National Malaria Programme Review 2019
Kingdom of Cambodia

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FOREWORD

From 01 to 18 July the Cambodia National Centre for Parasitology, Entomology and Malaria control (CNM) together with a team from the World Health Organization (WHO) and other partners undertook a joint Malaria Programme Review (MPR). The review is a tool that assists countries to assess both the performance of the programme and the underlying health systems. The entry point for informing this MPR is the Malaria Elimination Action Framework (MEAF) 2016-2020. Independent experts conducted desk reviews, field visits, consultations and data analysis to undertake a comprehensive assessment of the country's programme performance against the MEAF.This report summarizes the findings from the 2019 MPR together with recommendations from national and international experts in malaria control and elimination.

Cambodia has made impressive progress in malaria control and elimination during the period under review and is on track to meet its vision of a Cambodia free of all forms of malaria by 2025 and the interim target of eliminating *Plasmodium falciparum* (*P. falciparum*) within two years. The strong and continued commitment and substantial investments of the Government of Cambodia and programme partners has made this possible.

There are, however, challenges remaining if the vision is to be achieved. *P. falciparum* is now at historically low levels and is primary confined to difficult to reach forest areas, which will require innovative, targeted expansion of outreach services to forest goers and mobile migrant populations (MMP) at risk. *P. vivax* is now the dominant malaria species and will require the rollout of primaquine as a radical cure to eliminate the dormant liver stage malaria parasites from the 80 percent of all *P. vivax* cases that are thought to be due to relapse. The threat of artemisinin combination therapy (ACT) resistant malaria requires the country to remain vigilant and sustain strong surveillance to detect, rapidly investigate and respond to all malaria cases including follow-up to detect possible resistance and treatment failure.

Given the findings and recommendations of this report, all relevant stakeholders are all urged to support the intensification of programme interventions to reach all forest goers and MMPs in order to achieve elimination of *P. falciparum* within two years and to rollout the radical cure for *P. vivax* malaria nationwide as a necessary prerequisite to eventually eliminating all forms of malaria in Cambodia by 2025. The CNM and WHO have collaborated closely for many years in fighting malaria. Together with all partners and stakeholders we can eliminate malaria in Cambodia for good.

Dr. HUY REKOL
Director, CNM

ABBREVATIONS

ABER	Annual Blood Examination Rate
ACT	Artemisinin-based Combination Therapy
API	Annual Parasite Incidence
APLMA	Asia Pacific Leaders Malaria Alliance
APMEN	Asia Pacific Malaria Elimination Network
AS-AQ	Artesunate-amodiaquine
AS-MQ	Artesunate-mefloquine
BCC	Behaviour Change Communication
BMGF	Bill & Melinda Gates Foundation
CARE	Cooperative for Assistance and Care Everywhere
CCC	Country Coordinating Committee
CHAI	Clinton Health Access Initiative
CNM	National Centre for Parasitology, Entomology and Malaria control
CMEP	Cambodia Malaria Elimination Project
CMS	Central Medical Stores
CRS	Catholic Relief Services
CSO	Civil Society Organization
DHA-PPQ	Dihydroartemisinin-piperaquine
GF	The Global Fund to fight AIDS, Tuberculosis and Malaria
GMS	Greater Mekong Sub-region
G6PD	Glucose 6-phosphate dehydrogenase
HC	Health Centre
HF	Health Facility (includes HC, HP, RH, FDH)
HMIS	Health Management Information System
HP	Health Post
IEC	Information, education and communication
IRS	Indoor residual spraying
ITN	Insecticide treated net
LLIHN	Long lasting insecticide-treated hammock net
LLIN	Long lasting insecticide-treated bed net
LMIS	Logistics Management Information System

MEAF	Malaria Elimination Action Framework
NMCP	National Malaria Control Programme
MIS	Malaria Information System
MMP	Mobile and Migrant Population
MMW	Mobile Malaria Worker
MOH	Ministry of Health
MPR	Malaria Programme Review
MTR	Mid-Term Review
M&E	Monitoring and Evaluation
NSP	National Strategic Plan
OD	Operational District
ODMS	Operational District Malaria Supervisor
P. falciparum	Plasmodium falciparum
P. vivax	Plasmodium vivax
PFD	Partners for Development
PHD	Provincial Health Department
PMI	Presidents Malaria Initiative
PMS	Provincial Malaria Supervisor
PPM	Public-Private Mix
PSK	Population Services Khmer
PSM	Procurement and Supply Chain Management
RAI	Regional Artemisinin Initiative
RDT	Rapid Diagnostic Test
RH	Referral Hospital
SR	Sub-Recipient
UNOPS	United Nations Office for Project Services
URC	University Research Council
USAID	United States Agency for International Development
VMW	Village Malaria Worker
WHO	World Health Organization
WPRO	Western Pacific Regional Office (WHO)

EXECUTIVE SUMMARY

This report covers the findings of a month-long review of Cambodia's malaria programming conducted in August 2019. This covered a desk review, consultative meetings with governmental and non-governmental representative and field visits to 4 provinces. These findings were then presented at a review workshop in September 2019.

Firstly, the review notes that there has been successful sustained response to the significant increase in malaria transmission in 2016. The substantial drop in cases coincides with the implementation of the country's Malaria Intensification Plan. Key pillars of this plan include strengthened surveillance and more aggressive interventions for forest goers and migratory populations.

For the first time, in 2018, no malaria-related deaths were reported. In the first half of 2019, the number of cases decreased by 26% compared to the same period in 2018. The country has reported a rapid decline in *P. falciparum* cases. From January to June 2019, the number of *P. falciparum* cases fell by 76% compared to the corresponding period in 2018. Cambodia is now presented with a unique opportunity to reach its ambitious national target of *P. falciparum* elimination by 2020.
Secondly, the review notes that the Malaria Intensification Plan's implementation in high burden areas has brought about greater partner coordination. The plan is currently implemented with six civil society organizations. In 2018 the intensification plan was developed to specifically address seven high burden provinces throughout the country. Since the beginning of 2019, there has been a significant increase in contacts with forest goers, improving their access to both prevention, diagnosis and treatment.

The review also highlights the successful re-activation of village malaria worker (VMW) networks to increase access to diagnosis and treatment. As part of the response to the significant increase in malaria experienced by the country in 2017, the village and mobile malaria network has been re-established with a total of 4,740 VMWs operating in 2,850 villages at the end of 2018. This is a very successful model given that most malaria is now confined to forest areas and requires increased outreach efforts to reach these populations.

The review finds that Cambodia now has case-based data down to the village level. With changes and improvements to reporting forms down to village level, the programme is now in a stronger position to be able to understand the epidemiology of malaria at sub-national and Operational District (OD) level. Individual cases are now being recorded and reported within the electronic Malaria Information System (MIS) – a necessary prerequisite for implementing highly targeted elimination activities. We are seeing case investigation successfully deployed and expanding to new areas.

Finally, there have been well targeted mass campaigns for long lasting insecticide-treated hammock nets (LLHIN) and long-lasting insecticide-treated bed nets (LLIN) in high-risk villages. In 2018 there was a mass distribution of just over 1.5 million LLIN's and LLIHN's to the static population in high-risk areas, and a further 140,000 to the mobile migrant population.

The review also notes a number of pertinent challenges which need to be addressed in order to achieve *P. falciparum* elimination by 2023.

Although *P. falciparum* malaria has been substantially reduced over time, malaria infections are occurring primarily amongst the MMPs and forest goers. These are hard to reach populations

because of their mobility and remoteness from main transport routes. Costs associated with delivering services to them are high because they generally move in small, isolated groups. Some good work has already been done on mapping these populations, but still more needs to be done.

With the decline in *P. falciparum* cases, there have been a high numbers of *P. vivax* cases. The majority of these cases are likely to be relapses and there is no treatment being offered yet in the country. In order to properly treat these cases one must first test for a glucose 6-phosphate dehydrogenase (G6DP) deficiency in order to prevent severe side effects of treatment.

A major challenge for the programme is that Cambodia does not have sufficiently efficacious prevention tools for forest goers. Current vector control tools such as LLINs and LLIHNs have limited application for forest goers where transmission is happening given that they work during the night. Alternative personal prevention tools such as repellent are being provided in forest packs and distributed in some areas but has not been fully rolled out.

The review also notes that technical capacity needs to be enhanced in order to achieve elimination, both at national and sub-national level. Supply management is a particular challenge moving forward. Procurement processes need to align better to the new epidemiological patterns emerging as the country moves towards elimination. Lastly, policy changes, particularly in the context of changing first line treatment need to be more efficient.

In consideration of these points we highlight a selection of recommendations which are part of a larger group that are included in this review:

- Cambodia needs to push ahead with eliminating *P. falciparum* malaria in order to mitigate the risk of drug resistance. With current *P. falciparum* levels being very low, Cambodia has a unique opportunity to push Annual Parasite Incidence (API) to less than 1 / 1000 across the country.

- The country needs to maintain adequate stocks of malaria commodities at all levels. In order to have an effective program to eliminate *P. falciparum*, supplies of drugs and diagnostics need to be available at all times down to the periphery including forest outreach areas. It is recommended to pursue improvements in collaboration and coordination between the National Centre for Parasitology, Entomology and Malaria control (CNM) and Central Medical Stores (CMS) in order to have a more responsive procurement and supply management system that better reflects the epidemiological changes across the country, and the intensified efforts to scale up testing. Consumption based forecasting will not work well in an elimination setting.

- The CNM needs to properly equip human resources to fulfil their role in providing technical, managerial and implementation oversight of the program and to monitor and respond to outbreaks. It is recommended that an assessment us undertaken to determine what the real capacity needs are for the programme, and then to ensure that the capacities, skills and necessary equipment is available within the programme.

- A conducive policy environment needs to be created to support elimination. Policies need to be adapted and updated to better align to and support the move towards elimination. While at the central level, there is adequate capacity and technical assistance to draft policy, there is an opportunity to speed up the approval and endorsement of policies so that they can be rolled out in a timely manner.

- Finally, we need to acknowledge the importance of targeting and reaching the forest goers with the whole package of interventions to prevent and treat malaria. Over 90 percent of all infections are now occurring in the forest, well away from health centres. Mobile and Migrant Population's (MMPs) have shown some reluctance to visit health centres when ill due to their migrant status. We need to help both facilities and the target population change this mindset, and encourage positive health seeking behaviour.

If fully implemented, the recommendations listed in this report will make the most significant difference to Cambodia in terms of moving towards the long-term goal of a country free of malaria.

1 . INTRODUCTION

Photo Credit: WHO/Vlad Sokhin

1. INTRODUCTION

1.1 Objectives of the review

The general objective of the Malaria Programme Review (MPR) was to evaluate the progress made for the period 2016-2018 of Malaria Elimination Action Framework (MEAF) 2016-2020 implementation and refine strategic intervention for the remaining period and use as strategic information for developing a new National Strategic Plan (NSP) 2021-2025.

The specific objectives of the MPR were to:

- Assess the progress of the national malaria control programme towards the epidemiological impact targets of the MEAF during the period under review;

- Review the attainment of programme outcome targets during the period under review;

- Review the level of financing of the national malaria programme during the period under review;

- Review the capacity of the national malaria control programme to implement planned activities during the period under review;

- Make recommendations towards achieving the goals and objectives of the MEAF including mitigation of possible risks; and

- Provide strategic advice for the development of next 2021-2025 strategic plan.

1.2 Methodology

The review methodology was developed collaboratively between the CNM and WHO. Logistics and administration support in the lead up to and throughout the review was organized by WHO as was the development of field work protocols. The review comprised of collection and review of all key documents, data analysis, semi structured interviews with informants, site visits, personal observations and workshops to validate findings and agree on recommendations. Expertise amongst the external reviewers included health systems and programme management, planning, surveillance, epidemiology, malariology, vector control, health financing and other fields. A list of the reviewers can be found on page ii and terms of reference detailed in Annex 1.

The review commenced with a desk-based collation and summarization of all reports, surveys and epidemiological data covering the MPR period (2016 to 2018) by WHO malaria technical officers during June 2019. The desk reviews were then presented at the commencement of an internal review meeting held between 1 to 5 July 2019 to stimulate and frame discussion amongst the meeting participants. Government, civil society organizations (CSOs), technical agencies and development partners participated in the meeting.

The internal review meeting was structured around five thematic areas[1], each representing one objective of the MEAF. Each objective was discussed in detail by the meeting participants by MEAF strategic focus with the outcomes being captured during the internal review meeting.

The outcomes were then independently validated and expanded on during field visits to provinces and at national level by members of the external evaluation team during the week of 8 to 11 July. Four representative provinces were selected, 2 high burden provinces (Mondolkiri and Kampong Speu) and 2 elimination provinces (Battambang and Kampong Chhnang), circled red and green respectively in Figure 1. Representatives from CNM, WHO, the Global Fund to fight AIDS, Tuberculosis and Malaria (GF), the United Nations Office for Project Services (UNOPS), United States Agency for International Development (USAID), Clinton Health Access Initiative (CHAI) and CSOs participated during the field visits.

Figure 1: Provinces targeted for field visits

At the conclusion of the field visits, the external evaluation team reconvened in Phnom Penh to share and review high-level findings and recommendations, and to identify themes that were common across all locations visited. This was then used to fine-tune the agenda for the MPR Review Workshop the following week.

An MPR workshop was held 15 to 18 July 2019 and was attended by a total of 90 participants[2]. The purpose of the workshop was to reach consensus on the achievements of the national malaria programme against the 2016-2020 MEAF and agree on the recommendations based on the external analysis of the findings from the field visits and the validated internal desk review for subsequent inclusion in the MPR; and to prepare for debriefing with senior Ministry of Health (MOH) management and stakeholders.

Following the opening sessions of the workshop, the scene was set through presentations and discussions on the epidemiological and entomological impact analysis and validation of performance

[1] Programme management, case management, vector control, surveillance and IEC/BCC
[2] List of participants is shown in Annex 2 and a copy of the agenda in Annex 3

and recommendations under each of the five MEAF objectives building on the combined results of both the internal workshop and the external validation field visits.

The participants considered the current landscape for supporting malaria control and elimination through a series of presentations covering capacity to implement, financing landscape and the Greater Mekong Sub-Region (GMS) context for malaria elimination. The workshop concluded with group work to elaborate and reach consensus on key recommendations for achieving the MEAF 2020 goal. This was followed by a panel discussion on strategic considerations for the development of the next NSP 2021-2025.

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The high-level findings, challenges and recommendations were captured in the closing summary of workshop outcomes given by the Chief of Technical Bureau, Malaria Program Manager from CNM to participants including H.E Dr Hok Kim Cheng, Director General for Health, MOH, Cambodia.

The initial MPR report was drafted by a WHO contracted external consultant with input from the evaluation team, and this was then circulated to stakeholders for comment and correction. Taking into consideration the feedback received, a final report including annexes was prepared for subsequent formal presentation to the Government of Cambodia by WHO.

All reasonable precautions have been taken to ensure that the terminology used in this report is consistent with WHO Malaria Terminology (the Global Malaria Programme, updated 2018).

2. BRIEF COUNTRY PROFILE

Photo Credit: WHO/Vlad Sokhin

2. BRIEF COUNTRY PROFILE

2.1 Socio-political System

Cambodia is divided into 24 provinces and one municipality (Phnom Penh). Each province is divided into districts (srok) and each district into communes (khum).

Cambodia is a multi-party democracy under a constitutional monarchy ruled by the Prime Minister (who is head of government) and the King (who is head of state).

2.2 Demographics

Cambodia's total population is estimated at 15.64 million people[3] (2018) with an average growth rate of 1.3% (2013-2017). The current median age of the population is 25.3 years. The demographics of the country are much influenced by the civil war and later internal conflicts. The country has a population density of 86 persons per km². Over 76 percent of the total population live in rural areas.

2.3 Socio-economic Context

With an annual growth rate for Gross Domestic Product (GDP) in 2018 at 7.3%, Cambodia has the highest GDP growth of all countries in the GMS. Cambodia recently graduated to a lower middle-income country after it attained the status in 2015 when its gross national income (GNI) per capita reached US$1,070. By 2017, GNI had increased to US$1,230. Despite strong economic growth over the past decade, 14% of the population continued to live under the national poverty line in 2017.

[3] Asian Development Bank Basic 2019 Statistics: Economic Research and Regional Cooperation Department.

3. OVERVIEW OF MALARIA IN CAMBODIA

Photo Credit: WHO/Vlad Sokhin

3. OVERVIEW OF MALARIA IN CAMBODIA

3.1 Health system

The Cambodia MOH has the lead role for health system planning and development, in partnership with development agencies. Government health services are delivered through 24 Provincial Health Departments (PHD) and one municipality health department, comprising 101 Operational Districts (ODs). Each PHD has a provincial hospital and governs ODs. Each OD covers a population of 100,000 to 200,000 people and has a Referral Hospital (RH) and several health centres (HCs). HCs provide a package of preventive and basic curative services and are the first point of contact and act as gatekeepers to higher levels of care. Referral hospitals provide outpatient care, inpatient treatment for referred cases and services such as X-ray, ultrasound, laboratory and rehabilitation.

The Government of Cambodia is committed to moving towards universal health coverage. Across the country, the main health infrastructure and staff is funded through government funding and delivers a subsidized package of care across preventive, primary and curative care. Total health expenditure per capita has increased by more than 250 percent in the past decade and a half in line with consistently strong economic growth. General government health expenditure as a percentage of GDP has increased modestly, while government expenditure on health as a percentage of general government expenditure has declined from a high of 9.86 percent in 2005 to 6.58 percent in 2015 (Table 1). Private providers consume most health expenditures.

Table 1: Health expenditure per capita

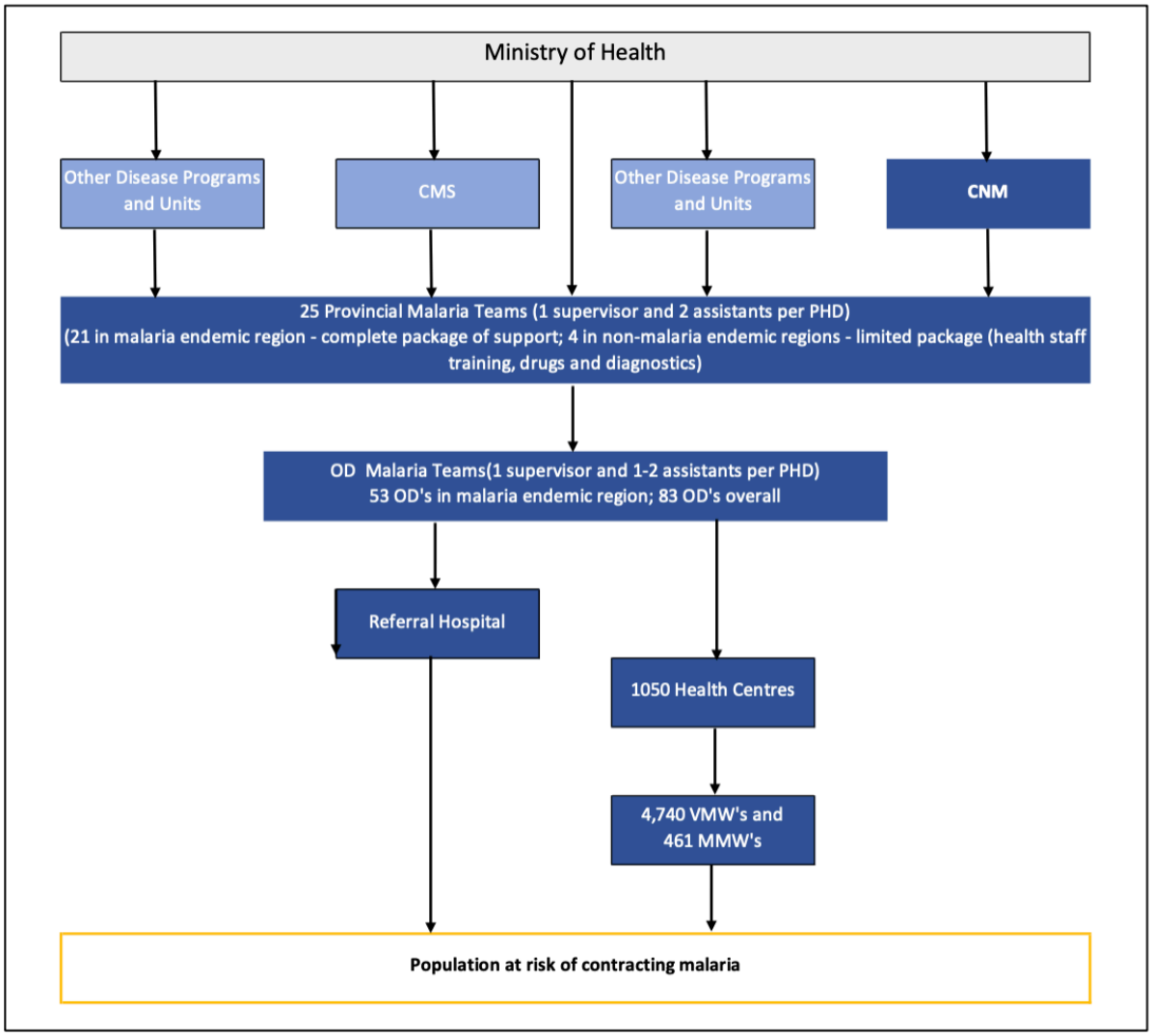
Data variable*	2000	2005	2010	2015
Current health expenditure per capita (current US$)	$19.74	$32.50	$54.30	$72.05
Domestic general govt health expenditure (% of GDP)	1.29	1.22	1.36	1.34
Current health expenditure (% of GDP)	6.54	6.85	6.91	6.17
Domestic general govt health expenditure (% of general government expenditure)	8.59	9.86	6.85	6.58
External health expenditure (% of health expenditure)	2.23	14.48	13.90	20.36
Out-of-pocket expenditure (% of health expenditure)	68.68	60.94	51.91	57.33

*Data extract from World Development Indicators database

The Ministry of Health and National Disease Programs have scaled up community systems for health including the establishment of village health support groups (VHSGs), HC management committees and community-based prevention and treatment support for TB and HIV. Programmes also employ village malaria workers (VMWs) and mobile malaria workers (MMWs) to expand early diagnosis and treatment; village health volunteers (VHVs) and VHSGs implement education programs.

Responsibility for control of malaria rests with the CNM, a specialized institution set up by the MOH, to function as the national level nodal department responsible for the control and elimination of vector borne and parasitic diseases. The structure of the National Malaria Program (NMP) within the MOH is shown in Figure 2.

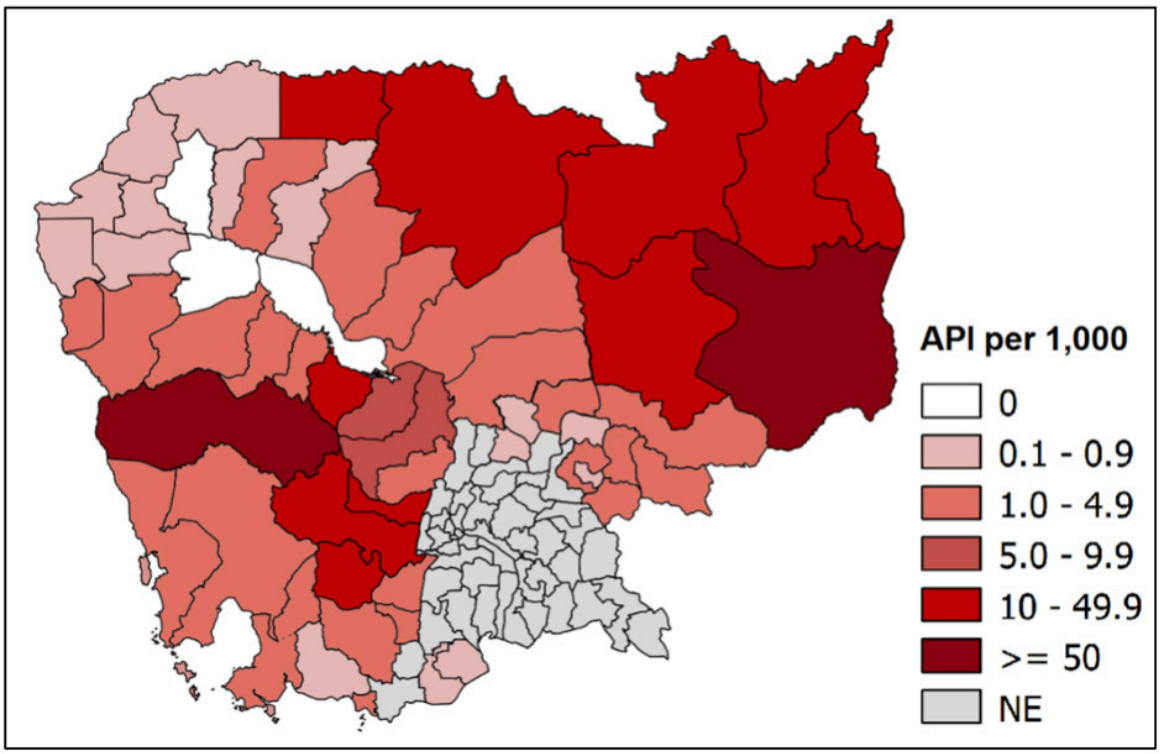
Figure 2: Structure of the National Malaria Programme within the Ministry of Health



3.2 Basic epidemiology of malaria in Cambodia

Malaria is endemic in 21 of the 25 provinces. Provinces in the southeast remain non-endemic. Transmission intensity varies significantly across different ecological zones. The highest rates of transmission are amongst static and mobile population groups living or traveling around the forest fringe or in the dense evergreen and semi-evergreen forest areas to the north and north east bordering Viet Nam and Lao PDR and in the deciduous forest areas in the west of the country bordering Thailand (Figure 3).

Figure 3: Annual parasite incidence by operational district, 2018



Twenty-five malaria vector species have been identified. Anopheles maclatus is present throughout the country while the highly efficient Anopheles dirus is present in the northeast. Anopheles dirus breeds in small collections of water in or near forested areas. Anopheles minumus is more prevalent in the west. Other vectors such An. barbirotrist, An. phillipinensis, An. vagus, and An. hyrcanus are also present throughout the country.

Deforestation has continued since the last MPR was carried out in 2012 with more land converted to farming; thus further shrinking the high-risk areas, which are now confined to the most difficult to access forest areas adjacent to the borders. Based on data from the Ministry of Environment, forest cover as a proportion of total land mass is around 45 percent as of 2016 (Figure 4 and Figure 5).

