Countries of the Greater Mekong are stepping up to end malaria
BACKGROUND

Countries of the Greater Mekong Subregion (GMS) are accelerating toward their shared goal of malaria elimination by 2030. The six GMS countries – Cambodia, China (specifically Yunnan Province), the Lao People’s Democratic Republic, Myanmar, Thailand and Viet Nam – have achieved remarkable progress. Between 2012 and 2017, the reported number of malaria cases\(^1\) fell by 75%. Malaria deaths fell by 93% over the same period.

Although 2017 saw an overall decline in malaria cases across the GMS, case increases were reported in several areas of the Subregion. Worryingly, preliminary estimates from the first half of 2018 suggest that the total number of cases in the GMS increased by 32% compared to the corresponding period last year. The estimated increase was mainly in a few provinces of Cambodia and Viet Nam, and largely attributed to an increase in *P. vivax* malaria. Accelerated action is needed, now more than ever, to continue the track of substantial progress in the Subregion.

The recent increase in cases can be attributed to a number of factors, including stock-outs of antimalarial drugs, delays in rolling out the drug treatment for *P. vivax* malaria, low utilization of mosquito nets, and increased population movement into areas of active transmission. Other factors, such as improved coverage of testing and better data collection, also affect the number of cases reported. Most cases have been reported in remote, forested areas, where hard-to-reach populations are disproportionately affected by malaria.

Reaching at-risk communities is a top priority. Strengthened and focused technical support is critical to support communities in the remaining endemic areas. By ensuring equitable access to malaria prevention, diagnosis and treatment interventions for all at risk, GMS countries can advance not only the goal of elimination, but also universal health coverage.

As countries approach elimination, the role of malaria surveillance systems continues to be critically important. Stronger, more sensitive surveillance systems are necessary for tracking down every malaria case. In this latest Bulletin, updates are provided on the range of surveillance activities in the GMS, including country-specific data.

\[^1\] In this publication, reported cases include cases reported from all sources of public health facilities, community health workers and the private sector, except for data from Cambodia and Myanmar, which do not include the private sector. Myanmar data do not include data from non-governmental organizations (NGOs). The case count in China includes only indigenous cases. This Bulletin presents available data as of October 2018.
COMMITMENT TO A COMMON GOAL

During the 71st World Health Assembly (WHA) in May 2018, the GMS Ministers of Health signed the Ministerial Call for Action to Eliminate Malaria in the GMS before 2030, renewing their commitment to hastening elimination. The Call for Action urges rapid implementation of the WHO Strategy for malaria elimination in the GMS (2015-2030). This subregional strategy, adopted by GMS Ministers of Health in 2015, aims to eliminate *P. falciparum* malaria by 2025 and all species of human malaria by 2030.

The 2018 Call for Action highlights the necessary steps on the road to elimination. Collaboration across borders, coordination among partners and multi-sectoral responses are fundamental to achieving elimination by 2030.

WHO is committed to helping countries implement the GMS malaria elimination strategy and the recent Call for Action. Through its six GMS country offices, regional offices in Manila and New Delhi, and headquarters in Geneva, WHO continues to provide technical support to the Subregion. The WHO Mekong Malaria Elimination (MME) programme, established in 2017, is a subregional team in Phnom Penh dedicated to supporting elimination in the GMS though partnership coordination, communication with external stakeholders and cross-border initiatives.

Financial and technical support from regional and international partners has played a vital role in the Subregion’s elimination efforts. The WHO MME programme hosted a Partnership Forum earlier this year, bringing together numerous partners to discuss challenges and lessons learned. Donors, including the Australian Department of Foreign Affairs and Trade, the Bill & Melinda Gates Foundation, the Global Fund to Fight AIDS, Tuberculosis and Malaria, the UK Department for International Development and the US Agency for International Development, are helping countries tackle the remaining hurdles on the road to elimination.
REGIONAL DATA-SHARING PLATFORM

All GMS countries are collecting and reporting monthly surveillance data to a regional web-based platform. The regional data-sharing platform (RDSP) – funded through the Regional Artemisinin-resistance Initiative (RAI) of the Global Fund to Fight AIDS, Tuberculosis and Malaria – collects and stores surveillance data to facilitate information-sharing and analysis by countries. The WHO MME programme hosts the RDSP through the district health information system (DHIS2) software.

The platform equips GMS countries with a range of applications, from outbreak monitoring to cross-country data-sharing. A key advantage of the platform is its capacity to provide detailed depictions of the epidemiological situation. Understanding where cases are located, particularly in border areas, is crucial to informing strategic decisions in the Subregion.

