention and control is necessary and globally supported.

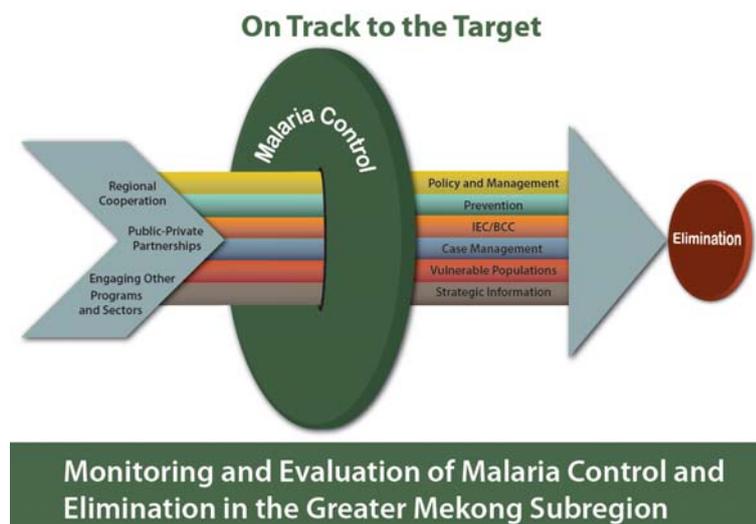
The foci of malaria control in the GMS are quite different than those of sub-Saharan Africa (SSA). Since much of the global malaria community's efforts have concentrated on highly endemic regions such as SSA, many of the existing indicators that have been developed for malaria M&E are not always relevant for the GMS. The unique epidemiological, social, and political environment in the GMS necessitates approaches to malaria control that are tailored to its specific regional situations. These include low endemicity, focal transmission, disproportionately affected subgroups, rapidly developing drug resistance, and high *P. vivax* to *P. falciparum* infection ratios.

In order to increase capacity for an effective response to malaria in the GMS, NMCPs from Thailand, Myanmar (Burma), Cambodia, China, Lao PDR, , and Viet Nam partnered with the World Health Organization (WHO), the U.S. Agency for International Development (USAID), MEASURE Evaluation, Malaria Consortium, and the Centers for Disease Control and Prevention to develop the Bi-Regional Malaria Indicator Framework (BMIF) for M&E of Malaria Control and Elimination in GMS. The BMIF is a bi-regional commitment for the control and progress towards the elimination of malaria through a uniform method of monitoring and evaluation within the Mekong subregion. This document outlines the goals and challenges of malaria control efforts in the subregion, and provides both a conceptual framework and specific indicators for use in monitoring and evaluating NMCPs. Progress towards this goal requires measuring the successes and failures of malaria control efforts; so specific, measurable indicators have been developed according to the conceptual framework. The framework is designed to address the unique needs of the GMS while synchronizing indicators as much as possible with existing Global Malaria Indicators (GMI).

The indicators are organized into six categories corresponding to the key programmatic approaches identified by NMCPs for achieving malaria control and elimination. These tactics

were selected to illustrate the GMS malaria control programming priorities and organize indicators into groups measuring related outcomes. The six approaches are:

- (1) policy and management;
- (2) prevention;
- (3) information, education and communication/behavior change communication (IEC/BCC);
- (4) case management;
- (5) engaging vulnerable populations; and
- (6) strategic information



GLOBAL PLAN FOR ARTEMISININ RESISTANCE CONTAINMENT

The emergence of artemisinin resistance in along the Thai-Cambodia border has tremendous implications for the Greater Mekong Subregion but also for the rest of the world in terms of the preserving artemisinin-based combination therapies for the effective treatment of malaria. WHO and many partners came together to develop the Global Plan for Artemisinin Resistance Containment (GPARC). The GPARC is intended to mobilize global and local stakeholders for the containment and ultimate elimination of artemisinin resistance where it has emerged and for the prevention of its emergence in or spread to new locations.