Figure 4: Change in forest cover 2006-2016

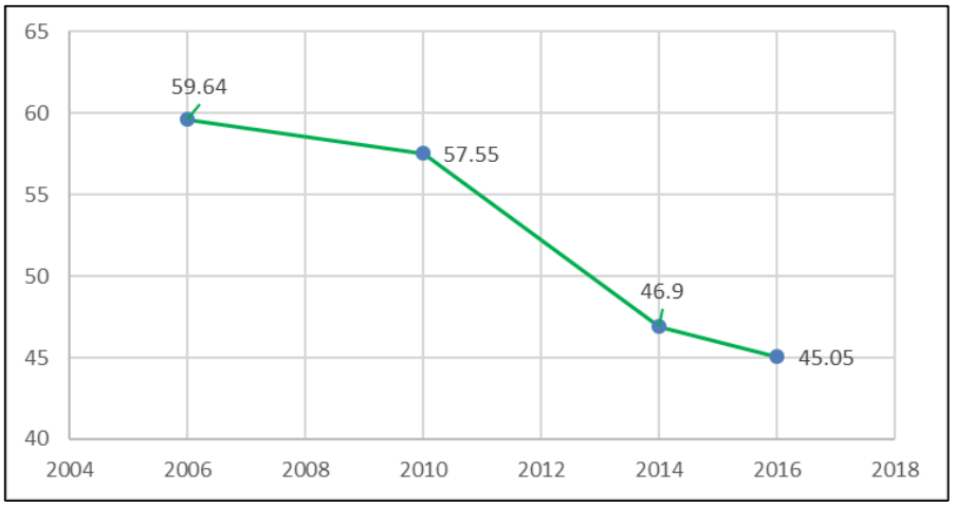
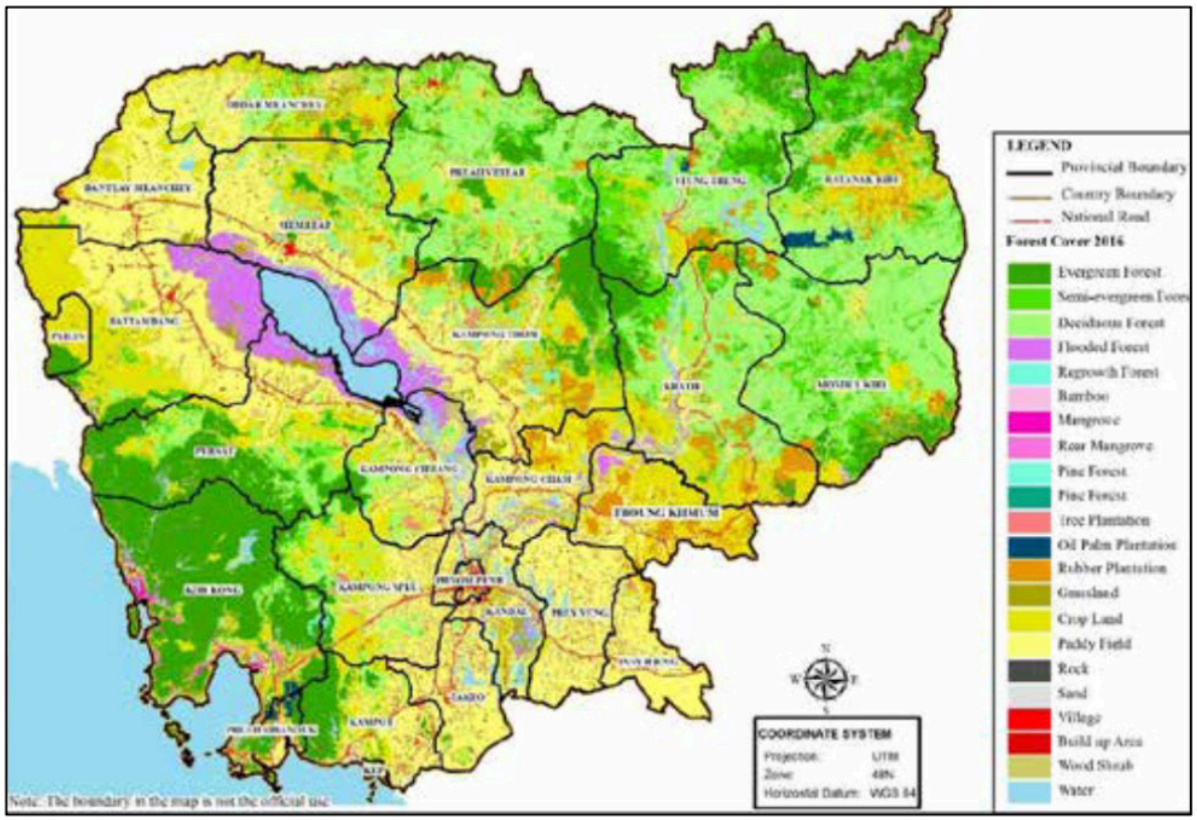


Figure 5: Map of forest cover, 2016



Malaria in Cambodia is principally a disease of adult males. More than 75 percent of all malaria cases occur amongst males aged between 15-49 years (Figure 6) and primarily among those that work in the forest collecting, farming, foraging and hunting. Despite deforestation, the forest still represents an important source of income for many Cambodians. Malaria transmission is seasonal with the highest number of cases occurring during the rainy season which lasts from June to November when the winds shift to the southwest monsoon (Figure 7).

Figure 6: Percentage of malaria cases by sex and age group, 2015-2019

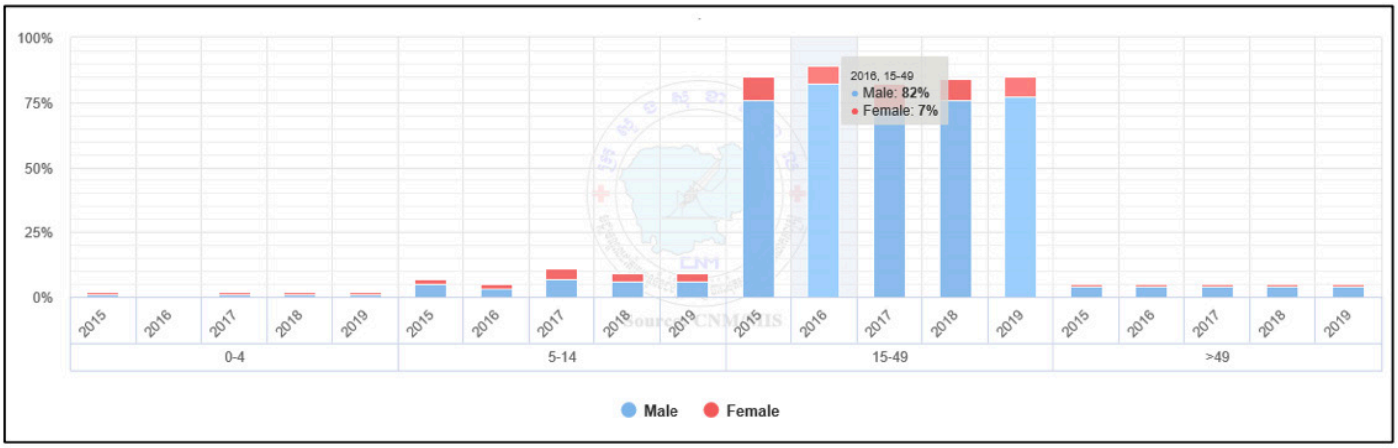
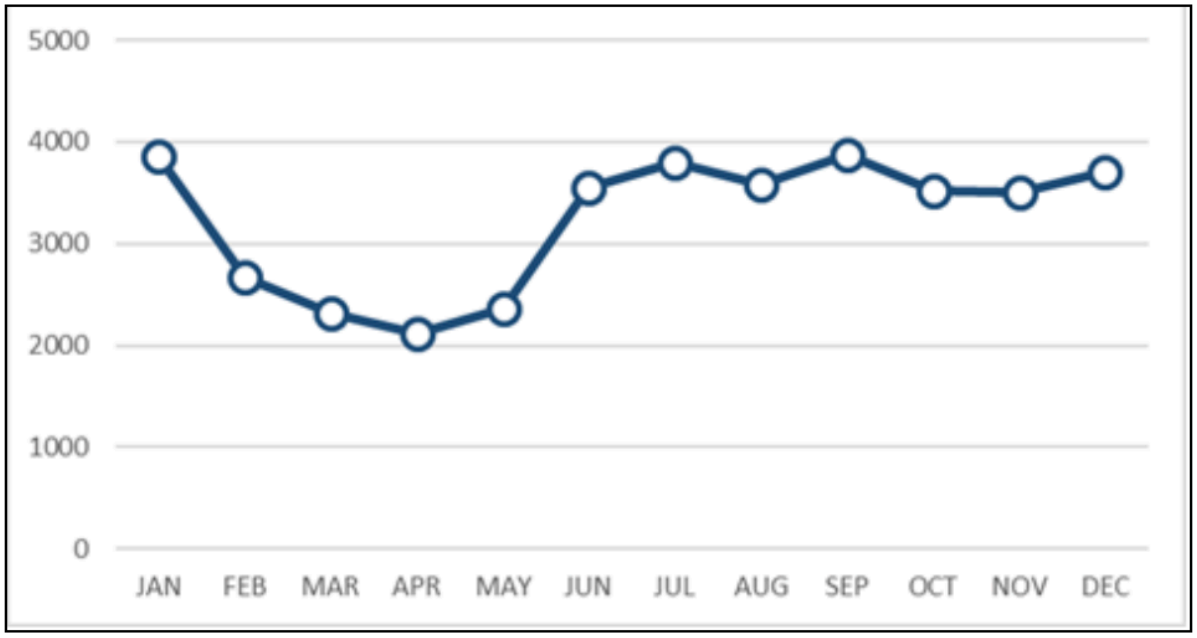


Figure 7: Mean monthly malaria cases, 2011-2015



3.3 National Malaria Programme

The National Malaria Programme's work has been guided by the National Strategic Plan (NSP) for Elimination of Malaria in the Kingdom of Cambodia, 2011-2025. This strategy was subsequently amended in response to changes in the country's epidemiological and programmatic context, while considering recommendations from the 2012 MPR and recent global and regional policy guidelines. The updated strategies are contained in the MEAF 2016-2020 which is now the framework that guides and directs the country's approach to malaria elimination.

Responsibility for the control and elimination of malaria rests with CNM which is divided into three bureaus that handle technical, financial and administrative aspects of the NMP. Deputy Directors provide technical oversight, financial planning, partner relations and project management. The NMP is the largest of the disease specific programmes managed by the technical bureau in CNM.

CNM has progressively evolved from a vertical programme to a more decentralized and integrated programme within the public health system. Responsibility for micro-planning of many activities has been devolved to staff at PHDs and ODs with dedicated provincial and OD malaria teams.

At the beginning of the period under review, the NMP was co-jointly implemented by CNM and up to 14 implementing partners, mostly CSOs, although by 2018 this had been streamlined to CNM plus eight implementing partners[4], six of whom are supported through the GF RAI2 grant. Additional details are contained in Section 5 on programme management.

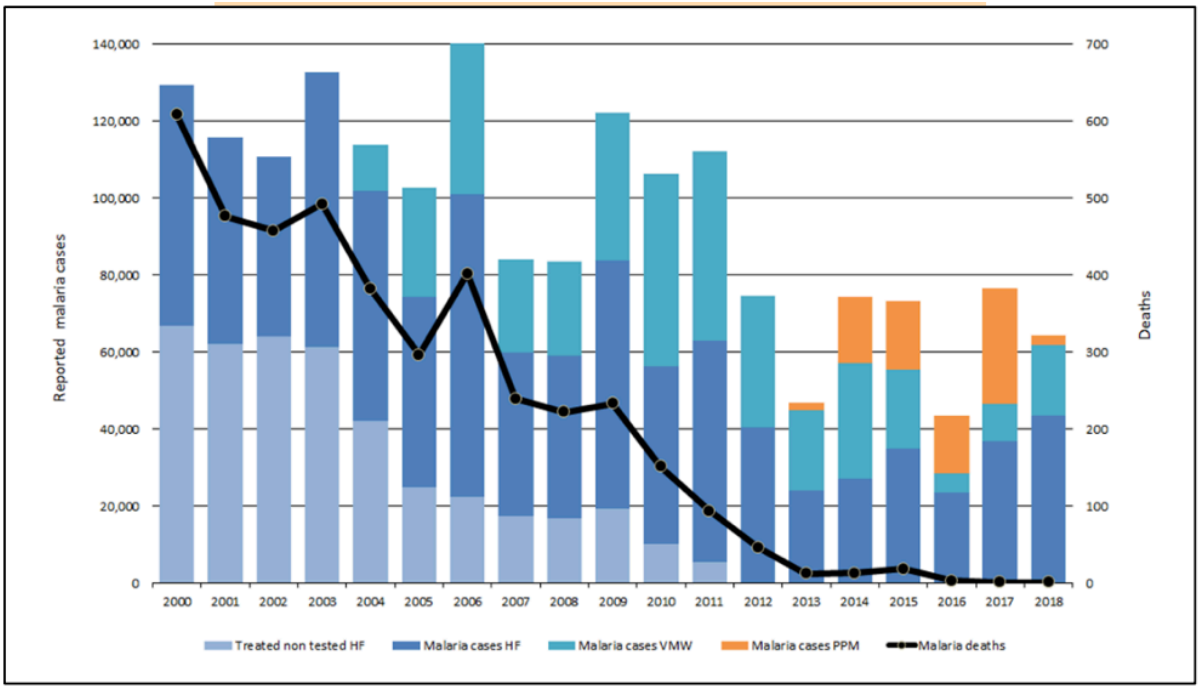
3.4 Progress in malaria control towards elimination

Cambodia has made substantial progress in diminishing the malaria burden since the beginning of the millennium, with a steady decline recorded in the reported number of malaria cases, both confirmed and clinically diagnosed. This can be attributed to the successes of the NMP and the increased coverage of malaria control interventions implemented through the NSP 2011-2025.

[4] Implementing partners are UNOPS (PR), PSI, WHO, CARE, CRS, HPA, URC - PMI and CHAI

The introduction of long-lasting insecticide treated bed nets (LLINs) and long-lasting insecticide treated hammock nets (LLIHNs), expansion of diagnostic services using sensitive rapid diagnostic tests (RDTs), the change to a more efficacious first line treatment and early diagnosis and treatment through an expanded VMW and MMW network have all contributed to a sustained reduction in both morbidity and mortality (Figure 8).

Figure 8: Reported malaria cases and deaths, 2000-2018



Leading interventions have had the most significant impact on *P. falciparum* in reducing incidence to such low levels that interruption of transmission has occurred in a number of provinces and elimination of *P. falciparum* is now a realistic objective for the country as a whole to achieve over the next two years. Currently 13 malaria-endemic ODs have an annual parasite incidence (API) <1 per 1,000 (2018).

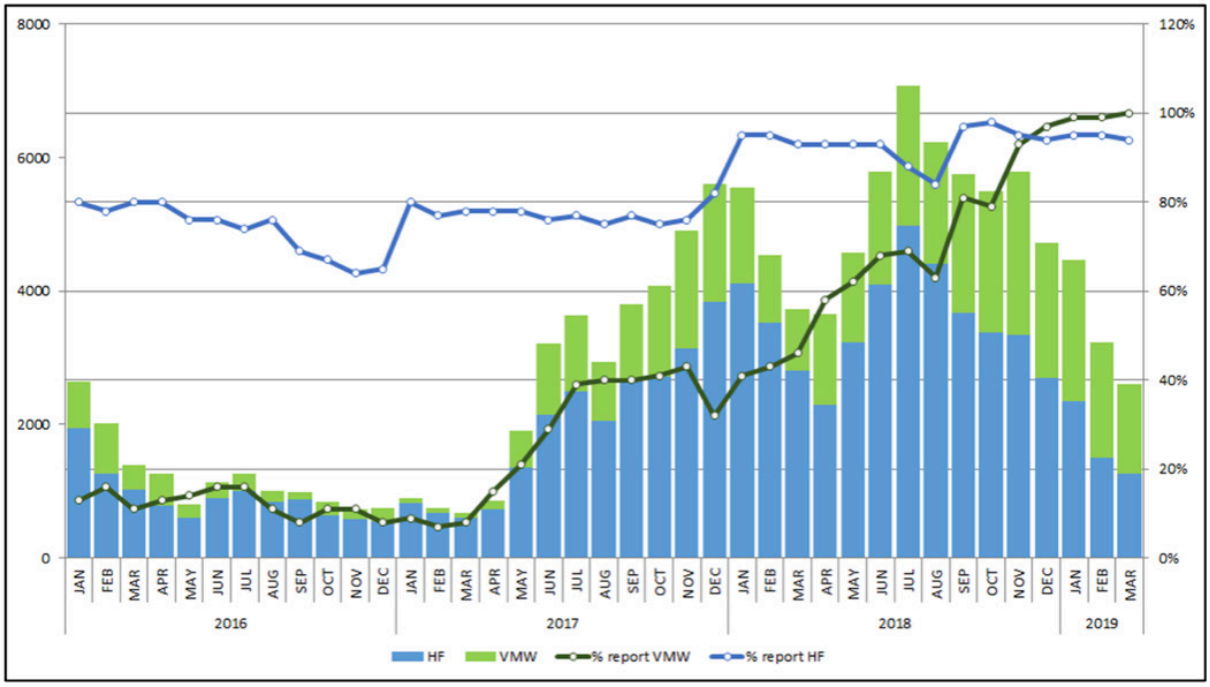
There is a high level of political commitment to eliminate all forms of malaria by 2025. The goal and objectives of the NSP 2011-2025 were endorsed by the Prime Minister of the Kingdom of Cambodia. In May 2015, together with neighbouring countries, Cambodia adopted the WHO Strategy for malaria elimination in the Greater Mekong Subregion 2015-2030 and more recently, Cambodia joined Health Ministers from other GMS countries and partners to pass a Ministerial Call for Action to eliminate malaria in GMS by 2030 at the 71st World Health Assembly at Geneva in May 2018.

The MEAF 2016-2020 was developed in 2015 by CNM through numerous consultations with malaria focal points from PHDs and ODs, other departments within the MOH, and technical, implementing and development partners. The MEAF outlines a stratified, phased approach to achieving zero deaths and the elimination of *P. falciparum* by 2020 as part of a longer-term goal of eliminating all malaria species by 2025.

Enhancements to the Malaria Information System (MIS) and reporting has resulted in 100 percent reporting completeness from the VMW network and close to 100 percent from HFs thus

providing a more complete picture of the burden of malaria, including a line listing of cases down to village level through an improved passive and active case detection network (Figure 9).

Figure 9: Malaria case reporting completeness, health facility and village malaria workers



3.5 Progress on drug resistance

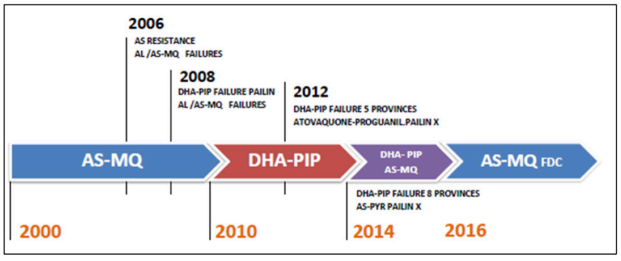
Therapeutic efficacy studies (TES) are ongoing in 5 sentinel sites to monitor drug resistance on first and second line ACTs. Drug resistance monitoring is also being done in collaboration with Mahidol-Oxford Reseach Unit (MORU), China, Korea, and other partners.

Cambodia changed its first line ACT from artesunate-mefloquine (AS-MQ) to dihydroartemisinin-piperaquine (DHA-PPQ) in 2010 in response to the high levels of treatment failures observed (to adapt to fast appearance of partner drug failure). In January 2014 the programme decided to shift back first line ACT to AS-MQ in the western part of the country due to documented failure of DHA-PPQ in 5 provinces, seen initially in western Cambodia and spreading to the rest of the country.

A number of TES undertaken in 2016 showed high treatment failure for the alternative ACT artesunate-amodiaquine (AS-AQ) at two sites (Mondolkiri and Pursat) and treatment failure for DHA-PPQ in the north eastern provinces of Stung Treng and Rattanakiri.

A consensus meeting in November 2016 decided on AS-MQ as first line treatment nationwide and to rollout a single low dose primaquine for *P. falciparum* and mixed species infections on the first day of treatment with AQ-MQ (Figure 10).

Figure 10: History of drug policy changes



In 2017, TES for AS-MQ in Kampong Speu, Stung Treng and Pursat provinces (N=54, 59 and 49 respectively) showed 100% adequate clinical and parasitological response (ACPR) and just one failure despite a day-3 positivity rate of up to 39% (Pursat). TES conducted in Rattanakiri and Mondolkiri (N=58 and 57 respectively) the same year using AS-PYR showed high efficacy (>95%), 3 recrudescence and a day-3 positivity rate of up to 47% (Rattanakiri).

The most recent TES conducted at the five sentinel sites in 2018 showed continued, very high efficacy of both AS-MQ and artesunate-pyrimethamine (AS-PYR or Pyramax) for treatment of *P. falciparum* and 100% efficacy for treatment of *P. vivax*.

There was an eighteen-month delay in rolling out AS-MQ as first line treatment nationwide due to late ordering and manufacturer delays. This plus the protracted approval process will need to be factored into any future changes to first line regimen

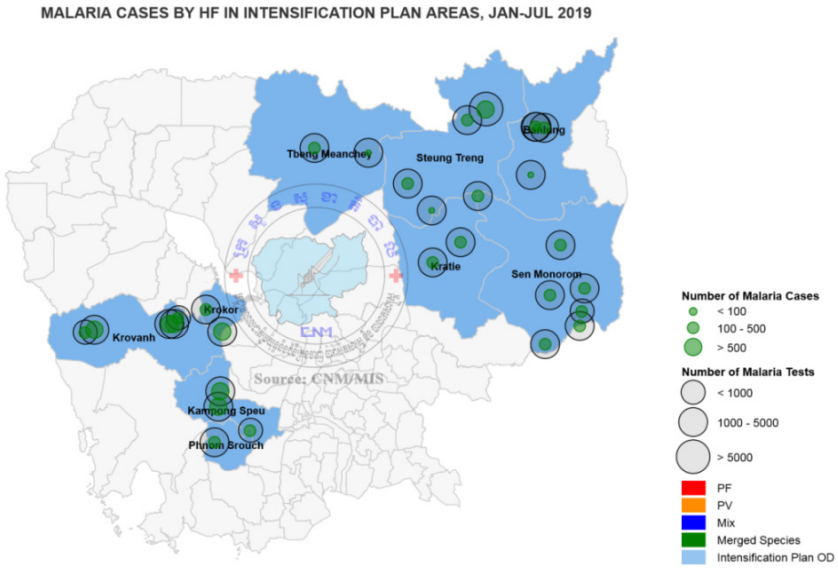
.

The country will need to remain vigilant to adequately respond to emerging drug resistance.

3.6 Focus on the malaria intensification plan

Following the increased malaria transmission in 2017-2018, the Cambodia National Center for Parasitology Entomology and Malaria Control (CNM) started an intensified response plan in October 2018 funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) for 12 months (October 2018 – September 2019). With a field epidemiological and technical support from WHO together with partner implementation efforts, CNM initiated the plan to reduce malaria transmission in the areas of the country with the highest malaria burden including Pursat, Ratanakiri, Mondolkiri, Kratie, Stung Treng, Preah Vihear and Kampong Speu. Within this target area, the intensification plan rationale was to increase malaria control intervention and supervision to high malaria burden areas (villages with high P.f incidence and forested high transmission areas) and populations at most risk of infection as forest goers (FG) and mobile migrant populations (MMPs). Primary interventions included strengthening of existing case management services, targeting long-lasting insecticide treated nets to ensure coverage in the highest risk villages, and expanding the mobile malaria worker (MMW) network to increase prevention among mobile and migrant forest-going populations. As shown in Figure 10, the catchment area included 30 Health Centers (average of 3 HCs per OD) across 10 ODs in 7 Provinces that accounted for over 75% of the country's case load, with a total of 120 MMWs (approximately 4 MMW villages per HC).

Figure 11: Operational Districts and Health Facilities selected for the intensification plan (October 2018 – September 2019)



The overall objectives of the intensification plan were to 1) strengthening programme coordination and ensure full implementation of malaria elimination action framework interventions:

- Provide national coordination and technical support to ODs

- Ensure access to early diagnosis and treatment including Single Low Dose Primaquine for P.falciparum cases

- Verify optimal coverage of vector control in the villages with high incidence

- Ensure access to early diagnosis and treatment to MMP

- Conduct VMW monthly meetings and ensure attendance by MMW, OD, and CSO

- Initiate OD data review after VMW/MMW monthly meetings

- Monitor and supervise HC and MMW performance

- Conduct monthly supervision trips by CNM to selected HCs

and 2) implementing more aggressive approaches to impact risk and deplete parasites reservoir in population with highest risk:

- Activate and maintain network of operational Mobile Malaria Workers (MMW) in worksites with high incidenc

- Determine high-transmission villages and conduct village selection and MMW recruitment (2 MMWs per site)

- Provide incentive for MMWs located in high-transmission villages (MMWs share a total of $40 per month). Selected MMWs have additional responsibilities such as longer hours of operation, conduct active case detection twice per month, distribution of forest packs and patient questionnaires, and conducting IEC/BCC messaging using speakers

- Procure speakers/recording for conducting IEC/BCC messages to forest goers

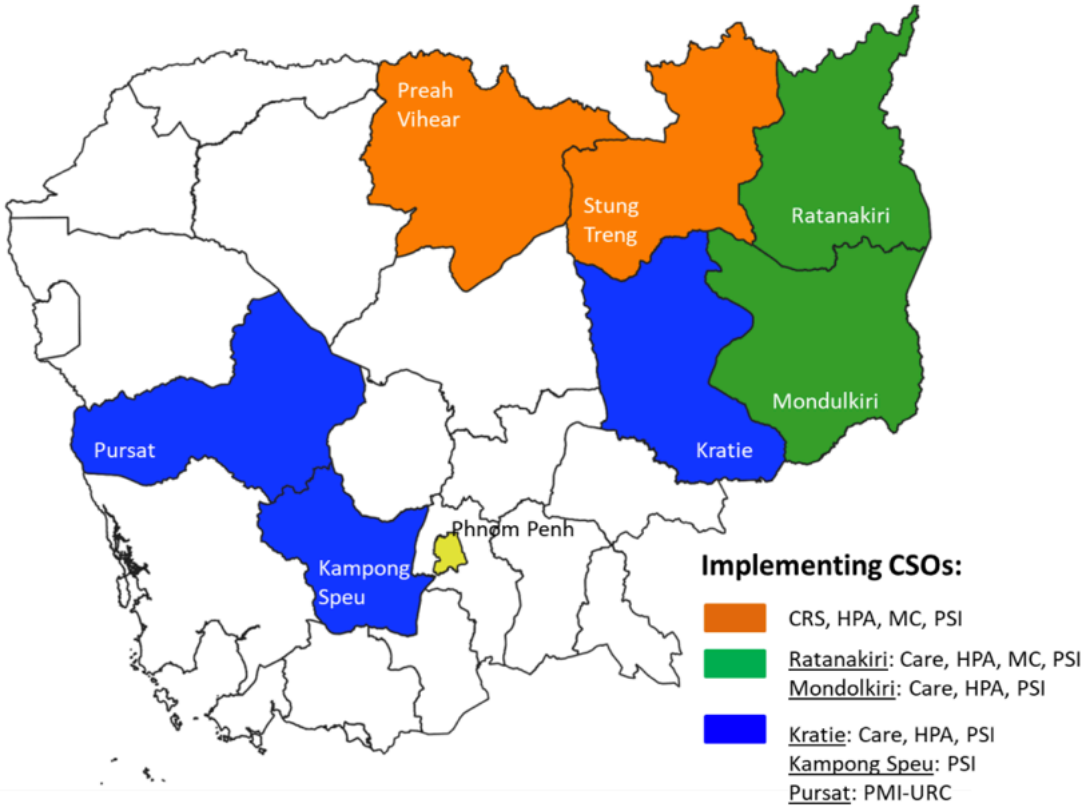
- MMWs distribute Forest Packs to forest goers. Forest packs included a backpack, IEC/BCC materials, hammock, boots, and LLIHN

- Conduct active case detection/screen & treat for MMPs in forested areas twice per month

A technical and programmatic support given at provincial level by CNM/WHO to strengthen the IP plan is being provided by 3 teams (CNM focal point and WHO epidemiologists). As shown in

Figure 11, one team support the northern provinces of Preah Vihear and Stung Treng, one team the north-eastern provinces of Ratanakiri and Mondolkiri and one team Kratie and Kampong Speu. One medical project manager, situated at Phnom Penh level coordinates their work and liaise with stakeholders at national level. They work hand in hand with PHD, OD and CSOs, providing support in surveillance, mapping, epidemiological analysis, supportive supervision, coordination and problem solving.

