



# NATIONAL STRATEGIC PLAN

## Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination

2016-2020

Department of Public Health  
Ministry of Health and Sports  
The Republic of the Union of Myanmar







# National Strategic Plan 2016-2020

---

**for Intensifying Malaria Control and  
Accelerating Progress towards Malaria Elimination**

Department of Public Health  
Ministry of Health and Sports  
The Republic of the Union of Myanmar



## Acknowledgements

---

The “**National Strategic Plan (NSP) for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020**” has been developed under the leadership of National Malaria Control Programme (NMCP) with technical support from WHO. The document is the final product of extensive National consultations with national staff working at various levels, Technical and Strategy (TSG) Group members, WHO, implementing partners, Ethnic Health Organizations and international experts. The document was finalized through series of workshops and Malaria Technical and Strategy (TSG) Group meetings.

The NMCP gratefully acknowledges the Director General of Public Health, Deputy Director General of Public Health, Director Disease Control, Deputy Directors (Malaria), Regional Officers, I/NGOs, implementing partners and many others for their indispensable contributions made towards the drafting, revising and finalization of the document. The NMCP also gratefully acknowledges the technical support and coordination provided by WHO for the drafting and finalization of the NSP.

The valuable comments and suggestions received from the members of Malaria TSG and all stakeholders have been extremely helpful for finalization of the NSP and NMCP is thankful for all their contributions.



## Foreword

---

Myanmar has made significant progress in reducing malaria morbidity and mortality. Since 2012 the incidence of reported malaria has dropped by 49% from 8.09 in 2012 to 4.16 per 1000 population in 2015. The targets of malaria related MDG have been achieved in 2004 well before the target year of 2015. The goal of the National Strategic Plan 2010-2016 to reduce malaria morbidity and mortality by at least 60% by 2016 relative to 2007 figures has also been achieved. Currently the country is facing the emergence and spread of artemisinin resistant malaria.

Myanmar has signed the APLMA declaration in 9<sup>th</sup> East Asia Summit in 2014 to eliminate Malaria in the country. Encouraged by recent achievements and to tackle the threat imposed by the emergence of artemisinin resistant malaria, “National Malaria Strategic Plan (NSP) for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020” has been developed and finalized under the leadership of National Malaria Control Programme (NMCP) with the technical support by WHO. This is in alignment with the “Global Technical Strategy for Malaria (2016-2030)” and “Strategy for Malaria Elimination in the Greater Mekong Subregion (2015-2030)”. The NSP represents the first phase of the 15 year strategy to eliminate malaria in Myanmar. The first five years of the strategy sets out to eliminate malaria in less endemic areas, while accelerating extensive control efforts in high endemic areas to reduce cases to a low level. It is expected that after 2020, all endemic areas will enter into elimination phase. *P. falciparum* will be eliminated by 2025 and malaria by 2030.

National Malaria Control Programme under the Department of Public Health has developed a timely NSP with the support from malaria Technical and Strategy Group, WHO, partners and other stakeholders. The NSP will act as a guide to support planning and implementation and act as an advocacy tool to secure funding - both domestic and external. This will also serve as a guide for the partners and stakeholders for planning and implementation.

I would strongly endorse the “National Malaria Strategic Plan (NSP) for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination by 2020” and render all necessary support to ensure its full implementation.

MU  
29.6.17

Dr. Myint Htwe

Union Minister,

Ministry of Health and Sports

## Acronyms and Abbreviations

<b>ABER</b>	annual blood examination rate	<b>LLIN</b>	long-lasting insecticidal net
<b>ACD</b>	active case detection	<b>LSM</b>	larval source management
<b>ACT</b>	artemisinin-based combination therapy	<b>MDA</b>	mass drug administration
<b>ADB</b>	Asian Development Bank	<b>M-HSCC</b>	Myanmar Health Sector Coordinating Committee
<b>AFI</b>	annual falciparum incidence	<b>MIS</b>	malaria informaton system
<b>AL</b>	artemether-lumefantrine	<b>MoA</b>	Ministry of Agriculture
<b>AMTR</b>	Artemisinin Monotherapy Replacement Project	<b>MoD</b>	Ministry of Defence
<b>ANC</b>	ante-natal care	<b>MoHS</b>	Ministry of Health and Sports
<b>API</b>	annual parasite incidence	<b>M&amp;E</b>	monitoring and evaluation
<b>APLMA</b>	Asia Pacific Leaders Malaria Alliance	<b>MPAC</b>	Malaria Policy Advisory Committee (WHO)
<b>APMEN</b>	Asia Pacific Malaria Elimination Network	<b>MPR</b>	Malaria Programme Review
<b>ASMQ</b>	artesunate+mefloquine	<b>NCA</b>	National Ceasefire Agreement
<b>ATSB</b>	attractive toxic sugar bait	<b>NGO</b>	non-governmental organization
<b>BCC</b>	behaviour change communication	<b>NHC</b>	National Health Committee
<b>BHS</b>	basic health staff	<b>NHL</b>	National Health Laboratory
<b>CEDAW</b>	Convention on the Elimination of All Forms of Discrimination Against Women	<b>NLD</b>	National League for Democracy
<b>CHW</b>	community health worker	<b>NMCP</b>	National Malaria Control Programme
<b>DHA-PIP</b>	dihydroartemisinin and piperazine	<b>NMEC</b>	National Malaria Elimination Committee
<b>DHIS2</b>	District health Information System	<b>NSP</b>	National Strategic Plan
<b>DMR</b>	Department of Medical Research	<b>OPE</b>	out of pocket expenditure
<b>DOT</b>	directly observed treatment	<b>PCD</b>	passive case detection
<b>DoPH</b>	Department of Public Health	<b>PCR</b>	polymerase chain reaction
<b>ECA</b>	External Competency Assessment	<b>PMI</b>	United States President's Malaria Initiative
<b>EMG</b>	ethnic minority group	<b>PSI</b>	Population Services International
<b>ERAR</b>	Emergency Response to Artemisinin Resistance in the Greater Mekong Subregion	<b>QA</b>	quality assurance
<b>FDA</b>	Food and Drug Administration	<b>QC</b>	quality control
<b>G6PD</b>	glucose-6-phosphate dehydrogenase	<b>RAI</b>	Regional Artemisinin Initiative
<b>GEN</b>	Gender Equality Network	<b>RDT</b>	rapid diagnostic test
<b>GIS</b>	geographic information system	<b>RHC</b>	rural health centre
<b>GFTAM</b>	Global Fund to Fight AIDS, Tuberculosis and Malaria	<b>RMT</b>	residual malaria transmission
<b>GMS</b>	Greater Mekong Subregion	<b>SOP</b>	standard operating procedure
<b>GTS</b>	WHO Global Technical Strategy for Malaria 2016–2030	<b>TES</b>	therapeutic efficacy study (of antimalarial medicine)
<b>iCCM</b>	integrated community case management	<b>THE</b>	total health expenditure
<b>IDP</b>	Internally Displaced Person	<b>TMO</b>	Township Medical Officer
<b>IEC</b>	information, education, communication	<b>TPHD</b>	Township Public Health Department
<b>IPC</b>	inter-personal communication	<b>TPHO</b>	Township Public Health Officer
<b>IRS</b>	indoor residual spraying	<b>TSG</b>	Technical and Strategy Group
<b>ITN</b>	insecticide treated net	<b>UNHCR</b>	United Nations High Commission for Refugees
<b>JICA</b>	Japan International Cooperation Agency	<b>VBDC</b>	Vector Borne Disease Control Programme
<b>LLIHN</b>	long-lasting insecticidal hammock net	<b>VHV</b>	village health volunteer
		<b>WHO</b>	World Health Organization

# Table of Contents

<b>1. BACKGROUND</b> .....	1
Introduction.....	1
Country profile.....	2
Malaria epidemiology.....	3
Malaria burden.....	4
Drug resistance.....	6
Population at risk.....	6
Gender equality and women’s empowerment.....	9
Human Rights barriers.....	10
Micro stratification.....	10
Health systems and community systems context.....	11
Social security.....	12
Peripheral health system.....	12
Human resources for health.....	12
Health system oversight in relation to malaria.....	12
<b>2. STRATEGIC FRAMEWORK (2016-2020)</b> .....	14
2.1 Vision, mission, goals and principles.....	14
2.2 Objectives.....	14
2.3 Approach.....	15
2.4 Key interventions and supporting elements.....	17
2.5 Activities.....	17
2.6 Measuring progress and impact.....	32
2.7 Milestones and Targets.....	33
<b>3. COST OF IMPLEMENTING THE STRATEGY</b> .....	34
<b>4. GOVERNANCE, COORDINATION AND LEADERSHIP</b> .....	36
<b>5. ANNEXES</b> .....	40
Annex 1. Development of the Strategy.....	40
Annex 2. The WHO Global Technical Strategy for Malaria 2016–2030 at a glance.....	41
Annex 3. A brief overview of Artemisinin Resistance .....	42
Annex 4. Health care system in Myanmar.....	43
Annex 5. Status of insecticide resistance in Myanmar.....	47
<b>LIST OF FIGURES and TABLES</b>	
Figure 1. Republic of the Union of Myanmar: administrative regions, population density and topography..	2
Figure 2. Recent trends in reported malaria burden (confirmed and probable cases and deaths) in Myanmar.....	4
Figure 3. Recent trends in reported <i>falciparum</i> and <i>vivax</i> caseload in Myanmar, 2012-2015.....	5
Figure 4. Incidence of malaria in Myanmar by age group and sex, 2015.....	5
Figure 5. Township level malaria micro-stratification map of Myanmar in 2015.....	11
Figure 6. Projected number of States/Regions by programme phase and year.....	16
Figure 7. Geographical presentation of timelines for Malaria Elimination in Myanmar by State/Region, 2015-2030.....	16
Table 1. Population groups at risk of malaria in endemic areas of Myanmar.....	6
Table 2. Population breakdown by strata based on 2015 micro-stratification by sub-centre.....	10
Table 3. Current funding sources.....	34
Table 4. Estimated summary budget by interventions/supporting elements 2016-2020 (US \$).....	35

# STRATEGY AT A GLANCE

## *Vision*

### **A Malaria Free Myanmar by 2030**

## *Mission*

The National Malaria Control Programme (NMCP) of the Ministry of Health and Sports of the government of Myanmar aims to achieve malaria elimination ('zero indigenous transmission' and 'zero malaria deaths') by ensuring equitable and universal access to effective preventive and curative services to all 'at risk populations' in coordination with the efforts of all communities, national and international non-governmental organizations, private sector stakeholders, United Nations agencies and financial partners. Achieving the vision of 'A Malaria Free Myanmar' will contribute significantly to poverty alleviation as malaria is most prevalent in the poorest segment of the population: those living or spending time in remote forested areas including mobile populations and migrants.

## *Goals*

This is a five-year strategy to reduce malaria morbidity and mortality by 85% and 75% respectively by 2020 relative to 2015 baseline figures. In States/Regions where malaria transmission has been interrupted, the goal is to maintain malaria-free status and prevent re-establishment of local transmission.

Achieving these goals will put Myanmar on the path to eliminate *Plasmodium falciparum* malaria by 2025 (in line with the urgent action required against multidrug resistance) and all malaria from Myanmar by 2030.

## *Principles*

- Efforts towards elimination are accelerated through combinations of interventions adapted to Myanmar conditions and responding to local needs.
- Building country ownership and leadership, and mobilizing partnership action with the participation of communities, the Defence Services, other implementing partners, technical agencies and the private sector, are essential to accelerate progress through a multisectoral approach.
- Adequate malaria case-based surveillance<sup>1</sup> and investigation is required to enable elimination.
- Improved entomological surveillance and investigation is required to support evidence-based vector control operations and accelerate elimination.
- Information systems that facilitate malaria stratification (to support planning, monitor progress and evaluate anti-malaria interventions) are required to optimize implementation of malaria interventions.
- Equity in access to services irrespective of gender, reach and ethnicity is essential, especially for the most vulnerable and hard-to-reach populations.
- Innovation in tools and implementation approaches will help to maximize progress.

<sup>1</sup> Case means any infection where, regardless of the presence or absence of clinical symptoms, malaria parasites have been confirmed by quality-assured diagnosis.

## *Objectives*

1. To reduce reported incidence of malaria to less than 1 case per 1,000 population in all States/Regions by 2020.
2. To interrupt transmission of *falciparum* malaria in at least 5 States/Regions by 2020 (Target States/Regions: Bago, Magway, Yangon, Mon, Mandalay).
3. To prevent the emergence of multi-ACT resistant *P. falciparum* in Myanmar.
4. To prevent the re-establishment of malaria in areas where transmission has been interrupted.

## *Priorities*

1. Reduce malaria burden in the most endemic areas.
2. Eliminate *falciparum* malaria in areas of multidrug resistance, including artemisinin resistance.
3. Strengthen the existing surveillance system and vigilance including the capacity of health care providers and programme staff at all levels for States and Regions entering the elimination and prevention of re-establishment phases.

## *Key Interventions*

1. Case detection and effective management.
2. Malaria prevention.
3. Malaria case and entomological surveillance.

## *Supporting Elements*

### **1. Expanding research for innovation and improved delivery of services**

- Develop novel tools and approaches to respond to existing and new challenges, such as drug resistance, insecticide resistance, outdoor biting and varying patterns of population mobility.
- Conduct operational research to optimize impact and cost-effectiveness of existing and new tools, interventions and strategies.
- Take action to facilitate rapid uptake of new tools, interventions and strategies.

### **2. Strengthening the enabling environment**

- Maintain strong political commitment and ensure adequate financial support for elimination.
- Support capacity development appropriate to the implementing strategy.
- Strengthen health systems to facilitate elimination.
- Provide comprehensive services to meet the needs of all at risk populations, including mobile populations and migrants.
- Foster inter-sectoral collaboration, community involvement and collective action.

# 1. BACKGROUND

## Introduction

In the past decade, Myanmar has made significant progress in reducing malaria morbidity and mortality. The number of malaria deaths has dropped steadily year by year from 1,707 in 2005 to just 37 in 2015 (about 98% reduction over 10 years) reflecting major improvements in access to early diagnosis and appropriate treatment.

Prior to 2012, trends in reported incidence are difficult to interpret due to significant changes in case management approaches and service coverage. Thanks to funding support from the Global Fund to Fight AIDS, Tuberculosis, and Malaria and other financial partners, data from 2012 onwards is robust and demonstrates a stable reduction in caseload year by year. The incidence of reported malaria has dropped by about 49% since 2012 (from 8.09 in 2012 to 4.16 in 2015 per 1,000 population). The goal of the previous National Strategic Plan (2010-2016) was to reduce malaria morbidity and mortality by at least 60% by 2016 relative to 2007 figures. By 2015 morbidity and mortality were down by 65% (in 2007 there were 520,887 cases and in 2015 there were 182,616 cases) and 97% (in 2007 there were 1,261 deaths and in 2015 there were 37 deaths) respectively relative to 2007.

