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FOREWORD

From 9 to 18 September 2017, the National Institute of Malariaology, Parasitology and Entomology (NIMPE) of Viet Nam and the World Health Organization (WHO) conducted a joint review of the National Malaria Control Programme. The review is a public health management tool for countries that wish to strengthen their malaria control programme performance and systems. Independent experts used state-of-the-art standards and methods for malaria control and elimination to perform a rigorous and comprehensive evaluation of the country’s programme.

This final report summarizes the findings from the 2017 malaria programme review as well as the recommendations of national and international experts. Viet Nam has made impressive gains in malaria control and is on track to meet its vision to eliminate malaria by 2030. This has been made possible through the strong commitment and substantial investments of the Government of Viet Nam and its development partners. However, challenges to eliminate malaria in the country remain: the disease is concentrated in at-risk populations living in hard-to-reach areas, access to diagnosis and treatment needs to be expanded, and artemisinin-resistant malaria is spreading. Thus, continued action is essential, as is the urgent attention of policy-makers, development partners and the public.

Given the findings of this report, policy-makers and development partners are urged to reorient the programme for malaria control towards elimination to help Viet Nam adapt to future circumstances when malaria elimination is eventually achieved. NIMPE and WHO have collaborated closely with each other for many years in fighting malaria. We now look forward to working alongside all stakeholders to eliminate malaria from Viet Nam for good.

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Abbreviations

ACPR  adequate clinical and parasitological response
ACT  artemisinin-based combination therapy
ADB  Asian Development Bank
*Ae.*  *Aedes*
*An.*  *Anopheles*
API  annual parasite incidence
BCC  behaviour change communication
CDC  centre for disease control
ConsortiumHA  Consortium for Health Action
CHC  commune health centre
CS4  Circular 54
DAV  Drug Administration of Viet Nam
DHA-PIP  dihydroartemisinin-piperaquine
DHC  district health centre
DOT  directly observed treatment
eCDS  electronic Communicable Diseases System
GMP  Good Manufacturing Practice
G6PD  glucose 6-phosphate dehydrogenase
HMIS  Health Management Information System
IEC  information, education and communication
IMPE  Institute of Malariology, Parasitology and Entomology
IRS  indoor residual spraying
ITN  insecticide-treated net
LLHN  long-lasting insecticide-treated hammock net
LLIN  long-lasting insecticide-treated bed net
MIS  Malaria Information System
M&E  monitoring and evaluation
NFM  New Funding Mechanism
NGO  nongovernmental organization
NIDQC  National Institute of Drug Quality Control
NIMPE  National Institute of Malariology, Parasitology and Entomology
NMCP  National Malaria Control Programme
*P.*  *Plasmodium*
PHD  provincial health department
PSI  Population Services International
RAI  Regional Artemisinin-resistance Initiative
RDT  rapid diagnostic test
SMS  short messaging service
SOP  standard operating procedure
TES  therapeutic efficacy studies
TFM  Transitional Funding Mechanism
VHW  village health worker
WHO  World Health Organization
Executive summary

This report is the result of an independent external review of the performance and achievements of Viet Nam’s National Malaria Control Programme. The Programme has made significant progress towards eliminating malaria in recent years. Malaria cases and deaths have been reduced remarkably, in large part because of the substantial commitment and investments of the Government of Viet Nam and its international development partners in malaria control.

This report provides recommendations to support the reorientation of the Programme’s approach from malaria control to malaria elimination. Policies and standard operating procedures will need to be redefined accordingly if the Programme is to sustain its impressive performance, and contain the spread of multidrug-resistant falciparum malaria. Specific recommendations are provided for: developing an updated national action plan for malaria elimination; introducing verification of subnational malaria elimination; sustaining national financing for malaria elimination; and integrating malaria surveillance activities into other communicable disease surveillance activities.

Viet Nam is now faced with a critical window of opportunity to achieve the elimination of malaria as mandated in the National Strategy for Malaria Control and Elimination in the Period 2011–2020 and Orientation to 2030. Efficacious antimalarial combinations still exist but are failing fast; potent tools for vector control are available but could be undermined quickly by the development of insecticide resistance; and financial support from external funding partners continues to flow but will likely be time limited.

The Government must now seize the moment and take bold steps to ensure that malaria is ultimately eliminated from Viet Nam.
1. Introduction

1.1 Objectives of the review

The objectives of this programme review were:

- to review progress towards meeting national, regional and global targets for malaria control and elimination;
- to provide recommendations to redefine policies and strategies and support programme transformation to sustain high performance;
- to review performance of malaria control and elimination activities by thematic areas at different levels of service delivery;
- to provide recommendations for transitioning the approach of the National Malaria Control Programme (NMCP) from malaria control to malaria elimination;
- to investigate and recommend methods to sustain resources and financing for malaria control, malaria elimination and prevention of re-establishment;
- to investigate and recommend methods to integrate malaria control and elimination activities in Viet Nam’s broader communicable disease control and surveillance system; and
- to assess the NMCP’s approach to contain the spread of artemisinin-resistant malaria.

Full terms of reference for the national malaria programme review are presented in Annex 1.

1.2 Review methodology

The malaria programme review comprised a desk-based review of documentation, face-to-face semi-structured interviews, site visits and data analysis. The review team consisted of experts from the World Health Organization (WHO) headquarters, Regional Office for the Western Pacific and Country Office Viet Nam; staff from the National Institute of Malariology, Parasitology and Entomology (NIMPE); and independent consultants from the People’s Republic of China and the United Kingdom of Great Britain and Northern Ireland. Six out of eight international members of the review team were WHO staff. The review team had expertise in the areas of health systems planning and finance, epidemiology, malariology, entomology, vector control, research and others. The review team was divided into four groups that each focused on a thematic area: programme management; case management; surveillance and response; and vector control. Each group focused primarily on its thematic area but also reviewed key findings from all other thematic areas through a comprehensive reporting matrix developed by the team. A list of review team members and their designations is presented in Annex 2. Authors are listed in alphabetical order at the beginning of this report.

The authors sought information, views and suggestions from a broad range of stakeholders, including key programme staff involved in planning and oversight at each level, technical partners, public sector implementers, volunteers and programme beneficiaries. The assessment included field visits to Dien Bien, Thanh Hoa, Dak Lak and Binh Phuoc provinces. The field component of the review covered provincial, district, commune and village levels, with groups visiting administrative and technical offices, health facilities and target communities. Findings from each field visit were consolidated and shared among the groups by email. Observations and key issues for follow-up were also shared in real time through mobile messaging apps and teleconferences over the Internet.
Review team briefings and consultations with stakeholders were done before and after the field visits. A list of persons met is presented in Annex 3.

The distribution, availability, condition and use of NMCP supplies and equipment were investigated as far as possible, and practices covered by NMCP-supported training were observed.

Site selection for the review was carried out by NIMPE and WHO. The aim of the site selection process was to provide a representative overview of the NMCP. The sites were selected from provinces with high, medium, low and very low endemicity; provinces with and without support from the Global Fund to Fight AIDS, Tuberculosis and Malaria; provinces with support from NIMPE or a regional Institute for Malarialogy, Parasitology and Entomology (IMPE) in Quy Nhon or Ho Chi Minh City; and provinces with and without international borders. The selection also aimed to ensure a practical schedule for each of the teams.

At the end of the country visit, the review team gave a debriefing for NIMPE, the two regional IMPEs and the WHO Representative to Viet Nam. The team also presented the results of the malaria programme review to the Vice-Minister of Health, Dr Nguyen Thanh Long.

Limitations of the review: Time constraints meant that only a few sites could be visited. Therefore, the sample may not have been fully representative. Time constraints also meant that it was not possible for teams to visit either of the two regional IMPEs. Furthermore, there was only very limited time for interaction with current and potential partners, and the private sector (including private sector health-care providers).

As required by governmental authorities in Viet Nam, visits were planned and announced well in advance of the review team's arrival. Ideally site selection should be the prerogative of the review team and visits to peripheral sites should be unannounced or announced only immediately prior to visits.
2. Overview of the malaria situation in Viet Nam

2.1 Health system

Viet Nam has a well-established public health-care network. An overview of the network in general (and how it relates to malaria in particular) is presented in Annex 4.

The Ministry of Health is in the process of integrating all vertically oriented disease programmes within a provincial centre for disease control in each province. This process should be completed by the end of 2020.

Each commune has a commune health centre (CHC). In malaria-endemic (or recently malaria-endemic) communes, CHCs have specially trained staff responsible for malaria control (among other duties). Village health workers (VHWs) are the backbone of the community-level health response in Viet Nam. VHWs are engaged in outreach activities, mainly focused on health promotion and prevention, including referral of suspected malaria cases to public sector health-care facilities. The NMCP also works in close association with the People's Committee, the Women's Union, the Youth Union and village leaders.

The private sector plays a significant but, until recently, poorly understood role in the management of malaria in Viet Nam. The NMCP recognized this important shortcoming and in 2015 partnered with Population Services International (PSI), which has extensive expertise in private sector engagement for malaria control in the Greater Mekong Subregion (see 3.3.2).

2.2 Epidemiology

The epidemiology of malaria in Viet Nam is highly complex, varying from location to location and from one population group to another. While all five species of plasmodia that affect humans occur, the vast majority of malaria cases are caused by *Plasmodium falciparum* (55.8% in 2016) and *P. vivax* (42.1% in 2016). Intense malaria transmission is largely restricted to hilly, forested areas in southern and central provinces where malaria transmission tends to be perennial with a seasonal peak in December–February. In the northern region, transmission is increasingly sporadic.

The main vectors of malaria in Viet Nam and the Greater Mekong Subregion (*Anopheles dirus* and *An. minimus*) are characterized, at least seasonally, by early outdoor biting habits. Nevertheless, as elsewhere in the Western Pacific Region, long-lasting insecticide-treated bed nets (LLINs) have proved an effective means of malaria control, and they continue to play a critical role in reducing malaria transmission.

The people at highest risk of malaria include forest and forest-fringe inhabitants (commonly ethnic minority groups), temporary migrants and seasonal workers, and new forest settlers (summarized in Box I). The level of malaria risk for each of these groups is dependent on a number of location-specific factors, including degree of endemicity, accessibility to

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1 Circular No: 26/2017/TT-BYT of the Ministry of Health on guiding functions, tasks, authorities and organizational structure of Centers for Disease Control and Prevention of provinces and cities under Central Authority.
malaria commodities and services, and health system strength. Marginalized mobile and migrant populations and ethnic minority groups working or living in the forest and on the forest fringes carry the greatest burden of disease.

The different situations require different malaria control strategies, adapted to suit the specific risk groups and vector behaviours, and adjusted to take into consideration local infrastructure and health service coverage.

**Box 1. Population groups at risk of malaria in endemic areas of Viet Nam**

**Static populations**
- Established forest and forest-fringe villagers (ethnic minority groups and ethnic majority (Kinh))
- New settlements
- Camps associated with large-scale construction projects (e.g. dams, bridges)
- Settlements associated with plantations (e.g. rubber, cassava, cashew, food)

**Mobile populations**
- Traditional slash-and-burn and paddy field farming communities visiting their forest farms (commonly ethnic minority groups)
- Seasonal agricultural labourers
- Military patrols
- Forest workers in the formal sector (police, border guards, forest/wildlife protection services)
- Forest workers in the informal sector (hunters, small-scale gem/gold miners, people gathering forest products (precious timber, construction timber, rattan/bamboo))
- Transient or mobile camps associated with commercial projects (e.g. road/pipeline construction, large-scale logging)

**2.3 National Malaria Control Programme**

The NMCP has adopted a multipronged approach to malaria control that is broadly in line with best practice in the Greater Mekong Subregion. Malaria case management activities cover public sector health facilities at all levels of the health-care system, community-based diagnosis and treatment by volunteers (although only in a very limited number of villages in just two provinces), and most recently, private sector engagement in the five most endemic provinces through the Programme’s partner, PSI. Vector control is based on a combination of conventional insecticide-treated nets (ITNs), LLINs, long-lasting insecticide-treated hammock nets (LLHNs) and indoor residual spraying (IRS). In line with the requirements of elimination, case-based surveillance (whereby every case is effectively treated as an outbreak) is in the process of being rolled out in all but the most endemic areas. Information, education and communication (IEC) activities are implemented (primarily through interpersonal communication by health staff and volunteers) to educate high-risk individuals about malaria prevention and cure, and to mobilize communities to engage in and support malaria elimination efforts. The health information system is being updated to support the stringent requirements associated with elimination.
2.4 Progress in malaria control towards elimination

The goal of the National Strategy for Malaria Control and Elimination is to actively control malaria in moderate and high endemic areas and to eliminate malaria in areas where malaria has been reduced to a low level. Targets for 2020 are:

- morbidity below 0.15 per 1000 population;
- mortality below 0.02 per 100 000 population; and
- malaria eliminated in at least 40 provinces.