Figure 12: CNM/WHO provincial support to the intensification plan.



To date, the intensification plan has been extremely successful, with testing increasing by 101.5% from January – June 2019, and total cases decreasing by 39% during the same period. Furthermore, a 75% reduction in *P. falciparum* and mixed cases nationwide has been reported when comparing between the same months in 2018 and 2019. Positivity rates also decreased from 28% in January to 10% in June 2019.
The basic principle of the intensification plan was to accelerate Pf malaria elimination in high burden area by focusing the intensified response in the right places at the right time.

Malaria epidemiological analysis has shown that malaria epidemiology is heterogeneous, rapidly changing. In order to focus the malaria response (in the right place at the right time), implementers need access to regular epidemiological mapping and analysis and flexibility and agility to adapt coverage of interventions by continuously redeploying malaria services (ie: MMW, targeted distribution of LLIN and LLHIN to new MMPs, distribution of forest pack, intensified and adapted IEC to FG and MMP). Thanks to the MIS and the great improvement of the quality of the data recorded, MIS now contains the information needed to review monthly the Pf epidemiology per village of residence of cases or of residence of the VMW/MMW. Soon, real-time data entry on

cellular phones will be done by VMW/MMW. In addition, 3 WHO epidemiologists are now supporting at provincial level epidemiological mapping and analysis and each epidemiologist is paired with a CNM focal point.

In conclusion, criteria are now met to have access to a finer monthly epidemiological analysis at PHD/OD level to adapt continuously the focus of the intensified response.

Better synergy, more flexibility and agility and decentralization of operational decision making at provincial/OD level could benefit greatly to the effectiveness of the IP response. This could be implemented likewise:

- **Autonomy:** Establishment of monthly malaria operational meeting steered by WHO with all implementers involved in the malaria response at OD level. The main objectives of this meeting are to analyze the current epidemiology and to adapt the IP response accordingly (relocation of MMW, priority areas for outreaches, VC, IEC interventions. This forum has decision power to adapt level and areas of intensification within the whole province (redeployment of MMW and newly created village mobile malaria workers, number of days dedicated to active case detection of forest goers, while remaining within the budget allocated).

- **Synergy:** All partners at provincial/OD level consider their resources to be in the same pool and define regularly together during the OD monthly malaria operational meeting their best deployment according to the Pf epidemiology. This is especially the case in the provinces of Ratanakiri, Mondulkiri, Kratie, Stung Treng and Preah Vihear where there are up to 4 actors involved in outreach/active screening activities of forest goers (RAI2E recipient: CARE or CRS, HPA, MC, PSI)

- **Flexibility and agility:** UNOPS/GF/other funding agency provide a lumpsum budget for MMW activities for each province. For example, a province is allocated a credit of 1000 active case detection day (or MMW outreach days). The OD in collaboration with partners CSOs and WHO will decide where and when to use these MMW outreach days depending on the local epidemiology.

In addition, VMWs could be involved in one outreach activity per month. It could be considered that outreaches are triggered by Pf detection only and would focus on reactive case detection at the place of the presumed transmission area. This would allow to adapt their level of activity to the local epidemiology and to better target outreaches. The lumpsum budget would allow to adapt the response as the epidemiology evolves and to have a finer focus of active case detection towards hottest hotpots. In some areas, some VMMW/MMW would be put on stand by while in hotspots, more VMW or MMW would be needed for more active screening/outreaches day, eventually shifting to case investigation and reactive case detection or FSAT as Pf cases are getting lower (as it is already the case in Preah Vihear province for example).

Different implementing partners should not be assigned a fixed geographical area of intervention within an OD or province in order to allow them to reinforce each other's response in an area of particularly high number of Pf and join their forces when needed. In high Pf hot spot areas, reinforcement from MMW(s) in an area near an existing VMW (within 5 km radius) should be allowed when supported by the local epidemiology.

Case management: great improvements have been done on the understanding of the common case definition of a suspected malaria case as having one of the following symptoms: fever, chills, sweat and that staying in the forest is a risk factor. However the broader case definition (two of the following: headache, diarrhea, vomiting, nausea, travel to forest, living/working with malaria patient) is usually not followed at the health center levels. Malaria testing of cases responding to the broader case definition of malaria should be re-emphasized with the support of job-aids and guidelines already available at all levels. The number of mobile malaria workers has increased considerably over the past year. CSOs, supported by CNM and WHO, successfully established a network of 104 MMWs who tested 13,038 suspected cases through active and passive case management focused on forest goer populations. Most of the villages with the highest number of *P. falciparum* cases are covered by MMWs but some villages with a relative high number of *P. falciparum* cases remain uncovered. As per existing guidelines, MMWs were only established in villages without a VMW, despite the potential value of performing active case detection in forest areas close to these villages. Outreach activities have been supervised by WHO and CSOs during the past months. Site visited during outreach activities have been mapped by WHO, showing that MMWs generally visited the same sites. Continuous mapping of transmission hotspots and close guidance to MMWs on visited sites during outreach activities is recommended. In areas where *P. falciparum* incidence remains relatively high, there has been a clear benefit of the strategy, while in areas with less intense transmission the contribution of outreach activities has been limited. Abolishing MMWs in areas with few or no *P. falciparum* cases in favour to recruiting news ones in areas with higher number of *P. falciparum* would contribute to have a more aggressive approach compared with the current evenly distribution of MMWs, including those areas with very little transmission. In areas where *P. falciparum* incidence remains relatively high, there has been a clear benefit of the strategy, while in areas with less intense transmission the contribution of outreach activities have been limited to date, but MMWs have filled an important gap where VMWs were missing in remote and high transmission forested areas and settlements.A further recommendation includes allowing decision making at OD level (supported by WHO/CNM and CSO) regarding MMW modus operandi (active case detection during outreaches, at temporary screening stations...), type of provider (VMMW, MMW), type of activity (Passive case detection, active case detection of forest goers, in villages, at entry, exit points, in the forest...), frequency/intensity of activities based on epidemiology and seasonality. Lump sum budget allocated to OD based on Pf epidemiology in the OD for MMW activities.

Drug supply: issues related to insufficient stock of RDTs, ACTs and primaquine were observed in different OD and HCs and this remains an issue in some provinces. The problem is mainly linked to insufficient supplies received at OD from CMS. Coordination and communication between CMS and ODs has margin for improvements and clear guidance on method to estimate quarterly or monthly order quantities should be provided at OD and HC levels. Furthermore the usage of paediatric dosage remains a challenge. Current guidelines include a description of the use of paediatric doses of ASMQ, which is usually not available at VMWs/MMWs compelling HCs to make their own recommendations for treatment of children with malaria, which is not necessarily aligned with existing policies; some HCs recommend that VMWs/MMWs split ASMQ tablets, others requests VMWs/MMWs to refer children testing positive for malaria to the HC, which in many cases still have some doses of paediatric ASMQ on stock. It is essential that only the most recent guidelines and job-aids are available in the field to reduce the risk improper use.

Vector control: new settlements in forested areas, consisting of a small number of households, showed evidence of relatively high incidence of *P. falciparum* through data reported by MMWs. LLINs, LLHINs and forest packs have been distributed and further

and further rounds distributions are ongoing. However, delays have been observed during the distribution among levels. It is recommended to ensure distribution of forest packs to those forest goers working/living in high Pf incidence areas and not only in IP areas.

Surveillance: great progress in the accuracy of MIS data has been observed. However, some discrepancies have been found among paper based registries (consultation form, OPD, lab book, malaria book) and MIS reported data. Close supervision at the HC level is recommended to ensure high quality data entry in paper-based registries and MIS server. Furthermore, incompleteness of MMWs data on active versus passive case detection has been reported. It is recommended to ensure clear distinction between cases detected by active and passive case detection in order to perform further analysis on the assessment of the effectiveness and value of the MMW strategy.

IEC/BCC: While IEC/BCC messages were recorded and distributed on loudspeakers for MMWs to play in the forest, more effort is required to measure the impact of IEC/BCC activities and how they can be better targeted in the IP extension. Because of their bulkiness, loudspeakers are mainly kept home and not brought during outreach activities, smaller ones could be distributed to MMWs. Messages broadcasted have been translated in different languages to be understandable from a wide range of people. However, some messages are not correct creating disappointment among forest goers (one message announces that forest goers will receive paracetamol and a forest pack containing mosquito repellent, while paracetamol is not supplied to MMW and forest packs do not contain any mosquito repellent). A revision of the messages is recommended. Furthermore, training and close follow up of MMWs is recommended to strengthen messages transmitted to forest goers about free testing available at village levels (VMW and MMW) closest to forest sites and availability of forest packs at MMW house.

Coordination: the IP initiated a monthly data review and action cycle that brings together CNM and all implementing partners to monitor performance and plan critical actions together. Based on key indicators for number of tests and cases, provision of single low dose primaquine, supply availability, and MMW outreach visits, partners are encouraged to focus their technical support on the areas that need most attention. Through this mechanism all partners have transparency, accountability, and a shared vision of addressing the most critical and urgent issues. However, CSOs participation and involvement is questionable. it is encouraged to have each stakeholder i) sharing its own analysis of results and operational priorities for the following month, ii) use this forum to share and discuss issues met in the implementation of the IP and generate solutions, iii) define action points with timelines and responsible person and follow up their implementation, iv) create ad hoc time bound technical working groups to address certain issues and feedback at the following IP meeting. At the OD level, monthly operational meeting have been implemented since May in Kampong Speu, Phnom Sreuch and Kratie ODs and are planned for the other IP ODs facilitating problem resolutions at the OD level.

The intensification plan has proven to be a useful initiative to accelerate malaria elimination in hotspot areas and the encountered challenges are lessons learnt for future implementing activities.

4.REVIEW FINDINGS AND RECOMMENDATIONS: MALARIA ELIMINATION ACTION FRAMEWORK GOAL LEVEL

Photo Credit: UNOPS

4. REVIEW FINDINGS AND RECOMMENDATIONS: MEAF GOAL LEVEL

Summary finding:
The programme has successfully reduced *P. falciparum* to very low levels, with transmission now confined to forest fringe and forest areas.

Summary recommendation:
Cambodia should push ahead to eliminate *P. falciparum* within the next two years, maintaining intensified case-based surveillance, to mitigate the risk of multi-drug resistance to spread.

4.1 Impact

The 2020 goals of the MEAF are to:

- Reduce the incidence of malaria to less than 1 per 1000 in each operational district; and

- Eliminate *P. falciparum*

4.1.1 Annual Parasite Incidence for all species

Table 2: Annual parasite incidence for all species, 2016-2018

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
IP-2a	Annual Parasite Incidence: Number of confirmed malaria cases per 1,000 population ALL COUNTRY	4.0	3.2	2.4	1.6	<1	2.9	5	4.2

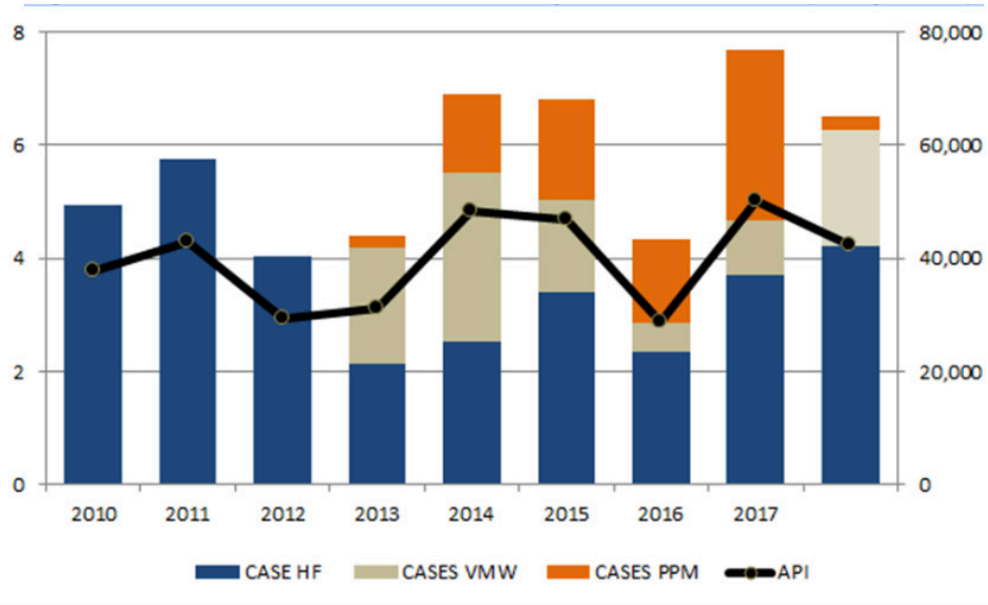
A recent peak in API of 5 per 1,000 population in 2017 (Table 2 and Figure 11) increased from 2.9 per 1,000 in 2016. This increase was primarily due to a spike in cases reported in three provinces in the west[5] and six provinces in the northeast[6]. The increase coincided with the interruption of several malaria control activities attributable in part to delayed implementation of the GF RAI grant, late change of first line ACT and low coverage and use of LLINs distributed in 2015.

The peak may be over-stated given that there was a likelihood that under-reporting of cases occurred due to reduced staffing in GF supported areas in 2016 and more recently, improved surveillance and roll out of MIS together with training on reporting from HFs. With improvements in surveillance, the periphery has also increased overall detection and reporting rates.

For the first six months of 2019, a total of 17,676 confirmed malaria cases (all species) were reported which is a 38 percent reduction compared to the same period in 2018 (Table 4). The decreasing trend is concomitent to overall improved early diagnosis and testing and interuption of reporting from private providers.

[5] Pursat, Kampong Speu, and Kampong Chhnang
[6] Stung Treng, Ratanakiri, Mondolkiri, Kratie, Preah Vihear and Oddar Meanchey Provinces

Figure 13: Number of cases and annual parasite incidence per 1,000 trends (all species)



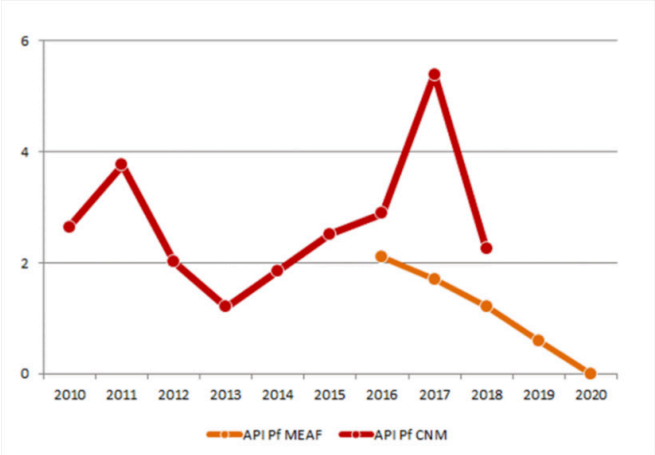
4.1.2 Annual Parasite Incidence – *P. falciparum* and mixed species

Table 3: Annual parasite incidence for *P. falciparum* and mixed, 2016-2018

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
IP-2b	Annual *Plasmodium falciparum* Incidence: Number of confirmed *Plasmodium falciparum* malaria cases (including mixed) per 1,000 population ENDEMIC ODs ONLY	2.1	1.7	1.2	<1	0	2.9	5.3	2.2

There has been an impressive overall decline in malaria incidence since the high in 2017, with *P. falciparum* reaching a low API of 2.2 per 1,000 in 2018 (Figure 12) in endemic ODs possibly due to the impact of specific interventions to decrease *P. falciparum* transmission and an expansion of early and effective diagnosis and treatment.

Figure 14: Annual parasite incidence trend and target, *P. falciparum* and mixed cases



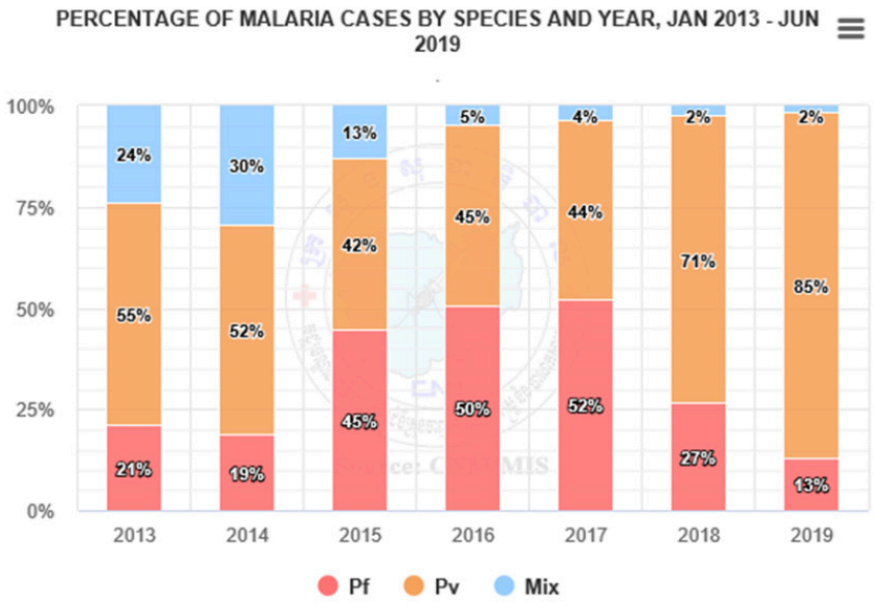
A total of 2,625 confirmed cases of *P. falciparum* and mixed species have been reported for the first six months of 2019, down from 10,908 cases in 2018 for the same period (Table 4), which is a remarkable achievement.

Table 4: Number of confirmed malaria cases, Jan-Jun 2018 and 2019

	2018			2019		
	Pf and mixed	*Pv*	TOTAL	*Pf* and mixed	*Pv*	TOTAL
Jan	2658	2933	5591	752	3562	4314
Feb	1609	2561	4170	498	2741	3239
Mar	1367	2735	4102	303	2356	2659
Apr	1491	2877	4368	280	2172	2452
May	1582	3554	5136	339	2102	2441
Jun	2201	4631	6832	453	2118	2571
	10908	19291	30199	2625	15051	17676

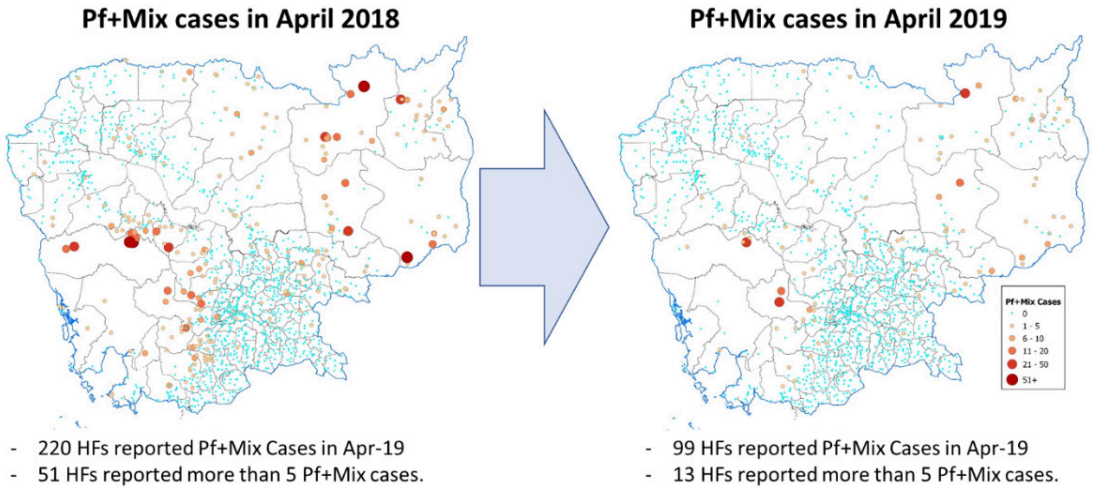
Cases of *P. vivax* now make up 85 percent of all confirmed cases followed by *P. falciparum* at 13 percent and mixed infection, 2 percent (Figure 15). The progressive reduction in the proportion of *P. falciparum* indicates that the intervention strategies are working and that the programme is largely on track to achieve the desired impact by the end of 2020.

Figure 15: Percentage of malaria cases by species and year



Impressive gains are being made in reducing the burden of *P. falciparum*. The disease is increasingly becoming focal as evidenced in Figure 16. The intensification plan is playing an important effort in high burden provinces to reach forest goers, improve surveillance and map foci and hot spots.

Figure 16: Reduction in *P. falciparum* and mixed cases, 2018 and 2019



- 220 HFs reported Pf+Mix Cases in Apr-19
- 51 HFs reported more than 5 Pf+Mix cases.

- 99 HFs reported Pf+Mix Cases in Apr-19
- 13 HFs reported more than 5 Pf+Mix cases.

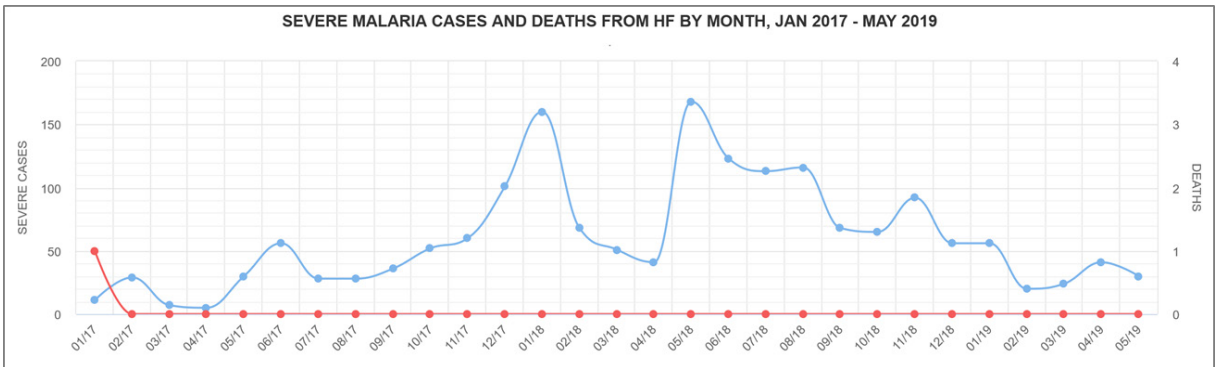
4.1.3 Severe malaria and malaria mortality

Table 5: Severe malaria and in-patient deaths, 2016-2018

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
IP-3	Number of severe malaria cases per 10,000 per population ALL COUNTRY	0.9	0,8	0.6	0.5	0.4	NA	0.3	0.8
IP-4	Number of in-patient malaria deaths per 100,000 population ALL COUNTRY	0,09	0.07	0.05	0.02	0	0.02	0.01	0

There were 443 severe cases of malaria reported through the MIS in 2017, rising to 1,211 cases for 2018 when reporting was more complete (Figure 17).

Figure 17: Severe malaria cases and deaths by month, 2017-2019



There has been a dramatic reduction in malaria mortality from 0.98 per 100,000 population in 2010 to 0.01 per 100,000 by 2017.

4.1.4 Operational Districts with annual parasite incidence <1 per 1,000

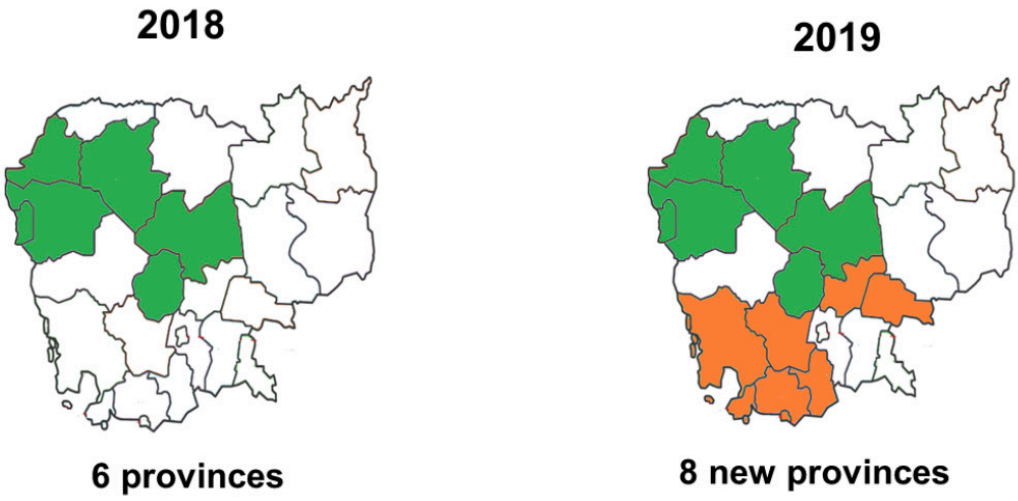
Table 6: Operational Districts with annual parasite incidence <1 per 1,000

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
IP-5	Number of endemic Operational Districts (ODs) that have API less than 1 per 1,000 population ALL COUNTRY	28	32	37	42	49	23	20	13

There are 53 malaria endemic ODs in Cambodia with an estimated 9.1 million population at risk of malaria. Delayed implementation of MEAF 2016-2020 in 2016 and 2017 has resulted in targets not being met for this indicator. By the end of 2018, only 13 ODs had met or exceeded the indicator (Table 6).