Despite these recent advances, malaria remains a leading cause of morbidity and a cause of mortality in Myanmar, and in 2015 the country's malaria burden still accounted for around 70% of reported cases in the Greater Mekong Sub-region<sup>2</sup> (GMS). Compounding this issue and threatening recent progress is the independent emergence and geographical spread of multi-drug resistant malaria throughout the country.

Recent evidence suggests that elimination of *P. falciparum* from the GMS is likely to be the only way to halt the spread of multi-drug resistance and prevent the emergence of untreatable malaria. The WHO Malaria Policy Advisory Group has recommended that the elimination of *P. falciparum* malaria in the GMS by 2030 is technically, operationally and financially feasible and at the 9<sup>th</sup> East Asia Summit in November 2014 all Asia Pacific leaders committed to a region free of Malaria by 2030. With high-level political commitment now in place, Myanmar is well positioned to pursue an elimination agenda.

*The National Strategic Plan for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination (2016-2020)* represents the first phase of a 15-year strategy to eliminate malaria in Myanmar. The first five years under the strategy set out to eliminate malaria in less endemic areas, while accelerating control efforts in high endemic areas to reduce cases to a low level. Post 2020, it is expected that the proportion of areas targeted for elimination phase will expand progressively. *P. falciparum* will be eliminated by 2025 and by 2030 Myanmar will be malaria free. The timelines and geographic targets for elimination are presented in Figure 6 and 7.

The NSP was developed by the NMCP in consultation with WHO and other stakeholders. The detail of the development of the strategy is annexed (Annex 1). The development process included extensive country dialogue with stakeholders and experts. The document will serve as reference for all institutions working on malaria control/elimination in order to ensure that their efforts are aligned with those of the NMCP. The strategy is in line with the *Strategy for Malaria Elimination in Greater Mekong Sub-region (2015-2030)*, the *Global Technical Strategy for Malaria 2016-2030*, and takes into account lessons learned from successful implementation of malaria control efforts in Myanmar during the past decade.

To implement the strategies described in this document, the enabling environment for elimination must be strengthened. To achieve the objectives of this strategy, it will be necessary to continue to foster support from the highest level of government to ensure effective multi-sectoral engagement for malaria control and elimination and to secure necessary resources to support full strategy implementation.

---

<sup>2</sup> The GMS includes Cambodia, Lao PDR, Myanmar, PR China (Yunnan Province), Thailand and Viet Nam.

## Country profile

Myanmar, previously known as Burma, is the largest country in mainland South-East Asia with a total land area of 676,578 square kilometers. It stretches 2,200 kilometers from north to south and 925 kilometers from east to west at its widest point. It is bounded on the north and north-east by the People's Republic of China, on the east and south-east by the Lao People's Democratic Republic and the Kingdom of Thailand, on the west and south by the Bay of Bengal and Andaman Sea, on the west by the People's Republic of Bangladesh and the Republic of India (Figure 1). Myanmar's capital city is Nay Pyi Taw and its largest commercial city is Yangon.

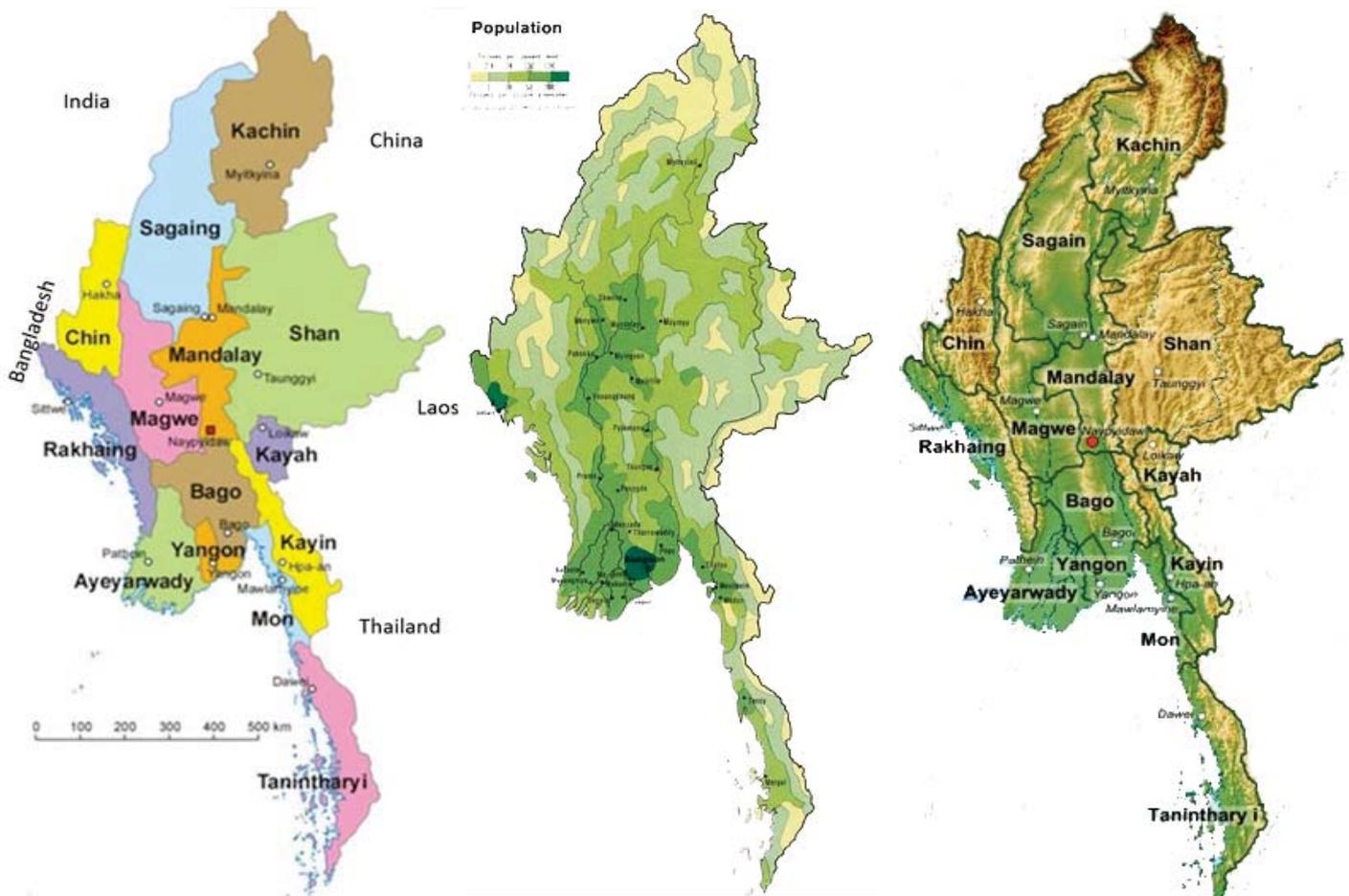
The country is divided administratively into Nay Pyi Taw Territory and 14 States and Regions, and comprises 74 Districts, 330 Townships, 398 Towns, 32 Sub-townships, 3,065 Wards, 13,619 Village Tracts and 64,134 Villages. The first level administrative area is Region in the central parts of the country, and State in the periphery. The Townships and Villages are the core planning and implementation units.

Myanmar falls into three well marked natural geographical divisions: the western hills, the central belt and the Shan plateau on the east, with a continuation of this high land in Tanintharyi to the south. Three parallel chains of mountain ranges from north to south divide the country into three river systems: the Ayeyarwady, Sittaung and Thanlwin.

Myanmar has a tropical climate with three distinct seasons: rainy, cold and hot. The rainy season comes with the southwest monsoon, lasting from mid-May to mid-October, followed by the cold season from mid-October to mid-February. The hot season precedes the rainy season and lasts from mid-February to mid-May.

Myanmar has undergone a remarkable political transformation in the last 5 years, with its leadership voluntarily transitioning from an isolated military regime to a quasi-civilian government intent on re-engaging with the international community.

**Figure 1. Republic of the Union of Myanmar: administrative regions, population density and topography.**



## Malaria epidemiology

The epidemiology of malaria in Myanmar is highly complex. All four species of human plasmodia are present in the country and cases of *Plasmodium knowlesi*<sup>3</sup> have also been documented<sup>4</sup>. The vast majority of malaria cases are caused by *Plasmodium falciparum* and *Plasmodium vivax*. The epidemiology of the disease varies greatly from location to location and from one population group or situation to another. In many cases the different situations and contexts require different malaria control strategies, adapted to suit specific risk groups and vector behaviours, and adjusted to take into consideration local infrastructure and health service coverage. Furthermore, the situation in any given area is prone to change rapidly as a result of factors such as developing drug resistance, changing ecologies, marked deforestation and large-scale population movements associated with seasonal labour, large-scale development projects, etc.

Intense malaria transmission is largely restricted to hilly, forested and forest fringe areas. The most efficient vectors, members of the *Anopheles dirus* species complex, cannot survive without dense shade and high humidity. Deforestation therefore generally leads to substantially reduced malaria transmission, although *An. dirus* can maintain transmission by breeding in wells. Reforestation projects and the establishment of oil palm and rubber plantations following deforestation can sometimes provide suitable habitats for vectors resulting in resurgence in malaria transmission. The next most efficient vector, which is probably the most important in terms of transmission, is *Anopheles minimus (sensu lato)*. This species is also primarily forest-based but can survive in less densely shaded forest, forest fringes and in the patchy bamboo thickets that commonly persist post-deforestation.

Secondary vectors such as *Anopheles culicifacies*, *Anopheles philippinensis* and *Anopheles annularis* occur in areas of irrigated open farmland and in flooded rice fields and sporadic secondary transmission can take place in these areas as a result of imported cases. *Anopheles maculatus*, *An. sinensis*, *An. aconitus* and *An. jeyporiensis* have also been implicated as vectors of limited capacity. *An. sundaicus* can support significant

transmission in coastal areas, particularly in areas where aquaculture projects have been abandoned resulting in accumulations of brackish water.

The behaviour of malaria vectors in Myanmar varies depending on climatic and other environmental factors. Both indoor and outdoor biting takes place, but primary vectors are characterised, at least seasonally, by their early and outdoor biting habit. This is a key feature of the epidemiology of malaria throughout the Greater Mekong Sub-region (GMS), which limits to some extent the effectiveness of key interventions for vector control and personal protection. Despite a portion of the vector biting occurring early and outdoors, Long Lasting Insecticidal Nets (LLINs) continue to play a critical role in reducing malaria transmission<sup>5</sup>.

Altitude plays an important role in determining the level of endemicity in an area because as temperature decreases with increase in altitude, the development of parasites in the mosquito stage of the malaria life-cycle slows and vectorial capacity falls. Transmission can occur at higher altitudes (as in the 2010 outbreak in Chin State 4,000 feet above sea level), but it does become increasingly seasonal.

There is no evidence of insecticide resistance among the primary malaria vectors in Myanmar at present (Annex 5), however monitoring has been limited. Given the selection pressure being exerted by insecticide use in public health and in the agricultural sector, surveillance needs to be strengthened.

---

<sup>3</sup> *Plasmodium knowlesi*: a zoonosis associated with macaques but sometimes transmitted to humans in deep forest areas.

<sup>4</sup> Jiang N, Chang Q, Sun X, Lu H, Yin J, Zhang Z, et al. Co-infections with *Plasmodium knowlesi* and other malaria parasites, Myanmar. *Emerg Infect Dis*. 2010 Sep.

<sup>5</sup> Kolaczinski, J., Macdonald, M., Meek, S. Vector control to eliminate artemisinin resistant malaria in the Greater Mekong subregion. *Lancet*, Vol 14:9-10, January 2014.

## Malaria burden

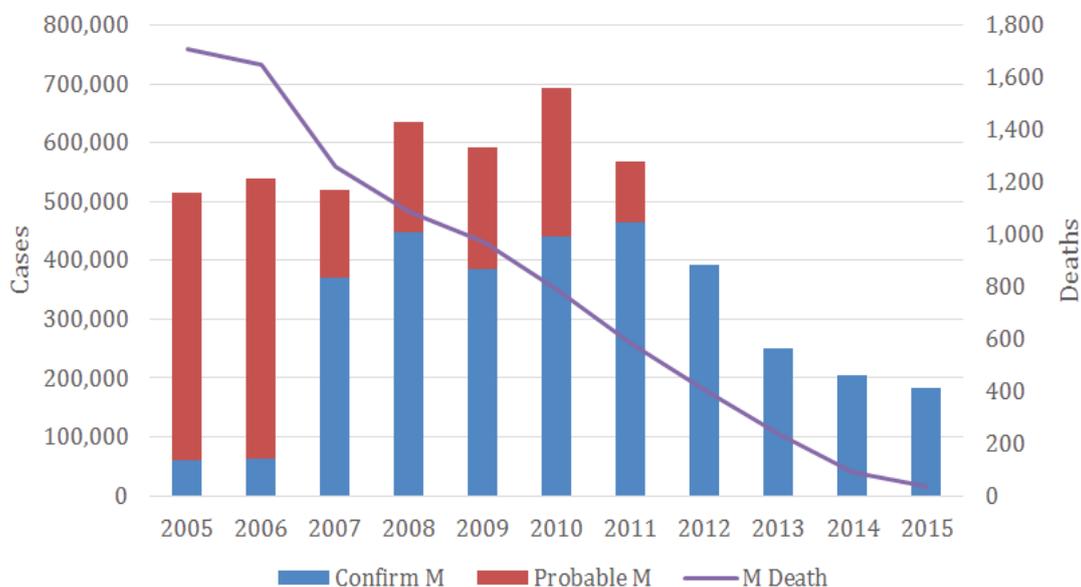
The NMCP figures presented below are based mostly on data from public sector health services as well as other implementing partners. It should be noted that some vulnerable groups living in endemic communities are not currently served by public sector community-based case management services. NMCP figures include limited data from the private sector at present, and the private sector plays a very significant role in malaria case management in Myanmar. Although initiatives managed by NMCP partners are now promoting parasitological diagnosis in the private sector, coverage is currently limited but growing. The reported malaria statistics therefore underestimate the true burden of disease. Nevertheless, they do give the most robust measure available of progress towards malaria control/elimination goals over time.