With more than 40 provinces now malaria-free, all of these targets at the impact level have already been achieved.

Malaria burden. The burden of malaria is decreasing rapidly in Viet Nam (Table 1), and the disease is becoming increasingly focal. In 2015, just 211 communes had an annual parasite incidence (API) greater than 1, compared to 488 in 2011. During the last 12 months for which data are available (August 2016–July 2017), just six provinces (Gia Lai, Binh Phuoc, Quang Tri, Dak Nong, Khanh Hoa, Ninh Thuan) together accounted for 81% (1297/1601) of confirmed *P. falciparum* malaria cases. Binh Phuoc alone accounted for 39%.

Table 1. Malaria statistics from 2000 to 2016

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<tr>
<td>2005</td>
<td>74,329</td>
<td>19,496</td>
<td>17,515</td>
<td>16,612</td>
<td>19,638</td>
<td>17,128</td>
<td>15,752</td>
<td>9,331</td>
<td>4,161</td>
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<td>2010</td>
<td>148</td>
<td>18</td>
<td>21</td>
<td>14</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td></td>
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<tr>
<td>2011</td>
<td>3.84</td>
<td>0.97</td>
<td>0.62</td>
<td>0.52</td>
<td>0.49</td>
<td>0.39</td>
<td>0.3</td>
<td>0.21</td>
<td>0.11</td>
<td></td>
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<tr>
<td>2012</td>
<td>Morbidity (/1,000 pop)</td>
<td>0.23</td>
<td>0.2</td>
<td>1.07</td>
<td>1.18</td>
<td>0.8</td>
<td>1.35</td>
<td>0.77</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Mortality (/1,000 pop)</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.003</td>
<td>0.003</td>
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| 2014 | Source: National Institute of Malariology, Parasitology and Entomology, Viet Nam

The graph of *P. falciparum* and *P. vivax* caseload by month in Fig. 1 clearly demonstrates the dramatic reduction in malaria burden since early 2015.

**Fig. 1. Monthly confirmed caseload in Viet Nam since January 2010**

Source: National Institute of Malariology, Parasitology and Entomology, Viet Nam
While these overall results are very promising, further analysis of the data at province level reveals some geographical variations in progress over the last 12 months relative to the previous 12 months. The situation in Quang Nam (P. vivax) and that in Quang Tri (P. falciparum) both give particular cause for concern. An analysis of the data for these two provinces during the period in question revealed a 4.6-fold increase in vivax malaria in Quang Nam in August 2016 relative to the same period in 2015, and a 16-fold increase in falciparum malaria in Quang Tri in June–July 2017 relative to the same period in 2016 (see section 3.4.2 for further discussion).

2.5 Progress on drug resistance

Delayed parasite clearance was first detected after treatment with dihydroartemisinin-piperaquine (DHA-PIP) in Bu Dang District of Binh Phuoc Province in 2009. Routine monitoring of treatment with DHA-PIP also detected other foci of delayed parasite clearance in Gia Lai (2010), Dak Nong (2011), Quang Nam (2012), and Kon Tum and Khanh Hoa provinces (2013).

Therapeutic efficacy studies (TES) conducted in Binh Phuoc, Dak Lak, Khanh Hoa and Kon Tum provinces (N = 50, 45, 44 and 10, respectively) in 2013–2014 using DHA-PIP did not identify any treatment failures despite a day-3 positivity rate of up to 36% (Binh Phuoc).

A study in Binh Phuoc completed in 2015 revealed 4 out of 30 patients had parasites with a K13 mutation and high late treatment failure rates (31.8%) following treatment with DHA-PIP. Further investigation confirmed the emergence of piperaquine resistance. Recent data from the TES site in Dak Nhau CHC show that adequate clinical and parasitological response (ACPR) is further decreasing (down to 53.6%, 22 ACPR/41 follow-ups).

Steps are only now being taken to implement the change of the first-line treatment in affected provinces, although the circular identifying alternate first-line treatments was issued in September 2016 (see section 3.3.2).

While the NMCP has not been able to prevent the development and/or spread of antimalarial drug resistance, it may well have slowed the process and has certainly made very significant progress in terms of burden reduction.
3. Review findings and recommendations by programme area

3.1 Programme management

Specific objective 6 in the *National Strategy for Malaria Control and Elimination Workplan 2015–2020* is to “provide effective management and coordination of the national malaria control and elimination effort”. The overall management and coordination of the NMCP at central level appears to be basically sound, as reflected in the current “BI” performance rating for Global Fund-supported activities. The rating was downgraded from “A” because of procurement delays beyond the NMCP’s control. However, the review team did identify a number of challenges related to programme management (3.1.2. below), and these will need to be addressed if the programme is to be fully effective, efficient and responsive.

3.1.1 Successes

- Overall, programme management is good, as evidenced by the Global Fund performance rating.
- Programme management is generally good within provincial health departments (PHDs), district health centres (DHCs) and CHCs in Global Fund-supported provinces.
- Human resources capacity is generally strong.
- Strong political commitment has been demonstrated by the People’s Committee, plus active involvement of Women’s Union, Youth Union, etc.
- Strong VHW commitment (some serving very long) makes the VHW network a strong partner for IEC and behaviour change communication (BCC) and quantification of commodity requirements, and potentially a strong partner for case management, surveillance and response.
- Ethnic minority groups are relatively well targeted by the health system.
- Annual cross-border information exchange meetings are held with neighbouring countries.
- Funding is provided by provinces for IEC/BCC.
- The District Communicable Disease Control Team (led by People’s Committee monitors) responds to outbreaks of communicable disease.
- DHCs have an integrated budget for communicable disease outbreak investigation and response, supplemented by contingency funds provided by the People’s Committee budget where necessary.

3.1.2 Observations, challenges and recommendations

*Programme management*. The quality of programme management varies considerably between provinces. In Thanh Hoa and Dien Bien, management appears to be generally good, but in Binh Phuoc, which has the highest malaria burden and the highest levels of antimalarial drug resistance in the country, the situation appears to be more challenging. Provinces facing management challenges should be allocated enhanced support, and those that are more endemic should be prioritized to receive this support.
The degree of autonomy exercised by provinces over the NMCP guidance also varies considerably from one province to another. In Dien Bien, staff follow the NMCP guidance exactly, while in the other three provinces visited, they adapt their strategic approach to suit local circumstances and perceptions, often in consultation with regional IMPEs and People’s Committee officials. In some instances, this may be beneficial, but in the case of VHWs not being allowed to diagnose and treat malaria, for example, it has clearly been detrimental. This is a major challenge to elimination and may require legislative amendments to ensure alignment with national guidelines.

Integration of provincial centres for disease control (CDCs). Staff in Thanh Hoa Province expressed some concern about the future budget, roles and responsibilities, and staffing being impacted when provincial and district CDC integration takes place in the coming years (CDCs will have a quota for the number of positions in each programme area, so abolition of certain positions will be unavoidable). In other provinces, staff felt that there would be no impact of CDC integration, and in Dien Bien the departments were combined prior to restructuring.

The NMCP should view this as an opportunity for more effective reorientation and leverage the CDC transition at provincial and district levels to support essential malaria-related activities as part of the integrated approach to communicable diseases. CDC integration should be seen as an opportunity rather than a threat. The NMCP must ensure that the human resources capacity necessary for malaria control is built in, and that the capacity required for elimination is maintained even into the prevention of re-establishment period. The training required to strengthen human resources capacity will need to be funded from the integrated CDC budget once donor support for malaria decreases.

Non-Global Fund-supported districts could provide a model to plan and demonstrate the post-elimination planning for the malaria programme. Lessons can also be learnt from the polio endgame strategy and planning process. The programme will need to utilize savings and cross-programme efficiencies for malaria elimination.

Training plans and materials integrated with those from other communicable disease programmes will need to be developed for CDC staff and VHWs. CDCs will need a pool of experts with a broader set of knowledge and skill sets to support integration.

Issues relating to the health insurance scheme. National health insurance policy payout limits are much higher at DHC level than at CHC level, which has led to the underutilization of CHCs. CHCs are as a result under-resourced, as they do not have enough patients to generate funds. This in turn has led to low morale and poor motivation among some CHC staff members.

Human resources. In Dien Bien Province (very low endemicity), staffing levels were considered to be adequate for dealing with malaria. Elsewhere, there were some concerns. In Thanh Hoa, staff said that doctors in particular were in short supply and were having to do an excessive number of night shifts. In one district in Binh Phuoc, several villages were without VHWs due to a lack of funding for VHW allowances. In one district in Dak Lak, staff complained that one person had to respond to the requirements of multiple programmes and that this person was overburdened. They saw this as a major challenge to elimination. The NMCP should conduct an in-depth review of its human resources requirements at different levels (central, province, district, commune and village) and in different programme settings (control, elimination and prevention of re-establishment) and develop a human resources plan and gap analysis to feed into the next national strategy and workplan.

5 Only 2 out of 16 provinces supported by the Regional Artemisinin-resistance Initiative (RAI) grant allow VHWs to diagnose and treat patients.
CHC capacity strengthening should continue to be promoted as a part of the national grassroots reform. The recently established WHO–Ministry of Health Grassroots Reform Task Force must push for strengthened human resources capacity, more training and better equipment to treat and diagnose common diseases. The Task Force should also facilitate changes to the current insurance payment thresholds and regulation of autonomy at district hospitals.

In Dak Lak, it appears that training for elimination has been based on the 2007 version of WHO’s manual, *Malaria Elimination*, which is now out of date. The NMCP should develop its own elimination framework document based on WHO’s 2017 *A Framework for Malaria Elimination*, and then develop locally appropriate guidance, job aids and standard operating procedures (SOPs) for dissemination to provincial and district levels.

*Infrastructure and logistics.* The NMCP appears to have the benefit of adequate office, laboratory and storage space at all levels of the health system, and these facilities generally seem to be maintained to a good standard. Computers appear to be up to date, and there is Wi-Fi Internet access down to the CHC level. There is a shortage of vehicles, but it seems that motorcycles can generally be hired as required.

*Policy and strategic planning.* The *National Strategy for Malaria Control and Elimination in the Period 2011–2020 and Orientation to 2030* (issued with Decision No. 1920/QĐ-TTg by the Prime Minister on 27 October 2011) provides a broad overview of planned programme direction during the current decade. The *National Strategy for Malaria Control and Elimination Workplan 2015–2020* provides a more detailed account of the activities that were planned for implementation during 2015–2020, but this is understandably somewhat out of step with the latest guidance on elimination from WHO, which was published in 2017. The activities described in the recent (2017) Global Fund funding request deviates somewhat from Workplan 2015–2020 in order to follow recent WHO guidance. The workplan should be updated as soon as possible for 2018–2020 to take into consideration the Global Fund funding request and to reflect the recommendations presented in this malaria programme review. The workplan will require realistic bottom–up costing that reflects the ongoing integration process, the likely withdrawal of donor support, and the gradual progression from control to elimination and prevention of re-establishment, which will happen at different times in different places. The workplan will need to identify clearly which areas can be integrated and financed from an integrated budget and which areas will require malaria-specific interventions supported by earmarked funding. This workplan, with its strong costing and the financial gap analysis, will serve to support local-level annual planning and will underpin national-level advocacy. A new national strategy document will need to be developed in 2020 for the 2021–2030 period.

Although the National Strategy for Malaria Control and Elimination is a sound document, there is some “disconnect” between what was written at central level and what is actually implemented in the periphery. This needs to be addressed through the development of SOPs, job aids and a programme of supportive supervision that reflect and support the national strategy.

*Operational planning (central and regional levels).* In Dak Lak, elimination roadmaps that have been developed for every district identify the year by which each one should reach zero cases. In contrast, in Tanh Hoa, there were no clear plans for transition to elimination and a notable lack of resources in non-Global Fund communes. Binh Phuoc (high endemicity) and Dien Bien are still in the control phase.

Dien Bien was apparently “stuck” in the control phase due to a very small number of cases that had occurred during the last three years in two communes with very small populations. According to current national criteria, a single case during the last three years in a commune with a population of less than 1000 residents renders the entire province
in the control phase. As such, criteria for entering the elimination phase need to be revised. API thresholds must be applied at district level, not commune level where the denominator is too small. The targeting of interventions to meet the needs of risk groups varied in quality from one province to another. In Thanh Hoa and Dien Bien, higher-risk groups were effectively targeted for services. In Binh Phuoc, however, targeting could be further improved. As well as being based on the national stratification of malaria risk, targeting of activities should take additional contextual factors into consideration. For example, compared to other ethnic minority groups, the Hmong often exhibit lengthy delays in seeking treatment due to their unique cultural beliefs. Specific measures should clearly be developed to address this.

Incentive levels for public sector staff are not always commensurate with the level of effort required for the various activities that they carry out. A staff member who conducts focus investigations in hard-to-reach forest locations, for example, receives the same incentive provided for focus investigations at village level. All incentive levels should be reviewed and brought in line with the level of effort required for the particular activity in question.