The global strategy for the containment of artemisinin resistances rests on 5 key areas:

- (1) **Stop the spread of resistant parasites.** Increased coverage with preventive measures, especially vector control, is a priority, as are programmes to control malaria in mobile and migrant populations. Where artemisinin resistance is confirmed, national malaria control programmes may also consider a range of epidemiological or transmission-reduction tools, including focused screening and treatment, active case detection, mass screening and treatment or mass drug administration.
- (2) **Increase monitoring and surveillance to evaluate the threat of artemisinin resistance.** Routine monitoring and surveillance will be critical to identify new foci rapidly and to provide information for containment and prevention activities.
- (3) **Improve access to diagnostics and rational treatment with Artemisinin-based combination therapies (ACTs).** National programmes should ensure that quality diagnostics and ACTs are accessible and available for the treatment of malaria which aims to limit opportunities for resistance to artemisinins and partner drugs. Effective behavior change communications should also be a component of these interventions.
- (4) **Invest in artemisinin resistance-related research.** Research is vital to improve our understanding of artemisinin resistance and to develop strategies to address it. Areas of priority research include laboratory research, research and development, applied and field research, operational research, and mathematical modeling.
- (5) **Motivate action and mobilize resources.** Successful implementation of the GPARC will depend on continued funding and motivating stakeholders at global, regional and national levels to support this effort.

A STRATEGY TO CONTAIN ARTEMISININ RESISTANCE MALARIA PARASITES IN SOUTHEAST ASIA

In the 1990s, artemisinin-based combination therapy (ACT) was pioneered in the region to respond to the growing spread of malaria drug resistance. With increased investment of effort and funds to ensure large scale access to effective malaria interventions along with the use of highly effective ACTs, exceptional progress has been made in the fight against malaria, including sub-Saharan Africa. However, recent evidence has suggested that the efficacy of ACTs is declining particularly on the Thai-Cambodian border, historically a site of emerging antimalarial drug resistance. Drug therapeutic efficacy studies have demonstrated significant prolonged parasite clearance times among patients from western Cambodia compared to those from northwestern Thailand. This alarming trend prompted the WHO and partners to develop an inter-country strategy to contain the spread of artemisinin resistance in the region. Without a doubt, the spread of artemisinin resistance from Asia to Africa and beyond would indeed be a global catastrophic setback for the progress and successes achieved thus far in malaria control and elimination efforts.

In January 2009, WHO, the Thai and Cambodia National Malaria Programmes, Malaria Consortium and other partners received funding from the Bill & Melinda Gates Foundation (BMGF) for implementation of an emergency 2-year project to contain artemisinin resistant malaria parasites in South-East Asia. The strategy and M&E framework focuses on 1) **eliminating artemisinin resistant parasites** by detecting all malaria cases in target areas and ensuring effective treatment and gametocyte clearance; 2) **preventing use of artemisinin-based monotherapy (AMT)**, fake drugs and inappropriate treatment in the **private sector**; 3) **prevention of transmission** by mosquito control and personal protection; 4) limiting the spread of artemisinin resistant malaria parasites by **mobile and migrant populations**; 5) supporting containment/elimination of artemisinin resistant parasites through comprehensive and harmonized **behavior change communication (BCC)**, community mobilization and advocacy; 6) undertaking basic and **operational research** to fill knowledge gaps and ensure that strategies applied are evidence-based; and 7) providing **effective management** system, including **surveillance, monitoring and evaluation**, and coordination.

These strategies are in line with the Thailand National Strategy for Malaria Control and Elimination, and medium term support will be sought through funding from the Global Fund for expansion of these strategies.

NATIONAL MALARIA CONTROL AND ELIMINATION STRATEGY OF THAILAND (2011 -2016)

VISION

The vision of the National Malaria Control and Elimination Strategy is that 80 percent of the total country areas will be free from locally acquired malaria transmission by the year 2020

TARGETS

1. Annual Parasite Incidence (API) (all species) per 1000 mid-year population among Thai + non Thai M1 migrants reduced from 0.4 per 1000 (baseline 2010) to 0.2 per 1000 population (2016)
2. Malaria Mortality Rate reduced from 0.14 per 100,000 (baseline 2010) to 0.05 per 100,000 population (2016)
3. Percent of districts achieving interruption of malaria transmission (no indigenous cases of malaria for three years) increased to 60% by 2016 and 80% by 2020

GOAL AND OBJECTIVES

The current National Strategy for Malaria Control and Elimination in Thailand (2011 - 2016) is closely aligned to the principles of the World Health Organization's Global Malaria Programme. The overarching goal of the national malaria programme is to contribute to Thai welfare by reducing malaria morbidity and mortality, by reducing the size of transmission areas and by containing and eliminating artemisinin-resistant parasites (in collaboration with neighboring countries). Thailand's National Malaria Strategy includes a sub-national elimination strategy which aims to strengthen existing surveillance systems and active case detection, investigation and follow-up through implementation of DOTs.