Of 52 million population residing in the country, 22.5 million (43%) reside in endemic areas, whereas 21.4 million (41%) live in areas with receptivity and vulnerability risk of malaria. A total of 182,616 malaria cases were reported in 2015. At present *falciparum* malaria accounts for around 64% of cases. Over the last 4 years, Annual Falciparum Incidence (AFI) has been declining each year (5.46 per 1,000 population at risk in 2012, 3.57 in 2013, 2.75 in 2014, and 2.66 in 2015). Just 37 malaria-related deaths were reported amongst hospital in-patients in 2015.

Figure 2 demonstrates the remarkable progress made in reducing malaria-related mortality in Myanmar over the last decade. The number of malaria deaths has declined steadily year by year from 1,707 in 2005 to just 37 in 2015 (about 98% reduction in 10 years). The number of malaria in-patients also decreased from 62,813 in 2005 to 7,478 in 2015 and the number of severe malaria cases decreased from over 9,000 between 2005 and 2008 to 660 in 2015. The malaria case fatality rate fell from 2.87% in 2005 to 0.02% in 2015 reflecting major improvements in access to early diagnosis and appropriate treatment.

The reduction in malaria caseload is due to a combination of factors including gradual expansion of healthcare coverage in recent years (most notably as a result of the roll out of community based malaria case management services) and the introduction of rapid diagnostic tests (RDTs) for point of care diagnosis throughout the health system. As a result of these advances almost all cases are now parasitologically confirmed. Data from 2012 onwards is relatively robust and demonstrates a steady and impressive reduction in caseload year by year. The incidence of reported malaria has dropped by 49% since 2012 (from 8.09 in 2012 to 4.16 in 2015 per 1,000 population) despite improved case detection resulting from the recent roll out of RDTs.

**Figure 2. Recent trends in reported malaria burden (confirmed and probable cases and deaths) in Myanmar (2005 - 2015)**

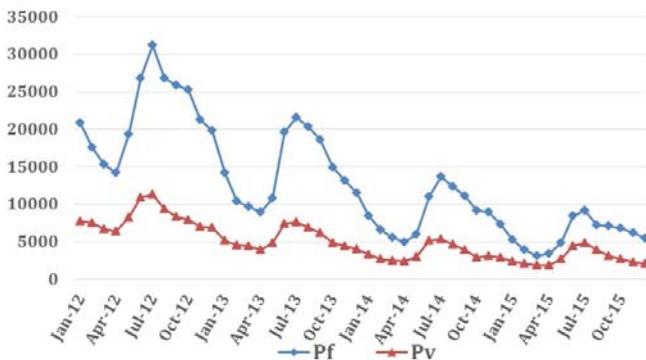


Malaria is becoming an increasingly focal disease. In 2015, out of 330 townships, 291 were endemic, and of these 120 Townships had Annual Parasite Incidence (API) <1 per 1,000 at risk population compared to 45 Townships in 2006. In 2015, 6 States/Regions out of Nay Pyi Taw territory and 14 States/Regions together accounted for 75% of confirmed *falciparum* cases (Rakhine, Sagaing, Chin, Kayin, Shan and Ayeyarwady). Rakhine and Sagaing accounted for 19% and 15% respectively.

While these overall reductions in malaria burden have been impressive, advances should be expected to diminish in future unless significant funding is allocated to addressing hard to control ‘residual malaria transmission’ (RMT), which persists despite universal coverage of LLINs (using insecticides to which local vector populations are susceptible). RMT results from vector and/or human behaviours that increase contact and undermine the effectiveness of control measures. Early and outdoor biting vectors and people with occupations that take them away from the protection of ITNs at peak biting times are key factors resulting in RMT in Myanmar.

Figure 3 demonstrates the steady decline in both *falciparum* and *vivax* malaria between 2012 and 2015. This figure also depicts seasonality of transmission of both *falciparum* and *vivax* – peaking in July and dropping to a minimum in March and April. This similarity between *falciparum* and *vivax* is unusual, as in many countries reported *vivax* caseload exhibits a second lower peak as a result of relapses.

**Figure 3. Recent trends in reported *falciparum* and *vivax* caseload in Myanmar, 2012-2015.**



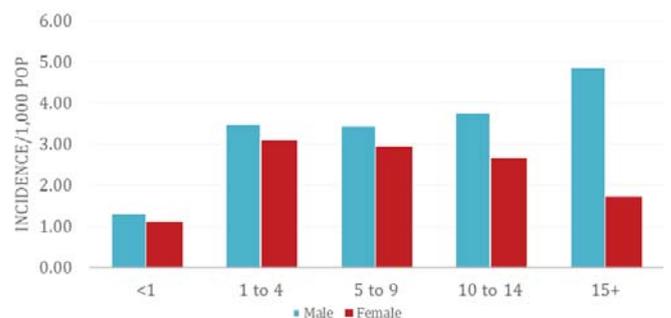
The absence of this second peak is probably partly due to the widespread use of primaquine for the treatment of *vivax* malaria in Myanmar resulting in radical cure.

Figure 4 demonstrates incidence of malaria by age group and sex in 2015. Malaria incidence appears to be slightly higher amongst boys than girls (age groups between 1 and 14), which may be the result of the boys’ tendency to spend more time playing outdoors in the evening.

The dramatic progress that has been made recently in Myanmar has been attributed to a number of factors including increased investment in malaria control operations (leading to improved coverage with LLINs and community-based case management), the introduction of artemisinin-based combination therapy (ACT), expansion of RDT-based diagnosis, the improving political situation (including the Nationwide Cease-fire Agreement - NCA) and advances in socio-economic development. Large-scale deforestation has also undoubtedly played a significant role in some areas.

Despite this progress, the disease remains a key health problem in forest and forest fringe communities, particularly in hard to reach and remote border areas. Although the likelihood of large-scale malaria epidemics has diminished considerably since the 1990s, the potential for smaller-scale epidemics remains real, and a number of sporadic outbreaks have occurred in recent years.

**Figure 4. Incidence of malaria in Myanmar by age group and sex, 2015.**



## Drug resistance

There is evidence that *falciparum* malaria in the GMS is becoming increasingly resistant to antimalarial medicines, and at the Cambodia-Thailand border it could become untreatable within a few years. With increased mobility of populations both within the GMS and beyond, the risk of broad distribution of drug resistant parasites is now higher than ever. The malaria situation in the GMS thus presents a global threat that needs to be comprehensively addressed through urgent, concerted and multi-sectoral effort by all relevant stakeholders.

Artemisinin resistance probably emerged at the border between Myanmar and Thailand in 2001, but was not clearly recognized until 2008. Since 2009, data from Myanmar has consistently shown delayed parasite clearance times among a significant proportion of patients treated with each of three ACTs (AL, ASMQ and DHA-PIP). All three nevertheless remain effective, giving high cure rates except in the case of ASMQ in the Myanmar-Thailand border region<sup>6</sup>.

K13 mutants have been identified in Myanmar, including recently in the west of the country. Analysis suggests that these mutants arose independently rather than spread from Cambodia. Brief overview of artemisinin resistance is annexed (Annex 3).

## Population at risk

The wide variety of population groups at risk of malaria in endemic areas of Myanmar is summarized in Table 1 and described in more detail below. The level of malaria risk for each of these groups is dependent on a number of location-dependent factors including degree of endemicity, accessibility to and strength of health system services. Poverty is another key issue that can limit access to malaria-related services and hence increase risk.

**Table 1. Population groups at risk of malaria in endemic areas of Myanmar.**

Static populations	Mobile and migrant populations
<ul style="list-style-type: none"> <li>Established villages (ethnic minority groups [EMGs] and ethnic majority)</li> <li>New settlements</li> <li>Camps associated with large scale construction projects (dams, bridges, mines, etc.)</li> <li>Settlements associated with plantations (rubber, oil palm, food)</li> <li>Prisons and prison worksite</li> </ul>	<ul style="list-style-type: none"> <li>Traditional slash-and-burn and paddy field farming communities visiting their forest farms (commonly EMGs)</li> <li>Seasonal agricultural labourers</li> <li>Defence services</li> <li>Non-state actors</li> <li>Forest workers in the formal sector (police, border guards, forest/wildlife protection services)</li> <li>Forest workers in the informal sector (hunters, small-scale gem/gold miners, people gathering forest products [precious timber, construction timber, rattan/bamboo])</li> <li>Transient or mobile camps associated with commercial projects (road/pipeline construction, large-scale logging, deep sea port projects)</li> <li>Formal and informal cross-border migrant workers (Legal and illegal workforces)</li> </ul>

<sup>6</sup> Data from SMRU border clinics that treat patients from the Myanmar side of the border.

## **Static population**

### **Traditional farming communities (see also mobile populations below).**

Traditional farming communities belong to many different ethnic groups. Most have their own distinct language and often only a small proportion of group members (predominantly men) speak the national language, making communication of health messages extremely problematic. Poverty in these communities is often extreme. Minority groups tend to be concentrated in remote areas (commonly along borders) where access to healthcare services (both public and private sector) is relatively limited. All age groups tend to be exposed seasonally to long periods of transmission, which can be intense. Adults are usually partially immune but children and pregnant women are extremely vulnerable.

### **Forest fringe communities.**

Many ethnic majority populations live in rice growing communities close to the forest. Villagers, predominantly young men, make frequent overnight visits to the forest to hunt and to collect construction wood and other products. These visits frequently result in malaria infection. People returning to the village carrying malaria parasites can infect anopheles mosquitoes breeding in and around the village and although these species are less efficient vectors than the ones found in the forest, limited local transmission can occur. All age groups are therefore at risk but the majority of cases are found in adult males.

### **Inhabitants of new forest or forest fringe settlements.**

Families who, for economic or political reasons, relocate to forested areas to establish farms are initially at high risk of contracting malaria. These groups are amongst the poorest and most marginalized in the country. Their immunity is usually low. Malaria transmission in these settings typically diminishes year by year with continued development and deforestation of settled areas.

### **Workers in development projects.**

Private companies involved in large-scale construction programmes (dams, bridges), plantation development (rubber, oil palm, fruit, nut, coffee etc.) and other commercial projects (road construction, large-scale logging etc.) may employ large numbers of staff and house them (or expect them to house themselves), often together with their families, in highly endemic areas where sometimes no public sector health care services exist. Some of these companies do provide

good quality health care for their employees and dependents, but many do not.

### **Rubber plantation workers.**

Rubber plantations such as those common in Tanintharyi can provide suitable habitats for Myanmar's primary malaria vectors, *An. dirus* and *An. minimus*. Rubber tappers work at night and very early in the morning when it is cool (in order to maximize latex yield). This greatly increases their potential for contact with vector mosquitoes. Typically latex is collected for ten months of the year from late April to February (when the trees are in full leaf). The workforce is therefore permanent and in large plantations can be sizeable. Typically whole families are involved and are housed in company owned settlements in or close to the trees. The men tend to start work first leaving women to tend to their children before joining them in the plantation soon after dawn. All age groups are therefore at risk of malaria but exposure is highest amongst adult males. As a result of falling global rubber prices many tappers have been forced to seek supplementary or alternative work and many have become involved in collecting forest products, another high-risk activity.

### **Prawn farmers.**

In the late 1990s and early 2000s, prawn farming expanded in Myanmar, particularly in Rakhine State. However, the technology used was outdated and within a few years yields started to decline. Damage caused by recurrent cyclones and the high cost of dyke maintenance meant that by 2011-2012 in some Townships more than 50% of prawn ponds had been abandoned. These abandoned farms provide ideal breeding sites for *Anopheles sunndaicus* (a secondary vector of malaria in Myanmar), placing people living nearby at increased risk of infection.

## **Mobile populations**

### **Traditional farming communities.**

Many ethnic minority groups have large communal villages that are left all but empty for much of the year as families spend months away tending their crops in small farms scattered through the nearby forest. In addition, individuals (usually young men) may spend short periods away from their homes or forest farms, hunting or collecting forest products. Access to healthcare is often made even more difficult as a result.

### **Forest goers and seasonal workers.**

People involved in forest-based activities in both the formal and informal sectors are at high risk

of contracting malaria. Key risk groups include Defence Services, forest/wildlife protection services, workers involved in timber extraction (including illegal loggers and sandal wood collectors and groups digging out timber stumps for the production of carved ornaments), workers involved in infrastructure development projects (such as building roads and dams), workers involved in agricultural development projects (establishing rubber, cashew and coffee plantations), gem and gold miners (e.g. in Mandalay) and, increasingly, tourists.

Seasonal workers harvesting fruit from orchards and rice close to the forest are also at high risk. While the forest goers described above are mostly men, the seasonal workers include many women. In each case, workers may come from villages near the forest but many also come from other regions when seasonal demand for labour in those areas is low. Often they have little or no immunity to malaria.

#### **Defence services.**

The Defence Services form a sizable and particularly mobile high-risk group. They are often deployed in hard to reach areas, based in camps located in the forest or forest fringes. While on night patrol duties they are at particularly high risk of contracting malaria. The fact that they are often redeployed long distances to new malaria endemic areas means that they have the potential to introduce parasite strains that are new to these areas. This is a particular concern given the possibility of artemisinin resistant *P. falciparum* being introduced to Myanmar from elsewhere in the region by returning migrants. Reaching these mobile populations with appropriate prevention and case management services is crucial to the success of malaria control and elimination efforts in Myanmar.

#### **Internally displaced persons (IDP).**

Due to ongoing clashes between the Defence Services and non-state fighters in Kachin, Rakhine and Northern Shan States, IDPs remain a significant problem in Myanmar. UNHCR reported 514,000 IDPs in December 2015 (of which around 120,000 were in Rakhine and around 100,000 were in Kachin and Northern Shan States). These populations generally have less access to the services and hence are less well protected from malaria than other populations in the same areas.

#### **Cross-border workers.**

These are a diverse mobile population who cross the border for work, both legal and illegal. Some

are long term or permanent migrants, while others cross the border often or even daily. According to the International Organization for Migration there are an estimated 2 million Myanmar nationals based in Thailand at present and about 200,000 in Bangladesh. While many of these spend their time abroad in urban or other non-endemic areas others, particularly seasonal agricultural workers (see above), are based in areas where transmission does occur. There is a possibility that cross-border workers returning from parts of the GMS could introduce multi-ACT resistant *P. falciparum* to receptive areas of Myanmar.

#### **Migrants.**

Migrants may be found in most of the situations described above, working for large private companies, living in unauthorized housing developments, working as seasonal agricultural labourers or as informal forest workers. Migrants, both national and international, are a particular concern in that they could potentially contribute to the spread of artemisinin resistant malaria parasites.

Providing a comprehensive package of services to these high-risk mobile population groups will be an important focus of the strategy described below.