At the provincial level, 14 of the 21 endemic provinces have been classified as elimination provinces as of 2019 with interventions tailored accordingly (Figure 18). Delayed implementation of the MEAF has resulted in the original phased approach to elimination being behind schedule. The status as at 2019 is equivalent to phase 2 (2017) in the MEAF with the exception of Pursat which remains in burden reduction phase due to a high API.

Figure 18: Elimination provinces, 2018 and 2019



4.1.5 Percentage of *P. falciparum* cases classified as local

Table 7: *P. falciparum* cases classified as local

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
IP-6	Percentage of *Plasmodium falciparum* cases (including mixed) that are classified as local ELIMINATION ODs ONLY	TBD	TBD	TBD	TBD	0%	NA	NA	99%

Case investigations only started in Q4 of 2018 and 49 cases investigations were completed by CNM. Only case investigations from the Cambodia Malaria Elimination Project (CMEP) in Battambang province is reported, where 99% of all *P. falciparum* and mixed cases have been investigated and identified as local (Table 7).

Earlier results from the Model Elimination Package implemented in Sampov Loun OD by PMI in 2015 and 2016 identified that of a total of 348 cases reported (168 *P. falciparum* and mixed + 180 *P. vivax*), 300 cases (86%) were classified as imported, 28 (8%) were indigenous and 20 cases remained unclassified. Of the imported cases, only 38 (12.6%) were imported to Sampov Loun from Thailand, and the remaining cases (87.4%) were imported from other provinces within Cambodia.

4.2 Conclusion – Malaria Elimination Action Framework

There has been a significant decrease in malaria morbidity since 2000 although the trend is somewhat difficult to interpret because of improvements made in the health system and surveillance systems and the introduction of new, more sensitive rapid diagnostic tests resulting in more patients being tested, detected and reported. Parasite based diagnosis has significantly improved particularly since 2012, resulting in patients receiving more accurate diagnosis and better treatment.

The reinstatement and expansion of the VMW network along with introduction of MMWs has improved access to diagnosis and treatment at community level. It is difficult to interpret the likely impact of the recent ban in April 2018 on private sector providers offering testing and treatment to the large numbers of patients that previously self-referred to these providers as it is unclear as to whether these patients are now being seen by VMWs or HFs.

The most optimistic indicator of impact can be seen from the malaria mortality data which has progressively declined from more than 600 malaria deaths reported in 2000 to zero in 2018. Second is the significant reduction of *P. falciparum* observed since 2017.

Given the epidemiologic changes that have been seen in recent years, the acceleration towards elimination in 14 provinces together with continued efficacy of the current first line treatment including use of single low-dose primaquine for blocking transmission of falciparum malaria, the review recommends that Cambodia should push ahead with eliminating *P. falciparum* malaria within the next two years in order to mitigate the risk of spread of multi-drug resistance.

Recommendations:

- To push ahead to eliminate *P. falciparum* within the next two years, maintaining intensified case-based surveillance, to mitigate the risk of multi-drug resistance to spread.

- To revise some of the indicators to better monitor progress of elimination of *P. falciparum*

5. REVIEW FINDINGS AND RECOMMENDATIONS BY PROGRAMME AREA

Photo Credit: WHO

5. REVIEW FINDINGS AND RECOMMENDATIONS BY PROGRAMME AREA

5.1 Programme management and coordination

Summary finding:
- The current programme management structure has brought about results previously unseen even with such a complex partnership landscape which may not always build on the natural strengths of each implementing partner.

- HR capacity and logistics management required to achieve elimination are inadequate, often due to lack of HR at OD level

- Information sharing across both international and provincial borders is limited.

- Sustained financing is uncertain.

The MEAF objective 1 is to provide effective programme management and coordination at all levels to efficiently deliver a combination of targeted interventions for malaria elimination. The MEAF M&E plan includes two indicators to measure progress towards achieving this objective (Table 8). The review team noted the limited number of indicators for objective 1 and that both indicators relate to procurement and supply management.

Table 8: Programme management, targets and achievements

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
PM-1a	Percentage of points of care with no stock-out of RDTs	TBD	TBD	TBD	TBD	>95%	NA	NA	NA
PM-1b	Percentage of points of care with no stock-out of first-line antimalarials	TBD	TBD	TBD	TBD	>95%	NA	NA	NA

Approximately 70 percent of all funding for implementing the MEAF comes from the GF grants, with the remaining being a combination of government and other development or technical partner funding (dominated by PMI). 33% of the US$42.8 million 3-year 2018-2020 RAI2E grant is budgeted to be implemented by CNM as a Principal Implementing Partner, a further 14% (US$5.99 million) is implemented by the MOH in support of building resilient and sustainable systems in health (RSSH) and the remainder of the fund is implemented by UNOPS, CSO partners and WHO. The average burn rate has been around 60% for the period 2016-2018 with the grant receiving "B1" or "B2" performance ratings by GF.

5.1.1 Successes

- Strong and sustained political commitment for malaria elimination exists. Cambodia is a signatory to region-wide elimination commitments.

Overall programme management is adequate, as evidenced by the GF performance rating.

- Good coordination framework is defined for central, provincial and district levels (Figure 18).

- Implementation arrangements are well mapped down to province and district.

- Expanded VMW/MMW network has improved access to community-based diagnosis, treatment and surveillance.

- At central level, a human resource plan is in place.

- Several partners are providing mentoring support to strengthen CNM's capacity, particularly on finance, M&E and programme management. Staff have been embedded within CNM at both national and provincial level to provide support and capacity supplementation.

- The intensification plan to reduce the malaria burden in 7 high burden ODs is demonstrating early impact.

- Standard operating procedures and guidelines are mostly in place.

- Cross-border collaboration is occurring on a regular basis.

- Annual planning and review meetings for development of malaria operational plans at all levels are occurring.

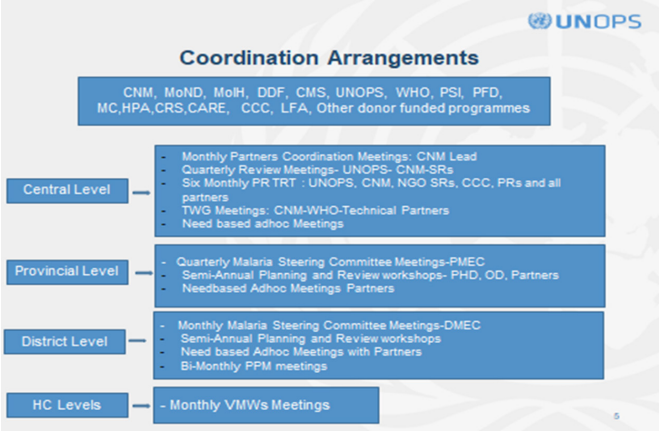
- Technical working groups (TWGs) are in place for diagnosis and treatment, vector control and surveillance, however they are not meeting on regular basis and no routine review is in place for the elimination provinces (Malaria Elimination Task Force-METF).

- Malaria elimination task forces in place. The Provincial Malaria Elimination Taskforce meets quarterly and the District Malaria Elimination Taskforce meets each semester. The National Elimination committee meets every six months.

- Technical meetings at CNM level involving all stakeholders working in Malaria Intensification Plan for Hard to Reach Populations in Cambodia provinces occur on a monthly basis.

- OD monthly operational meeting have been implemented since May 2019 in some intensification plan ODs (Kampong Speu, Phnom Sreuch and Kratie ODs) and are planned for the others

Figure 19: Coordination arrangements

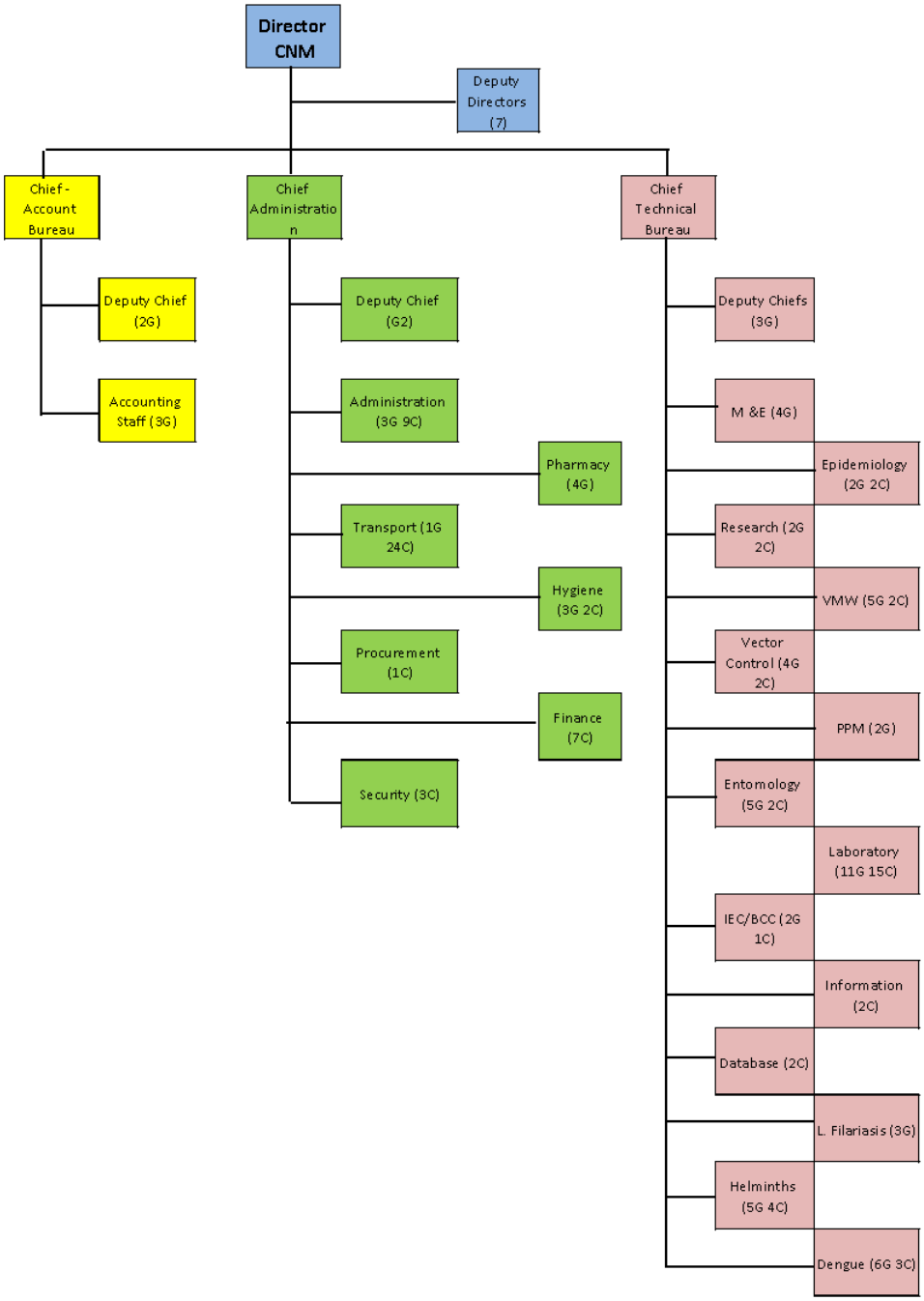


(Source: UNOPS)

5.1.2 Observations, challenges and recommendations

Programme management and coordination: Cambodia's malaria control and elimination response comes under the jurisdiction of CNM, a specialist institution set up by the MOH. At central level, CNM has a total staff of 167 (June 2019), of which 83 are government staff and 84 are employed under contract through other grants. The technical bureau is the largest of the three bureaus in CNM, comprising over 55% of total staffing. Figure 20 shows the organization structure of CNM at central level and number of staffs.

Figure 20: Structure of the National Malaria Programme within the Ministry of Health



At the province and OD level, CNM has a total of 75 staff in the 21 malaria endemic provinces. In most instances, there is one Provincial Malaria Supervisor (PMS) plus one Operational District Malaria Supervisor (ODMS) per endemic OD, except for Kep province, where one staff fulfils the dual role of PMS and ODMS. , Since March 2019, in intensification plan provinces, WHO and CNM increased their presence and support to ODs and CSOs. The NMP's capacity to deliver the expected results is largely dependent on its resources (financial, human and physical) to plan, coordinate, implement, monitor and evaluate the activities laid out in the MEAF. Low salaries, a lack of incentives and inadequate physical assets to do the work expected of them has resulted in a high staff turnover in CNM and a critical shortage of technical capacity in several areas (for example case management). Field trips conducted by the review team identified insufficient dedicated human resources at provincial and OD level resulting in supervisory visits not being undertaken on a regular basis, and few staff trained in malaria elimination.

The review team was unable to undertake any substantive analysis on HR capacity at national or provincial level. A proxy indicator of CNM's capacity to implement can be gleaned from the GF RAI2E financial report which shows CNM's amount expended against the 2017 and 2018 budgets as 60% and 54% respectively. A lack of access to motorcycles to carry out supervisory visits and poorly functioning laptops were examples cited by CNM as being amongst the constraining factors.

Coordination amongst GF funded implementing partners is generally good, with clear mapping of implementation arrangements in place (Figure 21). However, the partnership landscape is complex and does not always build on the natural strengths of each CSO with defined roles and responsibilities. Differences are noted between the results achieved by each implementing partner, with CNM sometimes needing to supplement their technical capacities. Burn rates (as a proxy to measure capacity to implement) ranged between 50-65% in 2018. Some of the under-expenditure directly relates to the cancellation of the PPM programme in April 2018, late reactivation of VMW and anticipation of LLIN/LLIHN mass distribution campaign in 2017.

Guidelines and SOPs are in place, but implementation is sometimes delayed or not followed because of a lack of capacity or resources to implement.

Recommendations:

- Right size, right skill and right equip staff at central and subnational levels to meet requirements needed to adequately implement.

- Motivate and retain staff by giving recognition and incentives to those who have significantly contributed towards malaria control and elimination.

- The team recommends that critical CNM vacant staff positions at central level be filled and that HR capacity and skills at provincial and OD level be increased, with an initial focus on high burden areas.

- The team notes that non-monetary incentives and creating a more enabling environment can improve the motivation and retention of staff, and recommends that annual staff recognition awards, right-equipping and right skilling the staff with the necessary resources and training to do their work, and options for pay for performance be explored.

- Organize Priority Setting Meeting at start of each month with all CNM unit heads to set priorities for next month and review progress of previous month, informed by burn rate data

- Streamline signature procedures for procurements with rapid approval mechanism for high priority/small ticket activities

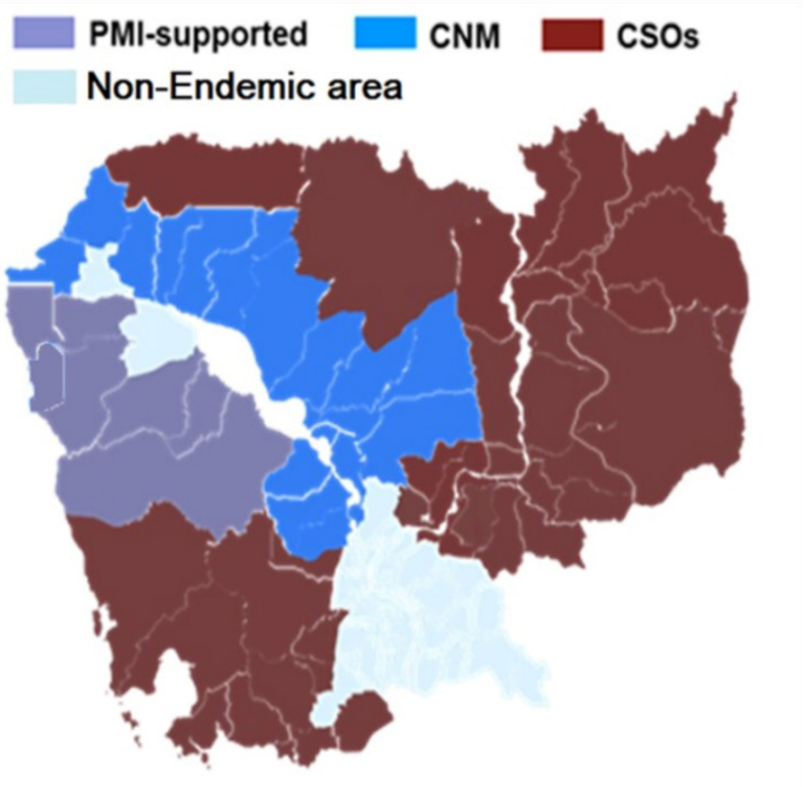
- Simplify procurement processes to make them pragmatic in relevant context. It may be difficult to get three quotes in remote areas and sign MoUs with suppliers especially for items like bike repairs

- Focused micro-planning that is aligned across CNM units, to avoid activity duplication

- Improving the frequency and quality of supervision at all levels is crucial. It should be planned in advance, aided by a simple checklist, visits recorded, and actions agreed and followed-up. Higher levels should rigorously monitor/verify that supervision at lower levels is happening. This includes supervision and on-the-job training for VMWs and MMWs at HC monthly meetings, and quarterly supervision visits to VMWs and MMWs aimed at ensuring all VMWs and MMWs are supervised on-site at least once a year.

- Lumpsum payment for certain activities could be advocated for in order to reduce the time and effort related to detailed reporting. VMW meetings, for example, could be paid monthly against a lumpsum based on the number of VMWs under an HC. This would be relatively easy to verify and audit.

Figure 21: Implementing arrangements for Global Fund implementing partners



Cluster	S.No	Prov_E	# OD_E	Core package
1	1	Kampong Speu	4	PSI Consortium
	2	Kampot	2	
	3	Kep	1	
	4	Koh Kong	2	
	5	Sihanoukville	1	
	6	Takeo	2	
Subtotal cluster 1		6	12	
2	1	Kampong Cham	4	
	2	Tbong Khmum	6	
Subtotal cluster 2		2	10	
Total For PSI Consortium		8	22	
3	1	Kratie	2	Care Cambodia
	2	Mondul Kiri	1	
	3	Ratanak Kiri	2	
Total for Care Cambodia		3	5	
4	1	Oddar Meanchey	2	CRS
	2	Preah Vihear	1	
	3	Stung Treng	1	
Total For CRS		3	4	
5	1	Banteay Meanchey	3	CNM
	2	Kampong Chhnang	3	
	3	Kampong Thom	3	
	4	Siem Reap	4	
Total for CNM		4	13	
6	1	Battambang	4	URC
	2	Pursat	4	
	3	Pallin	1	
Total for URC		3	9	
Grand Total		21	53	

Advocacy for malaria elimination: The review team notes that Cambodia is a strong political advocate for the elimination of malaria. The country is a signatory to the Asia Pacific Leaders Malaria Alliance region wide goal of an Asia Pacific free of malaria by 2030 and provides annual reporting for inclusion on the APLMA dashboard, a mutual regional accountability framework.

Within the immediate regional context, in May 2015, together with neighbouring countries, Cambodia adopted the WHO Strategy for malaria elimination in the Greater Mekong Subregion 2015-2030. Urging immediate action, the plan aims to eliminate *P. falciparum* malaria from the subregion by 2025 and all species of human malaria by 2030.

More recently, Cambodia joined Health Ministers from other GMS countries together with WHO Regional Directors from South East Asia and Western Pacific Regions, and partners, to pass a 'Ministerial Call for Action to eliminate malaria in GMS by 2030' at the 71st World Health Assembly at Geneva in May 2018.

There is regular reporting on progress towards elimination by CNM to the MOH. The CNM website and MIS (www.mis.cnm.gov.kh) provides summary level progress on malaria control and elimination and is readily accessible to the public. The annual World Malaria Day and the annual national malaria workshop are both used effectively in Cambodia to maintain public and political awareness of malaria elimination.

With low levels of domestic funding, and a heavy reliance on external funding primarily through the GF and PMI, adequate funding is only currently secured through until 2020. With the malaria burden progressively declining and the threat of drug resistant malaria diminishing once *P. Falciparum* is eliminated, it may no longer be considered a priority public health and health security issue, and as such Cambodia may end up with reduced funding allocated in the future through its traditional partners.

Partnerships: The review team identified that the CNM has mechanisms in place to maintain functional partnerships nationally, sub-nationally and regionally. Partnerships exist with other departments in the MOH, with other government ministries, international agencies and development partners, CSOs, neighbouring countries in the GMS and with academic and research institutions. All partnerships are required to demonstrate alignment with MEAF 2016-2020.

CNM Directors actively participate in APMEN and APLMA network meetings, as well as WHO Western Pacific Region (WPRO) malaria workshops. Deputy directors have also been assigned regions and participate in the Provincial Malaria Elimination Taskforce meetings.

A malaria conference is held annually, during which each partner presents their activities, progress and achievements, as well as challenges and plans for the next period. UNOPS and CNM regularly undertake partner mapping to ensure coordination of efforts.

CNM has three functioning technical working groups for diagnosis and treatment, vector control and surveillance meet on irregular basis.

In recognition of the significant role the private sector has played in the diagnosis and treatment of uncomplicated malaria in Cambodia, a public-private mix (PPM) partnership was initiated in 2011 to engage private sector providers in malaria control and elimination efforts. Under RAI2E, the PPM was jointly implemented through the PSI Consortium, CARE, and CRS, and CMEP in cooperation with PHDs, ODs and CNM. PPM partners were provided with free or subsidized ACTs and RDTs dependent on whether the PPM point of care was in endemic ODs with evidence of artemisinin resistance.

In 2017, the PPM tested over 158,000 patients through 1,668 points of care (representing 46% of all patients tested through HFs, VMWs and PPMs), resulting in 29,640 confirmed cases of malaria being treated. The PPM was suspended in April 2018 by the MoH. There is currently no public-private partnership in place.

Recommendations:

- Assess the implementing partner landscape for complimentary efforts and more rigorously oversee operational levels to harmonize the elimination strategy.

- Ensure good communication among stakeholders at the OD level to define common priorities and avoid duplications

- As the programme approaches elimination, partnerships will need to be further strengthened with the military, police and other government forces working along the border and in the forest areas.

- It was noted that there is some variability amongst implementing partners in paying VMWs at varying rates. The review team recommends that partners review and standardize payments.

- Improve the coordination among NGOs and between NGOs and CNM. National level coordination meetings (TWGs and METF) among all stakeholders in malaria elimination should be held on a regular schedule. They could be co-chaired by CNM and WHO. They should not be oriented towards RAI2E grant implementation but to national programme implementation.

- Ensure the existence of a year calendar on intensification plan meetings at CNM to ensure proper plan of all stakeholders involved in the targeted provinces

- The level and effectiveness of NGO involvement in the malaria control activities should be monitored. For those funded by GF, this should include assessment of the extent to which their capacity is fully utilized or possibly constrained by the structure of the RAI2E grant and their contracted role.

- Funding mechanism and national management level should provide more autonomy and flexibility at provincial level to adapt the malaria response to the changing epidemiology and allow innovation.

- NGOs should consider advocating for additional support for well justified personnel gaps

- NGO engagement during the monthly intensification plan meeting at CNM ensuring sharing own data analysis, encountered issues and possible solutions, and define operational priorities. A more formal process should be initiated to fully explore what would be the optimal and acceptable placement of NGO staff in the field. This should cover issues such as: why no highly qualified staff are currently placed in the field; whether having staff funded at a limited level of effort is effective; what activities fit best with NGO comparative advantage (e.g. facilitating administrative procedures/reporting requirements vs community outreach and public health).

Cross border collaboration for elimination: Through the RAI and RAI2E regional component of the grants and the earlier ADB second GMS regional communicable disease control project grants, Cambodia is collaborating on cross-border mapping of hotspots and channels of infections on the borders with Laos, Thailand and Viet Nam, and to identify high-risk sub-populations.

In 2016, a cross-border action plan was developed for Kampot province (bordering with An Giang province, Viet Nam). In 2017, cross border action plans focussing on malaria were

developed for Ratanakiri (bordering with Attapeu province, Lao PDR), Svay Rieng (bordering with Tay Ninh province, Viet Nam) and Preah Vihear provinces.

Sharing of cross-border data with Thailand is occurring and has been facilitated by WHO. Cambodia has created a border map to track channels of infection within 10km of the border with Viet Nam. However, Viet Nam has not yet reciprocated with a similar initiative.

A cross border collaboration meeting held in June 2019 in Thailand among 5 GMS countries agreed to share information and savings on implementation could be used for implementing activities along the border as part of cross border collaboration activities. There is a lack of resources for Cambodia to organize cross-border meetings.

The review team notes that while there is an emphasis on cross-border sharing of information, there is a broader issue of comprehensive data sharing that should not be overlooked. During the desk review meetings, it became apparent that provincial malaria managers do not have regular access to data on what is happening in their neighbouring provinces, let alone across the border. The Cambodia Mobile Populations Survey 2017 highlighted that amongst the MMPs' changing workplace or place of residence in the last three months, 66% previously lived in another province, with the provinces distributed over the country, covering all provinces (except Kep) and Phnom Penh.

Recommendations:

- Improve cross-border information sharing along both national and provincial borders and improve logistics management to maintain malaria commodities at all levels.

Financial resources to support programme implementation: Implementation of MEAF is estimated to cost US$136.9 million over the period 2015-2020 (Table 9), with vector control requiring US$49.6 million (36%) followed by surveillance, US$38.6 million (28%) and case management requiring US$32.9 million (24%). The costing was undertaken by CNM with assistance from partners and was based on an activity-based costing approach.

Table 9: Annual budget by year and Malaria Elimination Action Framework (US$ million)

	2016	2017	2018	2019	2020	TOTAL
Prog. Mgt	$0.559	$0.460	$0.497	$0.471	$0.512	**$2.499**
Case Mgt	$5.657	$5.659	$7.103	$7.330	$7.206	**$32.955**
Vector control	$6.293	$6.376	$22.925	$6.833	$7.116	**$49.543**
Surveillance	$6.891	$8.389	$7.397	$8.841	$7.124	**$38.624**
IEC/BCC	$0.915	$0.936	$1.174	$1.204	$1.234	**$5.463**
Other expenses	$1.480	$1.574	$1.577	$1.600	$1.624	**$7.855**
TOTAL	**$21.795**	**$23.395**	**$40.675**	**$26.282**	**$24.817**	**$136.964**

The review team found it difficult to obtain a comprehensive understanding of the funding landscape in support of MEAF implementation. Our best understanding of it is detailed in Table 10. PMI is the second largest donor and plays a key role in engaging directly with each of the main donors to coordinate activities to more efficiently support CNM.