All communicable disease programmes are integrated at DHC and CHC levels. There is some sharing of transportation for monitoring trips at district level; however, such sharing of resources across programmes at district level could be improved, and the importance of such sharing, particularly in light of integration, should be emphasized during routine supportive supervision.

Procurement and supply management. Management of expiring drugs and rapid diagnostic tests (RDTs) is overly burdensome, resulting in creative ways of avoiding stock expiry, such as using both RDTs and microscopy and not providing primaquine in less-endemic CHCs. Procedures should be reviewed and revised.

Political commitment. Political commitment appeared to vary from province to province and according to the level in the administration. In Thanh Hoa, political commitment seemed to be relatively low at provincial level, likely due to low budget allocation for malaria-control activities, but it was better at district level where the People’s Committee was actively involved. In Dien Bien, provincial leaders were clearly happy with the current situation, but they were also concerned about the possibility of resurgence. They were kept informed by provincial malaria control staff through numerous meetings of various types and provided some limited financial support for NMCP-related activities as requested when possible.

Partnerships. NIMPE has a number of valuable long-established partnerships with national and international institutes supporting various malaria-related operational research projects. In 2015, it developed a new partnership with PSI in order to ensure effective engagement with private sector malaria case management providers – a key component of the national strategy. In 2018, it will form a number of new partnerships with nongovernmental organizations (NGOs) supporting the implementation of the 2018–2020 RAI grant.

International exchange and cross-border cooperation. Provinces with international borders hold Global Fund-supported, cross-border communicable disease meetings with counterparts once a year. Additional ad hoc direct communication is performed, as necessary. In the past, teams from the PHC in Dien Bien have actually been deployed to the Lao People’s Democratic Republic to support outbreak response (previously for malaria but more recently for other diseases).

The current regional emphasis on cross-border sharing of information should not distract from the more important issue of comprehensive data sharing. Malaria managers do not know on a regular basis what is happening in neighbouring provinces in their own countries, let alone what is happening in neighbouring provinces across the border.
Given that mobile populations often travel across many provinces, sometimes crossing international borders, managers at central level need to know what is happening to the malaria situation province by province and month by month across the entire region. This will allow them to advise provincial managers accordingly and make sure that these managers are adequately prepared to deal with issues as they arise. The technology required to do this is already available. Mapping of data must not be put on hold until RAI’s regional platform for data sharing and analysis is functional. They are a valuable tool for assessing progress and identifying problems, and for making data easily accessible to people from all backgrounds.

The intercountry component of the regional element of the RAI grant focuses on cross-border malaria, with activities implemented by the NGO Health Poverty Action in association with ministries of health on the Cambodian (Kratie/Mondulkiri) and Vietnamese (Binh Phuoc) sides of the border. However, there does not appear to be any intercountry coordination within the Health Poverty Action teams working across borders, which seems to undermine the intention of the exercise. WHO needs to take a leading role in intercountry communication and data sharing, and this is already foreseen under the forthcoming RAI grant.

It was clear that the Health Poverty Action–Ministry of Health collaboration required substantial support from two out of six commune health workers in one of the key CHCs involved, which seems excessively burdensome on the CHC. It is the opinion of the review team that the intercountry component would be more effective if it were to focus on eliminating transmission in the large forested “islands” where intense transmission persists, rather than in narrow strips of land along the border. These so-called transmission islands often stretch well beyond border regions. Rather than taking away already overstretched CHC staff, the intercountry component should provide the additional short-term human resources required to eliminate malaria in these inaccessible high-transmission areas.

**Resource mobilization and financial sustainability.** Global Fund-supported districts are currently dependent on the Global Fund for 55–80% of their malaria-related budgets. The sustainability of this external funding is uncertain. Regardless, the NMCP appears to be adopting a so-called business-as-usual approach, rather than updating its business model, perhaps expecting another donor to materialize to fill the gap that will be left if the Global Fund goes.

In Thanh Hoa, financial planning seemed to require strengthening in some areas. There were no plans for sustainability. Increasing the state budget allocation for the CHC level seemed unlikely as there is a cap for each province and for each sector, and the majority of the budget is spent on salaries.

The NMCP needs to advocate in the Government of Viet Nam the inclusion of a budget line for essential public health functions and essential procurement in the national budget, as a part of progress towards integration. This means that the Programme needs to identify the so-called low-hanging fruit, where efficiency gains can be obtained through an integrated approach (e.g. integrated communicable disease surveillance, investigation, joint outreach activities by VHWs, communication). All this points to the need for reorientation and redefining of staff roles in elimination, and the need to move away from malaria-only staff at an integrated primary and secondary care level of service delivery.

The Programme needs to explore opportunities to package malaria elimination with other projects receiving donor support such as health information (Asian Development Bank (ADB)), health security and communicable disease control (World Bank, ADB, WHO and other bilateral donors), and primary health care strengthening (World Bank and ADB). It should also explore possible public–private partnerships for bringing in more resources at local level. The Vietnamese philanthropists who expressed interest in supporting malaria...
elimination in Viet Nam following approval of the Global Fund’s New Funding Mechanism (NFM) funding application should be approached again with evidence of the NMCP’s impressive track record since 2015 and its new workplan for 2018–2020.

Measuring progress and impact. Staff at all levels are overburdened by the reporting requirements associated with Global Fund grants and other disease-specific programmes. DHC staff have no time to enter CHC and DHC data into the Malaria Information System (MIS). The MIS and Health Management Information System (HMIS) need less duplication to be fit for purpose for malaria elimination.

Issues relating to specific indicators. The indicator “Percentage of suspected malaria cases that receive a parasitological test” is not useful as the denominator is not available. In fact, it appears that the numerator is usually used as a proxy for the denominator and hence the result is almost always reported as 100%. The use of annual blood examination rate (ABER) is common in elimination settings and, although problematic, may be preferable.

The indicator “Percentage of confirmed malaria cases that received first-line antimalarial treatment according to national policy” is not useful as all treated cases are assumed to have been treated according to national treatment guidelines. Hence, again, the result is effectively always 100%. The indicator is important, but it needs to be based on data from health facility audits.

The usefulness of the indicator “Percentage of confirmed falciparum malaria cases who received directly observed treatment (DOT) in low endemic areas” is questionable given the questionable usefulness of DOT (see section 3.3.2). The Programme should drop the DOT indicator and replace it with a new indicator “Percentage of cases that are slide positive at follow-up (day 28 or day 42”).

It would be useful to include “Percentage of foci fully investigated and registered within 7 days of detection (including malaria focus investigation form and focus geo-referencing and mapping)” as an additional elimination-specific indicator in elimination areas.

More use of process indicators and better presentation of results in general (e.g., through use of maps) would help to alert the programme and its funding partners to implementation issues at an early stage.

3.2 Vector control and personal protection

Vector control and personal protection is a major component of the NMCP in terms of financial and human resources as well as logistics and monitoring. A large percentage of the finances from Global Fund grants are used to support and strengthen vector control activities in Viet Nam.

Insecticide-treated nets. Until 2009, conventional ITNs were used to a much greater extent in Viet Nam than LLINs. However, since then, ITNs have been progressively replaced by LLINs as funds have become available through Global Fund funding (Round 7, Transitional Funding Mechanism (TFM), NFM and RAI grants). Supplemental single LLINs or LLHNs are also now provided to mobile populations and forest-goers. The Government of Viet Nam continues to support re-treatment of conventional nets for those who prefer to use their own bed nets or who live in less endemic areas not targeted for LLINs (depending on availability and expiry date of insecticides). In addition to the routine rolling mass distribution of LLINs to high-risk populations in established communities, the current approach, as outlined in recent Global Fund funding applications, lists eight mechanisms for the delivery of LLINs through continuous channels. Training on LLIN distribution, ITN treatment and associated communication for behaviour change is conducted at district level.
Coverage and utilization rates are determined annually for all ITNs. Quality assurance of conventional net treatment includes direct observations on preparation sites, quantity and condition of equipment and supplies, impregnation technique, and health and safety (including protection of impregnation teams, management of insecticides, processing of containers and disposal of redundant insecticides).

*Indoor residual spraying with insecticide (IRS).* IRS has been an important tool for vector control in Viet Nam since the eradication era. Currently, IRS with an alpha-cypermethrin formulation is carried out as a routine mass preventive measure in more endemic areas. It would also be used as a focal responsive measure in the event of an outbreak. The NMCP also foresees the use of IRS in response to confirmed transmission foci in elimination settings, but detailed plans have not yet been developed. Training of spray teams is conducted annually at district level, but conducting focal responsive spraying may require a different approach in elimination provinces.

Quality assurance of IRS involves direct observations of spray campaigns covering site preparation, quantity and condition of equipment and supplies, spray technique, number of structures sprayed, and adherence to safety standards. The residual efficacy of IRS is determined using WHO cone bioassays in selected sites at some stage during the six months post-spray (using either wild-caught vector mosquitoes or susceptible insectary-reared mosquitoes brought from NIMPE, IMPE or the PHD).

*Targeted additional personal protection.* Repellents have been used on a number of occasions for personal protection for forest-goers in high-transmission areas.

*Management and correct use of public health insecticides.* According to Workplan 2015–2020, the Ministry of Health will work with the Ministry of Agriculture and Rural Development to develop and implement guidelines on the management and correct use of public health insecticides (including annual reporting and mapping of insecticide usage for public health and agriculture and safe disposal of expired insecticide). This has not yet been put into action and there is no insecticide resistance management plan at present.

*Insecticide resistance monitoring, entomological surveillance and research.* Longitudinal surveys are conducted annually by NIMPE and the two IMPEs in three sentinel sites representing northern, central and southern provinces (one each where the main vector is *An. dirus*, *An. minimus* and *An. epiroticus*). Supplementary surveys are conducted in an additional 30–40 sites per year, which are selected annually based on the malaria situation as indicated by annual reports to the NMCP (and where there is high endemicity and/or an increase in cases). Data collected include information on *Anopheles* species composition, density and distribution, parasite infectivity rates, and insecticide susceptibility. Since 2014, pyrethroid⁶ susceptibility tests have been conducted using field-collected mosquitoes (F₀) unfed adults collected by human landing catch or indoor resting collections in homes or cattle enclosures). Resulting data are summarized in Table 2 (further details are presented in Annex 8).

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⁶ Lambda-cyhalothrin, alpha-cypermethrin and deltamethrin.
Table 2. Summary of outcomes from insecticide resistance monitoring with *An. dirus* s.l., *An. epiroticus* and *An. minimus* s.l. by standard WHO susceptibility tests, 2010–2017*

<table>
<thead>
<tr>
<th>Insecticide class</th>
<th>Vector species</th>
<th>Number of sites tested</th>
<th>Mosquito mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Pyrethroids*</td>
<td><em>An. dirus</em> s.l.</td>
<td>7</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td><em>An. epiroticus</em></td>
<td>11</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td><em>An. minimus</em> s.l.</td>
<td>20</td>
<td>97</td>
</tr>
<tr>
<td>Organochlorineb</td>
<td><em>An. minimus</em> s.l.</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>

* Blue shading indicates where resistance has been confirmed (i.e. mosquito mortality < 90%).

* Lambda-cyhalothrin 0.05%, alpha-cypermethrin 0.05%, deltamethrin 0.05%

Data are from standard WHO susceptibility tests. Where multiple insecticide classes or types, mosquito species, or time points were tested, the most recent resistance status is shown.

Other assessments include: evaluation of the vector bio-landscape, including the rate of open/closed houses as an indication of likely mosquito entry and appropriateness for IRS spraying; and the number of people who travel into the forest (such as for farming), how often they go, and how long they stay as an indication of the need for additional personal protection measures.

NIMPE has colonies of *An. dirus* (established 2005), *An. epiroticus* (established 2005), *An. minimus* (established 1997) as well as *Culex quinquefasciatus* (resistant strain), Aedes *aegypti* and *Ae. albopictus*. IMPE Quy Nhơn and IMPE Ho Chí Minh City have insectaries with strains of *An. dirus*, *An. epiroticus* and *Ae. aegypti*.

Entomological research focuses on assessments of the ecology of malaria vectors as it relates to human behaviour, the transmission role of vectors, and new vector control tools, technologies and approaches. These have included topical repellent creams, mosquito coils, repellent candles and insecticide-treated barrier fencing.

The main challenges as identified by NIMPE are malaria vector insecticide resistance, the outdoor and early evening biting behaviour of primary vectors, and provision of effective protection for forest-goers.

### 3.2.1 Successes

- The networks of VHWs, village leaders and commune People’s Committee members appear to be generally well able to identify high-risk groups (e.g. poor, forest-goers and migrants from elsewhere) and to quantify vector control and personal protection needs.7
- VHWs are well placed to provide IEC associated with vector control and personal protection.
- CHCs appear to do a good job of coordinating conventional net re-treatments.
- Entomological surveillance (vector distribution and insecticide resistance monitoring) is sufficient and there is clearly good capacity for this at central level.