All of the populations at risk described above, except those in permanent settlements close to a commune health centre, can be considered as having disproportionately low access to treatment services and all of the mobile and migrant populations described above can also be considered as having disproportionately low access to prevention services.

Key factors contributing to this inequality include: language (often only a small proportion of people from ethnic minority groups speak the national language making communication of health messages problematic); remoteness (malaria transmission tends to be most intense in remote areas, commonly along borders, where access to both public and private sector healthcare services is relatively limited); poverty (the populations living in or passing through these remote areas are generally some of the poorest in the country); marginalization (ethnic minority groups and migrants are amongst the most marginalized groups in the country); and mobility (the high mobility of some individuals means that they may have moved to non-endemic areas, where health workers are less likely to be familiar with malaria, when symptoms first appear).

Providing malaria-related services to high-risk static populations is relatively straightforward, at least theoretically. The location of settlements, plantations, construction sites and development projects can be mapped, populations can be quantified and plans for delivering interventions can be formulated. Furthermore, post-delivery checks can be made to validate coverage. However, in reality so far it has only generally been the 'established villages' that have been well served by routine prevention operations. Providing a comprehensive package of services to the remaining static population groups is one important focus of the strategy described below.

The challenges to service delivery among mobile populations are more complex. Mapping is often not possible, there may not be any actual houses or other structures in which to suspend an LLIN, the population size may vary from day to day making quantification of needs difficult, and in the case of illegal migrants and individuals involved in illegal activities, fear of punishment often prevents any contact with official groups or groups that are perceived to be official. Added to this, many people in these groups are driven only by the need to make money and so getting accurate information for health action from them is a sensitive and complex multi-sector task.

While forest goers in the formal sector, such as police, border guards and forest/wildlife protection services, may receive some level of protection in the form of ITNs and access to standby treatment, informal forest workers are commonly completely unprotected.

When ill, most of the seasonal workers described above attend health facilities close to the forest where they work, but many also seek treatment when they return to their homes in non-endemic areas where malaria may not immediately be suspected. In this way these individuals also effectively have disproportionately low access to treatment services. Malaria-related mortality in this group can be relatively high as a result.

Providing a comprehensive package of services to these high-risk mobile population groups will be an important focus of the strategy described below.

Malaria in Myanmar is closely associated with poverty. Marginalized mobile and migrant populations and ethnic minority groups working or living in the forest and on the forest fringes often carry the greatest burden of poverty and

disease. Well-targeted malaria control efforts by their nature therefore cater to the needs of some of the least privileged.

## Gender equality and women's empowerment

In the 2014 gender inequality index, Myanmar ranks as 85th of 187 countries<sup>7</sup>. The Myanmar government is a signatory to the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), the Beijing Platform for Action, the International Conference on Population and Development, and the Millennium Declaration.

Nevertheless, there are gender inequalities in legislation, access to economic opportunities and political representation in Myanmar. In addition, the knowledge and involvement of men in family planning, safe motherhood and HIV prevention is limited. A shortage of gender statistics and research, a lack of awareness, and limited institutional capacity hinder the development and implementation of effective policies and programmes for the empowerment of women. The National Strategic Plan for the Advancement of Women 2013-2022 outlines an integrated approach to improving the situation of women and girls in Myanmar. The plan provides an overarching framework, and details interventions and targets. The plan aims to create enabling systems, structures and practices for the advancement of women, gender equality, and the realization of women's rights.

The Gender Equality Network (GEN) currently operating in Myanmar is an active inter-agency network, comprising approximately 60 national and international NGOs, UN agencies, civil society networks and technical resource persons as approved by the membership. GEN works collaboratively with key stakeholders to promote gender equality and women's rights throughout Myanmar. It contributes to the development of laws, policies, systems, structures and practices to achieve women's rights and participation at every level.

Gender norms and values that influence the division of labour, work and leisure patterns, and sleeping arrangements may lead to different patterns of exposure to mosquitoes for men and women. There are also gender dimensions in accessing treatment and care for malaria, and in the use of preventative measures such as bednets.

<sup>7</sup> Human Development Report 2015.

A thorough understanding of the gender-related dynamics of treatment-seeking behaviour, as well as of decision-making, resource allocation and financial authority within households is important in order to maximize the effectiveness of malaria control and elimination efforts. Research on these gender related issues will be conducted in a broadly representative selection of epidemiological settings in Myanmar in order to fine-tune operations and maximise their effectiveness.

### Human Rights barriers

Four years of wide-ranging reforms have brought fundamental changes to Myanmar. During that time, thousands of political prisoners were released, numerous laws were adopted or reformed, and significant steps were taken towards allowing greater media freedom and government transparency. The general elections held in November 2015, which were assessed positively by both national and international observers (despite some irregularities and pre-election concerns), saw the National League for Democracy (NLD) win an absolute majority.

The new Government now faces formidable human rights challenges. The transition period following the elections has been smooth and peaceful, but also one of great uncertainty. Allegations of human rights violations continue to be reported, including arrests and prosecutions of civil society actors for peaceful and democratic activities. The new Government plans to further recent reforms initiated by the outgoing Government and create an environment in which communities, civil society actors and human rights defenders may speak out and protest peacefully without fear of reprisal. The international community remains engaged and is supporting Myanmar in furthering reforms and in fulfilling its international human rights obligations.

### Micro stratification

Malaria is a focal and sometimes sporadic disease, thus, it is essential in malaria control to identify the areas and populations at high risk, which must be prioritized for targeted intervention and mobilization and effective use of limited resources. The Vector Borne Disease Control Programme (VBDC), UNICEF and WHO developed an approach to micro-stratification, which reflects practical experiences from the country and other South-East Asian countries with similar transmission characteristics. This approach allows the use of simple and available ecological, social and epidemiological indicators to classify any area or village as malarious, potentially malarious (i.e. epidemic-prone) and non-malarious. Micro-stratification was completed in 180 Townships in 2012, 51 Townships in 2014 and 2015. However, criteria for micro-stratification have been revised and are primarily based on updated epidemiological indicators, such as Annual Parasite Incidence (API) instead of previously used ecological and social risk factors. Now some of the Townships already have village-wise parasitological data that can be used to stratify villages so as to be in line with changing strategic direction from control to elimination.

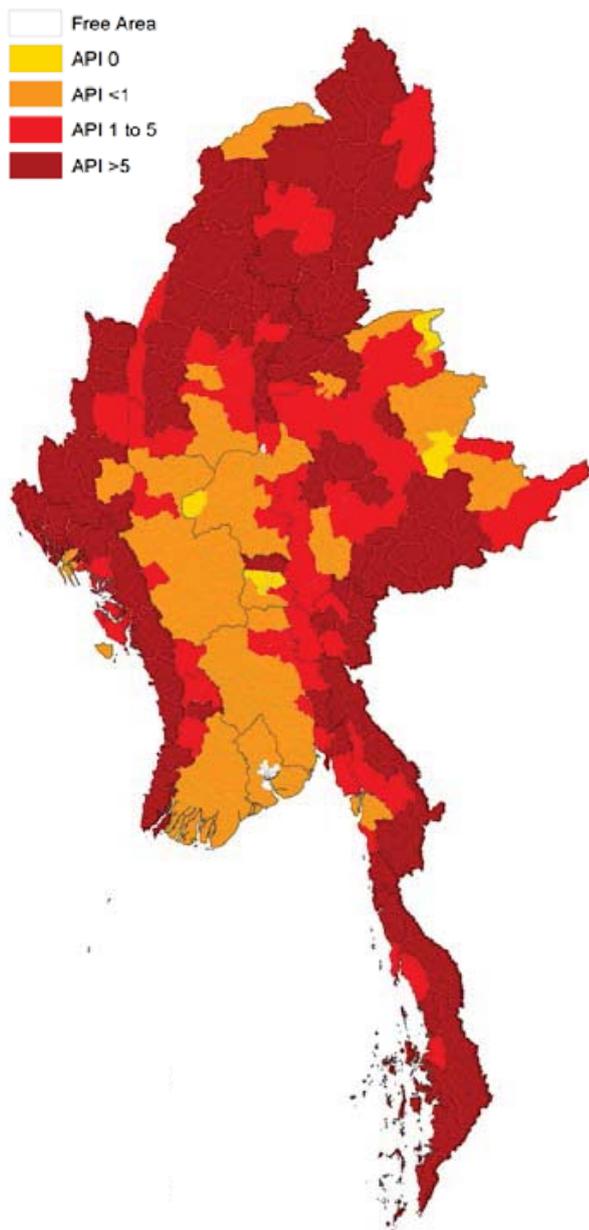
The unit of micro-stratification is “village” and that stratification is determined using primarily malaria case data by population (API) instead of using risk factors alone. Risk factors are still used to evaluate the receptivity and vulnerability in potential transmission areas where malaria data is incomplete. Due to limitation on the availability of population by village, subcentre has been considered as the unit of measurement for calculating population at risk under each stratum. The areas have been stratified as described below in Table 2.

**Table 2. Population breakdown by strata based on 2015 micro-stratification by sub-centre**

Stratum	Transmission status	Sub-centres	Population 2015	% of Population
3a	High	1,026	3,542,647	7%
3b	Moderate	1,461	6,328,845	12%
3c	Low	2,062	12,664,333	24%
2	Potential	4,439	21,354,063	41%
1	Malaria free	1,531	8,116,373	16%
Total		10,519	52,006,261	100%

It is recognized that in areas with highly mobile populations, even moderate or high API in a village does not necessarily imply that local transmission is occurring directly in that village, and that improved surveillance methods that distinguish between locally transmitted and imported malaria are needed to guide the choice of interventions. However, at present measuring API in the human population is considered to offer a more reliable indicator of local transmission than ecological risk factors and risk factors that pertain only to the mosquito vector.

**Figure 5. Township level malaria micro-stratification map of Myanmar in 2015.**



## Health systems and community systems context

Although recent decades of underinvestment left Myanmar's public health system under-resourced, significant improvements have been made during the last 5 years. Government Total Health Expenditure (THE) is increasing year by year and rose steadily from 86 billion kyats (US \$70M) in 2010-11 to 753 billion kyats (US\$ 610M) in 2015-2016 (fiscal years) – almost a nine-fold increase over four years. Government support allocated for the NMCP in 2016 exceeds US\$ 2 million (excluding HR costs). Government health services provide human resources, infrastructure and facilities, key medicines (including ACT) and some simple routine investigations (including RDTs) free of charge down to the village level.

Despite recent improvements most out-patient care is still obtained from private sector providers. Although Out of Pocket Expenditure (OPE) for health care fell from 80% in 2011 to 68% in 2013, it was still the seventh highest in the world resulting in high levels of catastrophic financial payments and subsequent impoverishment. Health outcomes are improving, but remain poor. In 2015 the under-5 mortality rate was 50 per 1,000 and life expectancy at birth was 66.

The public healthcare system in Myanmar is highly structured, following the State/Region-District-Township government hierarchy and based on the principles of primary health care, with medical officers overseeing all health-related activities in their designated areas (Annex 4). There is also an active national network of auxiliary midwives and community health workers, operating in collaboration with village health committees, providing prevention and out-patient care. Healthcare services at the local level are, however, under-resourced, and although some areas are supported by international non-governmental organizations (iNGOs), most lack the resources to provide effective care.

Strategies are in place to make grossly inadequate resources stretch as far as possible. However the need to review the extent to which the population at high risk, especially ethnic minorities and the hardest to reach, have access to the health care delivery system is important for further improvements in health outcomes.

Recent aid-based interventions have primarily been vertical programmes running independently of the public health system. However, funding for aid interventions has increased very significantly in the last few years, a number of new funding partners have engaged with the country and key implementing partners are taking an increasingly holistic approach to healthcare support.

## **Social security**

A social security scheme is being implemented by the Ministry of Labour, which requires enterprises (whether state owned, private or foreign) with over 5 employees to provide employee insurance. The contribution is tri-partite with 2.5% being provided by the employer, 1.5% by the employee and a government contribution in the form of capital investment (workers' hospitals, dispensaries, mobile medical units and branch offices have been established nation-wide). Insured workers under the scheme are provided with free medical treatment plus various benefits in-line with international practice. There are plans to develop stronger social support including an 'Essential Health Care Package' and universal health insurance coverage with protection from catastrophic healthcare costs but detailed discussions have not yet taken place.

## **Peripheral health system**

The Township Public Health Department (TPHD) is headed by the Township Public Health Officer (TPHO), who functions as the Assistant Director level (Annex 4). Under the TPHO there are two medical officers (one for Disease Control and one for Public Health) and one Administrative officer. Generally each TPHO is responsible for four to five Rural Health Centers (RHCs) and station hospital (each managed by a health assistant with a lady health visitor and at least one midwife) and four to five sub-RHCs (each managed by a midwife with a public health supervisor - level II). Microscopy services are available at Township hospitals and some NGO run clinics. Microscopists are multi skilled rather than malaria-specific.

## **Human resources for health**

There has been a steady growth in the number of basic health facilities and human resources for health in recent years. The hospitals in States/Regions and Districts are reasonably well staffed. The number of midwives has almost doubled over a 20-year period and midwives are the key providers of basic health services in rural areas.

Of the 31,542 doctors in 2013-2014, 18,443 worked as private practitioners and the rest in the public sector (annex 4). Many doctors and other staff in the public health service are engaged in private practice after official working hours to supplement their income.

'Village Health Volunteers' (VHVs) are a recent innovation in Myanmar and now form the foundation of malaria-control activities at village level. Of the 40,000 VHVs trained, around 38% are still active. VHVs are provided with two-day modular training on malaria diagnosis and treatment. They provide malaria diagnosis and treatment at community level using RDTs and ACT. Some are also engaged in preventive work such as LLIN distribution and health education depending on the organization (NGOs, INGOs) that supports and supervises them. Of the 182,616 malaria cases diagnosed in 2015, 104,925 (57%) were diagnosed and treated by VHVs. The quality of supervision provided for VHV varies considerably from one agency to another and this is likely reflected in the quality of both the care provided and the data submitted.

The completeness of the malaria register is sub-optimal and the proportion of reporting units reporting was just 86% in 2015. Efforts are therefore now underway to standardize data capture, timely reporting, training, supervision, and supply chain, and make improvements where necessary. There are still many endemic villages with high-risk population in hard to reach areas of the country that do not readily have access to health services. To reach these 'unreached', areas there is a need to expand the network of the VHVs.

## **Health system oversight in relation to malaria**

The National Health Committee (NHC) is a high level inter-ministerial body responsible for health. It takes a leadership role and gives guidance in implementing health programmes systematically and efficiently with emphasis on sectoral collaboration and community participation.