The analysis suggests that with the level of funding secured from existing sources, MEAF was substantially funded for the full period through 2020 except for $19 million (14%). With cumulative under-expenditure for the three-year period ending 2018 of $8.2 million across the three GF grants, the national malaria programme can be generally considered to be fully funded through until the end of the current MEAF. However, the NMP needs to start exploring opportunities now to identify efficiency gains that could be obtained in the next NSP period through a more integrated approach, such as expanding the role of VMWs and MMWs beyond malaria.

Table 10: Estimate of funding landscape to support the Malaria Elimination Action Framework (US$ million)

	2016	2017	2018	2019	2020	TOTAL
GF NFM	$11,716	$17,324	N/A	N/A	N/A	**$29,040**
GF RAI	$2.928	N/A	N/A	N/A	N/A	**$2,928**
GF RAI2E	N/A	N/A	$16.827	$12.998	$12.998	**$42.823**
PMI / USAID[7]	$5.150	$9.150	$8.150	$8.150	$8.150	**$38.750**
ADB 2nd GMS CDC	N/A	N/A	N/A	N/A	N/A	**N/A**
BMGF	N/A	N/A	N/A	N/A	N/A	**N/A**
Domestic[8]	$1.000	$1.000	$1.000	$1.000	$1.000	**$5.000**
TOTAL	**$20,794**	**$27,474**	**$25.977**	**$22.148**	**$22.148**	**$118,541**

Recommendations:

- The review team wishes to highlight the urgent need for the country to advocate to both internal and external sources for continuity of funding through until, and beyond the 2025 elimination goal is reached.

Interventions for mobile migrant populations (MMPs): The review identified several strategic level interventions that the programme and partners have initiated in order to better inform interventions for MMPs.

A large-scale survey of key MMP population groups at risk of malaria infection in Cambodia was undertaken in 2017 to obtain a more comprehensive and better understanding of MMPs

[7] Net of $0.85 million in-country staffing and admin costs
[8] Estimated based on *WHO National Health Accounts for Cambodia 2012-2016: Health Expenditure Report*

and malaria. A total of 4,844 MMP adult individuals from 158 selected survey sites across ten ODs and five provinces were interviewed. A breakdown of respondents and survey sites is shown in Table 11.

Table 11: Mobile migrant population survey respondents and sites

Province	Operational District	# of respondents	# of survey sites
Battambong		**997**	**26**
	Maung Russei	73	5
	Sampov Loun	194	5
	Battambang	730	16
Pursat		**1,073**	**31**
	Kravanh	651	18
	Krakor	422	13
Rattanak Kiri		**909**	**42**
	Banlong	715	27
	Borkeo	194	15
Stung Treng		**590**	**26**
	Stung Treng	590	26
Oddar Meanchey		**1,275**	**33**
	Samraong	328	11
	Anlong Veng	947	21
TOTAL		**4,844**	**158**

The study findings suggest that key MMP populations in Cambodia are particularly at risk of getting malaria, with the level of risk varying across the four sub-groups. While seasonal workers and construction or mine workers tend to be more mobile, forest goers and security personnel appear to have more frequent forest-going activities. Access to preventive measures as indicated by ITN ownership and utilization remains relatively low when compared with the general population in malaria endemic areas. The survey also identified the need to address misconceptions amongst the MMP about how people get and prevent malaria.

An earlier study undertaken in 2015 by PSI entitled Developing the evidence base for assessing the feasibility of malaria elimination efforts among workers employed on private plantations in Cambodia concluded that because of lower anticipated levels of malaria parasitemia amongst the plantation worker sub-group of MMPs, macro-level efforts such as targeted malaria elimination may be less effective and efficient than previously thought. It suggested instead that micro level approaches, with strong surveillance, whether active or passive, serving as the lynch pin to appropriate case detection, may be more feasible and appropriate.

In 2018, CNM published the MMP in The Context of Malaria Elimination Operational Manual, providing a framework for the national programme and partners for tackling malaria among most at risk populations and hot spot areas. The manual proposes intervention strategies targeting MMP in burden reduction and elimination targeting districts. However, the manual has not yet been widely circulated.
A key component of the intensification plan, as previously described on page 11, is to extend active case detection in forest areas through MMW outreach activities. By April

2019, a total of 183 MMWs were deployed under the GF grant, plus an additional 254 under Gates and PSI (Table 12).

Table 12: Mobile Maleria Workers funded by Global Fund grant

MMW Coordination	# MMW
HPA Regional Grant	33
CNM RAI2E	13
MC RAI2E (under CNM)	50
MC RAI2E	12
MC work site	9
PSI RAI2E	3
PFD RAI2E	6
CRS RAI2E	3
CARE RAI2E and work site	5
CARE intensification plan	28
CRS intensification plan	21
PSI intensification plan	7
TOTAL	**183**

The number of mobile malaria workers (MMWs) has increased considerably over the past year as part of the intensification plan. Most of the villages with the highest number of *P. falciparum* cases are covered by MMWs but some villages with a relative high number of *P. falciparum* cases still remain uncovered. As per existing guidelines, MMWs were only established in villages without a VMW, despite the potential value of performing active case detection in forest areas close to these villages.

MMWs perform passive case detection at home and active case detection twice per month in forest around their area. Mapping exercises supported by WHO/CNM and CSOs, showed that MMWs generally visited the same sites during outreach activities. Due to the lack of detailed information on where MMPs and forest goers stay, it is not always possible to accurately assess whether MMWs reach most MMPs/forest goers in their catchment areas. According to available data, MMWs mainly detect *P. falciparum* cases at the village level by passive case detection rather than during outreach activities. Nonetheless, some MMWs in high transmission areas diagnose and treat many cases during outreach activities. The low number of cases detected during outreach is expected as the prevalence of *P. falciparum* is low in most places and because many persons tested do not have signs of any infection. However, in areas where *P. falciparum* incidence remains relatively high, there has been a clear benefit of the strategy, while in areas with less intense transmission the contribution of outreach activities has been limited to date. In general, MMWs have filled an important gap where VMWs were missing in some remote areas.

Recommendations:

- Improve understanding of the heterogeneity of MMPs using standardized MMP mapping, ethnographic methods and community engagement strategies to strengthen the accuracy of targeting forest goers with malaria elimination interventions.

- The nascent MMW approach should be carefully monitored and the model adapted as necessary to ensure that it is cost effective. Use of VMWs is a more established model but still requires active oversight to ensure that it delivers. Funding should be allocated to do a formal evaluation of MMWs, VMWs and VMWs operating as well as MMW(possibly early 2020). This might include: distribution, training (including refresher), supervision, reporting of cases, knowledge, performance, output and cost).

- Improving the frequency and quality of supervision and adapting the workforce accordingly to the needs at all levels, in high burden areas, is crucial. It should be planned in advance, aided by a simple checklist, visits recorded, and actions agreed and followed-up. Higher levels should rigorously monitor/verify that supervision at lower levels is happening. This includes visits to targeted VMWs and MMWs by the health centre staff with support from responsible NGOs and documented in supervision logs kept by the VMWs and MMWs.

- Designing between CSO, OD, PHD, CNM and UNOPS a system that allows quick and flexible relocation of MMWs. Abolishing MMWs in areas with very few or no *P. falciparum* cases or relocating existing ones to areas with the highest number of *P. falciparum*. In high Pf incidence areas, ensure presence of more MMWs and/or for a longer period of time.

- Guidance and supervision of MMW outreach activities. Mapping of malaria transmission hotspots through paper maps and smartphone tools to collect GPS coordinates.

- The actual tracking and targeting of the right MMPs remains a challenge. Not clear if interventions manage to have an impact on this important population.

- Allow decision making at OD level (supported by WHO/CNM and CSO) regarding MMW modus operandi as: type of provider (VMW, MMW, MP), type of activity (Passive case detection, active case detection of forest goers, in villages, around villages, in the forest…), frequency of activities based on epidemiology and seasonality. Lump sum budget allocated to OD based on Pf epidemiology of the OD

- Create synergies among CSOs in those areas involving different stakeholders with different type of MMWs (MC MMW/MP, HPA MMW, CSOs MMW, PSI worksites, GEM project PSI, FMW PfD/IPC) to combine elimination efforts in the hottest Pf malaria spots

- Explore option of expanding VMW and MMW scope of activities with MOH and other health programmes to plan for longer-term sustainability efforts as malaria burden decreases

Supply management: At the time of the MPR, the supply management module developed for the MIS was not being fully utilized by HFs and there was no clear data to measure the achievements under this objective for programme management.

CNM currently collects supply management data through several channels: 1) a paper-based

e-mail system at OD level, 2) the MIS supply management module for facilities that are reporting in the MIS app at OD and HF level, and 3) Excel-based OD stock reports, which are supported by implementing partners. Data collected include: opening balance, receipts, issuance, adjustments for expiry/damage, closing balance, and soonest expiry dates. There is clearly a need to improve the completeness and timeliness of stock reporting, particularly from health centre level. The MPR team notes however that substantial effort has been made recently to address this with mSupply, an integrated networked Logistics Management Information System (LMIS) which is being led by MOH, currently being piloted in five provinces. However, presently, there is no comprehensive LMIS that is providing real-time information on stock levels. In the absence of solid LMIS data, the review team has relied on data from two proxy surveys for their assessment of performance against the MEAF indicators for programme management.

The 2017 Cambodia Malaria Survey identified 86% (n=73) of 85 public health facilities surveyed having ACT in stock on the day of survey and 73% of public health facilities that use RDTs having stocks of RDTs. 13% of public health facilities reported at least one episode of stock-out of RDTs for more than 1 week in the previous 3 months.
Field visits conducted as part of this MPR in July 2019 found no stock-outs of ACTs or RDTs at HC or VMW/MMW level for Battambang, K. Chhnang or K. Speu, although stock-outs were reported during 2018. Mondolkiri reported stock-outs at the periphery at the time of the field visit.

Field visits conducted as part of this MPR in July 2019 found no stock-outs of ACT adult dosage or RDT at HC or VMW/MMW level for Battambang, K. Chhnang or K. Speu, although stock-outs were reported during 2018. Mondolkiri reported stock-outs at the periphery at the time of the field visit. The review team are aware of the country-wide stock out of AS-MQ that occurred during 2018 as a result of insufficient stock ordered in comparison to occur substancial increase of case and manufacturing delay from CIPLA.

However, there was insufficient availability of paediatric dosage to ensure sustainable coverage at HC and village levels and adherence to malaria treatment for children according to guidelines. Current guidelines include a description of the use of pediatric doses of ASMQ, which is usually not available at VMWs/MMWs compelling HCs to make their own recommendations for treatment of children with malaria, which is not necessarily aligned with existing policies; some HCs recommend that VMWs/MMWs split ASMQ tablets, others requests VMWs/MMWs to refer children testing positive for malaria to the HC, which in many cases still have some doses of pediatric ASMQ on stock. No stock-outs of low dosage primaquine for Pf infections were observed at the HC level and distribution at the village level was ongoing. Through data analysis, a slow uptake of primaquine usage was observed along the past years. CNM is responsible for forecasting and quantification of all malaria commodities at the central level. Selection of commodities is undertaken by the CNM Technical bureau and the Pharmacy Unit in line with NTGs. UNOPS in its role as GF Principal Recipient, manages the entire procurement process for most of the antimalarials, RDTs and LLINs required by the malaria programme. MOH is involved in procuring second-line treatment and treatment for severe malaria. PMI has country funds that are used to fill commodity gaps when required, specifically for LLINs and LLIHNs, small quantities of RDTs and point of care G6PD tests and consumables. PMI does not procure any ACTs.

Different partners have developed different quantifications for malaria commodity needs that are in addition or separate to those supported by CNM. The review team note that historical consumption data has been the basis of quantification of malaria commodities. However, as the country moves towards elimination and scaling up of active case detection, quantification

will need to increasingly be based on epidemiological data and closely linked to targeted interventions.

Commodities flow from the Central Medical Store (CMS) to OD health offices and then to HFs or referral hospitals and finally to VMWs and MMWs. PHDs collate stock requests and other communications from OD level and communicate further to central, but do not warehouse stock at provincial level. CMS distributes essential medicines and commodities to ODs on a quarterly basis. The received quantity, at OD warehouses is then distribute to HFs based on a pull system after receiving requests from the HC. The review team noted instances of supply chain errors, under-supply (particularly for RDTs) and delayed delivery from CMS to ODs stores.

Lack of knowledge at OD and CSO levels on supply process was observed and the method of calculating the necessary quantity to request varies by district. If the OD requests for stock are not delivered to PHDs in time for onward communication to central by the quarterly distribution schedule deadline, then the emergency request system may be used to receive a resupply. Emergency supplies may take one or two months from the time of request submission to reach the OD and HF level, in part due to the processing of approvals at each level as well as limited data sharing between CNM/CMS. Shortages of supply, especially to VMWs/MMWs are still reported and primary issues appeared to be at the CNM/CMS level. However, currently VMWs/MMWs are supposed to be resupplied up to a stock base of 100 RDTs and 10 treatments of ACTs every month; this has improved supply availability of these essential products at community level. However this could not always be implemented due to lack of RDTs received from CMS at OD level.

Interaction between CNM and Central Medical Stores (CMS) has margins for improvement. Issues may exist on both sides. MIS is not yet adequate to serve as a basis for ordering of commodities. CMS "Average Monthly Supply" (AMC) uses data that is not up to date or not provided and as a consequence amounts of stock provided fall very short of amounts requested. As CNM, CMS, and partners each play a role in ensuring adequate supply of commodities at all levels, regular coordination meetings could significantly improve supply management of malaria commodities.

Recommendations:

- Clear written guidance on method to estimate quarterly order quantities at OD level and monthly order at HC level and emergency orders procedures should be developed and shared by CMS/CNM

- Ensure availability of pediatric ASMQ dosage at VMW level to ensure adherence to malaria national guidelines and job aids.

- Establish a quarterly Quantification Technical Working Group with all CNM programme and logistics staff, CMS, and partners, to review the latest data available and to update the supply plan as needed in order to ensure adequate supply availability

- Integrate the multiple data collection systems into a single streamlined LMIS and establish effective data-sharing systems between partners, in order to reduce redundant data collection, improve reporting rates at OD and HF level, and increase use of data in forecasting and programme planning.

- Continue the use of the VMW/MMW stock base of RDTs and ACT treatments that supports supply availability to the community level

5.2 Case management

Summary findings:
Appropriate malaria diagnosis and fully efficacious first-line treatment for falciparum malaria are available at public health facilities, including recent roll-out of single low-dose PQ.

The re-activation of VMWs and MMWs has increased access to diagnosis and treatment in remote areas but testing levels are still too low.

G6PD deficiency testing and radical cure for *P. vivax* are still not being operated.

MEAF objective 2 is to achieve universal coverage of case management services to ensure 100% parasitological diagnosis of all suspected cases and effective treatment of all confirmed cases including mobile and migrant populations.

The MEAF M&E plan used 13 indicators to measure progress towards achieving this objective as shown in Table 13.

Table 13: Case management targets and achievements

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
CM-1	Annual blood Examination Rate: Number of parasitological tests carried out per 100 population ENDEMIC ODs ONLY	5.0%	6.0%	7.0%	7.5%	8.0%	3.5%	4.4%	3.4%
CM-2	Access to parasitological testing: Percentage of suspected malaria cases that received parasitological test ENDEMIC ODs ONLY	100%	100%	100%	100%	100%	NA	NA	NA
CM-3	Access to first-line treatment: Percentage of confirmed malaria cases that received first-line antimalarial treatment ENDEMIC ODs ONLY	100%	100%	100%	100%	100%	NA	NA	NA
CM-4	Case fatality rate: Percentage of deaths among severe malaria in-patient in referral hospitals	1.5%	1.2%	1.0%	0.5%	0.0%	0.1%	0.0%	0.0%
CM-5a	Deployment of VMW/MMW/PMW Number of villages/point of care covered by with VMW/MMW/PMW	2882	4866	TBD	TBD	TBD	2,169	2,370	2,381
CM-5b	Deployment of new care providers: Number of active PPM providers	TBD	TBD	TBD	TBD	TBD	314	314	314
CM-6	Percentage of care providers with adequate case management practices and supply diagnostics and medicines	70%	75%	85%	95%	100%	NA	NA	NA
CM-7	Percentage of people from the mobile population with fever in the last 3 months that accessed parasite-based diagnosis	70%			>90%			29.2%	
QA-1	Number microscopy laboratories participating in Quality Assurance (QA) / Quality Control (QC) management system	TBD	TBD	TBD	TBD	TBD	NA	NA	NA
QA-2	Percentage of microscopists achieving both sensitivity and specificity greater than 90% during blind proficiency tests	80%	90%	95%	100%	100%	NA	NA	NA
DG-1	Percentage of private sector outlets in endemic provinces selling artemisinin monotherapy		0%			0%		1%	
DG-2	Number of antimalarial drug sample batch collected for QC test	120	120	TBD	TBD	TBD	NA	NA	NA
DG-3	Number of inspection visits conducted by central and provincial drug inspectors	1000	1000	TBD	TBD	TBD	165	75	21

Prompt and accurate diagnosis of patients with symptoms of malaria is necessary to treat infection within the population and to halt transmission. Diagnosis both ensures good fever case management as malaria cases decrease, and for surveillance and response. Case management efforts have focussed on improving access to RDTs for confirming diagnosis and ACTs for effective treatment. Access to both commodities has improved in Cambodia during recent years.

5.2.1 Successes

- Since policy change in 2012, patients are not treated without first being tested.

- Successful re-establishment and expansion of VMW network: over 4,700 VMWs operating from 2,300+ villages in 2018 improving community level access to diagnosis and treatment.

- Highest number of parasitological tests undertaken in 2017, although declined in 2018 due to the ban on PPM offering diagnosis and treatment. Increase in number of tests undertaken Jan-Jun 2019 versus same period 2018 (136%) with significant scale up in the number of tests conducted by VMWs

- High awareness of case definition for suspected malaria with staying in the forest is a risk factor. TPR Jan-Jun 2019 was 8% versus 30% same period in 2018, suggesting an increased emphasis on testing all fever cases as opposed to highly selective testing

- Availability of artemisinin monotherapy through private sector outlets is at very low levels.[9]

- First line treatment modified in 2017 according to results of drug resistance studies

- Case fatality rate has been progressively reduced to and remains at zero since 2017.

- Good cadre of health workers are now trained on case management

5.2.2 Observations, challenges and recommendations

Parasite-based diagnosis:

The number and proportion of clinical malaria cases has been steadily declining since 2000, at which time more than 50% of cases treated at HFs were not tested. Testing has increased in part because of the generally adequate availability and high reliability of sensitive RDTs, strengthened supervision and regular case management training. Parasite-based diagnosis prior to treatment is becoming the norm with 96% of HF patients confirmed positive for malaria receiving ACTs. Between 2014 and 2018, the total annual number of blood tests performed in HFs and VMWs (microscopy/RDT) has increased more than 89% (Table 14).

Table 14: Number of tests and test positivity rate by microscopy and rapid diagnostic tests, 2014-2018

	Microscopy			RDT		
	# slides	# positive	TRP rate	# RDT test	# positive	TRP rate
2014	54,716	4,598	*8.4*	94,600	16,711	*17.6*

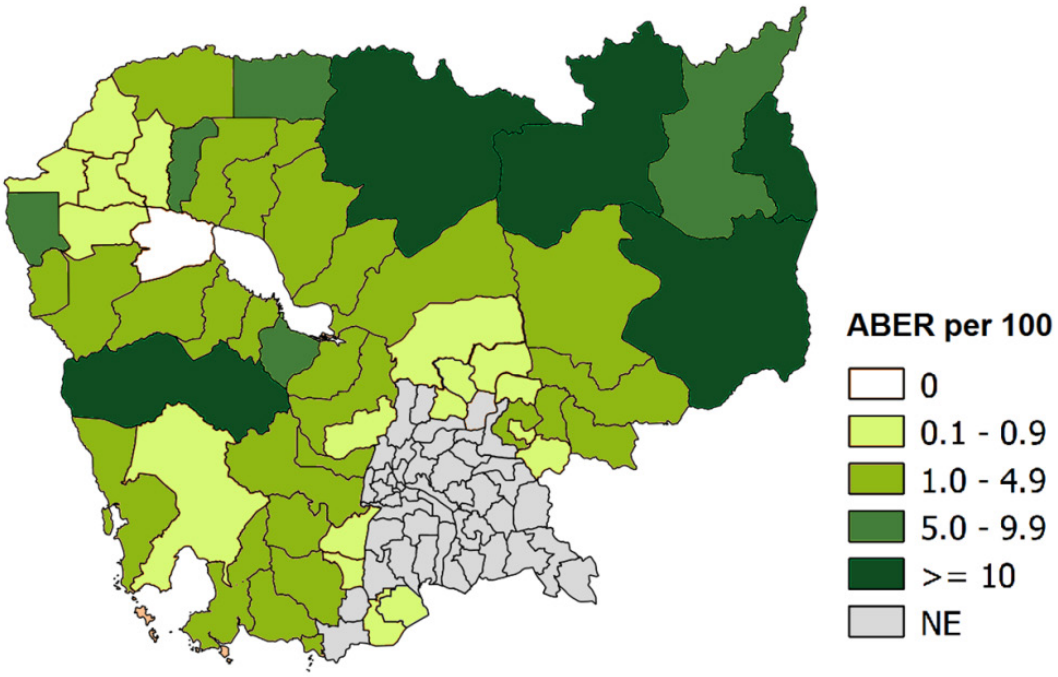
[9] Some disparity of findings between ACTwatch Survey and Cambodia Malaria Survey, 2017

	# slides	# positive	TRP rate	# RDT test	# positive	TRP rate
2015	49,357	7,423	*15.0*	114,323	26,507	*23.1*
2016	42,802	3,695	*8.6*	123,893	19,797	*15.9*
2017	38,188	5,908	*15.4*	130,057	31,024	*23.8*
2018	42,834	8,318	*19.4*	239,461	54,264	*22.6*

Source: WMR Cambodia data (excl. PPM)

The annual blood examination rate (ABER) for 2018 is 3.4% across the 53 endemic ODs with a test positivity rate (TPR) of 26%. High burden endemic ODs with an API >5 have a correspondingly higher ABER (Figure 22). A full list of API values, number of malaria cases and TPR for each endemic OD is included in Annex 4: API 2018 by operating district.

Figure 22 : Annual blood examination rate per 100 by Operational District, 2018

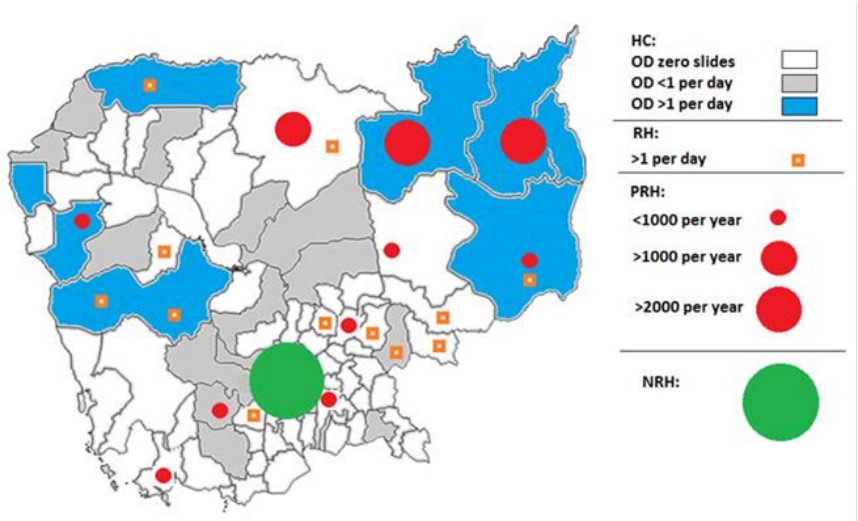


The case definition of suspected malaria is usually not followed when testing patients for malaria. Relatively high TRP rate would indicate highly selective testing with low levels of testing of fever patients to exclude malaria. The 2017 Cambodia Malaria Survey reported that only 10.7% of fever patients in public health facilities reported that they saw a health worker and received a blood test. Less than 30% of fever patients report having the three key assessments performed as part of the examination (temperature, fever and travel history) and a smaller proportion (14.9%) being asked the key five questions (fever history, travel history, travel to forest, recent malaria and recent malaria treatment). CNM issued strict instructions in late 2018 to increase testing for malaria and ensure adequate supply of RDTs.

In the first six months of 2019, a total of 219,171 tests were performed in HFs and by VMWs with a TPR of 8%. There has been a significant scale up of testing performed by VMWs ensuring community-based access to diagnosis and treatment. The scale up has been supplemented with case management training delivered in 2017 and a resolving of the electronic transfer of payments to VWMs/MMWs.

Microscopy as a proportion of total blood tests undertaken has progressively declined and is now around 15% (2018) compared to 36% in 2014. At PRH level, 13 of 25 (52%) performed less than 1 slide per day, 6 (24%) more than 1 slide per day and 4 (16%) more than 5 slides per day. At DRH level, 43 of 102 (42%) performed no microscopy test for malaria in 2018, 51 (50%) read less than 1 slide per day, and the remaining 8 (8%) more than 1 slide per day. Among HCs, 1,078 of 1,200 (90%) read no slides in 2018 (Figure 23).

Figure 23: Volume of microscopy tests by OD by facility type, 2018



With declining numbers of microscopy tests being performed annually, particularly at the periphery, there is concern about how to maintain the quality of microscopy services especially as competency is lacking at HC level. Quality assured microscopy could remain the preferred diagnostic method at national, provincial and district referral hospitals. A Quality Assurance of Malaria Diagnosis Operational Manual has been drafted and training on its use has begun.

Recommendations:

- Continue to ensure adequate availability of RDTs in all HFs and VMWs and to ensure free testing for all fever cases.

- Ensure application of free malaria testing and treatment policy in all government facilities Microscopy services should be rationalized based on utilization of services: i.e. withdrawn from all HCs and maintained with proper QA in selective hospitals

- Increase the number of people tested in high risk areas. HCs and VMWs with low ABER and/or high TPR may indicate sites where more testing is needed.