An important feature of the RDSP is having early access to disaggregated data from countries, currently at monthly intervals. This has contributed to facilitating a targeted response. WHO is working with national malaria control programmes (NMCPs) to enhance the RDSP, particularly with regard to timeliness and completeness of data reporting. More detailed collection and disaggregation of surveillance data, including data at the health facility or village levels, will help pin down where transmission is occurring.

Data from the RDSP also help improve coordination and communication among countries, partners and other stakeholders. External communication materials, such as the quarterly MME Epidemiology Summary, utilize the most up-to-date RDSP data. Cross-border meetings, too, use these data to prompt more thorough examinations of malaria at the border.

More refined data will continue to become available as countries strengthen their surveillance activities. In the GMS, surveillance systems are undergoing many changes, such as case-based investigation and integrated Drug Efficacy Surveillance (iDES). As such, it is important for countries to periodically review their surveillance systems and make necessary adjustments to standard operating procedures (SoPs) based on epidemiology and programmatic needs.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>STANDARD OPERATING PROCEDURES FOR MALARIA SURVEILLANCE</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>Surveillance for malaria elimination, operational manual</td>
<td>2017</td>
</tr>
<tr>
<td>China (Yunnan)</td>
<td>National malaria elimination surveillance plan</td>
<td>2015</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>Malaria elimination surveillance guideline</td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td>Malaria burden reduction surveillance guideline</td>
<td>2017</td>
</tr>
<tr>
<td>Myanmar</td>
<td>Malaria surveillance in elimination settings: an operational manual</td>
<td>2017</td>
</tr>
<tr>
<td>Thailand</td>
<td>Malaria elimination manual and manual for surveillance and rapid response teams (SRRT) (being finalized)</td>
<td>2018</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>Guideline for malaria surveillance and control</td>
<td>2016</td>
</tr>
<tr>
<td>COUNTRY</td>
<td>NATIONAL ELIMINATION PLANS AND STRATEGIES IN THE GMS</td>
<td></td>
</tr>
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<td>-----------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>Malaria elimination action framework (2016-2020)</td>
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<tr>
<td>China (Yunnan)</td>
<td>National malaria elimination action plan (2010-2020)</td>
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<tr>
<td>Lao PDR</td>
<td>National strategic plan for malaria control and elimination (2016-2020)</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>National malaria elimination strategy (2017-2026)</td>
<td></td>
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<tr>
<td>Viet Nam</td>
<td>National strategy for malaria control and elimination in the period 2020 and orientation to 2030</td>
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| TABLE 3. Data submission tracking by the six GMS countries |

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA REPORTING</th>
<th>DATA LEVEL</th>
<th>PERIOD</th>
<th>DESCRIPTION</th>
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<td></td>
<td>2010-2017</td>
<td>JAN-JUN 2018</td>
<td></td>
<td></td>
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<tr>
<td>Cambodia</td>
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<td>Yes</td>
<td>Health facility</td>
<td>Monthly Monthly data by health facility are available from January 2010 to June 2018.</td>
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<tr>
<td>China (Yunnan)</td>
<td>Yes</td>
<td>Yes</td>
<td>County</td>
<td>Monthly Monthly data by county are available from January 2010 to June 2018.</td>
</tr>
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<td>Lao PDR</td>
<td>Yes</td>
<td>Yes</td>
<td>Health facility</td>
<td>Monthly Monthly data by health facility are available from January 2017 to June 2018. Monthly data by district are available from 2010 to 2016.</td>
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<tr>
<td>Myanmar</td>
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<td>Yes</td>
<td>Township</td>
<td>Monthly Monthly data by township are available from January 2017 to June 2018. Annual data by township are available from 2010 to 2016.</td>
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<tr>
<td>Thailand</td>
<td>Yes</td>
<td>Yes</td>
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<td>Monthly Starting from July 2017, Thailand has agreed to share monthly data by province.</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>Yes</td>
<td>Yes</td>
<td>Province</td>
<td>Monthly Monthly aggregate data by province are available from 2010 to present.</td>
</tr>
</tbody>
</table>

Validation of data is necessary before uploading. Countries submit data after checking for internal consistency and completeness. If any validation checks fail, then feedback is sent to countries for checking, confirming and resubmitting data.
CAMBODIA

Between 2012 and 2017, Cambodia reported a 19% increase in cases, including a 98% increase between 2016 and 2017. The seven northern provinces accounted for most (78%) malaria cases in 2017.