The 'Myanmar Health Sector Coordinating Committee' (M-HSCC) (an expansion of the GF specific 'Myanmar-Country Coordinating Mechanism') was established in 2013 and takes a leading role in coordination of both governmental and non-governmental sectors.

The M-HSCC has a Technical and Strategy Group (TSG) for malaria, which is led by the Department of Disease Control, with WHO serving as technical secretariat. The mandate of the TSG-Malaria is to provide technical guidance in the development of national strategies, to provide coordination among partners, and to provide clarity on major technical and policy issues. The TSG meets periodically to discuss, review and endorse certain proposals, reports and other documents and carry out the assignments given to them. It also provides broad oversight of the implementation of grants and projects as required. The TSG-Malaria appoints a working group (the Core Group for TSG-Malaria) to deal with specific tasks as necessary.

The National Malaria Control Programme (NMCP) is a part of the Vector Borne Disease Control (VBDC) Programme, but the majority of staff and resources of the VBDC throughout the country, with the exception of bigger cities, are focused on malaria. The NMCP works particularly closely with the following government departments in order to implement key activities:

- The Department of Medical Services (which is responsible for medical supplies and management of hospital services) to collect hospital data on malaria morbidity and mortality.
- The National Health Laboratory (NHL) to support NMCP validators and strengthen the quality assurance system for hospital and facility based malaria microscopy.
- The Food and Drug Administration (FDA) for registration of antimalarials, quality control of antimalarials, control of counterfeit, sub-standard and unregistered antimalarials and implementing the ban on oral artemisinin monotherapy (in collaboration with Population Services International - PSI).

## 2. STRATEGIC FRAMEWORK (2016-2020)

### 2.1 Vision, mission, goals and principles

#### VISION

A Malaria Free Myanmar by 2030

#### MISSION

The National Malaria Control Programme (NMCP) of the Ministry of Health and Sports of the government of Myanmar aims to achieve malaria elimination ('zero indigenous transmission' and 'zero malaria deaths') by ensuring equitable and universal accesses to effective preventive and curative services to all 'at risk populations' in coordination with the efforts of all communities, national and international non-government organizations, private sector stakeholders, United Nations agencies and financial partners. Achieving the vision of 'A Malaria Free Myanmar' will contribute significantly to poverty alleviation as malaria is most prevalent in the poorest segment of the population: those living or spending time in remote forested areas including mobile populations and migrants.

#### GOALS

This is a five-year strategy to reduce malaria morbidity and mortality by 85% and 75% respectively by 2020 relative to 2015 baseline figures. In States/Regions where malaria transmission has been interrupted, the goal is to maintain malaria-free status and prevent re-establishment of local transmission.

Achieving these goals will put Myanmar on the path to eliminate *falciparum* malaria by 2025, considering the urgent action required against multidrug resistance and all malaria from Myanmar by 2030.

#### PRINCIPLES

- Efforts towards elimination are accelerated through combinations of interventions adapted to Myanmar conditions and responding to local needs.
- Building country ownership and leadership, and mobilizing partnership action with the participation of communities, the Defence Services, other implementing partners, technical agencies and the private sector, are essential to accelerate progress through a multisectoral approach.

- Adequate malaria case-based surveillance<sup>8</sup> and investigation is required to enable elimination.
- Improved entomological surveillance and investigation is required to support evidence based vector control operations and accelerate elimination.
- Information systems that facilitate malaria stratification (to support planning, monitor progress and evaluate anti-malaria interventions) are required to optimize implementation of malaria interventions.
- Equity in access to services irrespective to gender, reach, and ethnicity is essential, especially for the most vulnerable and hard-to-reach populations.
- Innovation in tools and implementation approaches will help to maximize progress.

### 2.2 Objectives

#### OBJECTIVE 1.

To reduce reported incidence of malaria to less than 1 case per 1,000 population in all States/Regions by 2020.

In high-burden areas, massive and rapid scale-up of existing disease prevention and management interventions, aimed at achieving a significant reduction in malaria burden, will form a transitional stage on the path to elimination, reducing the risk of spread of malaria to areas approaching elimination.

#### OBJECTIVE 2.

To interrupt transmission of *falciparum* malaria in at least 5 States/Regions by 2020 (Bago, Magway, Yangon, Mon, Mandalay).

In low-burden areas, emphasis will be on elimination. The programme will focus on reducing transmission rates through detection and radical treatment of all malaria cases, case investigation and response and on eliminating *falciparum* malaria transmission foci. There will be special emphasis on detecting, protecting and providing access to diagnosis and treatment for priority population groups (e.g. mobile groups and migrant populations, forest goers etc).

<sup>8</sup> Case means any infection where, regardless of the presence or absence of clinical symptoms, malaria parasites have been confirmed by quality-assured diagnosis.

### OBJECTIVE 3.

To prevent the emergence of multi-ACT resistant *P. falciparum* in Myanmar.

Deterioration in the efficacy of ACTs in neighboring countries, the likely emergence of multi-ACT resistance in Myanmar and the risk of malaria becoming untreatable with currently available drugs calls for urgent and aggressive measures.

### OBJECTIVE 4.

To prevent the re-establishment of malaria in areas where transmission has been interrupted.

As areas achieve interruption of transmission, programmatic focus will shift to prevention of re-establishment. The probability of malaria becoming re-established in a malaria-free area varies according to the area's receptivity and vulnerability. When importation of malaria (e.g. due to the arrival of refugees, Defence Services or migrant workers from a malaria-endemic area) coincides with high receptivity (e.g. as a result of halting anti-malaria measures or as a result of socioeconomic and climatic changes) re-establishment of malaria transmission can occur.

These four objectives will be achieved through the implementation of a number of key activities, presented in Section 2.5.

## 2.3 Approach

### Prioritization

This strategy aims for an accelerated scale-up of appropriate interventions in all endemic areas, tailored to the local epidemiology. Nevertheless, there is a need to prioritize, at least initially.

Factors to be considered include the past and current intensity of transmission in an area, the degree of resistance to different antimalarial drugs<sup>9</sup> and the size and mobility of affected populations. If a high-burden area is located near a low-burden area, then early reduction of transmission in the high-burden area will likely make it easier to achieve elimination in both.

Based on these considerations, the priorities are:

1. Reduce malaria burden in the most endemic areas.

2. Eliminate *falciparum* malaria in areas of multidrug resistance, including artemisinin resistance.
3. Strengthen the existing surveillance system and vigilance including the capacity of health care providers and programme staff at all level for States and Regions entering the elimination and prevention of re-establishment phases.

This prioritization does not mean that efforts to eliminate malaria in low-transmission areas will be put on hold, only that such efforts will not take precedence over addressing severe drug resistance and burden reduction in high transmission areas. Once the epidemiological landscape has been flattened, and all areas achieve malaria incidence below 1 case per 1,000 people at risk per year, then the entire country will be eligible for the elimination phase, which will simplify operations.

### Programme phasing

Successful malaria elimination requires a distinction between a transmission-reduction phase, where a combination of interventions is applied in all endemic areas, and an elimination phase, where these measures can be targeted to remaining foci and surveillance intensified with measures to rapidly detect and cure every case.

Phasing is necessary, because premature application of the elimination-phase approach would be prohibitively demanding. Thus, the malaria burden must be lowered before it is possible (and rational) to investigate and treat every case.

Programme phasing on the path to malaria elimination has two components:

- The *transmission-reduction* phase aims to bring malaria incidence down to a level at which elimination can be considered (below 1 case per 1,000 people at risk per year<sup>10</sup>). Interventions aim to reduce transmission and have an impact on morbidity and mortality. This involves aggressive scaling up of effective preventive and curative interventions to achieve universal coverage in transmission areas.
- The *elimination phase* aims to reduce incidence to zero. Malaria case and entomological surveillance become the core interventions -

<sup>9</sup> This will become important if pockets of multi-ACT resistance develop in Myanmar.

<sup>10</sup> Confirmed by population-based reporting from facilities with known catchment areas, very high and reliable case notification and, ideally, full participation of the private sector.

every case is investigated and managed to avoid onward transmission.

- Based on the investigated foci of transmission identified, appropriate vector control and antimalarial drug-based interventions are deployed to rapidly interrupt transmission.

The objectives of the national elimination programme will have been achieved when:

- locally acquired malaria cases have been reduced to zero; and
- health system and malaria case and entomological surveillance operations are fully capable of preventing re-establishment of malaria transmission.

Once elimination has been achieved, the maintenance of malaria-free status will become the responsibility of general health services, as part of their normal function in communicable disease control, in collaboration with other relevant sectors.

Figures 6 and 7 present the planned phasing of malaria elimination efforts in Myanmar.

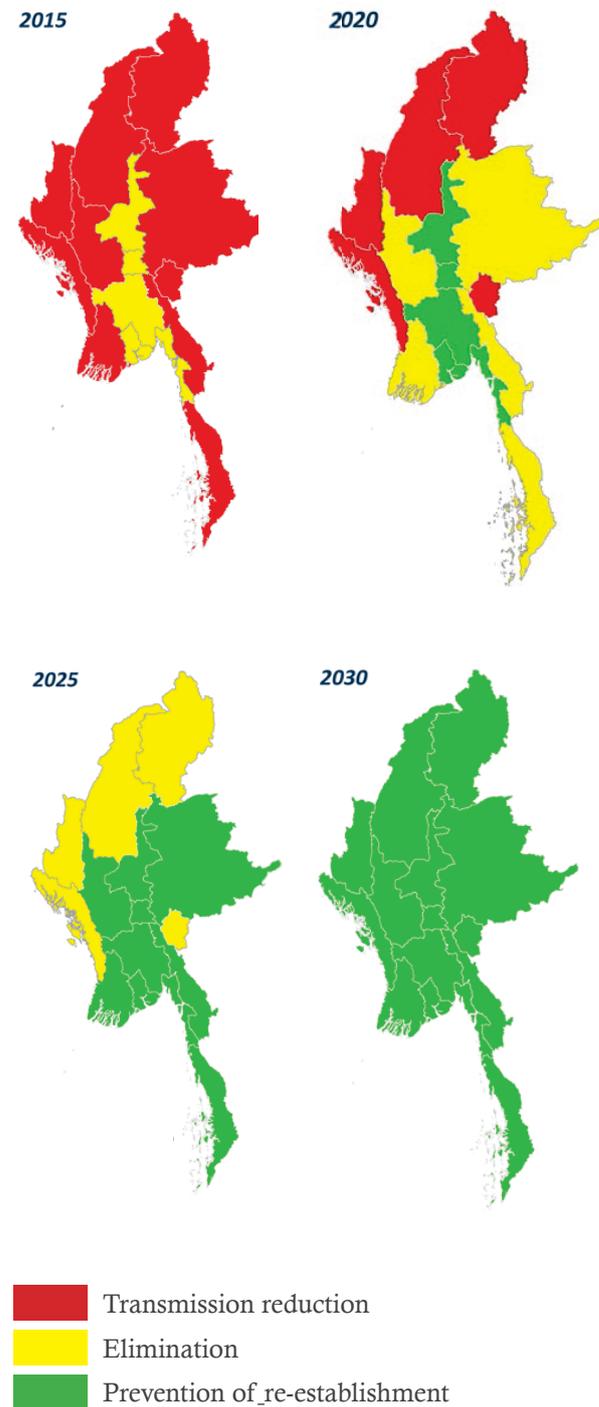
**Figure 6. Projected number of States/Regions by programme phase and year.**

No. of States and Regions	2016	2017	2018	2019	2020
5	Red	Red	Red	Red	Red
5	Red	Red	Red	Yellow	Yellow
5	Yellow	Yellow	Yellow	Green	Green

- Red: Transmission reduction - API >1 per 1,000
- Yellow: Elimination - API <1 per 1,000
- Green: Prevention of re-establishment - API 0 per 1,000

Out of the 15 States/Regions in Myanmar, five will reach elimination phase by 2018 and five will reach this phase by 2020. The 5 States/Regions which are already in the elimination phase will take 3 years to reach the prevention of re-establishment phase (Figure 6). Figure 7 shows a projection of the ‘shrinking of the malaria map’ in Myanmar.

**Figure 7. Geographical presentation of timelines for Malaria Elimination in Myanmar by State/Region, 2015-2030**



## 2.4 Key interventions and supporting elements

The National strategy is based on the following three key interventions and two supporting elements. The three key interventions are:

1. Case detection and effective management
2. Disease prevention
3. Malaria case and entomological surveillance.

The two supporting elements are:

1. Expanding research for innovation and improved delivery of services
2. Strengthening the enabling environment.

## 2.5 Activities

### INTERVENTION 1.

#### Case detection and effective management.

Ensuring universal diagnostic testing will reduce the over-use of ACTs and reduce drug resistance selection pressure on parasites. The detection of malaria infections will be based primarily on blood examination by RDTs or microscopy. Diagnostic methods with a higher sensitivity than RDTs and microscopy, such as polymerase chain reaction (PCR) or other molecular-based techniques will be used in National Malaria Reference Laboratory (for example to resolve discordant results from microscopy quality assurance (QA), for distinguishing recrudescence versus reinfection during TES) but not for routine case management. The annual blood examination rate (ABER) for the population at risk will be increased from 6% (2015) to 8% (2020) depending on the availability of funding and the absorption capacity of implementers. This increase is in-line with the increased case detection requirements and increased accessibility to treatment associated with the move towards malaria elimination.

Treatment for *falciparum* and non-*falciparum* malaria will be based on national treatment policies, which are in-line with WHO guidelines. Currently, all medicines recommended for the treatment of uncomplicated *falciparum* malaria are ACTs. Treatment will include primaquine to eliminate gametocytes, which are responsible for infecting mosquitoes with malaria and thus continuing transmission. Supervised treatment will be used to support patient adherence to radical treatment for *vivax* malaria, which requires 14

days/ once weekly for 8 weeks. This will entail follow-up by a health worker or volunteer on days 7 and 14. Directly observed treatment (DOT) for ACT, which has a 3 day regimen, may be applied, but only in the final stages of elimination when the number of cases falls to a point at which DOT becomes manageable. Until then, efforts will be made to maximize patients' adherence to their full treatment regimen through advocacy delivered by healthcare providers (inter-personal communication). The importance of this 'adherence advocacy' will be emphasized in all clinical training sessions in future.

Achieving universal coverage with case management requires three channels of service delivery: public, community based and private. While malaria incidence remains high, the programme will maximize coverage through all three channels while making efforts to improve quality. In order to ensure optimal case management, surveillance and reporting during the elimination phase, selected private sector providers will be allowed to test and treat patients according to the National Malaria Treatment Guidelines, but will be required to notify all positive cases to the local health authorities within 24 hours of diagnosis. Treatment by unverified private sector providers will be strictly prohibited in elimination phase Townships.