The National Malaria Programme's **overall goal is to reduce malaria morbidity and mortality and move towards the elimination of malaria parasites in Thailand**

The specific objectives to achieve this goal include:

1. To detect malaria cases (both asymptomatic and symptomatic) and **ensure effective diagnosis and treatment** and gametocyte clearance
2. To prevent transmission of malaria parasites through **effective vector control** and personal protection measures among vulnerable populations.
3. To support elimination of malaria parasites through **comprehensive behavior change communication**, community mobilization and advocacy.
4. To provide an **effective management system** (including **surveillance, monitoring and evaluation, and operational research**) to enable rapid and high quality implementation of the strategy.
5. To **interrupt malaria transmission** in target districts

The National M&E Plan is aligned to measure the impact and outcomes of these specific objectives (**Annex 1**).

STRATEGIC FRAMEWORK

In order to achieve these specific objectives for detecting all malaria cases and ensuring effective diagnosis and treatment, uptake of vector control measures and BCC/IEC and community mobilization, particularly for vulnerable populations, ensuring adequate management systems (including surveillance, M&E, and operational research) are in place, and to interrupt malaria transmission in target districts, the National Malaria Programme acknowledges the importance of the following key strategies in order to implement an effective programme:

1. **Enhance National Malaria Management** with community participation and involvement of all partners.

2. Implement programme for **sub-national elimination** of malaria in country and accelerate the integration of malaria control into public health systems.
3. Establish malaria control **collaboration mechanisms** for special risk populations and border areas.
4. Perform **enhanced surveillance**, prevention and control of drug resistant malaria parasites.
5. Promote **human capacity building**
6. Support **malaria research** and development

1) Enhance National Malaria Management with community participation and involvement of all partners.

- 1.1. Improve quality of malaria operations of the National Malaria Programme, in line with international guidelines and recommendations
 - 1.1.1. Contribute to the acceptance of policies at all levels by national and international partnerships, in order to establish short-term and long-term plans, provide resources including human resources and budget (national budget and funds from international assisting agencies) so they are of adequate quality and quantity.
 - 1.1.2. Improve detection of cases using ACD in villages and passive case detection (PCD) in villages and towns, diagnosed by microscopy or Rapid Diagnostic Tests (RDTs) in the field.
 - 1.1.3. Provide high-quality standard treatments according to the malaria species, follow-up cases for at least 28 days, provide systematic procurement of medical and non-medical supplies, transportation, and storage management in order to deliver drugs and avoid supply shortages.
 - 1.1.4. Establish the surveillance, prevention, and disease control system. The appropriate measures could be implemented when getting an alert from the warning system.
 - 1.1.5. Provide malaria investigation experts to support and participate with the district, provincial and national teams.
 - 1.1.6. Develop an entomological center, follow up malaria vector mosquito resistance to insecticides, conduct vector behavior studies, and control the standard insecticide and spray devices, improve regulations/rules to control chemical substance usage to be proper for the areas and epidemic situations.
 - 1.1.7. Provide integrated vector management, develop biological control, and use insecticides safe for humans and domestic animals, and other methods.

- 1.1.8. Encourage high risk populations to use long lasting insecticide-treated nets (LLINs), insecticide-treated nets (ITNs), and repellents.
 - 1.1.9. Supervise, monitor, control, follow up, evaluate, and provide practical guidelines for supervision, monitoring, evaluation, accurate data collection, collaboration among Ministry of Public Health agencies, in order to obtain accurate data according to the same standards, and conduct evaluation at each level.
 - 1.2. Organize a cooperative network of public and private sector organizations, including Ministry of Public Health, other government ministries, and private sector organizations (e.g., private hospitals, private clinics), and universities.
 - 1.2.1. Facilitate coordination of members of the network to conduct operational research and other research in line with the National Malaria Strategy.
 - 1.2.2. Encourage multinational organizations to coordinate work along the border areas (including cross-border screening and treatment of migrant workers)
 - 1.3. Strengthen advocacy, communications, and social mobilization leading to policy changes and sustaining contracts and budgets.
 - 1.3.1. Communication between service providers and communities helps people understand malaria and impels social change. The public will have knowledge and awareness of the problems of controlling malaria and will cooperate and help to keep communities safe from malaria.
- 2) *Implement programme for sub-national elimination of malaria in country and accelerate the integration of malaria control into public health systems.***
- 2.1. Make long-term malaria sub-national elimination plans at the district level.
 - 2.2. Support provinces, districts, and local areas in accelerating disease control in their target areas in all activities according to the National Malaria Control and Sub-national Elimination Manual, in order to eliminate malaria transmission so malaria does not return in areas with vector mosquitoes.
 - 2.3. Hasten and expand integrating into public health systems in every province with clear steps. This involves skills trainings for examining, treating and eliminating malaria for relevant agencies at each level in the province. Assess and push transferring work as planned.
 - 2.4. Ensure human resources, supplies, and equipments are available as needed to respond to all malaria cases investigated and followed up.
- 3) *Establish cross-border malaria control collaboration mechanisms for special risk populations and border areas.***
- 3.1. Strengthen mechanisms for cooperating in malaria control work at every level, including national and local levels, in order to plan to work together effectively. Designate responsibilities at each level clearly.