- Criteria for who should be tested should be clarified or reinforced with health staff and VMW/MMW and compliance assessed by supervisory visits

- Ensure adequate availability of RDTs in HCs and minimum stock of 100 RDT on hand at VMW and MMW levels after each month distribution – in priority for intensification plan catchment areas

- Emergency resupply before monthly meeting should be budgeted for high consumption villages to travel for resupply of stock at HC level

- Implement new Quality Assurance (QA) diagnosis manual and SOPs

Prompt efficacious treatment:

AS-MQ fixed dose combination is the first line treatment for uncomplicated cases of all species of malaria nationwide following a recommended update to the drug policy at the end of 2016. TES is conducted in 4-6 sentinel sites to measure efficacy of first line ACT and explore alternative drug combinations. A new edition of the malaria NTG is expected to be released in 2019 with a few adjustments to the earlier 2014 edition.

A diagnosis and treatment trainers manual has been produced. The manual includes a programme for a two-day course for the management of malaria in out-patient consultations for nurses, medical assistants or physicians in charge of outpatient consultations, plus a one-day training module for management of malaria at hospital level for nurses and physicians. An update to the manual in 2019 included a new module on *P. vivax*.

The 2017 malaria survey identified that across all public HFs surveyed, 75% had a copy of the NTG and 54% had the most current (2014) version, with the remaining 18% having an earlier version. 78% of staff interviewed correctly named AS-MQ as the first line drug recommended for uncomplicated *P. falciparum* or *P. vivax*. Significantly, the first line treatment only changed from DHA-PIP to AS-QM around the time of the survey.

More than 4,000 VMWs were trained in 2017, with refresher training planned in 2019. Clinical case management training conducted in 2018 for 2,181 HC health workers.
In 2019, CNM introduced new VMW QA approach at the refresher training to trainers (PHD/OD) with an updated paper-based checklist and guidance to assess performance over a few indicators at the VMW monthly meeting.

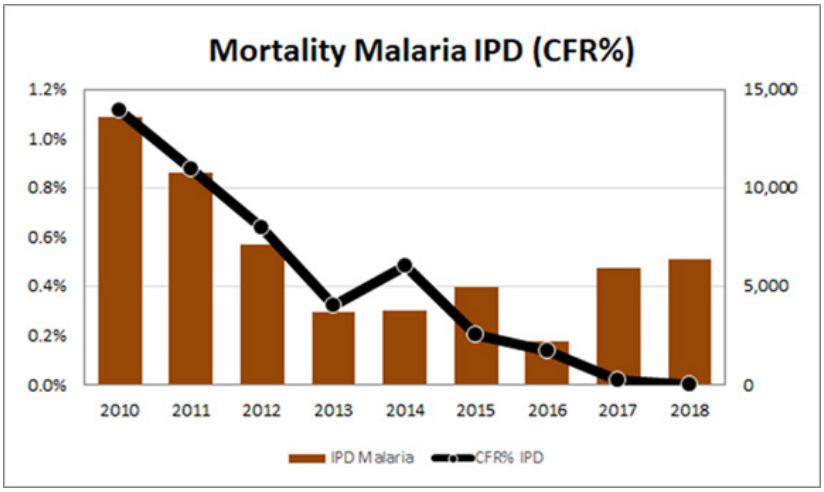
Delayed treatment seeking at points of care following the onset of fever is highlighted consistently in several surveys and operational research carried out between 2016-2018 with less than half of those reporting fever seeking treatment within 24 hours.

Field visits conducted as part of the MPR generally found no stock-outs of ACT and RDTs at PHD, OD, HC and VWM level. Because of stock management data limitations in the MIS, the review team was unable to establish with any degree of accuracy the current level of stock availability of first line AS-MQ at HF level during the MPR, and therefore we are only able to draw some conclusions based on historical data, anecdotal evidence and observations in the field. The survey identified 86% (73) of 85 public HFs surveyed having ACT in stock on the day of survey. Similarly, the 2017 ACTwatch survey identified that almost 100% of public HFs surveyed had first line AS-MQ in stock on the day of survey.

The team noted that in 2017 and 2018 PQ 15 mg was being used, but that the lower PQ dosage of 7.5 mg to treat patients 20 - 49 kg body weight was only distributed to OD level by July 2019. The review team noted during their field visits that PQ 7.5mg had not yet reached peripheral HFs in Battambang and K. Speu.

Despite delays in seeking treatment, and a surge in the number of severe cases of malaria seen in 2018, the current treatment regimen appears to be working well, as indicated by zero malaria mortality deaths in the past two years. Case fatality as a proportion of malaria inpatients (IPD) declined during the same period from 1.1 to 0.01 percent (Figure 24).

Figure 24: Trends for inpatient cases and case fatality, 2010-2018



There have been no reported deaths due to malaria since February 2017. This reflects gains in early diagnosis and treatment, and the increase in the number of community-based health workers who are effectively referring malaria cases to health facilities. Training conducted in 2018 for provincial and referral hospitals on managing severe cases of malaria might have contributed to there being no reported deaths despite an increase in severe cases treated in 2018.

Treated cases are currently followed up on day 28 for *P. falciparum* and mixed infections only by CMEP. No follow-up is being undertaken at day 42 to monitor the re-emergence of symptoms to identify drug resistant parasites.

Recommendations:

- Latest and up-to-date NTGs for malaria should be cascaded effectively to all HFs and supplemented with regular refresher training

- Ensure that the most recent job-aid is available in the field

- Monthly VMW/MMWs meetings to include integrated supervision and on the job training

- Plan, budget and operate quarterly OD supervision of HCs with performance scoring

- Develop standard malaria component as part of quarterly integrated OD supervision of HCs

- Ensure adequate availability of ACTs (pediatric and adult tablets) and primaquine in all HFs, VMWs and MMWs

- Ensure full roll out of single dose 7.5 mg PQ for 20-49 kg body weight and eventually roll out PQ radical cure for *P. vivax*.

- Expand access to G6PD testing and radical cure for *P. vivax*

- Continue annual TES studies in 5 sites supplemented by iDES with 42 days follow-up in areas with lower case load

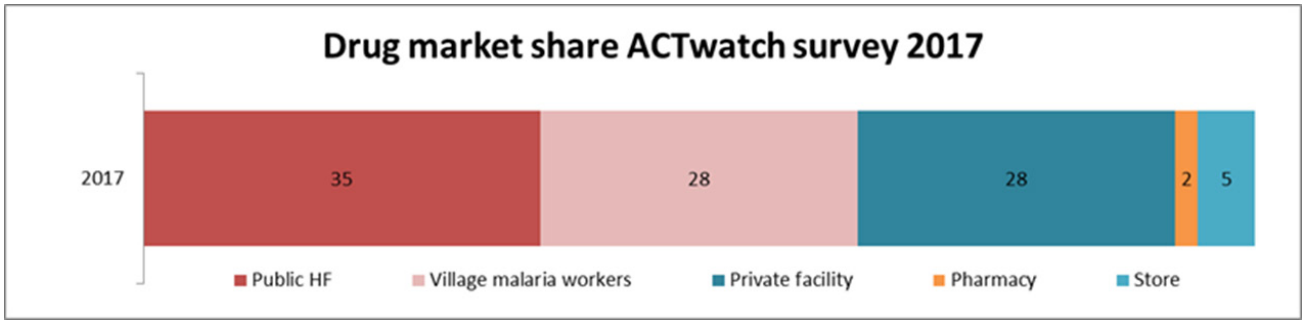
- Review DDF ACT registration processes and pre-emptively register alternative ACTs.

Private sector:

The private sector plays an important role in the provision of healthcare services in Cambodia. It comprises a wide range of outlets including registered health outlets such as pharmacies, depot A and B pharmacies, clinical pharmacies, non-registered drug stores, mobile providers, grocery stores and shops.

The ACTwatch 2017 survey identified private sector as holding 35% of the drug market share for ACT (Figure 25).

Figure 25: Drug market share in 2017 as per ACTwatch survey



A PPM programme was initiated in 2011 to engage private sector providers in malaria control and elimination efforts. To encourage participation, PPM participants were provided with free or subsidized ACTs and RDTs, which private sector then used to diagnose and treat patients at a charge thus making a higher profit than had they obtained unsubsidized malaria commodities from non-approved sources.

Implementation of PPM strategies have been adjusted based on evidence of multi-drug resistance. Under RAI2E, the PPM was jointly implemented through the PSK Consortium, CARE and CRS in cooperation with PHDs, ODs and CNM. PPM partners were provided with free or subsidized ACTs and RDTs dependent on whether the PPM point of care was in endemic ODs with or without evidence of artemisinin resistance. In 2017, PSI had a network of 672 PPM outlets in 14 provinces with plans to expand this to over 1,000 PPM outlets in 2018.

In 2016, private sector point of care providers performed 111,000 malaria tests. In 2017, the PPM tested over 158,000 patients through 1,668 points of care (representing 46% of all patients tested through HFs, VMWs and PPM), resulting in 29,640 confirmed cases of malaria being treated.
The PPM programme and diagnosis and treatment of malaria by private sector providers was suspended by MOH in April 2018 and replaced with a requirement to refer all suspected malaria

cases to a public HF.

In reviewing data for 2018 and 2019, the review team was unable to be assured that all febrile patients previously being seen by the PPM had been absorbed into the VMW and HF points of care. As such the possibility exists that some suspected malaria cases are slipping under the radar and are unreported. The review team notes that, to reduce the gaps in surveillance and optimize case detection it is important to understand where the patients previously treated by the PPM programme are going for services.

Recommendations:

- DDF/CNM to monitor at the private level observance of PPM ban (no testing and treatment at the PPM level and ensure suspicious malaria cases are referred at the HF level) and regularly sharing monitoring visits reports

- Undertake a rapid assessment to understand how the suspension of the PPM has impacted on the health seeking behavior of fever patients and the extent to which suspected malaria cases are being referred for diagnosis and treatment to the public-sector HFs.

Village malaria worker (VMW) and mobile malaria workers (MMW):

VWMs and MMWs are the foundation of case detection, treatment and surveillance in the MEAF and surveillance for malaria elimination. The MEAF calls for a progressive scale-up of VMWs and MMWs to ensure at least one VMW in every village considered at risk for transmission or importation of multi-drug resistance (including border sites). During the period covered by the MPR, the number of villages covered by VMWs or MMWs has increased 10% and stands at 2,381 villages at the end of 2018 (Table 15). The total number of trained VMWs and MMWs is around 2,564.

Table 15: Deployment of village malaria workers and mobile malaria workers

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
CM-5a	Deployment of VMW/MMW/PMW Number of villages/point of care covered by with VMW/MMW/PMW	2882	4866	TBD	TBD	TBD	2,169	2,370	2,381

The review team found that VMWs and MMWs are important sources of medical advice and treatment for fever. The 2017 malaria survey identified 22% of fever patients as seeking first treatment from VMWs or VHWs.

Cambodia Health Partnership consortium conducted a knowledge, attitudes and practices survey in 2016 on 8,566 households in three implementing regions (Ratanakiri, Mondolkiri and Stung Treng). Consistent with other studies, this study identified that overall, participants would most commonly seek treatment from a HC (62.3%) if they recognize the symptoms of malaria in themselves or someone in their household, or a private clinic (14.5%). However, in villages where there is a VMW, the second most common source for seeking treatment would be from the VMW (19.6%).

The CNM determines where to place VMWs in endemic ODs based on villages with an API >5 and distance to HC >5km. The criteria make sense but does not necessarily match specificz

conditions, such as groups of moving people temporarily living or working in at risk areas outside of village settings. Moreover, these criteria may result in gaps in service coverage. Mapping the movement of MMPs, the touch points and entry and exit points is critical for ensuring good coverage and an extension of outreach services.

GF funded activities were interrupted in 2016-2017 impacting village level case management services and resulting in a low level of activity by VMWs. However, since being resolved, there has been a rapid scale up of activities (and reporting), with approximately 40% of the total 288,000 tests for malaria undertaken in public facilities in 2018 performed by VMWs. Village based VMWs have significantly increased the detection rate of uncomplicated cases at community level, as well as built awareness of prevention measures amongst the population.

During the period covered by this review, the team noted measurable improvements in the passive case detection network, with recent high levels of reporting completeness by both HFs, and VMWs. The VMWs submit paper-based reports at monthly meetings convened by ODs. Report completeness by VWMs has progressively increased from <40% in 2017 to almost 100% at the beginning of 2019.

Recommendations:

- Annual revision of village stratification of malaria burden villages to avoid gaps and ensure VMW coverage

- Improving the quality of VMW/MMWs meetings with standard meeting agenda, interactive exercises, on the job training, data review, and mapping outreach locations based on *P. falciparum* distribution.

Quality assurance of antimalarials

The Department of Drugs, Food, Medical Devices and Cosmetics (DDF) under the MOH is the main regulatory body for pharmaceuticals in Cambodia. All pharmaceutical products are regulated by the DDF in accordance with the pharmaceutical law and other regulations, and only drugs registered with DDF can be legally imported into Cambodia. DDF requires importers to obtain an import permit for each shipment. DDF, the National Health Products Quality Control Centre, and CNM are involved in quality assurance and quality control in Cambodia for the private sector.

Most of the antimalarial medicines for Cambodia have been funded through the GF grants and as such must be in the current national or international standard treatment guidelines, or the WHO standard treatment guidelines. The medicines must be prequalified by the WHO prequalification programme or authorized for use by a Stringent Drug Regulatory Authority. UNOPS, in its role as Principal Recipient previously carried out post-shipment testing of all GF financed antimalarials at a WHO Prequalified laboratory or National Drug Regulatory Authority for quality control testing, it now only performs quality control at a national level through DDF. All antimalarials are procured from WHO pre-qualified sources.

Quality assurance of diagnostics:

In 2015, WHO provided technical assistance to CNM to establish a national malaria slide bank, consisting of 12,000 slides. 55 individual blood samples from malaria cases. After review of the collection in January 2019, 2,465 slides (20% of collection) were retained from 48 cases for use in trainings and assessment of microscopists. The remaining slides were archived.

WHO supported CNM to produce a Quality Assurance of Malaria Diagnosis Operation Manual 2019 which details the QA programme for RDTs together with SOPs. Training of provincial and district staff was done. Along with SOPs, the manual includes checklists and forms on how to conduct laboratory supervision and monitoring, slide cross-checking/validation, national competence assessment of microscopists and maintenance of a national malaria slide bank. New curriculum and full set of training material for basic and refresher trainings are also included.

External and national competency assessments for malaria microscopists were conducted during 2017-2018 with 37 microscopists participating from Cambodia. 19 microscopists (51%) achieved level 1 competency, 11 (38%) achieved level 2, and the remaining 7 required further training or mentoring prior to re-assessing their competencies (i.e. scored level 3 or 4).

The procurement of WHO pre-qualified RDTs is undertaken principally by UNOPS, following WHO standard evaluation criteria. Before 2018, post-purchase lot testing was performed by the Institut Pasteur Cambodia (IPC). In 2018, the Research Institute for Tropical Medicine (RITM) based in the Philippines was given full responsibility by WHO to cover the region for lot testing but GF decided that only pre-shipment lot testing is required, and post-purchase lot testing no more recommended.

Recommendations:

- Elaborate methodology for post-deployment lot-testing of RDT

- Implement new QA system for microscopy according to operational manual

Mass drug administration:

Though MDA is recommended as a potential tool by WHO to accelerate multi-resistant *P. falciparum* in the GMS region, there is still currently no policy to implement MDA in Cambodia.

5.3 Vector control

Summary findings: Well-targeted, insecticidal net distributions have resulted in universal coverage. However, current vector control tools have limited application for those at highest risk, such as forest goers, given that they often work during the evening or night when vectors are most active.

Objective 3 of the MEAF is to protect at least 90% of all populations at risk of malaria with an appropriate vector control intervention by 2017.

The MEAF measures progress against this objective through 9 outcome and output indicators which are detailed in Table 16. The six outcome indicators are reported on through periodic surveys while the three output indicators are reported against annually using programmatic data.

Table 16: Vector control targets and achievements

IND #	INDICATOR	TARGETS					ACHIEVED		
		2016	2017	2018	2019	2020	2016	2017	2018
VC-1	Percentage of population in targeted villages who slept under an insecticide-treated net (ITN) during the previous night		70%			>90%		45%	100 - 86%
	POPULATION TARGETED BY ITNs								
VC-2	Percentage of population in targeted villages using an ITN among the population with access to an ITN		80%			>90%		84%	
	POPULATION TARGETED BY ITNs								
VC-3a	Percentage of households in targeted villages with at least one insecticide-treated net.		95%			>95%		61%	
	POPULATION TARGETED BY ITNs								
VC-3b	Percentage of households in targeted villages with at least one insecticide-treated net for every two people		70%			>90%		26%	99 - 84%
	POPULATION TARGETED BY ITNs								
VC-4	Percentage of forest visitors in targeted villages who reported sleeping under an ITN the last time they slept in the forest	70%			>90%			42%	
	POPULATION TARGETED BY ITNs								
VC-5	Percentage of mobile people that used an ITN the last time they slept in transmission area							43%	
VC-6a	Number of LLIN distributed by mass campaign	645,333	973,431	TBD	TBD	TBD	322,569	519,184	1,028,285
VC-6b	Number of LLIN distributed by continuous distribution	379,925	214,685	TBD	TBD	TBD	123,911	149,104	143,213
VC-7	Percentage of the population-at-risk potentially covered by LLIN mass campaign	50%	59%	TBD	TBD	TBD	51%	58%	38%
	POPULATION TARGETED BY ITNs								

5.3.1 Successes

- LLIN universal coverage achieved following mass distribution campaign in 2,910 targeted at-risk villages in malaria endemic areas.

- High net ownership and increasing use of ITN amongst those that have access to ITN.

- 1.86 million LLINs distributed cumulatively through mass-campaign 2016-2018

- 0.41 million LLINs / LLIHNs distributed by continuous distribution during same period

- Forest pack distribution ongoing

5.3.2 Observations, challenges and recommendations

Since the 1990s, Cambodia has relied on ITNs, LLINs and LLIHNs for malaria control. Prior to 2005, the CNM focused on distribution and treatment of conventional nets first using a liquid pyrethroid formulation and later using pyrethroid tablets. Coverage was targeted to high transmission areas. The Programme began to replace ITNs with LLINs in a gradual manner from 2005 onwards.

LLINs is a primary vector control strategy for reducing human biting rate and vector survival of the anopheles mosquitos. LLIN effectiveness is maximal when high coverage and utilization is achieved, but their impact is temporary and dependent on their correct use, good physical integrity and the biological efficacy of the LLIN.

Mass distribution is undertaken every three years at village level by CNM, the PSI consortium, CARE and CRS. In between mass campaigns, continuous distribution has been conducted for the mobile and migrant population at workplace and forest locations and to replace damaged nets at community level. Nets are provided free of cost to all households and MMPs. National guidelines plan for universal coverage of 1 net to 1.8 persons in all at risk malaria identified villages[10].

Outside of the list of villages identified, other areas within malaria endemic provinces may be targeted where CNM approves either catchment areas for MMPs such as farms, plantations, mines, hydro-electric and other companies or temporary forest visitors that are identified by HFs or implementing partners. Additional areas may be identified by the Ministry of National Defence or Ministry of Interior-Health Department in view of identified risk of transmission to uniformed forces.

Integrated vector management: In 2017, CNM produced the Integrated Vector Management: National Guidelines & Intervention Framework, an operational framework to guide managers and those implementing vectorborne disease control programmes in designing more efficient, cost effective systems. The framework is broadly based upon the WHO Global Strategic Framework for Integrated Vector Management.

Complementary to the above framework, in 2016 CNM introduced the Guidelines for Distribution of Long-Lasting Insecticidal Mosquito Nets followed by the Entomological Surveillance for Malaria Elimination in Cambodia in 2017., The review team was unable to validate specific activities related to integrated vector management apart from development of the above documents.

LLIN mass distribution: The most recent mass distribution campaign was scheduled to commence in 2018 but it was decided to start the campaign early during the second half of 2017 due to an increase in malaria cases. The campaign commenced in four provinces targeting 1,075 villages during 2017 and continued through to completion in all remaining malaria target areas covering 1,835 villages in 16 provinces during the first semester of 2018.

Surveillance data is used by CNM to evaluate the impact of LLINs in each geographic location and to monitor ownership and utilization. The total target distribution of LLINs from the mass campaign for the second semester 2017 and first semester 2018 is detailed in Table 17. A total of 1.547 million LLINs were distributed during the campaign, comprising 0.519 million during the second semester 2017 and 1.028 million during the first semester 2018. Revised targeting for 2017-2018 was based on 2014 villages with an API >5

A 2019 CNM report on LLINs quick assessment in Cambodia was conducted as a follow-up to the mass distribution campaign. The report identified that overall the NMP achieved universal coverage of the target population with 103% (15,009 out of 14,530) of expected LLINs received, which was higher than the expected ratio of 1 net per 2 persons, although between 1-16% of the households included in the sample survey received fewer LLINs than they should have if the national LLIN guideline was followed (Figure 26). The findings would indicate that there is room for improvement in some provinces if the national guidelines on distribution were more closely followed.

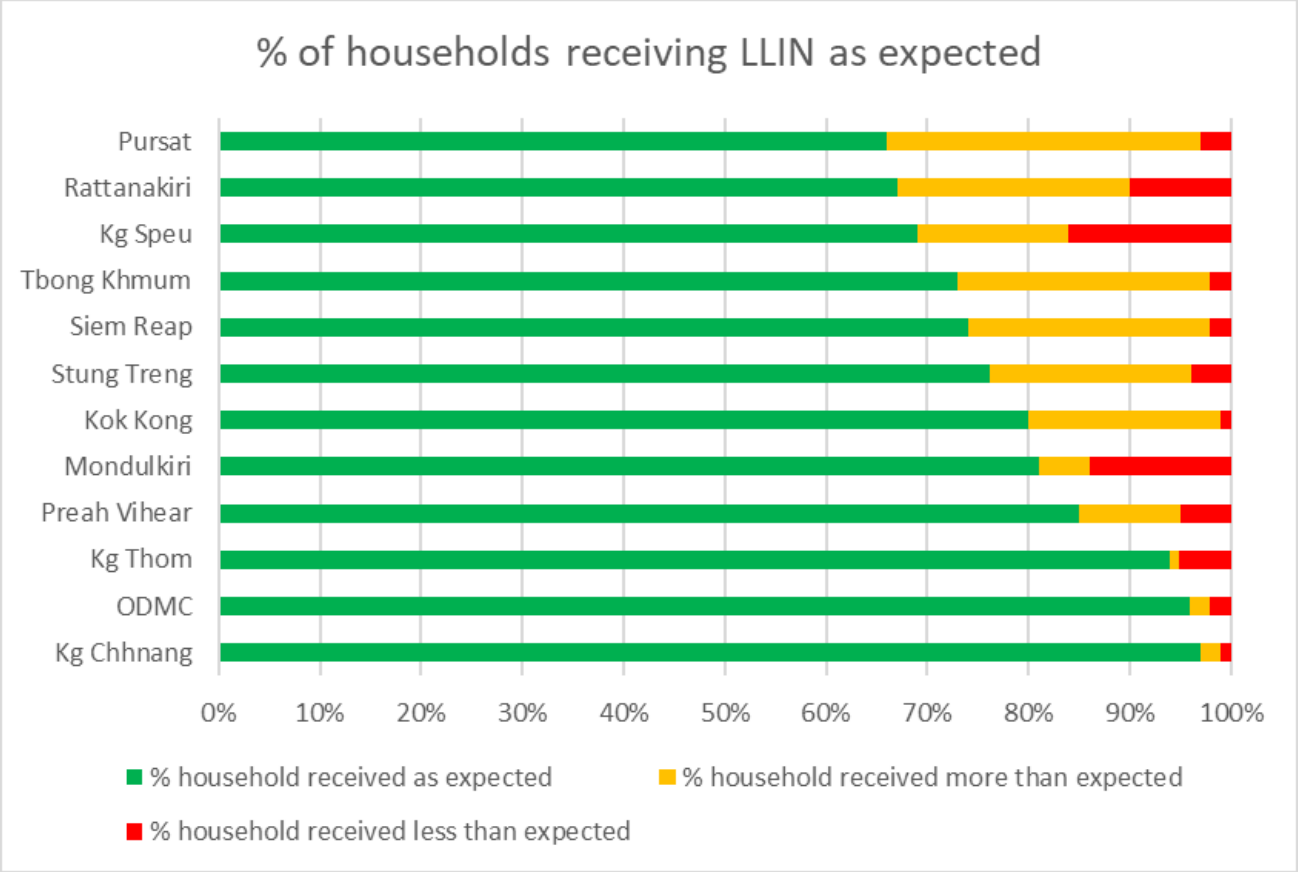
[10] CNM (2014). Letter issued by Director, CNM on net population ratio. 1 July 2014

Table 17: Target distribution of long lasting insecticidal net mass campaign, 2017-2018

Province	Second semester of 2017 # Operational Districts	# villages
Kg. Speu	4	341
Kratie	2	291
Rattanakiri	2	275
Stung Treng	1	168
		1075

Province	First semester of 2018 # Operational Districts	# villages
BMTC	3	29
Battambang	4	105
Kg. Cham	4	65
Kg. Chhnang	3	70
Kg. Thom	3	260
Koh Kong	2	18
Mondulkiri	1	102
ODMC	2	191
Pailin	1	39
Preah Sihanouk	1	10
Pheah Vihear	1	277
Pursat	4	212
Siem Reap	4	251
Takeo	2	20
Tbong Khmum	6	83
Kampot	2	103
		1835

Figure 26: Percent of households receiving long lasting insecticidal nets as expected



The same survey identified that of the 26,311 people interviewed, 86% claimed to have slept under an LLIN the previous night. This ranged from 75% of people who claimed to have slept under a net the previous night in Memut OD to 100% of people who claimed to have slept under a net the previous night in Kampong Chhnang OD indicating good usage behaviour. However, the survey found that many people were undertaking different activities during evening time which could have left them exposed to biting from vectors before they go to sleep.

Continuous distribution of LLIN/LLIHN: In accordance with the CNM 2016 Guidelines for Distribution of Long Lasting Insecticidal Mosquito Nets the NMP implemented a continuous distribution policy through the existing community volunteer network to replace LLINs where and when needed and cover additional needs (such as population growth) to sustain high coverage levels in between mass distribution campaigns. Forecasting assumes that 10-20% of nets need replacement within a year following distribution because of deterioration, damage or loss and to address population growth.

In addition to LLIN distribution to 1 per 1.8 persons in a household during the campaign, the NMP ensured that every household living in malaria endemic areas received 1 LLIHN along with its allocation of regular nets, so that if a family member intended to seek work in the forest, he would be able to take up the LLIHN and move into the forest area without having to buy a LLIHN.

The LLIN procurement and distribution plan aimed to ensure the targeted coverage of MMPs with LLINs and forest packs by allocating 1 LLIHN per person for MMP groups living within any of the malaria endemic ODs in the 21 provinces, and 1 LLIN and LLIHN per person for military and police and their families anywhere within the malaria endemic ODs. These strategies are considered critical elements of ensuring high coverage.
Distribution to MMPs and through continuous distribution resulted in 239,335 LLINs and 176,893 LLIHNs being distributed between 2016 and 2018 (Table 18).