#### 1.1 Strengthen and maintain existing microscopy-based diagnostic services.

Microscopy based surveillance will form a key tool in the move towards elimination. Quality-assured microscopy will be made available at Township hospitals in endemic areas and at State/Region levels nationwide, as well as in some NGO run health facilities. Microscopy has advantages for follow-up of patients, detection of gametocytes and determination of parasite density. New microscopists (multi-skilled) will be trained and existing microscopists will receive refresher training based on needs identified through QA.

#### 1.2 Strengthen and expand RDT-based diagnostic services

Rapid diagnostic tests (RDTs) for detection of *falciparum* and/or non-*falciparum* infections will be made available at all public sector and NGO run health facilities as well as at community-level. Free RDTs will also be made available through various private sector initiatives. Where microscopy services are present RDTs will only be used in the event of microscopy being temporarily unavailable, for example as a result of power failure or staff absenteeism.

### **1.3. Support case management, including the management of severe malaria, in public sector health facilities.**

Case management training and refresher training will be provided for all public sector health staff covering differential diagnosis and management of uncomplicated, severe and complicated malaria. The training will incorporate a module on inter-personal communication aimed at improving patient compliance with malaria treatment regimens and improving other malaria related behaviour such as personal protection and prompt treatment seeking. Special training will be provided to State/Regional and Township level doctors on the management of severe and complicated malaria.

### **1.4. Provide community-based diagnosis and treatment for malaria.**

Myanmar has a well-established free community-based case management service for malaria delivered by village health volunteers (VHVs), work site volunteers and backpacked (mobile) volunteers. Coverage however is still sub-optimal. Technically the community service providers are a part of public sector health services, but the providers themselves are volunteers, who depend on the support of an NGO or the National Programme. The volunteers substantially complement and extend the reach of public health services, particularly in rural and remote areas, where health infrastructure tends to be weak or absent and malaria transmission tends to be highest. In order to maximize the efficiency of the intervention, in future efforts will be made to reach the optimal solution of only one implementing partner managing community-based services in each Township.

During 2016-17 the Programme will expand community-based malaria case management for hard-to-reach areas to cover all endemic settlements more than 2 km (or as appropriate) from a functioning health facility. Expansion will start from stratum 3a and continue until all eligible settlements in stratum 3c have been covered. The role of volunteers will expand to cover diarrhoea and acute respiratory tract infections for children under 5 (iCCM) as well as a fever management service for all age groups. The latter will ensure that communities continue to use volunteer services even when malaria incidence falls to very low levels, and this will protect the malaria elimination related surveillance role of the volunteers. The volunteers will also help to monitor population movements and support

referral for severely ill patients. In areas in the elimination phase, volunteers will be required to support real time reporting wherever feasible and assist case and focus investigation and focus response teams as necessary.

Strengthened needs-based training as per the VHV Guidelines will be provided and this will be followed-up and monitored by supervisors with on-the-job training. The volunteers will meet regularly with supervisors for resupply, data cross-checking and reporting. The programme and its implementing partners will support costs related to travel for report submission and meetings. A harmonized incentive will be provided to retain and motivate the volunteers working under the programme and its implementing partners. This will be provided based on performance (e.g. number of RDT tested, reporting, stock management, etc.).

Providing services for mobile and migrant populations spending time in endemic settings is essential. A large proportion of the mobile population lives in the vicinity of remote villages and these populations will be catered for primarily through VHVs. Elimination will not be achieved unless these population groups have access to free malaria protection measures and early diagnosis and treatment. If the mobile population is a large group far away from the nearest VHV, an individual among the mobile population will be trained and supplied for malaria case management on site.

Mobile populations are difficult to reach for a number of reasons, including hard to reach/remote areas, low population density, limited mobility, languages differences and undocumented status for some. Improving their access to health services can be a complex multi-sector task. Although some migrants employed in informal or even illegal labour may prefer to avoid any contact with public services, others in regular legal employment may be easy to work with if they and their employers are approached in a sensitive manner.

Management of these community-based services will involve proactive and systematic collection of information on migrants and mobile populations for which intersectoral cooperation will be key.

### **1.5. Provide special diagnostic and treatment services in remote areas and at selected border crossing points.**

Special case management and screening services will continue to be provided through new malaria clinics/posts in high risk areas and at key migration transit points, including formal and informal international border crossings. Coverage is currently somewhat limited and so the approach will be expanded as appropriate in 2016-17. Support to these malaria clinics will include the provision of training and supply of RDTs and antimalarials.

### **1.6. Implement intensified case detection by mobile teams in special situations and in areas currently underserved.**

Township health teams and NGO partners will conduct intensified case detection in high burden villages without VHVs, and in new settlements (e.g. IDP camps) and in migrant work sites in endemic areas as necessary. Mobile teams will travel to wherever mobile populations spend time. They will also work with groups or individuals recruiting migrants.

The teams will test all fever cases with RDTs. Treatment will be provided as appropriate.

A number of NGO partners already have mobile outreach teams for managing malaria in mobile, migrant and remote populations through the provision of case management services and forest-packages for forest goers (including LLINs, repellent and information on the benefits of using bednets and repellents consistently). This approach will be expanded by NGOs and the National Programme to cover all areas where populations are currently underserved.

For settled populations, mobile services will only be a temporary measure to fill the gap-pending provision of static community based services, which will be rolled out as quickly as possible (see 1.4 and 1.5 above).

### **1.7. Provide diagnosis and case management within the Defence Services.**

Malaria case detection and management services within the Defence Services will be strengthened and brought in-line with National norms. RDTs, antimalarial drugs and commodities will be provided along with training of medical personnel. All case management data generated will be incorporated into the national reporting system.

### **1.8. Screen members of the Defence Service pre- and post-deployment to endemic areas.**

Microscopy-based screening will be introduced for all Defence Service personnel before and after deployment/redeployment to endemic areas. More sensitive screening methods may be utilized if funding permits.

### **1.9. Provide standby treatments in special circumstances.**

Standby treatment (a full course of ACT) along with appropriate information will be provided to individuals/groups that are travelling to areas that are so isolated that this approach offers the only means of ensuring prompt treatment. Where appropriate, delivery of standby treatment will be integrated with delivery of LLINs as well as with delivery of any other personal protection measures that might become available over time.

Uptake of standby treatments will be closely monitored and evidence of inappropriate application by healthcare providers will be investigated. Action will be taken as necessary to minimize misuse.

### **1.10. Screen pregnant women in high transmission communities.**

As demonstrated in figure 4, women still bear a considerable (albeit falling) proportion of the malaria burden in Myanmar. Quarterly RDT-based malaria screening for pregnant women will be introduced through ANC services in stratum 3a communities.

### **1.11. Introduce G6PD testing.**

G6PD testing will be rolled-out gradually (once point of use tests become available). Findings will be mapped to support the development of a longer-term policy on G6PD testing and primaquine use.

### **1.12 Introduce Mass Drug Administration (MDA) in special circumstances.**

MDA may be introduced as per WHO recommendations as an epidemic response or in the event of complex emergencies. Other applications may be considered pending WHO approval.

### **1.13. Provide follow-up testing for *falciparum* cases where feasible.**

Microscopy/RDT-based follow-up of patients on day 28 or day 42 (depending on the ACT's partner drug) will be introduced to detect potential recrudescence cases. Positive cases will be admitted to hospital for supervised second-line treatment.

Follow-up testing will focus on elimination phase Townships initially but may expand to transmission reduction phase Townships where feasible. The service will be implemented by BHS staff in collaboration with VHV's.

#### **1.14 Strengthen and monitor private sector case management services.**

The private health sector in Myanmar is vast and includes 18,443 (2014) medical practitioners as well as licensed and unlicensed pharmacies and authorized services belonging to private companies catering for their employees. At present only a small proportion of those working in endemic areas are targeted for case management support by NMCP's partners. Expansion of this initiative is required, but in order to minimize the risk of overlap resulting from support from multiple funding partners, an in-depth mapping needs to be carried out. This will take place in 2016.

The programme and its implementing partners will then expand their engagement with private medical practitioners for delivery of malaria curative services. Existing 'social franchising' of private medical practitioners will be further expanded and strengthened. Engagement will also be extended to cover pharmacies, private companies and selected vendors. Efforts will be undertaken to expand public-private partnership to maximize coverage. Training, supportive supervision and monitoring and evaluation will be strengthened in order to improve and sustain the quality of services.

A key message will be that the purpose of treatment is not only patient-centred but also for transmission reduction leading to elimination. Private sector partners will be provided with RDTs and antimalarials. This supply will be linked to timely and accurate reporting, which will feed into the national HIS.

Non-licensed drug vendors are a major source of irrational treatment and substandard medicines and, except in special circumstances, they will therefore be prohibited from treating malaria. VBDC will advocate for the Ministry of Health and Sports to coordinate with relevant departments to regulate non-licensed drug vendors. During the elimination phase, selling of over-the-counter antimalarial drugs will be strictly controlled.

Maintaining the motivation of private sector partners tends to become increasingly difficult as malaria burden falls, particularly in urban/peri-

urban areas. In order to maintain the role private providers can play in supporting surveillance for elimination, implementing partners will increase efforts to address provider interest through various means including placing more emphasis on RDTs as a tool supporting robust differential diagnosis.

#### **1.15. Address the issue of inappropriate, counterfeit and sub-standard antimalarials.**

A number of activities designed to minimize the use of inappropriate, counterfeit and sub-standard antimalarials will be supported. Special emphasis will be placed on border areas.

##### *1.15.1. Enforce Ministry of Health and Sports (MoHS) decision on banning distribution and sale of inappropriate antimalarials.*

The ban on import, manufacture, export, registration, re-registration, distribution and sale of artemisinin monotherapy will be reinforced by the FDA through communication with importers, manufacturers, exporters, wholesalers/distributors, pharmacies and drug sellers. The programme will support the police to enforce the ban. Facilities identified during quality monitoring visits will have stocks confiscated and if appropriate licences to practice will be revoked.

##### *1.15.2. Replacement of oral Artemisinin-based Monotherapy.*

The Artemisinin Monotherapy Replacement Project (AMTR), implemented by PSI/ Myanmar, is designed to rapidly replace the widespread availability and use of oral artemisinin monotherapy (oAMT) with quality assured ACT (QAACT). Negotiations with the primary importers of oAMT led to an agreement to distribute quality-assured artemisinin combination therapy. The intervention started with a subsidy and PSI had been selling 1.8 Million courses of subsidized quality assured ACTs, branded as Supa Arte and Artel+, through two major private drug distributors, AA Medical Products Ltd and Ploygold.

In 2015, PSI commenced the scale-up of Rapid Diagnostic Testing in private sector outlets with the purpose of reducing drug wastage, decreasing the risk of resistance to non-artemisinin partner drugs, and improving case management of malaria and non-malaria fever. PSI had started to expand the current geographical footprint of the project towards 51 townships in the western border areas of Myanmar including Rakhine, Magway, Sagaing and Western Bago. This activity is proposed to be continued under this NSP.

### **Box 1. Addressing the issue of inappropriate, counterfeit and sub-standard antimalarials.**

The programme will:

- Continue to strengthen the Food and Drug Administration's (FDA) functions especially to:
  - eliminate artemisinin monotherapy products and register only quality-assured medicines, and diagnostics;
  - strengthen quality assurance during and after registration to prevent the manufacture and sale of substandard products;
  - intensify surveillance to detect and eliminate the sale of oral artemisinin based monotherapies, spurious, falsified, falsely labeled and counterfeit antimalarials;
  - improve national capacity for cross-border enforcement activities (in collaboration with the Customs Department and other related agencies) to reduce the flow of counterfeit and substandard products;
  - enforce the ban on inappropriate antimalarials.
- Improve national capacity for quality-control testing (NMCP in collaboration with FDA will monitor quality of antimalarials at peripheral facilities and outlets using Minilab® test kits).
- Improve supply management and update the Logistics Management Information System to reduce any shortages and prevent stock out in the public supply chain;
- Work with partners and private sector to improve the availability of quality-assured products and eliminate substandard, falsified and counterfeit drug sales; and
- Improve rational and responsible use of all malaria medicines to reduce unnecessary use that may contribute to resistance.

#### *1.15.3. Drug outlet survey.*

In order to develop a more in-depth understanding of the role of the private sector in Myanmar the programme will support a drug outlet survey similar to those conducted recently in some other Mekong countries. This survey will be outsourced to a suitably qualified agency.

### **1.16 Provide comprehensive quality assurance/ quality control of drugs and diagnostics.**

Quality assurance of drugs, diagnostics, treatment, patient care and surveillance is important in both transmission-reduction and elimination phases.

#### *1.16.1. Monitor quality of antimalarial drugs and RDTs in the field.*

For case management, it is critical that medicines are of good quality and that supplies are adequate. Efforts to eliminate counterfeit and substandard medicines carried-out over many years must be continued and enhanced. Monitoring the quality of antimalarial drugs will be rolled-out to all endemic State/Regions. Drug quality test kits (Minilab) and consumables will be procured and staff trained. Monitoring missions will be carried out every 6 months, both in sentinel sites and in additional spot-check sites. Confirmatory tests of selected samples will be carried out at Central level.

The quality of random samples of RDTs from the field will be carried out in collaboration with DMR and WHO. The standard operational procedure for checking of QA/QC of RDT will be endorsed to ensure that the QA/QC procedure is appropriate.

#### *1.16.2. Provide quality assurance for microscopy.*

QA/QC of microscopy is particularly crucial in the elimination phase when microscopists see fewer and fewer positive slides and it becomes progressively more difficult for them to maintain their skills. The programme will invest special effort to strengthen microscopy QA in support of elimination. There will be strong collaboration between the NMCP (under Department of Public Health), the National Health Laboratory (under Department of Medical Services) and specialist INGOs to revitalize and strengthen Township and State level health departments and Regional VBDC laboratories to perform rigorous laboratory QA/QC. A core group of technical staff from VBDC will conduct periodic maintenance and repair of microscopes, provide supportive supervision and QA/QC according to SOPs, carry out (re)training of microscopists and laboratory technicians, and oversee procurement and distribution of quality microscopes, slides and reagents.

The existing VBDC Gyogone laboratory will be upgraded as a national malaria reference laboratory to conduct quality assurance and capacity building for malaria microscopy including supervision and monitoring. Every three years the programme will support an External Competency Assessment (ECA) for senior microscopists at Central and State/Regional levels.

As malaria incidence falls, access to positive slides will become increasingly important for maintaining microscopists's skills. The slide bank at central level will be maintained and State/Regional slide banks will be established for training and testing staff.