- 3.2. Develop and harmonize cross-border elimination strategies, planning and implementation.
- 3.3. Develop manuals for sub-national elimination (province and district level), and other manuals as standards for work, in order to use as guidelines to work in the same direction.
- 3.4. Participate in various networks for elimination including Asian Pacific Malaria Elimination Network (APMEN)

4) *Effectively perform surveillance, prevention and control of drug resistant malaria parasites.*

- 4.1. Support a network for consistent surveillance of effectiveness of first line drugs, including following up other factors such as sensitivity of parasites to drugs using several methods, surveillance of drug quality, and studies of factors that cause parasites to resist drugs.
- 4.2. Develop molecular biological methods, make a genotyping collection of malaria parasites, and conduct molecular biological studies of malaria parasites.
- 4.3. Develop manuals and standards for surveillance and follow-up effectiveness of antimalarial drugs.
- 4.4. Improve pharmaceutical management practices to prevent stock-outs or overstocks of ACTs and RDTs,

5) *Promote human capacity building.*

- 5.1. Review the organizational structure and direction of personnel development, for controlling malaria: Offices of Disease Prevention and Control (ODPC), Vector Borne Disease Units (VBDO), and Provincial Health Offices (PHO).
- 5.2. Designate responsible persons and create a Human Resource Development plan and database for systematically planning human resource development.
- 5.3. Develop teaching and learning opportunities about malaria control in the Vector Borne Disease training center, institutions training physicians, nurses, lab technicians, and other public health professionals at provincial and local levels concerned with disease control.
- 5.4. Train personnel in the various occupations relevant to malaria control in sufficient numbers and quality to conduct the work.
- 5.5. Conduct international level malaria trainings

6) *Support malaria control research and development.*

- 6.1. Create a conceptual framework and support guidelines for personnel conducting operational research for developing malaria control methods, as follows:
- 6.2. *Epidemiology*

- Epidemiology research should be conducted at the levels of the nation, province, and areas with special or unique characteristics, in order to study the current situations and risk factors causing malaria. The effects of the several special projects should be studied, such as the Global Fund projects and drug resistant parasite elimination strategies projects.
- Local level studies should be conducted, such as morbidity and mortality rates among pregnant women, children under two, and non-immune tourists.
- Continuous drug resistance surveillance in border areas with high transmission
- Entomology studies of Integrated Vector Management

6.3. Model development and public health system studies

- Effects of reforming the health system, including national insurance systems, civil service systems changes, and decentralization from administrators to local organizations.
- Research evaluating the effects of integrating malaria control into the provincial public health system, during and after the process.
- Community participation in malaria case finding and treatment
- Methods of preventing transmission in tourism areas.
- Develop a network for controlling drug resistance.
- Operation research on sub-national elimination interventions.

6.4. Clinical and laboratory research

- Studies of types of drugs in several forms, including new treatment modes (prophylactics, supplements, supported drugs and prevention (vaccines).
- Develop a network for malaria parasite laboratory services, continuous parasite culture, and drug sensitivity tests.
- Studies of emerging methods e.g. PCR for survey and diagnostic needs.
- Operation research on improving G-6-PD screening and safe integration of primaquine therapy for radical treatment of *P. vivax*

6.5. Social science and behavioural studies

- Engage community-based agents especially in remote areas to deliver malaria prevention
- Raise public awareness through various means about the dangers of counterfeit and substandard medicines
- Research innovative approaches to effectively reach identified vulnerable groups.

ANNEX

Annex 1. National Monitoring and Evaluation Plan for Malaria Control and Elimination in Thailand (2011 -2016)