Table 18: Mobile migrant populations and continuous distribution of long lasting insecticidal nets and long lasting insecticidal

2016		2017		2018	
LLIN	LLIHN	LLIN	LLIHN	LLIN	LLIHN
48,491	75,420	106,543	42,561	84,301	58,912

MMPs and bednet ownership and use: The Cambodia Mobile and Migrant Population Survey 2017 was the first large scale survey undertaken of key MMP groups at risk of infection in Cambodia in order to allow for a more comprehensive and better understanding of MMPs and malaria. One of the objectives of the survey was to establish an evidence base on ownership of insecticide treated nets and patterns of use when sleeping in a transmission area, and their knowledge about malaria and effective preventive measures.

The four key MMP subgroups included: seasonal workers; construction and mine workers; forest goers; and security personnel including military and police often related to patrolling activities in forested border areas. In addition to have the highest risk for malaria, evidence shows a direct correlation between mobile and migrant populations (those resident for less than 6 months and those resident for more than 6 months but less than a year), weaker immune status and less knowledge about malaria and health services compared to the local population who will have developed a relative immunity to malaria through repeated exposure and have access better to services (Table 19).

Table 19: Mobile migrant population malaria risk index

Exposure Index		Vulnerability Index: Mobile	Migrant	Local	Score	Access Index
					Score	
	Forest workers	9	27	25	23	9	Forest Workers	
	Construction workers	7	23	21	19	7	Construction workers	
	Security Personnel	7	23	21	19	7	Security Personnel	
	Seasonal workers	6	20	18	16	5	Seasonal Workers	
	Visitors	4	16	14	12	3	Visitors	

Nearly 95% of the interviewed MMPs reported to have owned at least one mosquito net, but only 58% of them owned at least one ITN. The ITN ownership coverage was much higher among security personnel and forest goers than among seasonal workers and construction workers (Table 20).

Table 20: Ownership of insecticide treated nets by type of nets and mobile migrant population subgroup

ITN Ownership	Seasonal (N=1,205)	Construction (N=1,209)	Forest goer (N=1,207)	Security (N=1,204)	All (N=4,825)
No ITN (%)	56.7	77.9	18.3	17.1	42.5
≥ 1 LLIHN and 1 LLIN (%)	7.9	4.2	48.6	46.9	26.9
≥ 1 LLIN only (%)	31.3	14.3	28.9	28.3	25.7
≥ 1 LLIHN only (%)	4.1	3.6	4.2	7.7	4.9
TOTAL (%)	**100**	**100**	**100**	**100**	**100**

The percentage of MMPs that used an ITN the last time they slept in transmission area was 43%, with great variation across the MMP subgroups.

The three main reasons for MMPs not sleeping under a mosquito net the previous night included: did not need a mosquito net (37%), did not have a mosquito net (27%) and mosquito net was not comfortable (18%). These three main reasons accounted for 82% of all cases. The findings suggest that access to preventive measures among MMPs as indicated by ITN ownership and use remains low when compared with similar indicators for the general population living in malaria endemic areas and is lagging far behind the targets set in the MEAF 2016-2020 framework. Although MMPs knowledge about malaria and preventive measures is

[11] Guyant, Philippe et al. "Malaria and the mobile and migrant population in Cambodia: a population movement framework to inform strategies for malaria control and elimination." Malaria journal vol. 14 252. 20 Jun. 2015

reasonably good, there are areas that require further improvement, including misconception about how people get and prevent malaria.

Forest packs: A strategic objective of the intensification plan is to implement an aggressive approach to deploy interventions to impact risk and deplete parasites reservoir in population with highest risk, particularly among forest goers. As part of the plan, the programme decided to mobilize MMWs to distribute forest packs to forest goers. The initial plan was to include a backpack, hammock, LLIHN, insect repellent (with instructions for applying), boots and a health education leaflet in each forest pack. MMWs are supposed to bring forest packs to distribute to MMPs during outreaches activities. Because of the difficulty to implement this activity (bad road conditions especially in rainy season, some MMWs walk into the forest) MMWs encourage forest goers to pick up the forest pack at the MMW house ensuing also a good network.

At the time of the MPR, a single round of forest packs had been distributed. Initially the packs in the first round of distribution did not include insect repellent; however, repellent has been donated to the programme and will be included for second round. CNM intends to increase the quality of the insect repellent and to include an exit questionnaire to monitor behavioural practices.

Indoor residual spraying in active foci: CNM trained 30 ODs staff in 2018. There is a strategy for IRS in MEAF but not in the surveillance manual because based on recent WHO guidance, IRS is not recommended.

Operational research: Operational research conducted by CNM during the period covered by the review included the 2017 Cambodia Malaria Survey and the LLINs Quick Assessment in Cambodia completed at the end of 2018 as follow-on to the mass distribution campaign.

TES for monitoring drug resistance continues and results are contributing to national drug policy decisions. Other research included the Cambodia Mobile and Migrant Population Survey 2017, the Cambodian Health Partnership BCC KAP survey 2016 and the PSI Outlet Survey 2017. Results from these studies are influencing the elimination strategy and helping shape interventions. A CNM research network meets every six months to coordinate the research agenda for elimination.

Insecticide resistance: Insecticide susceptibility test kits are procured each year by WHO for monitoring insecticide resistance in five sites, including Koh Kong, Kg. Speu, Rattanakiri, Pailin and Steung Treng. The results from each test are reported to WHO World Malaria Report each year; however, due to the very low number of replicates and controls being tested, the reliability of the data is questionable.

Table 21: Insecticide resistance by class, 2010-2018

Insecticide Class	Years	(%) sites[12]	Vectors[13]	Used[14]
Organochlorines	2014-2016	33.33% (3)	None (secondary only)	No
Pyrethroids	2014-2016	66.67% (3)	*An. maculatus s.L*	Yes

Source: WHO World Malaria Report 2017

[12] Percent of sites for which resistance confirmed and total number of sites that reported data (%)
[13] Principal vectors that exhibited resistance
[14] Class used for malaria vector control in 2017

Recommendations:

- Survey for hard to reach population should be tailored and done for the target population. Help the countries to have tracking tools (rather than surveys) the front-line workers should be able to know who is moving, which migration, length, times, etc. New tools are needed to know our target population. Or surveys to be done with specific expertise to target MMP and including irregular migrants.

- Perform quickly operational research (acceptability and use) of integrated impregnated hammock net.

- Ensure distribution of forest packs to forest goers by MMWs

- Expend forest pack distribution by VMW in villages with high Pf incidence.

- LLINs and LLIHNs. distribution should be based on up to date stratification data with post campaign rapid assessment survey to measure coverage at the village level and top up corrective distributions in under-covered areas.

- Prior to the next mass net distribution for target groups, empower subnational levels to implement distribution strategies through refresher training and intensified supervision.

- Assess current combinations of activities and conduct operational research to determine optimal approaches for future deployment including new components as they become available

- Continue insecticide resistance monitoring in high endemic areas where vector density is adequate for sampling.

5.4 Surveillance

Summary findings:
The malaria information system has greatly improved as a user-friendly web-based platform with dashboards and line-listing of cases. Passive case detection has improved with recent high levels of timely and complete reporting.

A substantial number of trainings have been done to strengthen surveillance, but some process and data quality issues are noted such as incomplete reporting of negative tests.

Guidance documentation on surveillance for elimination has much improved, elimination activities have started in 6 provinces in 2018 and expended to 8 provinces in 2019. However, foci investigation and management have just recently started and malaria is not yet a notifiable disease.

Objective 4 of the MEAF 2016-2020 is to enhance the surveillance system to detect, immediately notify, investigate, classify and respond to all cases and foci in order to move toward malaria elimination.

Progress towards achieving the objective is measured through 4 outcome indicators relating

to completeness of reporting and 6 outcome indicators specific to case investigation and detection and foci investigation and response as shown in Table 22.

Table 22: Surveillance targets and achievement

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
SV-1a	Completeness of reporting: Percentage of expected HIS reports submitted from Referral Hospitals	70%	80%	95%	100%	100%	NA	NA	NA
SV-1b	Completeness of reporting: Percentage of expected monthly MIS reports submitted from public HFs	85%	90%	95%	100%	100%	70%	80%	90%
SV-1c	Completeness of reporting: Percentage of expected monthly MIS reports submitted from VMW/MMWs	>90%	95%	100%	100%	100%	10%	25%	60%
SV-1d	Completeness of reporting: Percentage of expected monthly MIS reports submitted from private providers/PMWs	65%	75%	85%	100%	100%	NA	NA	NA
EL-1	Percentage of malaria cases notified within 24h according to surveillance manual ELIMINATION ODs	75%	85%	95%	99%	100%	NA	NA	NA
EL-2	Percentage of malaria cases investigated within 3 days after detection according to surveillance manual ELIMINATION ODs	75%	85%	95%	99%	100%	NA	NA	NA
EL-3	Percentage of patients with *Plasmodium falciparum* malaria (including mixed) with directly observed treatment (DOT) by VMWs ELIMINATION ODs	50%	60%	70%	80%	>90%	NA	NA	NA
EL-4	Proportion of cases investigated who were diagnosed within 24 hours after onset of symptoms ELIMINATION ODs	65%	75%	85%	100%	100%	NA	NA	NA
EL-5	Percentage of new active foci investigated according to surveillance manual ELIMINATION ODs	75%	85%	95%	100%	100%	0%	0%	0%
EL-6	Percentage of investigated foci in which response was initiated according to surveillance manual ELIMINATION ODs	75%	85%	95%	100%	100%	0%	0%	0%

5.4.1 Successes

- Surveillance system successfully migrated from MS Access database to web-based in 2016

- Line listing of cases using mobile devices introduced in 2017

- 2,998 OD and HC staff were trained on MIS application in the use of android tablet for case data entry in 2017. Additional 1,784 PHD, OD, HC and VMWs trained on use of android tablet and smart phone for real time case reporting in 2018.

- 84 PHD and OD staff trained on MIS in 2016, 53 in 2017 and 62 in 2018. In addition, 288 PHD, OD and HC staff were trained on surveillance in 2017

- Updated web-based MIS system to include surveillance for elimination data (SMS alert, case investigation and reactive case detection) deployed in 6 provinces in 2018.

- Progressive improvement in reporting completeness from HFs and VMWs – close to 100% by end of 2018.

Surveillance dashboards have been developed in MIS which allows CNM to monitor of trends and early detection of increased incidence in burden reduction areas.

- Cambodia Malaria Survey, MMP survey and ACTwatch survey all completed in 2017.

5.4.2 Observations, challenges and recommendations

MIS specifications:
The malaria surveillance system is described in the Surveillance for Malaria Elimination in Cambodia Operational Manual 2017 edition which has been developed in line with the Government's MEAF 2016-2020.
Significant improvements have been made to the MIS with incremental updates and upgrades made to the MIS application and supporting IT infrastructure since 2016 to include surveillance for elimination data, real time reporting and commodity stock management reporting, although not all modules are fully functional. Partner data has been integrated into the database and upgrade improvements to dashboards and backend are ongoing. Data is stored on a physical server with CNM and on cloud servers. There is currently no server administrator to maintain the system. A generator has been purchased using GF funds but requires a budget for maintenance and fuel.

Management of mobile devices:
As of May 2019, ~1,000 tablets have been provided to all HCs in the country and another ~1,000 smartphones have been provided to VMWs within the 6 elimination provinces. In June 2019, another 1,000+ smartphones will be provided to users in the 8 new elimination provinces followed by a similar amount in 2020. The largest challenge relates to the operational management of the large fleet of mobile devices spread throughout the country.
An easy system is needed to ensure that Android data collection app in all devices are quickly updated if changes are made or bugs are fixed. Despite having this SOP in place, it is also extremely difficult for CNM, given the current capacity, to manage the volume of broken, lost, and stolen devices currently in the field. Every device in the field must receive a top up/data plan to ensure that they are able to report cases.

Surveillance capacity building:
Training for surveillance is guided by the Surveillance for Malaria Elimination Trainers Manual which has most recently been updated at the beginning of 2019 and includes 3 modules. Module 1 was developed in 2017 encompassing three days of training for HCs on case notification and case investigation. Training sessions are designed for OD level and two trainees from each HC. Module 2 was developed in 2019 and encompasses two days of training for PHD/OD staff on monitoring of case-based surveillance and foci investigation. Module 3 is a two-day session for HCs on integrated drug efficacy surveillance (iDES). Most of the HF staff have received training in surveillance in 2017 but the review team noted that there limited supervision was done after trainings and supplemental training or supervision was not planned to account for staff turnover. ,

Management and use of data at all levels:
The review team noted the heavy workload at HF level due to the multiplicity of hardcopy registers that needed completing. We recommend a review and streamlining of registers at HF level, particularly where the same data field is being entered multiple times. Once the MIS is completely stable and the mobile application is being consistently used for case reporting, the review team considers that paper-based reports can be eliminated.

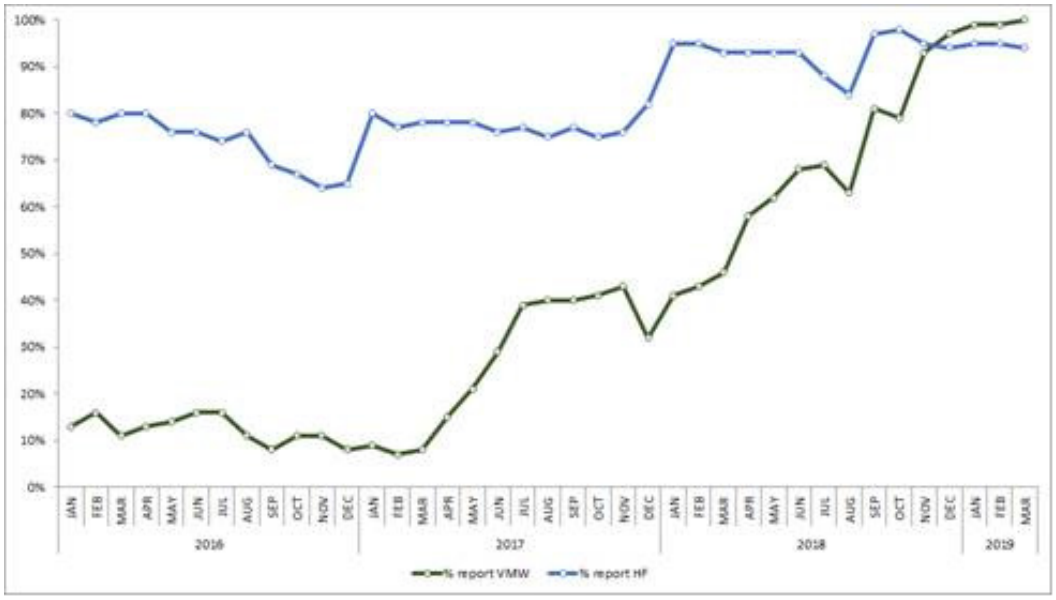
MIS training has been focusing on training HCs and ODs to enter data into MIS through tablets. The capacity of staff for data management, analysis and interpretation to inform action and prioritize activities is still limited.

The review team notes that although PHDs and ODs have access to MIS data, access is limited to their own area of responsibility. CSO implementing partners only have access to their own data.

The review process was frustrated at times because of inconsistent datasets reported by different implementing partners for the same thing.

Passive case detection:
Currently, malaria is not yet a notifiable disease by law. CNM is currently preparing documents to be submitted to MOH to mandate malaria as a notifiable disease.
There has been a significant improvement in MIS report completeness over the past three years from HFs and VMWs (Figure 27), and although there are now similar confirmed case counts to HMIS, there is still a problem because of not fully capturing and reporting all the negative tests affecting the record for the total tested (MIS is under-reporting by 20% when using HMIS data as a reference). This practice undermines the reliability of data, particularly for test positivity rates, and highlights the need for the programme to conduct a comprehensive national surveillance assessment to better identify possible gaps in data capture and system processes.

Figure 27: Malaria Information System reporting completeness, 2016-2018



Previously, the police and military reported malaria data to CNM on an annual basis. Since 2018, they have been submitting paper-based monthly data which CNM then enters into the MIS. Due to frequent changes of military staff, it has been challenging for the programme to identify a military focal person to take on this responsibility.

Active case detection:
In burden reduction provinces, active case detection of malaria cases reported by VMW/MMWs remains paper-based, aggregated, and entered into the MIS at the HC

level. Unfortunately, passive and active case detection cannot be distinguished making difficult an assessment of the effectiveness and value of the active detection.

Case notification, case investigation and re-active case detection:
In elimination-targeted ODs, a variation of the Chinese 1-3-7 approach is implemented. Cases are notified within 24h, investigated and classified within 3 days. This approach requires intensive human resources and timely response to each indigenous case using a Day-0 SMS alert system for rapid notification, follow-up of cases, and where appropriate, reactive case detection that is conducted around index cases.

In 2018, there were 6 elimination provinces consisting of Pailin, Battaambang, Banteay Meanchey, Siem Reap, K. Thom and K. Chang, with an additional 8 to be added in 2019. Even though much effort is required to implement RACD, representative data from the first half of 2019 shows significant improvements in achieving MEAF indicators measuring the 1-3-7 approach and response activities.

In the 5 ODs targeted by CMEP, of the 808 positive cases of malaria diagnosed in the second half of 2018, 613 (75.8%) were notified – 512 (63.3%) of which were notified less than 24 hours following diagnosis. There was significant variation in both the notification rate and timeliness of notification between the ODs (23).

Table 23: Percent of confirmed malaria cases in targeted Operational Distircts notified within 24h

Province	OD	# Positive	NOTIFIED	NOTIF<24	% NOTIF <24
Battambang	Thma Koul	*46*	46	46	*100%*
	Maung Russei	*346*	230	154	*45%*
	Sampov Luon	*98*	98	92	*94%*
	Battambang	*252*	211	198	*79%*
Pailin	Pailin	*66*	28	22	*33%*

Source: DMEP - period May-Dec 2018

Case investigation of *P. falciparum* and mixed species is being carried out by HCs in accordance with the surveillance manual in ODs targeted for elimination. In CMEP ODs, this is being undertaken for all cases and all species. In Battambang province during second half of 2018, the team noted that there is good evidence of successful implementation of case investigation (Table 24).

Table 24: Malaria elimination progress using 1-3-7 strategy in Battambang, 2018

Indicators	Target 2018 (national)	Thma Koul	Mauna Russei	Sampov Luon	Battambang
# of Pf/mix classified local	N/A	2	37	14	25
% notified within 24h	95%	100%	50%	100%	84%
% of Pf/mix investigated and classified within 3 days	95%	100%	44%	100%	74%

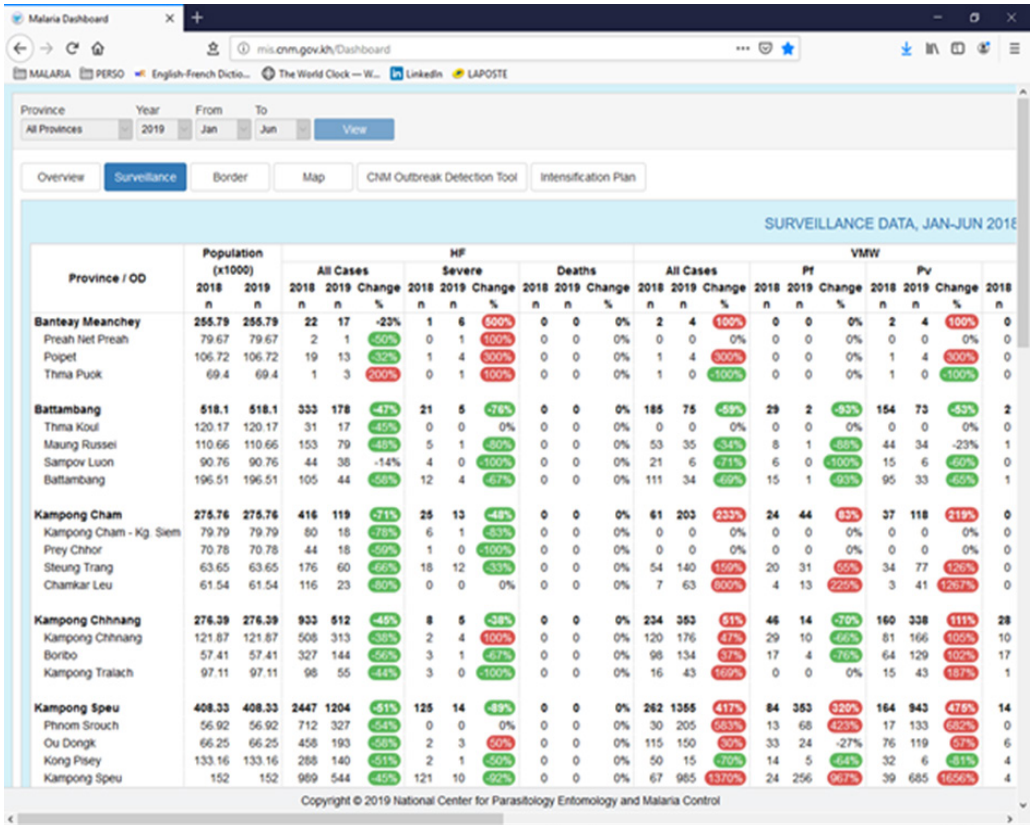
Indicators	Target 2018 (national)	Thma Koul	Mauna Russei	Sampov Luon	Battambang
% of Pf/mix DOTS by VMWs	70%	N/A	100%	100%	90%
% of index cases in which response was initiated	N/A	100%	37%	100%	53%

Foci investigation and response:
The NMP is in the early stages of strengthening its capacity to classify, investigate and intervene into malaria transmission foci.
A revised SOP for foci investigation and classification V2.3 was introduced in 2019 together with a focus investigation form and simplified tables to rank vulnerability and risk of importation. These are co-supported by module 2 in the Surveillance for Malaria Elimination Trainers Manual with training of PHDs/ODs and CSOs most recently conducted in June 2019.

Outbreak preparedness and response:
An outbreak dashboard has been developed in MIS which allows CNM to undertake close monitoring of incidence in burden reduction areas so early detection of increased malaria incidence can prevent outbreak events (Figure 28).

The first detection of an abnormal malaria case increase was in July 2017 and investigation was conducted in 7 provinces. In response to the outbreak, an intensification plan was developed, which included new activities targeting forest goers. Funding was reallocated and the plan commenced implementation in early 2018.

Figure 28: Malaria Information System dashboard and analysis tool



Noting the positive response to the outbreak, but the delays in implementing that response, the review team recommends that a specific outbreak response fund is set aside and that clear guidelines on its use are put in place to enable an early response unimpeded by delays in accessing the funds.

Programme monitoring and evaluation:
Monitoring and evaluation of the MEAF is guided by the Monitoring and Evaluation Plan of the MEAF 2016-2020 developed by CNM in consultation with WHO and partners to monitor progress of achievements against the MEAF. The NSPEM 2011-2025 and GMS Regional Malaria Indicator Framework (WHO) were consulted to ensure the Cambodia malaria M&E indicator framework is aligned with national, regional and global malaria M&E indicator frameworks.
A mid-term internal review of MEAF 2016-2020 was planned for the end of 2017 as part of the M&E plan but this was delayed due to the delayed initiation of the MEAF implementation. Moreover, an external MPR was scheduled for the end of 2019 but this was brought forward because of the need to develop the next NSP and funding application to the Global Fund which is due in March 2020.

The review notes that a number of periodic surveys and monitoring have taken place or are underway including the Cambodia Malaria Survey (2017), a KAP survey and MMP survey (2016), a HF survey (2017), TES (on-going), entomological surveillance (annual) and insecticide resistance monitoring. The findings of these surveys have been addressed during earlier sections to this report.

CNM's Technical Bureau oversees all aspect of M&E activities with collaboration with the 8 technical units: Epidemiology, Data Management, Monitoring and Evaluation, Vector Control, Laboratory, Health Education, PPM and VMW.

All data generated in the MIS platform are verified through data check, cleaning and collation. CNM carry out six monthly supervisory visits with field staff to assist in planning, implementation, M&E of malaria control activities. A costed M&E workplan is included in the MEAF operational costed plan.

Recommendations:

- Malaria is not yet a notifiable disease by law in Cambodia. It is important that advocacy activities are continuing to ensure that malaria becomes a notifiable disease. Such a law will be of paramount importance for the last difficult steps toward elimination achievement.

- Give complete open access to MIS data and expand it beyond the limited area of responsibility for OD/PHD/CSO

- Conduct a comprehensive national surveillance assessment to better identify possible gaps in capacity, processes, data capture and reporting

- Strengthen the Mobile Device Management (MDM) platform to facilitate app updates and management/maintenance of all devices.

- Develop MIS component of standard checklist for integrated supervision of HCs

- Review and streamline data collection/entry process and registers at HF level

- Clarify standard data collection and reporting procedures in hospitals and inclusion of test and cases from non-endemic ODs into MIS

- Distinguish records of from passive and active case detection at VMW/MMWs level

- Conduct MIS data review/monitoring progress on regular basis at OD and PHD level

- Develop simple standardized tools/checklist to improve data quality and provide basic training in data analysis for OD/PHD staff.

- Modify dashboards to allow spatial analysis of case incidence at the village resolution

- Explore possibility to accelerate expansion of case investigation of *P. falciparum* and foci investigation to intensification plan area in 2019 and to the entire country in 2020

- Review quality and efficacy of re-active case detection and assess comparative advantage of alternative response

- Explore phone call as an alternative to automated SMS to improve completeness of case notification from VMW/MMWs

- Insert additional dashboards to monitor completeness and timeliness of case-based and foci-based investigations and response

- Expand MIS coverage including other care providers as worksites, police and armed forces

- Clear bottlenecks for collaboration between CNM and ODs to conduct foci investigation and operate subsequent interventions

5.5 Information, education and communication and behaviour change communication

Summary findings: IEC/BCC strategies for elimination have not been fully rolled out. Difficulties in overcoming language barriers, mobility and sensitivities among MMPs such as legal status, prevent a segment of high risk groups from receiving messaging on prevention and case management.

Objective 5 of the MEAF is to implement a comprehensive IEC/BCC approach with the intention being to positively influence those at risk of malaria's health seeking behaviour and utilization of the available protection tools.

Progress towards achievement of the objective is reported periodically with the data source being the Cambodia Malaria Survey, conducted every 3 years. Two indicators measure progress (Table 25).