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7 The networks conduct pre-LLIN distribution surveys annually to determine how many nets of what type are already available in their communities, which individuals go to the forest, and, in less endemic target areas, which households are able to purchase nets themselves. They then formulate a list of who should be provided LLINs, LLHNs or bed-net dipping, and the commune and district authorities certify this list. The same networks also provide counts of the numbers of LLINs/LLHNs distributed and ITNs re-treated, and these counts appear to be generally accurate.
3.2.2 Observations, challenges and recommendations

Quantification. The quantification of LLIN/LLHN requirements has been problematic in recent years. While a bottom–up planning approach is recognized at central level as being ideal, their request to provincial level for a bottom–up LLIN gap assessment to inform the development of approximately three-yearly Global Fund funding requests has consistently been late. As a result, data from the periphery have not been collated systematically and net quantifications presented to the Global Fund have been inaccurate. This has led to a suboptimal mix of top–down and bottom–up planning for vector control. In some provinces where LLIN requirements have been underestimated, the number of nets requested at each level seems to be adjusted down according to allocation provided by the administrative level above. Planning must be linked to an updated stratification based on recent data. ITN/LLIN/LLHN gap assessments must be conducted in time to inform the quantification of requirements for Global Fund applications (it is important to consider the three-year lifespan of LLINs plus the size of each net to accurately define the population in need).

Quantification of LLIN/LLHN requirements should be based on the number of people going to the forest, rather than simply on a rate of one per household. The request for this information from central planners should be submitted to the PHC, DHCs and CHCs at least six months prior to the funding request submission deadline.

The job of quantification of LLIN requirements for mobile workers has been undermined by the fact that big companies involved in construction, forestry and other operations in endemic areas often underestimate their number of employees in order to minimize their tax and social security obligations. The NMCP should work with NGO partners to quantify commodity needs associated with big companies, again in good time to inform funding application development.

Allocation of vector control and personal protection interventions. Over-allocation of LLINs, net re-treatment and IRS were observed in some areas, while there were significant gaps in other areas. In some situations, allocations at commune and village levels seemed to be more for the sake of “fairness” rather than based on any clear scientific rationale. Targeting of LLINs and ITNs should be tightened up to focus on achieving total coverage for people in transmission sites. There need to be nationally defined criteria for targeting re-treatment programmes. Currently the full benefit of this activity is not achieved as provinces arbitrarily decide where to conduct re-treatments based on fairness rather than needs.

LLINs/LLHNs are only distributed to named individuals authorized by commune People’s Committees. This effectively excludes people who have not registered with the People’s Committee. Health officials need to convince People’s Committee officials that providing LLINs/LLHNs to all people in endemic areas, including unregistered mobile people, is in the best interests of their communities.

Product quality. The quality of LLINs and LLHNs procured was inadequate. The polyethylene LLINs procured under RAI in Viet Nam were too small, with users complaining that they are unable to tuck their nets under their sleeping mats. The size of nets (un-stretched) should be clearly specified during the initial stages of the procurement process. The size and/or relative stiffness of polyethylene LLINs were considered by some interviewees to likely limit utilization and thereby undermine impact. During the 2016 review of quality of implementation under the RAI grant, some interviewees said that utilization rates with polyethylene nets have fallen to as low as 30%. Evidence, however, remains anecdotal. If utilization of polyester LLINs is indeed greater than that of polyethylene LLINs, this should be convincingly demonstrated to the Global Fund in order to restrict procurement to polyester LLINs in future and thereby maximize programme impact.
Hammock nets procured under RAI are poorly designed. The “envelope” of the net is not deep enough for the hammock to hang down into, and the cover flap is unnecessarily long. As a result, they are uncomfortable and utilization seems likely to be suboptimal. More care must be taken with specifications when procuring LLHNs in future.

Lambda-cyhalothrin is the insecticide currently used for ITN re-treatment in Viet Nam. The formulation used has a relatively short residual life. In an effort to address this issue, a study on a long-lasting formulation of deltamethrin was conducted by NIMPE and IMPEs. Results, however, indicated that the formulation was not efficacious (although studies elsewhere had confirmed that it remained efficacious after 30 washes). Other factors, such as price and quality (i.e. self-dipping could result in harm to people or the environment), also influenced the decision by the NMCP not to adopt the long-lasting formulation of deltamethrin.

**Effective targeting.** LLINs and LLHNs both need to be targeted more effectively. As surveillance improves, LLIN strategies should be reviewed to identify ways of avoiding the excessively costly blanket coverage currently provided in many less endemic areas. For example, programmes could restrict mass distribution of LLINs to communities with local transmission observed within the previous three-year period. Case investigation, which is being rolled out as a key component of the elimination strategy, will yield the necessary information on whether or not transmission is likely to be local. Since a restricted approach to LLIN distribution would carry some limited risks of small-scale focal malaria resurgence, provision would need to be made for increased responsive distribution of LLINs in confirmed transmission foci such as the maintenance of stock at provincial or district levels.

Rural grocery stores, blacksmiths and motorbike repair shops near forest entry points and border crossings are being mapped and assessed by PSI in five provinces of the Greater Mekong Subregion Elimination of Malaria through Surveillance (GEMS) programme to inform the creation of an LLHN distribution channel. The programme was launched by PSI in 2016 and is supported by the Bill & Melinda Gates Foundation.

**Continuous distributions.** Although recent Global Fund funding applications list eight mechanisms for the delivery of LLINs through continuous channels, the review teams did not see any evidence of LLIN delivery through continuous channels. Nets were not in stock at any level for rapid deployment as part of focus response. The continuous channels for the delivery of LLINs described in recent Global Fund applications were conceived to effectively target people at greatest risk of malaria. The programme should support their immediate roll-out. The workplan should be updated accordingly, SOPs should be developed immediately, and training should be provided to provincial level and beyond (starting in the most endemic areas). Sufficient stocks of LLINs/LLHNs will need to be maintained at provincial, district and commune levels, as appropriate, to support continuous distribution channels.

**IRS.** The criteria for selection of areas for IRS are vague and the timing of IRS is often suboptimal, based largely on availability or expiry of insecticides. To be fully effective, IRS must be applied immediately prior to any seasonal increase in transmission, the timing of which varies from one region to another primarily according to latitude. The NMCP’s plans to use IRS in response to confirmed transmission foci in elimination settings will require investment, as spraying has not conventionally been carried out in these areas. Responsibilities and mechanisms within the CDC structure will need to be determined.

**Combined ITNs/LLINs and IRS.** Both pyrethroid-based IRS and pyrethroid-treated nets were delivered to target communities in many areas visited by the review teams. This practice goes against WHO guidance. It is an inefficient use of resources and could potentially
accelerate the development of insecticide resistance. The NMCP should consider halting the use of IRS for mass prevention in areas adequately protected by LLINs/ITNs, as this will potentially free up a significant amount of resources. Where IRS is to be deployed for focal response in the same area as LLINs/ITNs, a non-pyrethroid insecticide should be used.

Supplementary measures. Additional personal protection measures, such as repellents and bush clearing around households, are also being used or promoted in some settings. IEC/BCC materials provided by the NMCP and used by health-care workers and VHWs indicate that these techniques impact on malaria. However, there is no clear evidence to support the assertion that these interventions have a significant effect in reducing or preventing malaria transmission.

Monitoring and evaluation (M&E). M&E associated with LLINs and IRS (coverage, quality and utilization) is not systematic. Global Fund-supported LLINs are reported separately from Government-supported ITNs and IRS, and as a result there is no real clarity on the proportion of the population protected with vector control. M&E and reporting on vector control and personal protection needs to be strengthened and aligned with standard protocols. The entomological surveillance plan should be critically assessed and potentially revised to ensure data collected are used to support vector control planning, which requires longitudinal data from established sentinel sites. Standard forms will need to be updated to align with vector control process indicators (nets treated, LLINs distributed and/or IRS deployed) and to ensure the total population protected with vector control can be adequately calculated and reported.

Entomological surveillance and research. There is limited continuity in data from surveillance sites. Operational research should focus on key strategic questions related to the impact of vector control on malaria. The programme should establish a mechanism for targeted investigations in case of potential issues (e.g. high LLIN coverage and use but no decline in cases).

3.3 Case management

Malaria case management activities such as diagnosis and treatment are carried out by public sector health facilities at all levels of the health-care system, by community-based volunteers (currently only in a few villages of two provinces – Binh Phuoc and Quang Nam) and through malaria posts, and most recently, by private sector engagement in the five most endemic provinces in collaboration with PSI.

According to the latest Global Fund funding request, microscopy is the diagnostic method of choice at health facilities in Viet Nam. RDTs are only used when microscopy services are not available, for diagnosis of cases that have already received some treatment (e.g. inappropriate treatment through the private sector), and for diagnosis during focus investigations.

3.3.1 Successes

- Training and refresher trainings are conducted regularly.
- Most malaria cases are laboratory confirmed by microscopy and/or RDTs.
- The number of suspected patients treated is decreasing.
- Use of standby treatment is decreasing.
- RDTs are generally available for VHWs and malaria posts in Global Fund-funded areas.
• Adequate stocks of first-line treatments and injectables are available in health facilities.
• Primaquine is being prescribed for *P. vivax* and *P. falciparum* cases.
• PSI’s private sector engagement strategy is well under way in four out of five of its programme provinces.

### 3.3.2 Observations, challenges and recommendations

*Training methodology.* RAI-funded training materials developed by NIMPE for VHWs and commune health workers were far too complicated and not well tailored to the needs of the two target audiences, which differ greatly in skills and knowledge levels. NIMPE and WHO should work together to develop a satisfactory technical oversight mechanism to support the development of programme materials and documentation.

*Supply management.* In 2016–2017, due to Global Fund procurement issues, there was a major stock-out of RDTs in all 15 provinces supported by NFM but not by RAI. Global Fund-selected products did not have the necessary import permit or free-sales certificate required by the Ministry of Health despite this requirement being flagged by NIMPE before the start of the procurement process. This major RDT stock-out clearly underscores the need to retain microscopy capacity.

Other than this, supply seemed to be generally good.

In Dien Bien, all microscopy supplies were sufficient and of good quality. Pharmacy stocks included artesunate, doxycycline, primaquine, quinine and clindamycin as well as injectable artesunate. All were within their expiry dates and stored and organized appropriately. The pharmacy’s national online stock tracking system appeared to work well. Although large stocks of artemisinin-based combination therapy (ACT) were found expiring in Binh Phuoc, this can be attributed to the recent dramatic reduction in caseload in this province. Drug expiry is unavoidable in these types of situations.

*Microscopy.* In some laboratories, there was no evidence of integration of malaria microscopy into broader laboratory services. All microscopists should be multi-skilled, and malaria microscopy should be fully integrated into general laboratory services.

In 2017, 506 Olympus microscopes were procured by the Global Fund. These purchases significantly exceeded the project budget (US$ 3500 each instead of US$ 1500 as budgeted based on a Chinese brand used to develop tender specifications) and their quality exceeded the need. They did not come with boxes, which are necessary for safe storage and field transport and which now need to be procured separately at an additional cost of US$ 215 each.

Further investment in microscopes for malaria should be discouraged, as it will become overly burdensome to maintain the quality of malaria microscopy in a huge network of health facilities in an elimination setting. Instead, the programme should shift its focus to the use of RDTs, with microscopy restricted to provincial and in some cases district centres of excellence.

*Microscopy quality assurance.* All positive slides and 10% of negative slides are sent to the district, then province, and then NIMPE/IMPEs for confirmation. Thus, slides from CHC level are cross-checked three times (although in Binh Phuoc few records relating to the cross-checking of tests were found, even at the provincial CDC and at hospitals). Furthermore, there is no “blinding” of slides for cross-checking at any level. Microscopy is preceded by RDT testing and results may well be influenced by RDT test results. Robust quality assurance is the foundation of effective microscopy, so cross-checking must be
blinded. While all slides can be sent from one level to the next, only a representative sample needs be cross-checked at each level.

Slide banks were not used in Thanh Hoa or Binh Phuoc, but they were present in Dien Bien and Dak Lak. In Dien Bien, a slide bank was used for on-the-job and provincial-level training. Microscopists are provided supportive supervision two times per year. During each supervisory visit, microscopists review 10 slide-bank slides (20 per year). Comprehensive technique evaluation forms are filled out during supervisory visits, including species and stage assessment. While the assessment forms were good, they could be improved by incorporating a report on sensitivity and specificity. In elimination settings, where access to positive slides is extremely limited, the frequency of supervision and the number of slide-bank slides reviewed per microscopist per year may need to be increased to maintain skills.