#### *1.16.3. Quality assurance for case management.*

Robust supervision is the key to QA of patient care, and will be applied with clear protocols in accordance with the national malaria treatment guidelines and monitoring systems for both public and private sectors. Clinical reviews will be carried out in facilities suspected of underperforming (based on reports or data analysis) and remedial measures will be put in place where appropriate (including special needs-based training for clinical staff).

## **INTERVENTION 2. Malaria prevention.**

### **2. Vector control measures for transmission prevention**

The selection of vector control interventions has been guided by an eco-epidemiological assessment informed by malaria case and entomological surveillance data. Implementation will be within the framework of integrated vector management to ensure optimal use of resources. Use of insecticidal interventions will follow technical recommendations provided in WHO's *Global plan for insecticide resistance management in malaria vectors*.

#### **2.1. Provide free LLINs for all groups at risk of contracting malaria.**

LLINs treated with synthetic pyrethroids have been shown to reduce malaria incidence by around 30% in forested areas in the Greater Mekong Subregion (GMS), despite the local malaria vectors in some areas being characterized by early and outdoor biting. LLINs are a core malaria prevention measure in Myanmar, widely used to reduce transmission and provide personal protection.

The LLIN programme will use multiple delivery strategies to maximize coverage of insecticide treated bednets in all stratum 3 areas nationwide. Urban areas will be excluded. The target coverage rate for large sized LLINs will be 1.8 people per net (in-line with WHO standards). In case funding is limited target areas will be divided into absolute (3a), high (3b), medium (3c), and low priority (2) according to endemicity. Targeting will be based on the most up-to-date stratification of malaria transmission intensity available. As the quality of surveillance improves, the stratification will evolve to distinguish between endemic villages and villages where all cases are imported. Endemic villages will continue to receive periodic mass distributions but in villages where all cases are imported, LLINs will be provided only to targeted population like forest goers. The programme will thus move away from blanket LLIN coverage and move towards increased focus to maximize cost effectiveness and sustainability. Distribution of LLINs will be coupled with locally appropriate and gender sensitive IEC/BCC to ensure community mobilization and high and correct LLIN usage.

#### *2.1.1. Provide LLINs for established communities.*

Free LLINs will be provided to cover the entire population residing in established settlements (villages, IDP camps, prisons etc.) in target communities. These LLINs will be delivered through regular mass distributions. The periodicity of these mass distributions will depend on the expected lifespan of the LLINs procured (based on the most recent polyester LLINs distributed in Myanmar, mass distributions will take place every 3 years).

Township officials will conduct microplanning for bednet distribution as part of their routine duties. Micro-level planning will take into consideration which members of a household share a sleeping space in order to ensure 100% coverage without wastage.

#### *2.1.2. Provide additional LLINs for use in forest/forest farms.*

Where appropriate, additional LLINs will be provided for use in forest/forest farms (targeting traditional farming communities and informal sector forest workers e.g. small-scale gem/gold miners, people gathering forest products). These nets will be delivered in LLIN target communities during routine mass distribution.

*2.1.3. Provide additional LLINs to pregnant women.*

Additional LLINs will be given to pregnant women in communities targeted for mass LLIN distribution. These nets will be delivered through ante-natal care (ANC) services. This approach maximizes LLIN coverage for infants and has a positive impact on ANC attendance.

*2.1.4. Provide annual insecticidal treatment for conventional bednets in established communities.*

For people who prefer to use their own conventional bednet rather than the LLINs provided by the programme, a bednet treatment service (using long-lasting insecticide) will be provided during mass distribution campaigns. This service will be restricted to communities where conventional bednet ownership exceeds 20% (80% coverage is required to achieve 'community effect' whereby those without LLINs/ITNs are protected by those with LLINs/ITNs).

*2.1.5. Provide LLINs to employers to provide to their workers.*

LLINs will be provided to employers in endemic areas of stratum 3a and 3b Townships to provide to their workers. At the same time efforts will be made to encourage employers to provide this service to their employees in future at their own cost. This intervention will target: construction projects (e.g. dams, bridges and mines); plantations (e.g. rubber, palm oil, food); forest workers in the formal sector (e.g. forest/wildlife protection services); and camps associated with commercial projects (e.g. road/railway construction, large-scale logging).

*2.1.6. Provide LLINs to protect seasonal agricultural workers.*

LLINs will be provided to managers of farms in endemic areas of stratum 3a and 3b Townships to give to their seasonal agricultural workers when they arrive.

*2.1.7. Provide LLINs to protect people in new settlements.*

LLINs will be provided to people in new settlements in target sub-centres e.g. IDPs, roadside economic migrants, settlements adjacent to construction projects.

*2.1.8. Provide access to LLINs for forest workers in the informal sector.*

LLINs will be supplied through malaria clinics and volunteers at forest entry points. This intervention will target forest workers in the informal sector e.g. small-scale gem/gold miners and people gathering forest products.

*2.1.9. Provide LLINs to Defence Service personnel.*

Defence service personnel based in or operating in target areas will be protected from malaria by distributing LLINs. The distribution will be done by the Defence Services themselves. Oversight and technical assistance will be provided by the NMCP.

*2.1.10. Continuous distribution through VHV.*

Continuous distribution of LLINs will be provided through the VHV network in order to address any LLIN attrition in-between mass distributions. LLIN stores will be held at RHC and Township level.

VHVs will monitor and report on unusual population movements to allow programmes to react in a timely manner to low LLIN coverage levels caused by the arrival of mobile population groups in risk areas.

*2.1.11. Provide LLINs in the event of disasters and in response to outbreaks and confirmed transmission foci.*

In the event of disasters, outbreaks and confirmed transmission foci in target areas, LLINs will be provided to anyone who has not already been covered.

**2.2. Conduct focal responsive IRS as appropriate.**

As with LLINs, the effectiveness of spraying the walls and ceilings of houses and animal sheds with residual insecticides ('Indoor Residual Spraying' - IRS) is somewhat constrained by the early and outdoor biting habit of key local vectors. Nevertheless, IRS can have a significant impact on malaria transmission in the region provided that the construction of houses is sufficiently solid to provide enough sprayable surfaces.

The programme will conduct focal responsive IRS in the event of outbreaks/confirmed transmission foci. IRS will however only be applied in areas which have not been targeted for LLINs during the previous three years. Areas that have received LLINs in the last three years will instead receive top-up LLINs as required.

In accordance with the national policy the choice of insecticide will take into account safety, efficacy, cost, availability and susceptibility of vectors.

To be effective, IRS requires a well-organized operation with skilled spray-men and very strong field supervision. An outbreak response team will be formed. As with LLINs, IRS operations require careful planning at both the macro and the micro levels (including geographic reconnaissance

to ensure the suitability of construction in target areas). Community mobilization, and behaviour change communication will be key to ensuring access to homes in order to achieve the high level of coverage (>80%) required to maximize impact.

Emphasis will be placed on strengthening logistics in order to ensure timely and adequate supplies of consumables, equipment (spray pumps, replacement parts, personal protective equipment etc.) and transport. Attention will also be given to strengthening coverage assessments and documentation.

### **2.3 Conduct larval source management (LSM).**

LSM will be implemented as a form of community mobilization by the volunteer networks and CSOs, and used where vector-breeding sites are 'few, fixed and findable' as per WHO guidance. The focus will be on wells in villages where wells are identified as a significant source of *An. dirus* and in disused shrimp farms and coastal lagoons where these are generating high densities of *An. sudaicus* associated with significant transmission of malaria.

### **2.4 Implement novel vector control/personal protection measures as appropriate.**

Spatial repellents and attractive toxic sugar baits (ATSB) may have potential as a supplementary measure to LLINs and IRS for reducing human-vector contact and controlling malaria transmission and disease in specific situations. Trial outcomes will inform the integration of this tool into Myanmar's vector control strategy.

More investigations into the effectiveness of personal repellents and insecticide-treated clothing for reducing residual malaria transmission (RMT) in Myanmar will be carried out. Large-scale implementation will be dependent on findings relating to potential adverse effects as a result of skin absorption.

## **INTERVENTION 3. Malaria case and entomological surveillance.**

For States and Regions in the transmission reduction phase, the basic system of surveillance, which involves monthly reporting supplemented by outbreak monitoring, will be maintained and strengthened where necessary. For States and Regions in the elimination phase, standard surveillance will be replaced with 'case-based' surveillance whereby effectively every case is treated as an outbreak.

Currently there are multiple malaria surveillance approaches in use in Myanmar. An expert review will be undertaken in association with MoHS in 2017 to assess these various approaches and prepare a roadmap for the development of an elimination-specific case-based reporting system. The review report will define the new system's relationship to the MoHS's DHIS2 system, identify data aggregation levels and clearly articulate how data will be used for decision-making.

Essentially similar strategies will be used to investigate suspected outbreaks and suspected transmission foci. Similar strategies will also be used to deal with confirmed outbreaks and confirmed transmission foci.

In-line with guidance from the ASEAN Communicable Disease Working Group, VBDC will collaborate with Myanmar's 'Emergency Operating Center' to integrate malaria-related surveillance and response mechanisms into the broader health sector approach. Malaria response efforts will be progressively merged into the existing emergency mechanisms implemented by the multi-task detection and response teams associated with other epidemic-prone diseases.

### **3.1 Expand, modernize and strengthen the national malaria information system.**

The national malaria information system (MIS) in transmission reduction Townships will be expanded and modernized in support of the move towards elimination. The system will be upgraded to allow weekly reporting and geographical presentation of results (Geographical Information System - GIS) (down to household level in stratum 3c). More emphasis will be placed on the provision of timely and to-the-point strategic feedback from Central and State levels to Township teams and peripheral health staff.

In elimination phase Townships the programme will adopt a learning-by-doing approach. A case-based surveillance and response system based on GIS will be established initially in five priority States/Regions with low malaria burden, which are moving to the elimination phase. Later it will be expanded to other States and Regions as appropriate.

In addition, malaria data will feed into the MoHS's 'District Health Information System (DHIS2)'.

### **3.2. Maintain outbreak detection capability and establish transmission focus detection system.**

Outbreak detection capability will be maintained (strata 3a and 3b) and a transmission focus detection system will be established (stratum 3c) through training and supportive supervision for staff at State/Region, District and BHS level. NMCP will work with MoHS to make malaria a notifiable disease in stratum 1, 2 and 3c Townships.

The timeliness of the response is key, and therefore Myanmar has adopted a '1-3-7 initiative'. This requires malaria outbreaks (transmission reduction phase)/cases (elimination phase) to be reported within one day, full outbreak/case investigation to be conducted within three days, and response actions to be taken within seven days. Performance will be monitored against this 1-3-7 benchmark.

The existing outbreak detection system (currently based on the threshold system of 'mean monthly caseload for the last 3 years plus 2 standard deviations') will be revised to improve sensitivity in light of recent steady reductions in caseload. Caseload will be reviewed at every health facility on a daily basis. If an outbreak is suspected then the health worker responsible will submit a 'suspected outbreak notification report' to the BHS who will immediately communicate with the Township focal point by phone.

Health facility staff in stratum 3c Townships will be trained to review and assess every malaria case identified (travel history, ecological factors and recent epidemiological data potential). If local transmission is suspected the health worker will submit a 'suspected transmission focus notification report' to the BHS who will immediately communicate with the Township focal point by phone.

Volunteers and authorised private sector providers in stratum 3c Townships will be required to report any case detected to their nearest health centre for review and assessment plus further action as necessary.

### **3.3. Maintain outbreak/transmission focus preparedness.**

Outbreak/transmission focus preparedness will be maintained through training (integrated) and through the provision of equipment and supplies. SOPs will be developed for outbreak/transmission focus response. Buffer stock of LLINs,

insecticide, RDTs and drugs will be maintained at State/Regional level to deal with outbreaks and natural disasters (stock rotation will be applied with routine supplies to prevent expiry).

### **3.4. Conduct outbreak/transmission focus investigations.**

Prompt investigations will be carried out in response to any suspected outbreak/transmission focus notification report. A team made up of staff from Township and BHS level will initiate an investigation within 3 days of a case being detected. The investigation will include group discussions and interviews (focusing on risk behaviour) and active case detection (ACD). The scale of the ACD will be tailored by the team to fit the local situation (based on SOPs). VHV's will assist as necessary. The investigation team will submit an investigation report to the Township Medical Officer (TMO) and higher level (to feed the national malaria register and active foci register) within 24 hour of completing their one-day investigation. In the case of foci investigations RDT-based diagnosis will be augmented by microscopy-based diagnosis in order to maximize sensitivity. Follow-up treatment will be provided to any asymptomatic slide positive patients as soon as results become available.

### **3.5. Implement timely response in the event of confirmed outbreaks/transmission foci.**

The investigation report will be reviewed by the TMO in consultation with State/Regional staff and if an outbreak/transmission focus is confirmed its intensity and likely scale will be assessed and an emergency plan will be developed. The scale of the response will be tailored to suit each specific situation (based on SOPs). ACD will be instigated in the surrounding area.

In addition, entomological and ecological assessments will be carried out and if appropriate either LLINs will be given to those in need (see 2.1.11) or focal responsive IRS will be applied by day 7 (see 2.2). Outbreak response funding will be channelled through NMCP to affected State/Regions, Townships and BHSs.

### **3.6 Implement geographical surveillance for confirmed cases in stratum 3c Townships.**

In each stratum 3c Township the BHSs will be equipped with a smartphone so that staff can report the geographical position of all confirmed malaria cases. For these areas a geographical information system (GIS) will be used to identify the exact position of each patient.

This will enable detailed planning and will support monitoring progress towards elimination. Training on use of smartphones will be integrated into routine supportive supervision.

### **3.7 Drug resistance monitoring.**

The Department of Medical Research, the Defence Services Medical Research Center, and NMCP will work together with State/Regional level VBDC to monitor antimalarial drug resistance in-line with the latest WHO guidelines. First-line treatment efficacy will be monitored through therapeutic efficacy studies (TES) annually. In addition to the 11 sentinel sites currently under surveillance, more new sites will be established as necessary to ensure that TES results provide a representative overview of the situation nationally. Staff will be trained and equipment procured as necessary. Blood samples will be collected from hospitals nationwide for molecular monitoring of parasite populations (genetic epidemiology). Monitoring drug resistance in *P. vivax* will be carried out in parallel where feasible.

The programme will also carry out special clinical fieldwork in outbreak areas and in areas where treatment failure is suspected. Once the number of patients falls to low levels, it will no longer be possible to perform TES; instead, the focus will shift to attempting to follow up all patients (especially *falciparum* malaria patients) on the days specified in the WHO TES protocol for the ACT in question (see 1.13). Positive cases will be admitted to hospital for supervised second-line treatment.