Preliminary estimates from January to June 2018 show a 155% increase in cases compared to the same period in 2017. Numerous factors help to explain the recent case increase, such as drug stock-outs, low use of mosquito nets, two years of disruption to the village malaria workers programme, and the high influx of people moving into forest areas where access to treatment is limited. Delays in the supply of the country’s first-line treatment drug as well as the continued use of a failing drug also contributed to case increases. Other confounding factors (e.g. improved data compilation and reporting) influenced the total number of cases reported.

In view of the recent increase in cases, Cambodia is implementing an intensified response plan in the seven provinces with the highest malaria burden. This plan focuses on populations at high risk of infection, including migratory populations and forest workers.

Cambodia revised its Surveillance operational manual, outlining the SoPs for districts in the burden reduction and elimination phases. The country intends to annually revise the manual as new evidence and tools on intervention strategies become available.

With support from partners, Cambodia is piloting case-based surveillance – whereby every case is reported and investigated – in the seven elimination provinces with lower malaria burden. The country plans to expand case-based surveillance to seven more provinces in the second half of 2018.

A major hurdle has been the increasing number of P. vivax cases, which more than doubled between 2017 and 2018. From January to June 2018, 64% of all cases were P. vivax. Unlike the P. falciparum malaria parasite, P. vivax has the ability to become dormant and can cause relapses in a patient, and a specific drug regimen is needed to prevent these relapses. Cambodia is working to operationalize the treatment for P. vivax malaria.

CHINA

China has achieved tremendous success in malaria case reduction. Since 2017, no indigenous cases have been reported. In April 2018, Jiangxi province was verified by the country as malaria-free, and more provinces are expected to achieve this status in the coming months.

China began the process of subnational verification of malaria elimination at the end of 2017, with the plan to verify 24 provinces by 2020. The country’s
“1-3-7” surveillance strategy is implemented nationwide and reviewed each year at the national level. The strategy involves three time-bound objectives: case notification within one day, case investigation within three days and foci investigation and targeted action within seven days.

Imported cases continue to be a major hurdle, however. So far this year, China has reported 1425 imported malaria cases and five malaria deaths (as of June 2018). China is countering the threat of cross-border transmission through engagement and leadership in regional elimination initiatives. Under its ‘Belt and Road Initiative’, China is involved in multiple projects, including the Lancang-Mekong project and the South-South Cooperation Assistance Fund.

Along with Sri Lanka and Myanmar, China hosted the side event at the 71st WHA where the Ministerial Call for Action was signed. The event focused on country-led and country-owned responses to malaria. A central message conveyed at the event was that malaria elimination and universal health coverage go hand in hand.

**LAO PEOPLE’S DEMOCRATIC REPUBLIC**

The number of malaria cases in the Lao People’s Democratic Republic (Lao PDR) fell by 80% between 2012 and 2017, with a 40% decline reported between 2016 and 2017. According to preliminary estimates, the first half of 2018 saw a drop in cases of close to 10% compared to the same period last year.

The national malaria programme is focused on strengthening surveillance and accelerated burden reduction in the five southern provinces. Priorities include the deployment of trained village malaria workers in high burden villages in southern Lao PDR; the new case-based surveillance strategy in the northern elimination provinces; and, the outbreak detection and response strategy in the southern high burden provinces.

The country initiated a rollout of case-based surveillance and response in the 13 elimination-ready provinces in the north. The roll-out included the development of an elimination-capable surveillance system, as well as clear national guidelines and operational protocols linked to case and foci investigation and response. An outbreak response threshold in the five high burden provinces in the south has also been developed which is linked to the new surveillance and response guidelines for high burden provinces.

Lao PDR continues to enhance its routine malaria information system. In June 2018, all data from private sector health facilities, collected as part of the private public mix (PPM) project, were fully integrated into the system. As a result, Lao PDR is the first GMS country to analyse both public and private malaria case information together.
Although the surveillance system and guidelines have been developed and disseminated, the challenge now is to build health system support for the new reactive approaches, particularly in the areas of programme management, technical capacity, equipment and infrastructure.

**MYANMAR**

Myanmar dramatically reduced its malaria cases by 82% from 2012 to 2017, with an accelerated decrease of 23% from 2016 to 2017. According to preliminary estimates, the number of cases continued to fall between January and June 2018, representing a 36% decrease compared to the same period in 2017.

Myanmar has achieved substantial progress toward the targets of its *National malaria strategic plan 2016–2020*. Eight states and regions achieved an annual parasite incidence (API) of less than one case per 1000 population in 2017, against the country’s target of five states or regions. Building national capacity for elimination standard surveillance, investigation and response is on the agenda for elimination settings. Another priority is the development of a national strategy for integrated community case management, by which village health volunteers provide malaria services primarily, in addition to services for dengue, lymphatic filariasis, leprosy, tuberculosis and HIV.