**Rapid diagnostic tests (RDTs).** Generally, both RDTs and microscopy are used to test all suspected patients when both are available, usually resulting in double testing and possibly in double reporting (particularly likely to be an issue in the case of annual blood examination rate). However, in many cases, the number of people tested by both RDT and microscopy was not available. Testing every patient with both RDT and microscopy should be discouraged and should only happen in exceptional circumstances. It must not be the norm.

RDTs should be used to expand universal access to diagnosis especially among the most at-risk populations living and working in forests and forest-fringe areas. Until VHWs are allowed to dispense ACTs (see “Community-based case management and malaria posts” below), they should refer RDT-positive patients to CHCs for treatment (a clear mechanism of follow-up must be established to ensure treatment is accessed and complied with).

The NMCP should establish a mechanism to count the number of people tested by microscopy and by RDT at all levels and in all sectors (public, private and community), not only the number of people testing positive.

**National treatment guidelines.** TES in Binh Phuoc in 2015 revealed DHA-PIP late treatment failure rates of more than 30% (see section 2.5) and ACPR has since fallen to below 54%. The national treatment guidelines were updated in September 2016, but they have not yet been implemented in the two provinces with high levels of resistance. The guidelines need to be urgently updated whenever TES findings indicate that a change in treatment is required. For this to happen, changes to the guidelines need to be predicted so that they can be introduced and implemented rapidly. Licensing procedures for new antimalarials also need to be expedited with support from the highest levels of government where necessary.

The national treatment guidelines need to describe the provision of ACT by VHWs in more detail. Primaquine dosage needs to be aligned with WHO guidelines, and primaquine should be administered starting on the first day for all malaria infections (current NMCP guidelines call for primaquine to be administered on day 3). All associated trainings, including microscopy and case management refresher trainings conducted at provincial, district and commune levels, need to be strengthened and standardized and aligned to meet the national treatment guidelines.

**Facility-based case management.** All diagnosis and treatment and associated services are either free (RDT, ACT and other antimalarials) or covered by health insurance (admission, consultation, etc.). Wealthier people, who mostly live in towns, do not have health insurance. People from other provinces who register in the province where they are being treated must pay for health insurance to access free services. People from abroad must pay for consultation and admission (if necessary), but diagnosis and antimalarials are free for all.
Compliance with national treatment guidelines was generally good (doctors tended to deviate from them more than lower-level health workers). However, data in Binh Phuoc indicated that antimalarial consumption was significantly higher than it should have been given the number of confirmed and suspected cases reported. Some job aids were out of date.

The number of clinical cases has been falling steadily thanks to strengthened supervision, improved quality of diagnosis, and ensuring application of standard criteria to define clinical cases. More however needs to be done. There was large-scale use of ACTs for febrile conditions with negative malaria test results even in highly endemic areas where immediate testing with RDTs is available. Training should stress the fact that RDTs are now very sensitive and emphasize the importance of finding an alternative aetiology for febrile patients with negative malaria test results, who are most likely suffering from non-malarial fevers. The use of ACTs due to their antipyretic effects should be discouraged in these situations.

There was excessive use of artesunate (AS) injection in some communes in more endemic provinces. Injectable AS is given first for most patients, and then usually (but not always) followed with an ACT. Most of these patients seem to have been able to take oral medications. Staff cited high parasite density as a reason for providing AS (though little evidence of parasite density was being documented). Commune clinicians prefer to give AS injection and then refer patients to hospital if they have falciparum malaria, regardless of their ability to take oral medication. The indications for use of injectable AS need to be clarified and its use as pre-referral medication discouraged unless clinically indicated.

Community-based case management and malaria posts. There is limited access to diagnosis and treatment in most vulnerable communities. Community-based case management services delivered by VHWs have not been widely adopted in Viet Nam. VHWs are provided with antimalarials for case management in only 2 of the 16 RAI-supported provinces, and then only in very remote areas. None of the VHWs is provided with primaquine. Immediate measures should be taken to improve access to quality-assured diagnosis and treatment, especially for migrant and seasonal workers and indigenous people through expansion of community-based diagnostic and treatment services by VHWs. WHO must support the NMCP to ensure that special permission is granted for VHWs to use ACTs in highly endemic provinces as part of the elimination strategy.

There are no details at central level of where VHWs are and what they are doing. In order to facilitate management and planning, a VHW database should be developed, listing the name and location of every VHW, level and date of training, services provided, etc.

The malaria post visited in Binh Phuoc was functioning. However, with only a few passers-by tested, most of whom were without fever, impact seemed likely to be limited. The appropriateness of the malaria post approach should be urgently reviewed in light of the recent Presidential declaration restricting forest access. Alternative approaches should be developed if required. If the malaria post strategy is to continue, then positioning of malaria posts should be based on need rather than on equitable allocation across provinces, as is currently the case (10 per province). Proactive case detection may prove to be a more feasible and effective means of accessing hard-to-reach populations.

Security services. The NMCP provides insecticides, microscopy consumables (lancets, immersion oil, slides and sometimes RDTs) to the military sector. These are used at army health border stations, which are considered border microscopy points. These stations report monthly, quarterly and annually to provincial centres, and are included in the slide quality assurance system.

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9 Alternative approaches include provision of case management services and LLHNs by health staff based near shops known to sell supplies used by forest-goers.
**Private sector initiatives.** Private sector health-care providers nationwide are expected to report malaria cases to their DHCs, but the Ministry of Health has no guidelines regarding distribution of case reporting forms to the private sector.

As stated previously, PSI has secured funding from the Bill & Melinda Gates Foundation for a comprehensive strategy of private sector engagement and associated IEC/BCC. The GEMS programme is now being implemented by PSI in collaboration with the NMCP in the five provinces with the highest malaria burden (Gia Lai, Binh Phuoc, Dak Lak, Quang Binh and Kon Tum). To date, registered private clinics have been mapped, assessed and those eligible have been trained to test, treat and report malaria cases in high-burden districts of four out of five GEMS programme provinces. Registered private pharmacies have been mapped, assessed and those eligible have been trained to refer all customers with fever to the nearest trained clinic or health facility. To date, pharmacy trainings and post-training “mystery” customer visits (to prompt correct referral practices) have been completed in three out of five GEMS programme provinces. Worksites have been listed, mapped and assessed to identify nine prioritized worksites in three of the five provinces, so far. PSI is providing onsite malaria test–treat–track services in five of these worksites (and Zero Malaria BCC messaging and worker-engagement in all nine worksites).

PSI’s private sector interventions could be expanded to additional high-burden provinces as required. Added emphasis should be placed on addressing the issue of non-antimalarial drug cocktails being inappropriately sold to treat malaria through training and enforcement.

**DOT and case follow-up.** There is often no follow-up of treatment except in TES sites. In some areas, VHWs were informed during their monthly review meeting of malaria cases sent home by CHCs. However, this was normally too late for the VHWs to take any follow-up action to improve treatment compliance. CHCs should ensure effective case follow-up by using SMS to immediately inform VHWs of any malaria cases being sent home. The NMCP needs to establish clear guidelines for reporting up and down about cases from VHW to province and back, perhaps through the use of mobile messaging applications such as WhatsApp or LINE.

The value of DOT as currently practised in more endemic settings in Viet Nam is questionable. However, supervised treatment with follow-up will be required as part of the endgame to eliminate malaria in Viet Nam. In less endemic settings, all treatments need to be supervised to ensure complete adherence to the treatment regimen and all patients need to be followed up (on day 28 or 42 depending on the partner drug, possibly through the use of the VHW network to collect blood smears) to ensure that parasite clearance has been achieved. Patients with treatment failure will need to be given second-line treatment and monitored to ensure radical cure.

*Use of primaquine and G6PD deficiency.* Primaquine is generally issued for both *P. vivax* (14-day regimen) and *P. falciparum* (single dose – 0.5 mg/kg) infections. The provision of primaquine is accompanied by information on correct regimen, potential side-effects (haemolysis due to G6PD deficiency) and actions; contraindication triggers immediate referral and cessation of treatment. In less endemic provinces, primaquine is not stocked at CHC level due to concerns over toxicity (primaquine is included in toxic table B). In these settings, primaquine is made available by the district team, which is deployed to the commune as soon as they receive a positive case report. There is no checking of compliance, especially with the 14-day primaquine regimen for vivax malaria. Such a mechanism should be established through the VHW network. Volunteer VHWs who could conduct follow-up visits during treatment (e.g. around day 7) and on day 14 to ensure full compliance. Wherever primaquine is used for the treatment of *P. vivax*, patients should be given paper cups so that they can check for haematuria and terminate treatment if necessary.

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10 G6PD stands for glucose 6-phosphate dehydrogenase.
Standby treatment. The use of standby treatment in Viet Nam has decreased significantly in recent years following pressure from the NMCP to reduce the amount of ACT in circulation and thereby reduce the selection pressure for antimalarial resistance. Nevertheless, it still accounts for a high proportion (40% (1872/4800)) of ACT usage in more endemic parts of Binh Phuoc. WHO strongly discourages standby treatment with ACT and recommends immediate cessation of the practice. Provision of RDTs for self-diagnosis could be an option.

Quality and safety of antimalarial medicines. Antimalarial medicines are locally manufactured. In fact, as a matter of government policy, all government-funded medicines including antimalarials are procured from local manufacturers. The key agencies responsible for ensuring quality and safety of antimalarials in Viet Nam are the Drug Administration of Viet Nam (DAV), the National Institute of Drug Quality Control (NIDQC) and its provincial network, and the National Drug Information and Adverse Drug Reaction Monitoring Centre. DAV licenses all drug manufacturers and enforces compliance to Good Manufacturing Practice (GMP) standards. There are currently several manufacturers of antimalarial medicines in Viet Nam, but only some are certified as GMP compliant. Other good practice standards, such as good distribution and good storage practices, are also enforced to all pharmaceutical distributors. The registration of antimalarial medicines is also undertaken by DAV, with licenses (called product visas) valid for up to five years.

The NIDQC and its provincial network are mainly responsible for post-marketing surveillance of medicines in Viet Nam including for antimalarials. In 2011–2016, with Global Fund funding, WHO provided extensive support to strengthen the post-marketing surveillance system focusing on medicines for key public health programmes: antimalarials, tuberculosis drugs and antiretrovirals. The NIDQC undertakes risk-based sampling and surveillance through its network.

Despite these systems being in place, substantial challenges remain. An assessment of the pharmaceutical industry in 2012–2013 showed the existence of locally produced formulations of quinine and paracetamol, a serious concern as these are being sold as ordinary antipyretics. A recent study commissioned by WHO showed that a substantial proportion of antimalarial samples are substandard. In addition, despite a series of Government-issued orders between 2010 and 2014 to stop production of oral artemisinin-based monotherapies and to recall them from the market, the survey has found that these products are still available in the market in some countries in the Greater Mekong Subregion.

The National Drug Information and Adverse Drug Reaction Monitoring Centre is responsible for pharmacovigilance of all medicines in Viet Nam including antimalarials. Adverse drug reactions are reported from consumers, industry and health service facilities. The National Centre is a member of the Uppsala Monitoring Centre network. Reports of severe adverse drug reactions are processed through the quality network, whereby the National Centre undertakes causality assessment, the NIDQC is responsible for quality testing of the subject drug, and DAV initiates the recall of the products upon recommendation of the National Centre and the NIDQC.
3.4 Surveillance and focus/outbreak preparedness and response

Workplan 2015–2020 outlines plans to improve and update the epidemiological surveillance system in line with the requirements associated with malaria elimination in less endemic areas and ensure sufficient capacity for malaria outbreak response in more endemic areas. Substantial progress has been made in this regard, but more work is required to ensure that the system is fully functional and “elimination ready”.

3.4.1 Successes

- A high proportion of suspected cases are being tested for malaria by microscopy or RDTs.
- VHWs in some provinces are detecting cases using RDTs.
- Case-based reporting has been rolled out to Global Fund-supported communes in zone 3.\(^\text{11}\)
- Case notification within 1–2 days seems to be occurring approximately 80% of the time in many areas (although not in Binh Phuoc).
- The proportion of cases with completed case report forms is high in some areas.
- Some communes, districts and provinces are analysing data and preparing bulletins.
- In Dien Bien (very low endemicity), the origins of all imported cases were known.
- A five-zone stratification has been completed down to commune level and is understood at least to district level. Several communes demonstrated subcommune stratification.

3.4.2 Observations, challenges and recommendations

Epidemiological surveillance. The roll-out of the MIS began in 2014 but has since stalled. The system is not functioning consistently at any level due to server update requirements. The NMCP and WHO should explore the technical flexibility of the Viettel\(^\text{12}\) electronic case-based data platform to ensure compliance with data exchange standards and interoperability requirements. Circular 54 (C54) is not yet fully functional. Many districts still do not enter information into the electronic Communicable Diseases System (eCDS), the software for C54, and C54 does not carry all of the data items required for elimination. The MIS will need to create linkages with C54 and become an integral part of it in the future. The Programme cannot wait for eCDS to become fully functional if it is to meet the needs associated with elimination. This should be planned in the broader framework regarding an integrated approach for HMIS (with both preventive and curative arms). At the same time, the malaria case data collected through C54 should be monitored to cross-check with data collected by the NMCP. C54 data should be disaggregated by suspected, probable and confirmed cases.