Table 25: Information, education and communication and behaviour change communication targets and achievement

		TARGETS					ACHIEVED		
IND #	INDICATOR	2016	2017	2018	2019	2020	2016	2017	2018
IE-1	Percentage of population who could explain how malaria is prevented through the use of ITN		65%			>90%		58%	
IE-2	Proportion of respondents reporting VMW as first point of consultation for fever		40%					23%	

Two strategies underpin the achievement of objective 5, being:

- Improve quality and delivery of IEC/BCC messages for malaria elimination, and

- Strengthen community mobilization for increased uptake of malaria interventions

5.5.1 Successes

- The NMP and partners have begun to develop a revised IEC/BCC strategy aligned with elimination (expected Q4 2019).

- Good improvement in the percentage of population who could explain how malaria is prevented through the use of ITN (2017 = 58% versus 41.8% in 2013).

- Significant improvement in the proportion of respondents reporting VMW as the first point of consultation for fever (2017 = 23% versus less than 1% in 2013).

- Draft national BCC strategy completed in December 2017 with active participation of partners.

- Broad range of BCC materials across multiple media developed, printed and distributed to at risk groups including MMP and forest workers on prevention, health seeking behavior and treatment compliance. BCC messaging has been prepared in multiple languages (Khmer, Laos, Vietnamese and Thai). In high endemic area of the intensification plan, BCC messages were produced in 4 indigenous languages in addition to Khmer. They are Kreoung , Tompoung, Charay, and Phnong.

- CNM, MC and HPA printed and distributed multi languages (Khmer, Laos, Vietnamese & Thai) BCC materials as well as radio broadcasts i5 local ethnic minority languages.

- Forest pack with BCC messages distributed to 17,400 forest goers; 1,580 militaries and 200 police patrols.

- Knowledge, attitudes and practices survey undertaken in 2017 to further inform and guide IEC/BCC interventions

5.5.2 Observations, challenges and recommendations

Quality and delivery of IEC/BCC message: The NMP's Health Education Unit is responsible for developing and delivering educational messaging, including the production of supporting materials such as billboards, poster, educational leaflets and radio spots. A number of CSOs organize messaging campaigns, generally in collaboration with CNM.

The current national malaria communication strategies are not fully implemented. The review team noted that VMWs/MMWs sometimes find it difficult to locate mobile populations resulting in an under-delivery of health education. In some cases there are language barriers when VMWs do encounter MMPs, further complicating delivery of messages. MMWs received a loudspeaker with malaria messages to be broadcasted during outreach activities. However due to their big size, loudspeakers cannot be carried into the forest. Furthermore wrong messages are broadcasted leading to disappointment of forest goers (presence of repellents in forest packs and availability of paracetamol at MMW level).

The Ministry of National Defence and the Ministry of the Interior train their own troops and their families on malaria prevention and treatment.

The previous IEC/BCC strategy is being replaced with an updated strategy to include BCC for malaria elimination. The strategy is still under development and no new messaging was available at the time of the review. Critical to the revised strategy will be to initially understand what drives MMPs' health seeking behaviour. Once behaviour is better understood, more impactful messaging can be developed. A revised strategy should emphasize the role of every Cambodian to work towards eliminating malaria, including a list of actions to be taken by every segment of the population.

Community mobilization: Much of the community mobilization efforts have been less than successful at targeting those most at risk, specifically MMPs, due to their absence in villages during outreach activities. In many cases, males in the community, generally the family member who travel to the forest, do not attend community mobilization activities. As a result, a substantial gender gap in educational outreach and mobilization efforts exists.

Recommendations:

- Finalize the IEC/BCC strategy to include elimination material and consider creating a national technical working group, co-chaired by CNM, to guide strategy development and to ensure funding availability for outreach activity implementation.

6. RISKS AND RISK MITIGATION

Photo Credit: UNOPS

6. RISKS AND RISK MITIGATION

6.1 Risk identification and classification

For the purpose of this MPR, risk is defined as a state of uncertainty where there is the possibility of an adverse deviation from the programmes intended objectives between now and the end of 2020. The review team have classified risk relative to the likelihood of that risk happening, and the impact it would have on the programme if it occurs. This approach allows the NMP leadership to determine the level of acceptable versus unacceptable risk.

The risk matrix in Table 26 below classifies the risks and identifies those risks that must be managed through until the end of the current MEAF.

Table 26: Risk identification and risk assessment

		Likelihood of the risk happening					
Consequence of the risk occurring		Rare (1)	Unlikely (2)	Possible (3)	Likely (4)	Almost certain(5)	
	Catastrophic (9)	9 Loss of political support for the elimination agenda		27 Loss of efficacy of current first line treatment due to growing drug resistance before pre-approvals in place for alternatives	36	45	
	Major (7)	7 Delays / erratic / non payments to VMWs resulting in loss of VMW outreach activities	14 Loss of key CSO implementing partners prior to 2020	21 Stockouts of critical drugs and commodities particularly at the periphery Erosion of technical capacity at CNM due to staff attrition A proportion of patients previously seeking treatment through PPM are going undetected or unreported	28 Failure to fully utilize the existing funding envelope by end of 2020 Delayed identification of and/or response to outbreaks	35 Not achieving optimal prevention, diagnosis and treatment coverage for MMPs and forest goers	
	Moderate (5)	5	10 Sub-standard ACT's or artemisinin monotherapy being used	15 Insecticide resistance rendering the current vector control tools less effective for blocking transmission	20 Not achieving Pf elimination by 2020	25	
	Minor (3)	3	6	9	12	15	
	Insignificant (1)	1	2	3	4 Drugs reaching their expiry date prior to utilization	5	

6.2 Strategic risk approach

The review team recommends that the programme adopt the following overarching strategic risk approaches to monitor, manage and mitigate the risks identified in Table 27 through until the end of the current MEAF.

Table 27: Strategic risk approach

Strategic risk approach					
	Risk rating[15]	Strategic risk approach Acceptable risk – **monitor** periodically for any changes to risk rating	Acceptable risk – **monitor** periodically for any changes to risk rating. **Control** the risk through continued implementation of existing interventions to maintain the status quo and prevent any escalation in risk rating	Unacceptable risk. Interventions required to **reduce** risk rating (likelihood and / or consequence)	Unacceptable risk. **Immediate priority** to Implement controls and actions to **avoid, eliminate or** reduce the likelihood and / or consequence of the risk
Loss of political support for the elimination agenda	9		X		
Withdrawal of external funding support prior to end of 2020	18			X	
Loss of efficacy of current first line treatment due to growing drug resistance before pre-approvals in place for alternatives	27				X
Delays / erratic / non-payments to VMWs resulting in loss of VMW outreach activities	7		X		
Loss of key CSO implementing partners prior to 2020	14		X		
Stockouts of critical drugs and commodities particularly at the periphery Erosion of technical capacity at CNM due to staff attrition A proportion of patients previously seeking treatment through PPM are going undetected or unreported	21			X	
Failure to fully utilize the existing funding envelope by end of 2020 Delayed identification of and/or response to outbreaks	28				X
Not achieving optimal prevention, diagnosis and treatment coverage for MMPs and forest goers	35				X
Sub-standard ACT's or artemisinin monotherapy being used	10		X		
Insecticide resistance rendering the current vector control tools less effective for blocking transmission	15		X		
Not achieving Pf elimination by 2020	20				X
Drugs reaching their expiry date prior to utilization	4	X			

[15] From Table 26

6.3 Risk mitigation

The review team recommends the following actions detailed in Table 28 be taken to mitigate unacceptable risk. The team also proposes the entity that will assume 'ownership' for monitoring and managing that risk.

Table 28: Risk mitigation actions

RISK	PROPOSED ACTIONS	PRIORITY	RISK OWNER
Withdrawal of external funding support prior to end of 2020	Ensure government co-financing requirements are met	Medium	CNM
	Clean annual audits	Medium	UNOPS/CNM
Loss of efficacy of current first line treatment due to growing drug resistance before pre-approvals in place for alternatives	Maintain high quality TES studies	High	CNM
	Obtain pre-approval for alternate first line treatment	Highest	CNM/DDF
	Maintain pharmacological vigilance over importation of drugs	High	DDF
Stockouts of critical drugs and commodities particularly at the periphery	Strengthen PSM processes	Medium	CNM/UNOPS/partners
	Improve timeliness of stock reporting by full implementation of MIS and LMIS	Medium	
Erosion of technical capacity at CNM due to staff attrition	Review options for incentives	Medium	UNOPS
	Improve availability of necessary equipment	High	
A proportion of patients previously seeking treatment through PPM are going undetected or unreported	Commission rapid assessment to understand impact of cancellation of PPM programme in terms of health seeking behaviour of private sector patients	Highest	UNOPS
	ACTwatch survey to look at availability of ACTs and RDTs through private sector outlets	High	?
Failure to fully utilize the existing funding envelope by end of 2020	Accelerate and scale up implementation of all activities, particularly related to high burden ODs and those directed at MMP/forest goers	Highest	UNOPS/CNM/partners
	Increase capacity to implement	High	Partners
	Develop and implement an ambitious 2020 workplan	High	All
Delayed identification of and/or response to outbreaks	Expand VMWs use of app for real time reporting	Medium	UNOPS/CSOs
	Rollout outbreak preparedness/response training	High	CNM
	Earmarked funding with streamlined access to for responding to outbreaks	High	UNOPS
	Improve access to and data sharing between ODs	High	CNM
Not achieving optimal prevention, diagnosis and treatment coverage for MMPs and forest goers	Scale up forest pack distribution in intensification plan areas, including personal repellent	Highest	CSO/UNOPS
	Support operational research in the areas of bite prevention products, integrated hammock nets, acceptability, compliance and durability	High	CNM/WHO
	Explore options to expedite approval, procurement and distribution of novel vector control products	High	CNM/WHO
Not achieving Pf elimination by 2020	Improve coverage and use of LLINs/LLIHNs amongst MMP/forest goers through outreach, community mobilization and BCC	High	CNM/CSOs
	Extend the implementation period for the intensification plan in the 7 highest burden ODs	Highest	CNM/UNOPS
	Scale up insecticide resistance (IR) monitoring as per guidelines and incorporate IR mapping in IRD		
	Increase # of persons tested for malaria through (a) strict implementation of testing all fever cases to exclude malaria (b) scaling up MMW testing of forest goers both in location and on return to the village from the forest	High	CNM/CSO

7. ANNEXES

Photo Credit: WHO/Vlad Sokhin

ANNEXES

Annex 1: Terms of reference for the malaria programme review

I. Aim

The aim of a Malaria Programme Review (MPR) is to undertake an evidence-based appraisal of a country's malaria situation and programme performance in order to strengthen the programme for better results and impact. An MPR therefore is meant to help a country and its partners to set or reset its medium-term malaria agenda based on evidence.

II. Questions to be answered

The MPR answers the following questions:

1. Was the planned impact of the Malaria National Strategic Plan (NSP) for the period under review attained and how can impact on malaria burden be enhanced?

2. Was the financing of the programme during the period under review optimal and how can programme financing be optimized?

3. During the period under review, was the capacity of the programme to implement planned activities optimal and how can this capacity can be further strengthened?

4. Were required malaria services delivered optimally to those who needed them and how can malaria service delivery be further enhanced?

5. What lessons have been learned in the implementation of the NSP during the period under review and what are the future programming implications of the lessons?

III. Objectives

The objectives of MPR are built around the five questions being answered. They are as follows:

1. To assess the progress of the national malaria control programme towards the epidemiological and entomological impact targets of the NSP during the period under review and make appropriate recommendations towards enhanced impact;

2. To review the level of financing of the national malaria programme during the period under review and make appropriate recommendations towards optimal financing;

3. To review the capacity of the national malaria control programme to implement planned activities during the period under review and make appropriate recommendations towards optimal capacity for programme implementation;

4. To review the attainment of programme outcome targets during the period under review and make appropriate recommendations for optimal delivery of malaria services; and

5. To define the programming implications of the lessons learned and implementation on the NSP.

IV. Terms of reference

1. Review of the Cambodia'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, and Vector Control, Surveillance, IEC) and at different levels of service delivery (Central, Provincial, OD, HC and Village Level).

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 elimination

6. Investigate and recommend methods to integrate malaria elimination activities in Cambodia broader communicable disease control and surveillance system, particularly at the provincial, OD and HC levels of the health system.

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

8. Make specific recommendations to the National Malaria Control Programme in Cambodia.

Annex 2: List of participants at MPR workshop

	Name	Title	Organization
1	Say Savy	Deputy PHD	Kampong Speu
2	Prak Dara	PMG	Kampong Speu
3	Peou Sovannrin	OD Director	OD Mong Russey
4	Chea Nguon	Deputy Director	CNM
5	Jan Norlander	Deputy Programme Director	CARE
6	BK Karella	CDC/PMI Advisor	PMI
7	Dr Huy Rekol	CNM Director	CNM
8	Srey Sophanarot	M & E	CNM
9	Em Savy	MPM	CRS
10	Hazel G. N.	PSM Specialist	UNOPS
11	Naeem Durrani	PC	UNOPS
12	Heang Phyrum	PO	UNOPS
13	Lek Dysoley	Deputy Director	CNM
14	Bill Parr	Consultant	WHO
15	James Kelly	WHO	WHO
16	Bunmmeng Chhun	PM	CHAI
17	Mark Debachen	CD	MC
18	Pengby Ngor	MIS	CNM
19	Hok Kry	OD Director	Phnom Srouch
20	Andrew Martin	Country Director	HPA
21	Rosie Ameyan	Senior Programme Officer	GF
22	Tho Sochantha	Deputy Director	CNM/MOH
23	Po Ly	Head of VMW	CNM
24	Chy Say	Technical Officer	WHO
25	Chea Huch	Deputy Director	WHO
26	Yoeun Soklin		CNM
27	Bou Kheng Thavrin	Deputy Director	CNM
28	Slot Rida	Programme Mgt Specialist	PMI/USAID
29	Michelle Pahl	SPM	CHAI
30	Inessa Ba	Regional Manager	CHAI
31	Tom Pelo	Epidemiologist	MORU
32	Ung Kim Heang	PO	UNOPS
33	Pernille Jorgensen	Epidemiologist	WHO
34	Pech Chanrasmey	Pro-Analyst	UNOPS
35	Hiro Okayasu	Coordinator MME	WHO
36	Jon Cox		BMGF
37	Choy Kimse	OD Boribo	
38	Sokchea Chanphaktra	M&E Officer UNOPS	UNOPS
39	Chanthap Lon	Chief	AFRIMS
40	Norung Kanha	Administrator	CNM
41	Top Sophornara	Technical Officer	CMEP/PP
42	Tol Bunkea	Epidemiologist	CNM
43	Siv Sovannaroth	Malaria Programme Manager	CNM
44	Norng Chanraksmey	Interpreter	FC
45	Jon Norlander	Deputy Country Director	CARE

	Name	Title	Organization
46	Louisa Richards	Volunteer	WHO
47	Giulia Manzoni	Epidemiologist	WHO
48	Sin Sopheap	Director	OD KSP
49	Sar Heang	Finance CNM	CNM
50	Nguon Sokomar	STA	PMI-CMES
51	But Engrroy	PHD Kampong Chhnang	KHC
52	Bun Sour	PHD Director	PHD MDK
53	Kin Mengse	M & E	UNOPS
54	Renn Tesfazghi	Technical Advisor	PSI
55	Hok Phearom	M & E	UNOPS
56	Meas Tha	Deputy	CNM
57	Chin Polo	Programme Manager	PSI
58	Thor Chanthe	Health Programme Manager	CRS
59	Andrew Mc Cracken	CD	CHAI
60	Sharon Thangadurai	COP-CMEP	WRC
61	Try Rady	Technical Officer	WHO
62	Preap Sodavath	Programmer Officer	UNOPS
63	Tat Veyvath	ODMS	OD BTB
64	Hok Kry	OD Director	
65	Mak Sareth	Malaria Director	PSI
66	Ouk Rada		CNM
67	Dr Forosy	Programme & ME Specialist	UNOPS
68	Pen Kim Heang	PMS	PHD-MDK
69	Jeffroy In	COP PMW	
70	Prak Vonn	Director	KCN
71	Math Imran	Chief Admin	CNM
72	Vaibhav Gupta	Director Country Engagement	APLMA
73	Sut Thangphonn	Lab Chief	CNM
74	Soeur Sothea	Staff Pharmacy	CNM
75	Dr Vannak Chrun	PO	UNOPS
76	Chan Davoeung	PMS	BTB PHD
77	Roth Sirititiya	M & E PFD	PFD, Phnom Penh
78	H.E Hok Kim Cheng	DG of Health	MOH
79	Ho Samnang		City Media
80	Cheak Samonn	ODMS	Kampong Chhnang
81	Rithy Kong	Project Leader	PSM
82	Severine Calza	Executive Secretary	RAI RSC
83	Borngyuan Wang	Head of Programme	HPA
84	Soy Ty Khong	URC	
85	Voeurng Bunseth	Director	BTB PHD
86	Christina Lau	Director OPHE	USAID
87	Tuseo Luciano	Communicable Diseases Team leader	WHO
88	Guintran Jo	Malaria	WHO
89	Sun Maysal	PM	PfD
90	Chan Vibol		WHO
91	Him Phalline	Assistant	WHO

Annex 3: Agenda for MPR workshop

DAY 1 - Monday 15 July

Times	Topic/Activities	Presenter
SESSION 1: OPENING		
07:30-08:00	Registration and announcement	Dr. Huy Rekol
08:00-08:15	Welcome speech from CNM Director	Representative from WHO
08:15-08:30	Remarks from WHO (James?)	UNOPS
08:30-08:45	Remark from UNOPS	PMI/USAID
08:45-09:00	Remarks from PMI/USAID	HE Secretary of State
09:00-09:30	Opening from Secretary State	CNM
9.30 – 10:00	Malaria Programme Review objectives and expected outcomes	All
10:00-10:30	**Coffee Break – Group photo**	CNM/TWG
10:30-11:00	Desk Review: Epidemiological impact analysis	
SESSION 2: VALIDATION OF PERFORMANCE BY THEMATIC AREAS /OBJECTIVES		
11:00-12:00	Review by Thematic Area: Programme Management	Consultant
12:00-13:30	**Lunch Break**	All
13:30-14:30	Review by Thematic Area Finding: Case Management	WCO
14:30-15:30	Review by Thematic Area Finding: Surveillance	WRO
15:30-16:00	**Coffee Break**	
16:00-17:00	Review by Thematic Area Finding: IEC/BCC	WRO

DAY 2 - Tuesday 16 July

08:45-9;00	Wrap-up of the first day	Representative
9:00-10:00	Review by Thematic Area Finding: Vector Control and discussion	WCO
10:00-10:30	**Coffee Break**	
SESSION 3: LANDSCAPE ANALYSIS		
10:30-11:00	Capacity to implement analysis and discussion	UNOPS
11:00-11:30	Financial landscape and discussion	UNOPS
10:45-11:00	MME - GMS context for malaria elimination	MME Coordinator
11:00-11:15	RSC Independent Monitoring Panel	RSC Secretariat
12:15-13:30	**Lunch Break**	
SESSION 4: RECOMMENDATIONS FOR ACHIEVING 2020 MEAF OBJECTIVES		
13:30-15:00	Group work to elaborate recommendations by objective	TWG
15:00-15:30	**Coffee Break**	
15:30-17:00	Group work to elaborate recommendations by objective	TWG

DAY 3 - Wednesday 17 July

8:00-8:15	Wrap-up of the second day	Representative
8:30-9:00	Recommendations by objective 1 and discussion	Plenary
9:00-9:30	Recommendations by objective 2 and discussion	Plenary
9:30-10:00	Recommendations by objective 3 and discussion	Plenary
10:00-10:30	**Coffee Break**	
10:30-11:00	Recommendations by objective 4 and discussion	Plenary
11:00-11:30	Recommendations by objective 5 and discussion	Plenary
11:30-12:00	Risk mitigation	WHO
12:00-13:30	**Lunch Break**	All
SESSION 5: STRATEGIC CONSIDERATIONS FOR DEVELOPMENT OF 2021-2025 NSP		
13:30-14:00	Setting Goal and milestones of 2021-2025 NSP	WHO
14:00-15:00	Panel discussion on Goal and milestones of 2021-2025 NSP	CNM

DAY 4 - Thursday 18 July

SESSION 6: STAKEHOLDER MEETING FOR REVIEW AND ENDORSEMENT OF THE MPR RESULTS		
09:00-10:00	Plenary on the findings, conclusions and recommendations	All
10:00-11:00	Closing remarks from Director General of Health	
12:00-13:30	Lunch Break	

Annex 4: Annual parasite incidence 2018 by operating district

Annual Parasite Incidence Endemic OD's

Year: 2018
Month: Jan-Dec
Source: MIS
Extracted Date: 16/07/2019

Province	OD	Population	Tested Cases	Confirmed		Death	Mortality Rate	Test Positive Rate	ABER
				Cases	API				
Banteay Meanchey	Poipet	213445	3366	50	0.23	0	0.00	1%	2%
Banteay Meanchey	Preah Net Preah	159357	729	5	0.03	0	0.00	1%	0%
Banteay Meanchey	Thma Puok	138798	1408	16	0.12	0	0.00	1%	1%
Battambang	Battambang	393028	7802	409	1.04	0	0.00	5%	2%
Battambang	Maung Russei	221322	2810	444	2.01	0	0.00	16%	1%
Battambang	Sampov Luon	181535	11305	146	0.80	0	0.00	1%	6%
Battambang	Thma Koul	240355	848	59	0.25	0	0.00	7%	0%
Kampong Cham	Chamkar Leu	123087	1132	201	1.63	0	0.00	18%	1%
Kampong Cham	Kampong Cham - Kg. Siem	159576	177	136	0.85	0	0.00	77%	0%
Kampong Cham	Prey Chhor	141564	106	90	0.64	0	0.00	85%	0%
Kampong Cham	Steung Trang	127304	1106	370	2.91	0	0.00	33%	1%
Kampong Chhnang	Boribo	114838	2082	919	8.00	0	0.00	44%	2%
Kampong Chhnang	Kampong Chhnang	243734	2447	1521	6.24	0	0.00	62%	1%
Kampong Chhnang	Kampong Tralach	194230	785	303	1.56	0	0.00	39%	0%
Kampong Speu	Kampong Speu	304018	5001	2748	9.04	0	0.00	55%	2%
Kampong Speu	Kong Pisey	266329	984	690	2.59	0	0.00	70%	0%
Kampong Speu	Ou Dongk	132506	1658	1299	9.80	0	0.00	78%	1%
Kampong Speu	Phnom Srouch	113850	2782	1755	15.42	0	0.00	63%	2%
Kampong Thom	Baray and Santuk	293042	1346	357	1.22	0	0.00	27%	0%
Kampong Thom	Kampong Thom	320047	5391	798	2.49	0	0.00	15%	2%
Kampong Thom	Stong	148238	2244	175	1.18	0	0.00	8%	2%
Kampot	Chhouk	201767	5595	949	4.70	0	0.00	17%	3%
Kampot	Kampot	164439	2437	166	1.01	0	0.00	7%	1%
Kep	Kep	42194	845	45	1.07	0	0.00	5%	2%
Koh Kong	Smach Mean Chey	67331	785	240	3.56	0	0.00	31%	1%
Koh Kong	Srae Ambel	68941	301	187	2.71	0	0.00	62%	0%
Kratie	Chhlong	134335	1938	628	4.67	0	0.00	32%	1%
Kratie	Kratie	320076	12127	4515	14.11	0	0.00	37%	4%
Mondul Kiri	Sen Monorom	82282	16515	6337	77.02	0	0.00	38%	20%
Oddar Meanchey	Anlong Veng	109764	7837	2000	18.22	0	0.00	26%	7%
Oddar Meanchey	Samraong	148836	1663	130	0.87	0	0.00	8%	1%
Pailin	Pailin	85175	2026	114	1.34	0	0.00	6%	2%
Preah Sihanouk	Preah Sihanouk	214983	1630	585	2.72	0	0.00	36%	1%
Preah Vihear	Tbeng Meanchey	241129	24254	6013	24.94	0	0.00	25%	10%
Pursat	Bakan	138432	1851	266	1.92	0	0.00	14%	1%
Pursat	Krokor	113034	9585	3103	27.45	0	0.00	32%	8%
Pursat	Krovanh	117894	23161	10041	85.17	0	0.00	43%	20%
Pursat	Sampov Meas	128509	1200	505	3.93	0	0.00	42%	1%
Ratanakiri	Banlung	162455	11709	3299	20.31	0	0.00	28%	7%
Ratanakiri	Borkeo	85029	7722	987	11.61	0	0.00	13%	9%
Siemreap	Angkor Chhum	262865	3520	241	0.92	0	0.00	7%	1%
Siemreap	Kralanh	123047	9177	23	0.19	0	0.00	0%	7%
Siemreap	Siemreap	390510	3272	238	0.61	0	0.00	7%	1%
Siemreap	Sot Nikum	313864	6065	594	1.89	0	0.00	10%	2%
Stung Treng	Steung Treng	163011	19949	6389	39.19	0	0.00	32%	12%
Takeo	Ang Rokar	137119	1649	349	2.55	0	0.00	21%	1%
Takeo	Kirivong	131935	83	20	0.15	0	0.00	24%	0%
Tbong Khmum	Dambae	80174	914	330	4.12	0	0.00	36%	1%
Tbong Khmum	Kroch Chhmar	103346	227	93	0.90	0	0.00	41%	0%
Tbong Khmum	Memut	158844	1872	674	4.24	0	0.00	36%	1%
Tbong Khmum	Ponhea Krek	142895	746	382	2.67	0	0.00	51%	1%
Tbong Khmum	Suong	40921	152	105	2.57	0	0.00	69%	0%
Tbong Khmum	Tbong Khmum	197978	2162	284	1.43	0	0.00	13%	1%
	Total	**9103317**	**238478**	**62323**	**6.85**	**0**	**0.00**	**26%**	**3%**

Acknowledgements

The Review Team would like to thank the Ministry of Health of Cambodia, the Director and staff of the National Centre for Parasitology, Entomology and Malaria Control, leadership and staff of international and regional institutions, development partners and civil society organizations who generously gave their time to provide data, share their views and participate in workshops, field visits and consultations during the course of this malaria programme review.

The Team also acknowledges the great assistance of government staff, health workers, community leaders and volunteers at provincial, district and community levels, for providing information and investing time to enable the field visits to be successfully undertaken in Battambang, Kampong Speu, Kampong Chhnang and Mondolkiri provinces. Inputs from these visits have provided a reality check and insight into the challenges of malaria control and elimination at community level and particularly amongst forest goers and the mobile migrant population. This invaluable insight has greatly shaped the recommendations emanating from this MPR.

Finally, team members would like to express their gratitude to WHO staff and the WHO Country Office in Cambodia as well as the Mekong Malaria Elimination programme for their coordination and supportive role before and during the review mission.

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