Surveillance has improved over recent years, capturing information from most health facilities, over 18 000 volunteers and 1500 general practitioners. In addition to implementing the “1-3-7” strategy pioneered by China, Myanmar has launched several new initiatives, such as piloting the tablet-based DHIS2 software in one township. A malaria elimination demonstration site is also under development in one township and will function as a learning laboratory for the programme.

Strong commitment from policy makers and effective partnerships have created a catalytic effect on programme success. Local and international partners help deliver equitable services to groups at high risk of infection like mobile populations, migrants and affected communities in hard-to-reach and conflict areas. At the same time, cross-border collaboration with China and Thailand provides further opportunity for reaching at-risk groups.

Although access to hard-to-reach groups has improved through support from local health organizations, there remain conflict areas where access has not yet been achieved. Population movement within the country is another hurdle for elimination. Other challenges for Myanmar include the human resource gap for surveillance activities and timely reporting from implementing partners.
THAILAND

From 2012 to 2017, the number of malaria cases in Thailand fell by 67%, with a 39% drop between 2016 and 2017. The number of cases continued to fall during the first half of 2018, accounting for an estimated 47% decrease compared to the same time period in 2017.

The establishment of a National Malaria Reference Laboratory (NRL) is a high priority for Thailand’s malaria programme. In collaboration with WHO, the Bureau of Vector-Borne Diseases is leading efforts to form the NRL, which will serve as a pre-requisite for the certification of elimination.

Another key objective for Thailand is to bolster sustainable financing and community ownership through local (subdistrict) administration offices (LAOs). The country is working to build the capacity of health workers and LAO authorities in provinces with ongoing malaria transmission to apply for government funding and to increase available budgets for elimination activities.

In March 2018, WHO evaluated the performance of Thailand’s integrated Drug Efficacy Surveillance (iDES). iDES is designed to integrate follow-up information on every patient into Thailand’s routine surveillance reporting. The country piloted iDES in three northern provinces last year, scaling up to five provinces with active malaria transmission. The plan is to continue scaling up to all provinces with active transmission, thereby helping to ensure compliance to the full course of treatment for all patients.

At a national event for World Malaria Day 2018, Thailand celebrated the validation of 35 provinces (out of 76 total) as malaria-free. The event highlighted commitment to elimination from non-health sectors, particularly the armed forces, and community and local administration agencies.

As the country gradually integrates its vertical malaria network into the public health system, one challenge is the potential loss of experienced malaria staff, especially microscopists and field entomologists, due to retirement. The establishment of the NRL poses other challenges, including the need to establish a national inventory of malaria laboratories across sectors along with an inventory of malaria microscopists.
VIET NAM

Viet Nam has achieved significant progress, reducing its total number of malaria cases by 77% from 2012 to 2017. The country has already met and exceeded its strategic targets for 2020, including malaria elimination in over 40 provinces. Most cases are now concentrated in only six provinces, with one province alone accounting for nearly 46% of cases.

After a period of steep decline, cases have mostly flatlined in 2017 and 2018. In some limited areas, however, cases have increased due to the increased movement of people into forests for work and increased rainfall. Overall, the country reported 4542 malaria cases in 2017, which represents a 10% increase in cases compared with 2016. Preliminary estimates from the first half of 2018 show a 50% increase in the number of cases compared to the corresponding time period in 2017.

Most cases are confined to hilly, forested areas. Remaining challenges in these areas include access to diagnosis and treatment in at-risk communities and the increasing failure rate of the country’s first-line antimalarial drug in some provinces.

Viet Nam is working to ensure that the surveillance system is elimination ready. Case-based surveillance has been rolled out in multiple communes, with the goal to investigate, classify and respond to every malaria case in the country.

For World Malaria Day in April 2018, WHO, in collaboration with the National Institute of Malaria, Parasitology and Entomology (NIMPE) of Viet Nam, launched the National malaria programme review, Viet Nam 2018. The report synthesizes the results of an independent evaluation of Viet Nam’s NMCP. International malaria experts noted the steep decline in cases over recent years due to the substantial commitment and investment of the government.

The in-depth report recommends the reorientation of the NMCP from malaria control to malaria elimination. This includes strengthening surveillance to focus on high-risk groups, such as migrant and forest workers, and containing the spread of artemisinin-resistant malaria. Viet Nam currently faces a critical window of opportunity to achieve malaria elimination as mandated in the national malaria strategy.
DRUG EFFICACY

Protecting the efficacy of antimalarial drugs is a priority in the GMS – not only for regional health but also for global health security. The world’s most effective antimalarial medicines, artemisinin-based combination therapies (ACTs), are currently the best available treatment for uncomplicated *P. falciparum* malaria.