The revised MIS must ensure clear lines of information flow between case identification, case notification, case investigation, case follow-up, focus investigation, focus response and focus follow-up reports.

The NMCP’s surveillance manual needs to be updated to align with the 2017 WHO Framework for Malaria Elimination and upcoming surveillance guidelines. Until the new MIS is up and running, provincial malaria centres should maintain a list of all confirmed cases to monitor foci and conduct focus investigations.

\(^{11}\) See “Stratification of malaria risk” on page 24.
\(^{12}\) Viettel is Viet Nam’s largest mobile phone network provider.
Bulletins are prepared on an annual basis at provincial, district and commune levels. NIMPE has been effectively providing guidance and structure to the analyses, but templates could be further improved and annexed to SOPs.

**Stratification of malaria risk.** The country has been stratified at the commune level into five zones according to malaria risk: Zone 1 – Areas without malaria transmission; Zone 2 – Areas with vectors but free from malaria; Zone 3 – Low malaria endemic area; Zone 4 – Moderate malaria endemic area; and Zone 5 – High malaria endemic area. Re-stratification has been performed routinely every 4–5 years. Targeting by zone is appropriate, but the NMCP needs to make this more explicit and consider how to handle subprovincial stratification for provincial-level activities including focus investigations. CHC staff need to know which stratum they are in, the national elimination objective and their district roadmap goals.

The stratification approach needs to be reviewed in light of the rapid reduction in malaria burden and adjusted if appropriate. Whatever the stratification approach, the stratification should be updated annually and activities targeted/re-targeted accordingly. Donor flexibility will be required to accommodate this retargeting. Following each stratification update, CHC staff will need to be briefed if the stratum they are in has changed.

**Focus/outbreak/epidemic preparedness.** Communicable disease control mobile teams at district level (headed by the vice-president of the People’s Committee) are responsible for monitoring outbreaks. In more endemic areas, supplies for outbreak response (including ACT and insecticide) are kept at provincial level, but in less endemic areas, where supply routes are adequate (take less than 24 hours), supplies are sent or collected from central level, as and when required.

**Early detection of foci/outbreaks/epidemics.** In more endemic communes, weekly caseload is plotted on a wall chart, which shows the mean weekly caseload for the previous three years plus two standard deviations as an outbreak threshold. If the caseload exceeds this threshold, an outbreak is reported to district level. Given the recent dramatic declines in malaria burden, this approach should now be replaced with case-based reporting.

So far, case-based reporting has been officially rolled out to Global Fund-supported communes in Zone 3, and so there is inconsistency in practice of case and focus investigations between Global Fund and non-Global Fund areas. The RAI grant focuses on \textit{P. falciparum} and this seems to have led to confusion, with case and focus investigations only being supported for falciparum malaria in RAI-supported provinces (despite the fact that they also have NFM support). Provincial and district-level staff should try to account for every case in their area and ensure that these cases are followed up to confirm radical cure. The review team recommends that the programme should now roll out case-based surveillance (for all species of malaria) to all endemic and receptive communes (zones 2–5 in Global Fund and non-Global Fund areas). In more endemic communes (zones 4–5), case investigations and focus investigations should be carried out to the extent that this is feasible (it should be possible to investigate 100% of cases in these areas at least during the low transmission season). This way, these more endemic areas will be fully capable of implementing case-based investigation as they enter the elimination phase.

The NMCP should clarify surveillance guidance to ensure investigation is conducted for every case. To be of value, case investigations must go beyond simple form filling and focus on finding out exactly where patients probably became infected (using maps if possible). The information generated should be used systematically to help strategically target areas of possible transmission with appropriate interventions.

With the advent of health insurance, people are increasingly bypassing CHCs and presenting at district and provincial hospitals. Guidance needs to be developed so that case reports are provided back to the commune from district and provincial hospitals to facilitate case investigations, and ensure VHWs are informed, so they can follow-up
and ensure full compliance with treatment regimens and ensure complete cure, and the commune counts the case in its totals. Case investigations are not being done regularly in the community.

Guidance is not clear on whose responsibility it is to investigate cases, or how to register cases when diagnosed outside the commune. The NMCP must develop clear guidance on reporting, investigating and registering cases diagnosed outside the commune, from other provinces and also imported malaria from other countries. The NMCP needs to start reporting the number of imported malaria cases and their country of origin.

*Focus investigations.* Focus investigations are not regularly conducted in any area. There are no focus registers, and no focus response SOPs. Focus investigations need to be conducted based on recent WHO guidance with clearly defined responsibilities. Activities to be undertaken within focus investigations need to be clarified and linked to programmatic decisions through the development of appropriate SOPs. The efficiency and impact of reactive case detection needs to be monitored and evaluated to improve the effectiveness of the activity. Provincial-level malaria staff should begin tracking malaria incidence and act proactively to conduct focus investigations in areas with high numbers of cases, with a view to limiting such transmission as early as possible.

Suspected transmission foci in forest campsites and forest farms are not investigated. Focus investigations need to be extended to include forest farms and forest campsites and the necessary incentives or additional human resources required for this needs to be provided. The NIMPE project supported by the Consortium for Health Action, or ConsortiumHA, in Phu Yen Province provides a good model for this.

In Dak Lak, focus investigation forms from 2016 were unavailable for review because they had been sent off for reimbursement. Any form sent to the Global Fund for reimbursement (focus investigations, case investigations, DOT) needs to be copied so that the sending institution is left with a record.

*Focus/outbreak/epidemic response.* There is lack of specific guidance on focus response. The NMCP needs to develop its focus response strategy and prepare and disseminate SOPs. Criteria for follow-up focus investigations for active foci, and for follow-up upon detection of cases in residual non-active or cleared foci need to be incorporated into these SOPs.

The Quang Tri falciparum outbreak described in section 2.4 did result in an investigation by provincial staff, but there was no cross-border communication with the Lao authorities at either national or provincial level even though it was clear that many of the cases detected had been imported from the Lao People’s Democratic Republic. Lao authorities were apparently independently aware of an outbreak on their side of the border and dealt with it appropriately, but there was no attempt to notify Vietnamese authorities. Clearly, cross-border communication needs to be improved.

The review team that visited Dak Lak felt that the intense focus of falciparum malaria transmission in Buon Drang Phok commune in Krong Na District warranted an investigation by a team from central level.
3.5 Communication

Specific objective 5 of Workplan 2015–2020 is to “improve the knowledge and behaviour of people relating to malaria control so that they can actively protect themselves against malaria”. The Workplan outlines a comprehensive approach to BCC, community mobilization and advocacy. This includes the development of targeted, locally appropriate IEC/BCC materials (including interpersonal communication aids, audio and video sketches/presentations, billboards, posters, brochures, articles and pamphlets) and methodologies tailored to the specific requirements of the various target groups and to the specific requirements of elimination. The Workplan highlights the use of interpersonal communication for BCC (delivered by district health staff, commune health workers, midwives, traditional birth attendants, VHWs and selected communicators including hamlet leaders, and Women’s Union and Youth Union representatives) and mass media for communication at national and subnational levels (taking full advantage of free opportunities where possible). The Workplan also describes support for the socialization of malaria by encouraging faith-based, civil society, charitable and nongovernmental organizations and village leaders to be fully involved in malaria elimination.

3.5.1 Successes

- Provincial government officials seem to be kept well informed by provincial malaria control staff through regular meetings of various types (both formal and informal).
- A communication plan, an advocacy plan and a community engagement framework were available at provincial level at least in Dien Bien.
- VHWs seem to provide an effective means of delivering IEC/BCC to their communities. The VHW network is clearly a key strength within Viet Nam’s broader public sector health system, and it should continue to be strengthened to ensure capacity, training, supplies and empowerment to access and support the community. The VHW network convenes monthly meetings with villagers to remind them to clear bushes around houses, to go to the CHC for blood smear examination if they are returning from the forest or have a fever, to use bed nets at night, and to take their bed nets to the CHC when re-treatment campaigns are held. These meetings are held at the village leader’s house and are attended by one representative from each household. IEC materials advise on the causes of malaria and control measures. Forest-goers are advised to take LLINs (single, double) to the forest if they stay overnight.
- IEC/BCC annual campaigns include posters, videos, pictures and health news in newspapers.
- Rural grocery stores, blacksmiths and motorbike repair shops near forest entry points and border crossings are being mapped and assessed by PSI in its five GEMS programme provinces to inform forest-goers regarding the placements of test/treat and BCC facilities.
- Zero Malaria campaign messages are being placed by PSI using several targeted channels in all five GEMS programme provinces (e.g. billboards near worksites and border crossings, print materials in public and private health facilities, VHWs trained to use an interpersonal communication tool, YouTube video to be used in community engagement and screening activities, etc.)
- The NMCP supports an annual large-scale community mobilization event on World Malaria Day (25 April). This is an important opportunity for high-level advocacy.
3.5.2 Observations, challenges and recommendations

Communication. It was not clear during the malaria programme review to what extent the plans presented in Workplan 2015–2020 had been put into action. There appeared to be some disconnect between what is written at central level and what is actually implemented in the periphery. Development of detailed SOPs and robust tools for monitoring activities in the periphery should help to ensure that plans are effectively implemented. PSI should be well placed to support the NMCP in this regard.

Key BCC messages should cover:

- the dangers of fake, substandard and inappropriate antimalarials;
- the importance of compliance with the full course of treatment;
- availability of services (advertising the location of and services provided by CHCs, VHWs, malaria posts and PSI-supported private sector health-care providers); and
- the importance to the community of all cases receiving appropriate treatment in an elimination setting.

3.6 Overarching recommendations

- Intensify national malaria elimination efforts.
  - Continue to advocate further political leadership, leading to increased domestic resources for malaria elimination.
  - Continue strengthening technical capacity at NIMPE and two regional IMPEs.
  - Ensure sufficient national financing for malaria elimination activities, especially in non-Global Fund-funded provinces.
  - Develop a national action plan for malaria elimination.
  - Conduct intensive awareness-raising among health managers, clinicians and public health staff at CDCs in all provinces regarding change in strategy to achieve malaria elimination.
  - Develop and update SOPs and prepare associated job aids, reporting forms and supportive supervision formats to guide elimination efforts within an integrated CDC structure.
  - Establish a standard national curriculum oriented towards elimination and ensure that all in-service training is aligned.
  - Ensure that all levels of the health system nationwide adopt a laser-like focus on ensuring rapid detection, complete treatment and full parasite clearance for all malaria cases from now until elimination.
  - Establish an independent national elimination committee to verify subnational malaria elimination (see guidelines in Annex 7) and help advise the country to achieve national elimination.
- Improve access to quality assured diagnosis and treatment and extend surveillance and response through expansion of case management services implemented by VHWs.
- Re-evaluate the stratification approach to ensure that resources are allocated to those most at risk.
• Further explore efficiency gains through adopting an integrated approach across programmes, starting in non-Global Fund districts.
  • Change the current “business as usual” mindset to one better suited to the NMCP’s elimination goal. A strong business plan, or a change management plan, with realistic costing and a financial gap analysis will help both local planning and national-level advocacy.
  • WHO’s health systems team is well placed to continue working with the malaria/communicable diseases group to support the basic analysis needed for such a plan.
  • With CDC integration starting in country, and the malaria incidence reducing rapidly the time is now right for integration of malaria services at primary care levels (relevant reference documents are attached as annexes 5 and 6).
  • Strengthen malaria elimination activities through integration of malaria into integrated CDCs and build capacity within those institutions to accelerate control and elimination. Strengthen and integrate malaria surveillance into communicable disease surveillance and prioritize case-based surveillance.

• Analyse and develop tailored interventions with appropriate delivery channels to target risk groups based on their specific needs.
  • There needs to be a far greater sense of urgency and far more action to address the issue of malaria in mobile populations. There should be more effort to target risk groups at gathering points and at points of entry into risk areas.
  • Special emphasis should be placed on strengthening preventive and case management services in the military, a highly mobile and particularly critical risk group. A local NGO, ConsortiumHA, may be best placed to support this.
  • As malaria incidence decreases to low levels, there is a need for more precise targeting and better tailoring of interventions to specific areas and populations.
  • This calls for micro-level planning for all interventions, at least at district level and eventually at the level of individual foci of residual malaria. Planning should be based on thoughtful analysis of available data from operational research, technical surveys, routine reporting, and foci and case investigations. At the moment, this is not happening – or at least not to a sufficient extent; the mix and method of deployment of interventions is mostly the same everywhere.
  • To eliminate malaria, Viet Nam will need to move progressively to micro-level planning, which will require a greater level of support.