In the last decade, partial resistance to artemisinin has emerged independently in multiple areas of the GMS. Resistance to ACT partner drugs has also emerged. High treatment failure rates in the GMS are usually detected in areas where there is both partial resistance to artemisinin and resistance to the ACT partner drug.

Resistance to antimalarial drugs threatens to undermine the progress achieved in the GMS. Partial resistance to artemisinin may potentially lead to serious consequences, including total resistance to artemisinin, the loss of artemisinin as an effective treatment for cases of severe malaria and increased resistance to ACT partner drugs.

Continued monitoring through therapeutic efficacy studies (TESs) will catch declines in the efficacy of antimalarial medicines. TES results help guide treatment policies of national malaria programmes. When early warning signs of treatment failure are detected, alternative ACTs need to be identified and used.

MAP 2.

**Number of ACTs failing in the GMS**

Artemisinin refers to artemisinin and its derivatives.
INSECTICIDE RESISTANCE IN THE GMS

Globally, insecticide resistance has been reported for all major malaria vector species. Resistance to the four main classes of insecticides used in public health – pyrethroids, organochlorines, organophosphates and carbamates – is widespread, with 57 malaria-endemic countries reporting resistance to two or more classes. Because pyrethroids are used in all WHO-recommended long-lasting insecticidal nets (LLINs) as well as for indoor residual spraying (IRS) in many countries, resistance to this particular insecticide class is a serious concern.

In the GMS, resistance to pyrethroids has been confirmed in malaria vectors at one or more sites in all six countries. However, the full extent of resistance in the principal vectors is not well known. Targeted data collection and reporting are needed to better understand the status of resistance in the principal malaria vectors. Although there is limited understanding of how resistance impacts the effectiveness of tools like LLINs and IRS, it is important that action is taken to prevent, mitigate and manage insecticide resistance. New data on insecticide resistance for the GMS are available on the WHO Malaria Threats Map (www.who.int/malaria/maps/threats).

MAP 3.
Resistance of malaria vectors to pyrethroids in the GMS (2010-2018)
**TIMELINE AND KEY TARGETS**

Early warning signs of *P. falciparum* resistance to artemisinin detected in Cambodia.

*P. falciparum* resistance to artemisinin first confirmed along the Cambodia-Thailand border.\(^2\)

Artemisinin resistance containment project, supported by WHO and funded by the Gates Foundation, initiated along the Cambodia-Thailand border.

WHO launches a Global Plan for Artemisinin Resistance Containment (GPARC). The GPARC sets out a high-level plan of attack to protect ACTs as an effective treatment for *P. falciparum* malaria.

WHO launches the *Emergency response to artemisinin resistance in the Greater Mekong Subregion, Regional framework for action 2013-15*, and establishes a regional hub in Phnom Penh, Cambodia, to coordinate multi-partner action.

The WHO Malaria Policy Advisory Committee recommends the adoption of the goal of elimination of *P. falciparum* malaria in the GMS.

GMS Ministers of Health adopt the WHO *Strategy for malaria elimination in the Greater Mekong Subregion*. The plan aims to eliminate *P. falciparum* malaria from the subregion by 2025 and all species of human malaria by 2030.

GMS Ministers of Health sign the *Ministerial Call for Action to Eliminate Malaria in the GMS before 2030.*

Transmission of *P. falciparum* malaria interrupted in all areas of multidrug resistance, including ACT resistance.

*P. falciparum* malaria eliminated in Cambodia.

All species of human malaria eliminated in Yunnan Province, China.

*P. falciparum* malaria eliminated in all countries of the GMS.

All species of human malaria eliminated in Cambodia and Thailand.

All species of human malaria eliminated in all countries in the GMS.

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\(^2\) Retrospective analysis has shown that artemisinin resistance likely emerged as early as 2001, before the widespread deployment of ACTs.
**Malaria cases in the six GMS countries (2012-2018)**

**Malaria deaths in the six GMS countries (2012-2018)**

**Number of malaria cases in Cambodia (2012-2018)**

**Number of malaria cases in Lao PDR (2012-2018)**

**Monthly trend of malaria cases in Cambodia (Jan 2017-Jun 2018)**

**Monthly trend of malaria cases in Lao PDR (Jan 2017-Jun 2018)**

*2018 covers the period January to June.*

*The five-year monthly trend is calculated from historical data on monthly reported cases between 2012 and 2016. The trend line is intended as a reference tool for summarizing the overall trend of reported cases over that five-year period. To calculate the trend line, the statistical methodology called the cumulative sum (C-SUM) was applied.*