• In addition to more precise and strategic planning, there is a need to improve quality control to ensure that implementation of planned activities achieves the intended coverage and quality.
  • This requires an effective hierarchy of supportive supervision.
  • Leaders of malaria elimination will need access to independent assessments of the quality of programme implementation, including data quality audits.
  • “Operations research” should take the place of “operational research”, with the programme “learning by doing” rather than “learning then doing”.


4. Overall conclusion

The NMCP has made remarkable progress towards eliminating malaria in recent years. Viet Nam is now faced with a critical window of opportunity to achieve the elimination of malaria as mandated in the National Strategy for Malaria Control and Elimination in the Period 2011–2020 and Orientation to 2030:

- Efficacious antimalarial combination therapies still exist, but they are failing fast.
- Potent tools for vector control are available, but they could be undermined quickly by the development of insecticide resistance.
- Financial support from external funding partners continues to flow but will likely be time limited.

The Government must seize the moment and take bold steps to ensure that malaria is eliminated from Viet Nam for good.
Annex 1. Terms of reference for the malaria programme review

Overall terms of reference and scope

1. Review Viet Nam’s progress and standard operating procedures towards meeting the needs for national, regional and global targets for malaria control and elimination as stated in the National Strategy for Malaria Control and Elimination for 2011–2020 and Vision for 2030, the WHO Global Technical Strategy (GTS) for Malaria 2016–2030 as well as the WHO Regional Action Framework for Malaria Control and Elimination in the Western Pacific 2016–2020.

2. Provide recommendations to redefine the policies, strategies and support programme transformation to sustain high programme performance in the future including review of national malaria policy and strategic frameworks for planning, management, implementation and timely reporting.

3. Review performance of malaria control and elimination activities by thematic areas (programme management, case management, surveillance and vector control) and at different levels of service delivery (central, regional, provincial, district, commune, village).

4. Provide technical advice and recommendations for transitioning the National Malaria Control Programme from a malaria control approach to a malaria elimination approach.

5. Investigate and recommend methods to sustain resources and financing for malaria control and elimination during and after Viet Nam reaches malaria elimination status.

6. Investigate and recommend methods to integrate malaria control and elimination activities in Viet Nam’s broader communicable disease control and surveillance system, particularly at the provincial, district and commune levels of the health system.

7. Assess the national malaria programme’s approach to contain the spread of artemisinin-resistant malaria in Viet Nam and across international borders in the region, which may threaten progress towards malaria elimination.

8. Make specific recommendations to the National Malaria Control Programme of Viet Nam.

On all of the above, and other issues as highlighted by NIMPE:

Specific terms of reference for thematic area teams

1. Programme Management Team

   - Investigate and recommend methods to sustain financing and other resources for malaria control and elimination after Viet Nam reaches malaria elimination status, including through high-level advocacy.

   - Assess human resources plans and training towards malaria elimination with special attention Viet Nam’s plans to integrate disease control activities at the provincial level through the provincial centre for disease control.

   - Assess current strategies for developing the Malaria Information System (MIS) and potentially linking MIS with existing Health Management Information System (HMIS) initiatives.
• Explore potential collaborative links and efficiencies of malaria programme with other communicable disease programmes in Viet Nam.
• Recommend methods of enhancing partnerships with stakeholders, NGOs and private sector in aid of the Government’s strategy for malaria elimination.
• Determine the appropriateness and completeness of interventions targeting high-risk groups such as mobile populations, migrants and cross-border populations.

II. Surveillance Team
• Review and assess malaria epidemiology, risk stratification and mapping.
• Assess the malaria surveillance and response system and the MIS and determine ways forward for developing and maintaining a system capable of supporting malaria transmission reduction and elimination.
• Review the implementation of case investigation, focus investigation and focus response (especially in transmission foci in the forest).
• Assess human resources and capacity-building needs for staff at the lower levels of interventions pertaining surveillance and active case detection and response.
• Assess current strategies for developing the MIS and potentially linking MIS with existing HMIS initiatives.
• Explore options for integration of existing disease surveillance systems with the MIS.

III. Vector Control Team
• Assess the strategies and procedures of vector control measures to guide programme implementation in light of malaria elimination.
• Review the targeting and quantification of long-lasting insecticide-treated bed net (LLIN) particularly for continuous delivery and in light of recent Global Fund reprogramming for LLIN procurements.
• Review methodology of LLIN distribution campaigns.
• Assess vector control quality assurance including insecticide resistance monitoring.
• Assess vector control and personal protection measures expected to target the most vulnerable populations such as mobile and migrant populations and temporary forest dwellers.
• Explore potential links and efficiencies of malaria programme with other communicable disease programmes, particularly with other vector control programmes such as dengue and Zika.

IV. Case Management Team
• Determine the efficiency and effectiveness of malaria (falciparum and vivax) case management from policy to implementation including individual patient follow-up, surveillance, reporting and linkages between the national malaria programme and curative/general health-care facilities.
• Determine how to provide community-based case management services to inaccessible communities and high-risk populations in the absence of a system involving village health workers.
• Assess malaria treatment guideline and case management training methods.
• Assess research activities and plans and recommend ways in which the malaria research agenda can contribute to malaria elimination in Viet Nam.
• Assess the results from latest therapeutic efficacy studies, and review the progress of monitoring of drug efficacy and drug quality in light of containing the spread of artemisinin-resistant malaria in Viet Nam and across international borders in the region.
• Assess the effectiveness of procurement and supply management to mitigate stockouts of antimalarial commodities.
Annex 2. Malaria programme review team members

Team 1 – Programme management: Thanh Hoa Province, 12–16 September 2017

1) Dr Momoe Takeuchi, Coordinator, Health Systems Development, WHO Viet Nam
2) Dr Najibullah Habib, Malaria, other Vectorborne and Parasitic Diseases Unit, WHO Viet Nam
3) Dr Nguyen Manh Hung, National Expert, former Director NIMPE
4) Mr Truong Minh Hieu, NIMPE (facilitator/translator)

Team 2 – Case management: Binh Phuoc Province, 12–16 September 2017

1) Dr Rabindra Abeyasinghe, Coordinator, Malaria, other Vectorborne and Parasitic Diseases Unit, WHO Regional Office for the Western Pacific
2) Dr Shuisen Zhou, Chief of Malaria Department, National Institute of Parasitic Diseases, People’s Republic of China
3) Dr Ta Thi Tinh, National Expert, Department of Research and Treatment, NIMPE
4) Mrs Nguyen Van Hong, NIMPE (facilitator/translator)

Team 3 – Surveillance: Dak Lak Province, 12–16 September 2017

1) Dr Kimberly Ann Lindblade, Team Leader, Malaria Elimination Unit, WHO Headquarters
2) Dr Tran Cong Dai, Malaria other Vector-borne Diseases Unit, WHO Viet Nam
3) Dr Le Xuan Hung, National Expert, former Deputy Director, NIMPE
4) Dr Nguyen Quy Anh, Epidemiology Department, NIMPE (facilitator/translator)

Team 4 – Vector control: Dien Bien Province, 12–16 September 2017

1) Dr Tessa Knox, Technical Officer, Entomology and Vector Control Unit, WHO Headquarters
2) Dr Sean Hewitt, Independent Malaria Expert, United Kingdom
3) Dr Vu Duc Chinh, National Expert, Head of Entomology, NIMPE
4) Mrs Lai Thi Hong Loan, NIMPE (facilitator/translator)
Annex 3. People met

Central Level

Ministry of Health

- Dr Nguyen Thanh Long, Vice Minister

NIMPE/IMPEs

- Associate Professor Tran Thanh Duong, Director of NIMPE, Director of NMCP and VGF Malaria Projects (TFM, RAI)
- Dr Nguyen Quang Thieu, Deputy Director of NIMPE, Deputy Director of NMCP and VGF Malaria Projects (TFM, RAI)
- Associate Professor Nguyen Manh Hung, Former Director of NIMPE, Training Officer of VGF Malaria Projects – Malaria Programme Review Team Member
- Associate Professor Le Xuan Hung, Former Deputy Director of NIMPE, M&E Officer of VGF Malaria Projects – Malaria Programme Review Team Member
- Dr Tran Quang Phuc, Head, Planning Department
- Dr Ngo Duc Thang, Head, Epidemiology Department
- Dr Vu Duc Chinh, Head, Entomology Department – Malaria Programme Review Team Member
- Dr Ta Thi Tinh, Former Head, Clinical Department – Malaria Programme Review Team Member
- Dr Bui Quang Phuc, Head, Clinical Department
- Dr Nguyen Quy Anh, Deputy Head, Epidemiology Department
- Dr Cao Ba Loi, Head, Training and Science Department
- Dr Nguyen Thi Hang, Deputy Head, Training and Science Department
- Mrs Lai Hong Loan, Secretary, VGF Malaria Project

Partners

- Dr Nguyen Tuan Minh, Malaria Focal Point, Population Services International - Viet Nam
- Dr Tran Quoc Tuy, Malaria Programme Coordinator, Health Poverty Action - Viet Nam
- Dr Thuy Tran, Program Manager, Clinton Health Access Initiative - Viet Nam
- Dr Colin Ohrt, Founding Director, Consortium for Health Action - Viet Nam
Thanh Hoa Province

1. Center for Malariology, Parasitology and Entomology
   - Dr Do Thanh Tung, Director
   - Mr Le Ba Khanh, Vice Director
   - Mr Nguyen Huu An, Head of Entomology
   - Mr Le Thi Sau, Head of Finance

2. Lang Chanh District Health Centre
   - Dr Do Thanh Thuy, Director
   - Dr Luong Van Xuan, Vice Director
   - Dr Pham Van Tai, Head of Infectious Diseases
   - Dr Luong Van Phu, Head of Diagnostics
   - Mr Nguyen Huu Giang, Secretariat

3. Tri Nang Commune Health Centre
   - Dr Cao Van Cong, Head
   - Mr Ha Van Hung, Staff in charge of malaria control

4. Tam Van Commune Health Centre
   - Dr Pham Van Son, Head
   - Dr Pham Van Luat, Vice-Head

5. Lam Phu Commune Health Centre
   - Dr Ha Van Tiep, Head
   - Mr Cao Van Luan, Staff in charge of malaria control

6. Tho Xuan District Health Centre
   - Dr Ngo Thi Hoa, Director
   - Ms Tran Thi Lam, Staff in charge of malaria control

Binh Phuoc Province

1. Binh Phuoc Provincial Centre for Disease Control
   - Dr Bui Van Quan, Director
   - Dr Huynh Van Hanh, Chief of Planning and Accountancy

2. Bu Gia Map District Health Centre
   - Dr Cao Van Minh, Director
   - Dr Hoang Van Tham, Chief of CDC’s department
   - Dr Nguyen Kim Thuy, Staff at CDC’s department
3. Dak O Commune Health Centre
   • Dr Tran Van Nhan, Head
   • Mr Phan Van Huu, Technician
   • Mrs Hoang Thi Tuyen, VHW at village 4
   • Mrs Dieu Thi Duyen, Volunteer in malaria post at village 4

4. Bu Dang Distric Health Centre
   • Dr Nguyen Van Bien, Vice Director
   • Mr Tran Thi Chin, Deputy Chief of CDC’s department
   • Nguyen Thi Hong Duyen, Staff at CDC’s department

5. Dak Nhau Commune Health Centre
   • Dr Tran Duy Thao, Head
   • Dieu Thi Hoai, Assistant doctor, VHW at Dang Lang village
   • Vuong Nu Huyen Trang, Volunteer in malaria post at Dang Lang village

6. Bom Bo Commune Health Centre
   • Dr Pham Ngoc Thanh, Vice-Head
   • Dr Nguyen Xuan Phuoc, Private sector

Dien Bien Province

1. Dien Bien Provincial Project Management Unit
   • Dr Nguyen Chau Son, Head of Professional Department of Dien Bien Provincial Health Services
   • Dr Nguyen Quang Ngoc, Director of Provincial Centre for Malaria Control (PCMC)
   • Dr Nguyen Thi Man, Vice-Director of PCMC
   • Mr Nguyen Danh Dong, Chief accountant of PCMC
   • Mrs Le Thi Lan, Storekeeper
   • Mr Le Khac Thong, Microscopist

2. Dien Bien Dong District Health Centre
   • Dr Nguyen Van Minh, Director
   • Dr Cao Thi Ly, Vice-Director
   • Dr Hoang Van Bac, Head of District Team of Preventive Medicine
   • Dr Lo Van Trong, Vice-Head of the District Team of Preventive Medicine
   • Mr Pham Xuan Cuong, Staff member of the District Team
   • Mr Nguyen Duy Dai, Head of Planning Department
   • Dr Lo Van Hong, Staff member of the District Team
   • Mr Bui Dang Bac, Accountant
3. Na Son Commune Health Centre of Dien Bien Dong District
   • Dr Luong Van Mang, Head
   • Mrs Lo Thi Tinh, Vice-Head
   • Ms Quang Thi Phuong, Nurse
   • Ms Tong Huong Quyet, Staff in charge of malaria control
   • Lo Thi La, Midwife
   • Quang Van Oi, VHW of Na Phat A village (Thai village)
   • Mr Lo Van Truong, Head of Na Phat A village
   • Lau Thi Danh, VHW of Ho Co village (Hmong village)

4. Tuan Giao District Health Centre
   • Dr Trinh Duc Long, Director
   • Dr Vuong Quy Ngoc, Head of District Team of Preventive Medicine
   • Mrs Nguyen Thi Quynh Hoa, Staff member of the district team
   • Mrs Pham Thanh Thuy, Head of Examination Department (Laboratory)
   • Dr Vua Thi Cua, Vice-Head of Infectious Diseases Department
   • Mrs Nguyen Thi Hoa, Head of Planning Department
   • Mrs Le Thi Thuy, Storekeeper in Department of Pharmacy

5. Quai To Commune Health Centre of Tuan Giao District
   • Dr Lo Thi Dung, Vice-Head
   • Mr Luong Van Thien, Staff in charge of malaria control
   • Mr Lo Van Sang, VHW of Na Hoi village

Dak Lak Province

1. Centre for Malariology, Parasitology and Entomology
   • Dr Hoang Hai Phuc, Director
   • Dr Ho Tan Tien, Vice-Director
   • Dr Nguyen Chau Thanh, Head of Planning Department
   • Dr Le Van Tu, Head of Epidemiology Department
   • Mr Dinh Minh, Head of Entomology Department
   • Dr Ngo Thi Tam, Head of Lab and Parasitology
   • Dr Y Dao Ayun, Vice-Head of Planning Department

2. Buon Don District Centre for Preventive Medicine
   • Dr Vu Minh Hung, Director
   • Mr Y Bun Toan, Malaria focal point in Outbreak Control Department
   • Mr To Van Dich, Vice-Head of Planning Department
   • Ms Duong Thi Minh Tam, Planning Department
   • Mr Tran Vo Hoang Dung, Outbreak Control Department
   • Mr Le Khoi Quyet, Staff
3. K’rong Na Commune Health Station
   • Mr Ysoi Hwing, Deputy Director and Microscopist
   • Mr H’Xa Lung Kbour, Malaria focal point

4. Thong Nhat Village
   • Ms Pham Thi Minh, Village health worker

5. K’rong Bong District Preventive Health Centre
   • Mr Nguyen Tuan Viet, Director
   • Ms Nguyen Thi Bao Tram, Malaria focal point in Outbreak Control Department
   • Ms Nguyen Thi Nga, Accountant

6. K’rong Bong District Hospital
   • Representative of Department of Internal Medicine, Pediatrics and Infectious Diseases
   • Representative of Laboratory

7. Cu Pui Commune
   • Mr Truong Van Bao, Head of Commune Health station
   • Mr Vo Thi Tu Ka, Malaria focal point

8. Ea Rok Village Health Post
   • Mr Duong Van De, staff in charge of Ea Rok Village Malaria Post
Annex 4. Service delivery systems

Viet Nam has a well-established public health-care network. Health service provision has two arms: the curative (hospital) system and the preventive medicine system. Currently, there are challenges in linking and coordinating the two systems in some districts. In May 2014, the Prime Minister approved Decision 37, governing a restructuring of the functions and responsibilities of specialized agencies of the People’s Committees of districts, provincial towns and cities of provinces. This restructuring will enhance the linkage between the preventive and curative arms. Activities under the Health Systems Strengthening Global Fund Grant will collaborate with the National Malaria Control Programme (NMCP) to build capacity in health management and service delivery.

Specialized malaria control services are responsible for malaria control nationwide. The NMCP and the National Institute of Malariology, Parasitology and Entomology (NIMPE) are central institutions responsible for nationwide technical direction and malaria control activities in the northern provinces. The regional Institute of Malariology, Parasitology and Entomology (IMPE) Quy Nhon is responsible for malaria control activities in the central provinces and IMPE Ho Chi Minh City is responsible for malaria control activities in the southern provinces and Lam Dong (a central province). A Central Steering Committee together with a Provincial Steering Committee, District Steering Committee, communes and other bodies work towards planning and coordinating operations. The Central Steering Committee meets twice a year to plan activities and for oversight.

In the 24 most endemic provinces, there is a separate Provincial Center for Malaria Control (PCMC). In less endemic provinces, the Provincial Centre for Preventive Medicine manages malaria control with a smaller Department for Malaria Control. Malaria-endemic districts (those with communes in malaria stratification zones 3-5) also each have a Department for Malaria Control with a malaria focal point. They also have communal or inter-communal malaria microscopy points. In non-endemic districts any malaria-related services are provided through a district centre for preventive medicine. Each commune has a commune health centre (CHC) and in malaria-endemic communes these have specialized staff responsible for malaria control.

At the peripheral level, the policy is to have one village health worker (VHW) in each village. These VHWs are members of the community who receive training from the provincial health service, often at the district level, to cope with the most common medical needs of the population of the village. VHWs are the backbone of the community-level health response in Viet Nam. VHWs are not full-time employed government officials, but do receive an allowance from the government budget for the times they are engaged in outreach activities, mainly focused on health promotion and prevention. They are unusual in the Greater Mekong Subregion in that they are not volunteers and they differ from Cambodia’s village malaria workers, for example, in that they are relatively extensively trained. VHWs receive a monthly allowance that is equal to 30% of the basic salary of a government officer, which translates to around US$15 per month. For more disadvantaged communities, the allowance is equal to 50% of the basic salary, which is around US$25 per month. Generally VHWs are paid from provincial budgets but in disadvantaged communes the central budget will provide support for one VHW. Where there is a need for VHWs to provide additional services, this requires additional financial incentives and other support (e.g. transport fees). In addition, the NMCP works in close association with two key national community groups: the Women’s Union and the Youth Union.

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13 The basic salary of a government officer is 1.15 million dong (about US$ 50).
Role of the private sector. A survey conducted in Binh Phuoc Province in 2011 suggested that around 13% of resident patients and 23% of migrants were accessing initial health care from the private sector. However the situation varies from one province to another and the role of the private sector has been increasing in recent years. It follows therefore that the Binh Phuoc study results are probably not representative of the country as a whole and are probably also already outdated. In reality, little is known at present about the private sector’s role in the delivery of malaria case management in Viet Nam. The NMCP recognizes that this is an important shortcoming. It also recognizes that it has limited experience in dealing with private sector-related issues. In order to address this problem NIMPE therefore recently engaged with the international NGO Population Services International (PSI), which has extensive Greater Mekong Subregion-related expertise in this field. As a result, a collaboration between NIMPE and PSI has been established and steps are now being taken to address this important knowledge gap. PSI has secured funding to conduct a large-scale survey of private sector pharmaceutical outlets in Viet Nam in 2015 (ACTwatch). The results of this survey will inform the development of a national strategy to better address the issue of malaria case management in the private sector in future. It is likely that substantial additional funding will be required to implement this new strategy.

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14 Nguyen Quy Anh & Le Xuan Hung, unpublished data, 2011.
Annex 5. Regional Framework for Action on Transitioning to Integrated Financing of Priority Public Health Services

Http://www.wpro.who.int/about/regional_committee/68/documents/wpr_rc68_8_annex_integrated_financing.pdf?ua=1

A WHO Regional Office for the Western Pacific Division of Health Sector Development and Division of Communicable Diseases joint document identifies three main action points required for a smooth transition from a vertically funded programmatic approach to a whole-of-system approach. These are: 1) Confirm core programme elements and service delivery arrangements; 2) Strengthen financing institutions to make better use of available resources; and 3) Increase domestic financing. Many of the activities proposed in this document may be applicable to the malaria post-elimination context.

Annex 6. A System-wide Approach to Analysing Efficiency across Health Programmes


A new WHO headquarters document that presents the steps for analysing cross-programme efficiencies with some guiding questions for analysis of different elements such as stakeholders, service delivery, financing, human resources, medicines, governance and policy development options. Although quite theoretical, the document provides a useful framework for analysis and for the development of a business plan.
Annex 7. Guidelines for establishing an independent national malaria elimination advisory committee

The new WHO Framework for Malaria Elimination calls for establishing independent national malaria advisory committees in malaria-eliminating countries (MECs). The purpose of these committees is to provide an external view of progress and gaps in malaria elimination programmes, assist in adapting WHO guidance to the national context, and review malaria trends and progress towards elimination.

The committee should be independent from the national malaria programme to provide a frank and open review of the programme’s activities, strengths and weaknesses. Several countries that have established such or similar committees have benefitted from retired academic or government malaria experts as committee chairpersons.

During the inaugural global forum of countries that have the potential to eliminate malaria by 2020 (the E-2020 countries) that was held in Geneva from 16 to 17 March 2017, many countries reported having established similar bodies; however, most committees are not fully operational. The purpose of this document is to provide generic terms of reference that national programmes can use to develop their own terms of reference and related operating procedures.

1. Terms of reference for the independent national malaria elimination committee

- Advise the national malaria programme on implementation of the National Strategic Plan for malaria elimination.
- Monitor progress towards elimination.
- Provide assistance in adapting WHO guidelines and policies.
- Identify bottlenecks towards elimination, develop potential responses to address these issues, and evaluate bottleneck resolution.
- Support the national malaria programme in the preparation of the national elimination report to be submitted to the WHO Malaria Elimination Certification Panel (CEP).
- Advise the national programme on the plan to prevent re-establishment of malaria transmission.
- Form ad hoc thematic working groups, e.g. surveillance, case management and vector control (depending on country needs).

Subnational verification of malaria elimination is an option for large countries that have achieved interruption of local transmission in certain parts of their territory (states, regions or provinces). The subnational verification is managed by the national health authorities of the country concerned; WHO will only be involved in national certification. The independent national malaria elimination advisory committee should monitor and verify the work of the national programme in subnational elimination and help document verification of elimination (where relevant).
2. Composition of the committee

The committee should be independent from the national malaria programme and could comprise the following types of members:

- retired academic or government malaria experts;
- health system specialists;
- experts from other vector borne diseases;
- representative/s from academia;
- representative/s from research institutions;
- representative/s from private sector; and
- experts from information, health education or communication for behaviour change.

WHO could be included as a technical partner, while other aid agencies, other technical partners, donors and INGO/NGO could serve as observers.

Countries should identify a process for appointing members to the committee, as well as the length of their tenure. Consideration should also be given to inviting relevant government personnel from other parts of the government and representatives from other agencies to serve as observers and/or to make specific presentations to the committee.

3. Meeting procedures

The committee should meet on a regular basis as determined by country needs and resources. The secretariat (i.e. the national programme) should develop and circulate the agenda of the meeting in advance. Additional relevant partners will be invited depending on the agenda of the meeting. The secretariat should produce concrete recommendations and action items, all to be made publicly available on the Ministry of Health website.
Annex 8. Outcomes from insecticide resistance monitoring for \textit{Anopheles spp.} in Viet Nam

Summary table of outcomes from insecticide resistance monitoring for \textit{Anopheles spp.} in Viet Nam by standard WHO susceptibility tests, 2010–2016. Blue shading indicates where resistance has been confirmed (i.e. minimum mosquito mortality < 90%).

<table>
<thead>
<tr>
<th>Insecticide class</th>
<th>Vector species</th>
<th>Number of sites tested</th>
<th>% mosquito mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Pyrethroids(^a)</td>
<td>\textit{An. aconitus}</td>
<td>13</td>
<td>97%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. annularis}</td>
<td>2</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. dirus s.l.}</td>
<td>7</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. epiroticus}</td>
<td>11</td>
<td>81%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. jamesii}</td>
<td>2</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. jeyporiensis}</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. kochi}</td>
<td>12</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. maculatus s.l.}</td>
<td>10</td>
<td>97%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. minimus s.l.}</td>
<td>20</td>
<td>97%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. nimpe}</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. nivipes}</td>
<td>4</td>
<td>96%</td>
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<td></td>
<td>\textit{An. philippinensis}</td>
<td>32</td>
<td>96%</td>
</tr>
<tr>
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<td>\textit{An. sinensis s.l.}</td>
<td>7</td>
<td>53%</td>
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<td></td>
<td>\textit{An. splendidus}</td>
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<td>99%</td>
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<tr>
<td></td>
<td>\textit{An. subpictus s.l.}</td>
<td>2</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. tessellatus}</td>
<td>9</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td>\textit{An. vagus}</td>
<td>4</td>
<td>63%</td>
</tr>
<tr>
<td>Organochlorine(^b)</td>
<td>\textit{An. minimus s.l.}</td>
<td>1</td>
<td>100%</td>
</tr>
</tbody>
</table>

\(^a\) Lambda-cyhalothrin 0.05%, alpha-cypermethrin 0.05%, deltamethrin 0.05%

\(^b\) Dichlorodiphenyltrichloroethane (DDT) 4.0%