Three ACTs are currently registered in Myanmar and therefore, in the event that a change in first-line treatment is required, the NMCP is well placed to quickly manage the transition.

### **3.8. Quantify and monitor the prevalence of artemisinin resistance using molecular techniques.**

NMCP will use the latest molecular techniques to quantify and monitor the prevalence of artemisinin resistance markers. It will carry out routine genotyping of *P. falciparum* parasites from all Township Hospitals around the country.

### **3.9. Strengthen the pharmacovigilance system.**

NMCP will work closely with the FDA to establish effective pharmacovigilance at least at health facility level. This is particularly important in the case of primaquine as used for the radical treatment of *vivax* malaria given the existence

of G6PD deficiency in Myanmar, especially amongst some ethnic minorities.

### **3.10. Provide human resources and infrastructure for surveillance in the elimination phase.**

WHO data assistants who are at present responsible for surveillance at State/Region and Township level will be gradually phased out and replaced with VBDC staff. Health staff and malaria volunteers will be trained to investigate malaria cases in accordance with SOPs. Results will be verified by Township public health staff. The resulting data will be reviewed by TMOs, who will classify the case and communicate it to the State/Region level surveillance response team. A surveillance response team from State/Region or Township level, which includes staff trained in epidemiology, entomology and operations management, will carry out the investigation and management of foci.

### **3.11. Support epidemic prediction.**

The programme will work with other government departments (MoA, MoD etc.) both at central and State/Regional levels to ensure that it is fully informed regarding actual or expected population movements (including larger scale international travel) and on major construction/development projects likely to impact on the malaria situation. NMCP will advise government bodies reviewing impact assessments for major projects in endemic areas. Focal-points will liaise with counterparts on a regular but ad hoc basis. Major events will be reported immediately and there will be routine quarterly teleconferences between State/Regions and central focal points.

In addition, National contingency plans will be drawn-up in accordance with the most likely risk scenarios. These will specify the channels to be used to transfer emergency funding to ensure speedy mobilization of the necessary resources.

### **3.12. Insecticide resistance monitoring and entomological surveillance.**

Entomological knowledge is key to stratification and identification of transmission risk areas; targeting and selecting appropriate vector control interventions; and monitoring their impact on vector populations. Since 2010, resistance to pyrethroids has been reported in the secondary vectors *An. sinensis* and *An. hyrcanus* in Myanmar, but not yet in the primary vectors *An. dirus* and *An. minimus*. Increased use of pyrethroids in agriculture and the increased presence of pyrethroid-treated mosquito nets are likely to exert further selective pressure for resistance.

It is essential that the situation is closely monitored by NMCP and partners (including WHO and other international technical agencies) as a foundation for insecticide resistance management as outlined in the WHO *Global Plan for Insecticide Resistance Management*. NMCP will collaborate with other Ministries to control the import and use of insecticide for agricultural purposes and by private pest control operators. Regular entomological surveillance and insecticide resistance (IR) monitoring will be carried out in 14 sentinel sites (7 each year) and in additional sites as required (e.g. in outbreak areas where IR is suspected). Entomological surveillance will be tailored to the specific context, for risk area stratification, for burden reduction areas, elimination areas and foci investigation. The programme will monitor the coverage and quality of interventions, including the coverage, quality and residual efficacy of IRS and the physical condition and insecticide retention of LLINs. LLIN coverage, use and preferences, especially continued use of untreated nets from the market vs. free LLINs, will also be assessed.

Entomological intelligence will be used to evaluate risk of re-establishment where malaria-free status has been achieved recently. In addition to sentinel site surveillance, entomologists at regional and township level will participate in foci investigation (section 3.5) to determine coverage of vector control interventions and entomological assessments as needed.

Establishing and maintaining a surveillance system capable of effectively supporting elimination efforts will require human and infrastructural capacity – vector technicians, insectaries and laboratories appropriately placed to support vector sampling, identification and characterization at sites selected based on eco-epidemiological representativeness. There are currently very few staff in State/ Regional level to conduct entomological activities. As the burden of malaria declines and more and more foci investigations are carried out, decentralized entomological and epidemiological capacity will be required.

The programme will establish a core group of highly trained entomologists to manage entomological surveillance and make evidence-based recommendations to interventions and delivery strategies as the context changes along the path to elimination. In this regards entomological labs and insectary will be set up in Gyong

VBDC Office. Decisions on the monitoring and management of insecticide resistance will be informed by national plans developed on the basis of a comprehensive situation analysis.

### **3.13. Develop and implement guidelines on the management and correct use of public health insecticides.**

MoHS will work with MoA to develop and implement guidelines on the management, monitoring and correct use of public health insecticides (including annual reporting and mapping of insecticide usage for public health and agriculture and safe disposal of expired insecticide).

## **SUPPORTING ELEMENT 1. Expanding research for innovation and improved delivery of services.**

A comprehensive package of needs-based operational research will be supported as far as funding permits. NMCP will work in collaboration with WHO and national and international experts and institutes to develop research capacity and improve the quality and relevance of research outputs.

Research will aim to address bottlenecks in operations and find innovative ways to address residual malaria transmission (RMT) and effectively deliver services to hard-to-reach populations. All research should be declared to NMCP and carried out in collaboration with NMCP counterparts following the approval of the Myanmar Ethics Review Committee.

### **SE 1.1. Conduct operational research.**

Research priorities will be reviewed annually and revised as necessary but at least initially topics are likely to include: Insecticide-treated cloth and repellent (including spatial repellent); Attractive toxic sugar baits (ATSB); Larval source management; More cost-effective deployment of LLINs; Acceptability, utilization and cost-effectiveness of net retreatment kits vs LLIN; The role of sub-patent asymptomatic parasitaemia in malaria transmission; Adherence to treatment guidelines by health care providers and patients; New diagnostic technologies; New antimalarial regimens; Validation of G6PD test kit use at community level; Gender-related dynamics of treatment-seeking behaviour, as well as of decision-making, resource allocation and

financial authority within households; Remote sensing to assess risk for difficult to reach populations; Barriers to access for high risk groups; Develop locally appropriate tools for mobility assessment; mHealth applications (mobile apps for health).

### **SE 1.2. Conduct annual review of research.**

The Research Technical Working Group will conduct annual technical reviews of research findings. Programme strategies and research priorities will be updated accordingly. Regular meetings between NMCP representatives and research partners will ensure a coordinated national approach.

A committee will be established within MoHS (with DMR as Secretariat) to place special emphasis on moving proven new interventions and approaches quickly towards operational adoption. An open access research website will be established by DMR to allow interested institutions/researchers to access topics of interest, submission procedures, ethical regulations, potential funding sources, informal results and publications, Q/A forums, etc.

## **SUPPORTING ELEMENT 2.**

### **Strengthening the enabling environment.**

The adoption of the elimination strategy increases the need for leadership and management in the malaria programme. Operations will need to be managed with rigor and flexibility, supported by robust monitoring and quality control. The programme will need to be responsive to the evolving needs of the elimination effort in order to accelerate programmatic impact. Partners will provide support covering a broad range of programme areas and will work with the National programme and WHO to strengthen the leadership and management capacity of the NMCP. The Programme will provide effective management and coordination to enable rapid and high-quality implementation of the elimination

### **SE 2.1. Support National Malaria Elimination Committee (NMEC).**

An established high-level multi-sectoral National Malaria Elimination Committee (NMEC) will be made functional. The NMEC includes representatives from NMCP, MoHS and NGOs. The NMEC has working and executive working groups.

### **SE 2.2. Policy review, strategy development and programme planning.**

There will be regular sessions of policy review, strategy development and programme planning. A strong participatory approach with clear roles and responsibilities of all partners concerned, annual plans from partners and quarterly meetings to exchange information and consultations between WHO, partners and the national programme, will be encouraged and promoted to better coordinate malaria elimination efforts and facilitate resource mobilization.

#### *SE 2.2.1. Progress review and strategy development.*

There will be an annual review of progress. Strategies, guidelines and SOPs will be reviewed periodically and developed and revised as appropriate. Diagnostic and treatment guidelines will be revised as necessary. Epidemiological surveillance regulations (and related SOPs for supervision and M&E) and SOPs for elimination will be revised/developed in the immediate future. The programme will support an annual entomological review workshop.

The insecticide resistance status of malaria vectors in Myanmar will be reviewed and action plans developed as appropriate. Where appropriate the programme will integrate malaria control with other public health programmes maximizing synergies where possible (it will for example work with partners to roll-out of iCCM plus fever case management services for adults).

#### *SE 2.2.2. Periodically update malaria risk stratification.*

In future, once the MIS is fully functional, the stratification of malaria risk will be carried out on an annual basis (each village will be identified by its MIMU<sup>11</sup> code). The movement patterns of migrant groups will be monitored by NMCP and partners using specially developed mapping tools that will be designed to assist with the targeting of appropriate interventions based on each group's source of vulnerability. Where appropriate, interventions targeting mobile populations will focus on the populations while settled rather than while in transit.

#### *SE 2.2.3. Develop NSP 2021-2025.*

In 2020 the next NSP (2021-2025) will be developed by NMCP in consultation with WHO and a broad range of stakeholders.

---

<sup>11</sup> Myanmar Information Management Unit.

### **SE 2.3. Financial management.**

The programme and its partners will continue to provide sound financial management in-line with national guidelines (and in line with internationally recognised best practice).

### **SE 2.4. Advocacy.**

A broad-based advocacy package will be developed targeting decision makers and community leaders at central, State/Regional and Township level. Malaria programme experiences, best practices, successes and lessons learnt will be documented and consolidated and disseminated amongst stakeholders. Programme representatives will provide regular briefings to government ministers and opinion leaders.

### **SE 2.5. Partnerships.**

Representatives from various sectors (governmental and non-governmental) will be involved in the planning and implementation of malaria control and elimination efforts. Partners include: Regulatory agencies; other government ministries; civil society; private sector; WHO and other International organizations. Meetings will be held to coordinate the multi-stakeholder effort and a special group will be established to coordinate activities related to malaria control amongst migrants, mobile and other difficult to reach populations. This special group will include representatives from the Ministries of Defence, Agriculture and Transport.

### **SE 2.6. International exchange and cooperation.**

Efforts will be made to ensure strong cross-border collaboration at State/Regional and Township levels as well as technical exchange within the region and beyond.

### **SE 2.7. Technical assistance.**

Technical assistance will be provided for various issues as required. Long-term technical support will continue to be provided through WHO.

### **SE 2.8. Human resources (HR).**

Technical capacity within the National Programme has declined in recent years due to a number of factors, including an ageing workforce, limited opportunities for high-level training, and increased staff attrition due to recruitment by partner agencies. Urgent steps need to be taken to strengthen capacity at all levels of the health system in-line with the demanding requirements for elimination.

#### *SE 2.8.1. Update HR development plan.*

The NMCP will conduct a comprehensive review of existing human resources and identify gaps in relation to changing requirements as the focus of the programme evolves from transmission reduction to elimination. Due to the need for strong surveillance systems and high quality operations, human resources will need to be increased at all levels. There is a particular need already identified at Township level. Although the required staff increases may appear disproportionate to the disease burden it can be justified by overall programme goals.

For existing NMCP staff a training needs assessment will be carried out.

The programme's HR development plan will be updated on an annual basis.

#### *SE 2.8.2. Training.*

A comprehensive programme of training and needs-based refresher training will be implemented to strengthen service provision in all programmatic areas. This training will be integrated wherever practical to maximize cost-effectiveness and minimize transaction costs for participants. Training will include everything from international PhD level training to in-house training for VHVs in the periphery. Access to higher level training courses will be competitive and merit-based. In the immediate future staff at all levels will receive reorientation training to support the move from a control focus to an elimination focus.

#### *SE 2.8.3. Support specialized training for senior technical staff.*

Specialized training will be supported for senior technical staff at central, State/Regional and Township levels (entomologists, epidemiologists, sociologists, BCC specialists etc.). Technical and managerial capabilities will be strengthened at Central and State/Regional levels through international exchange visits.

### **SE 2.9. Infrastructure development, maintenance and running costs.**

Infrastructure strengthening and maintenance will be supported. Buildings, vehicles and equipment will be ensured and maintained and their running costs at Central level and in the periphery will be supported.

## **SE 2.10. Procurement and related quality assurance (QA).**

### *SE 2.10.1. Procurement.*

Vehicles, equipment, commodities and consumables will be procured as required. All procurement will be carried out in strict accordance with national guidelines. Quality assurance will be managed according to standard operating procedures (SOPs).

### *SE 2.10.2. Quality assurance (QA) for programme commodities.*

Samples will be taken from all batches of insecticide and insecticide treated materials both post-production and on receipt. The samples will be sent for testing at WHO collaborating centres prior to deployment to ensure that they are within the specifications set-out in the manufacturer's product documentation. Sub-standard products will be rejected and returned to the supplier.

'On receipt batch testing' for RDTs and antimalarials will be carried out. The samples will be sent for testing at WHO collaborating centres prior to deployment to ensure that they are within the specifications set-out in the manufacturer's product documentation. Sub-standard products will be rejected and returned to the supplier.

## **SE 2.11. Supply.**

Supply systems will be strengthened through training, supervision and system updates. Logistics strengthening workshops will be held periodically. The programme will provide strong supportive supervision from central and State/Regional level to ensure efficient programme logistics in-line with national SOPs. The programme will also develop and introduce an SMS based supply management system in collaboration with MoHS. A system for the collection and proper disposal of expired antimalarials will be established, wastage will be monitored and mitigation measures put in place.

## **SE 2.12 Community involvement.**

Malaria prevention must go hand in hand with community participation. Unless individuals in communities see the merits of preventing the illness, even the best-designed prevention strategies might not be used.

The programme will provide support for elimination of malaria through comprehensive behaviour change communication (BCC), community mobilization and advocacy. The

program will work with health authorities and implementing partners to educate target groups on malaria and ensure adequate malaria case management for migrant populations visiting endemic areas; on arrival, during their stay and on their return.

### *SE 2.12.1. Provide expert management of BCC effort.*

The IEC/BCC technical working group will hold two meetings per year (integrated into routine NMCP review meetings) and ad hoc meetings as necessary. BCC activities will be coordinated with other health programmes.

### *SE 2.12.2. Update BCC methodology periodically.*

Every two years the programme will conduct an assessment of BCC methodology and approaches and revise as appropriate.

### *SE 2.12.3. Develop IEC/BCC materials.*

The programme will work to develop target group specific and locally appropriate IEC/BCC materials and methodologies. Materials are likely to include IPC aids, audio and video sketches/presentations, billboard, posters brochures, articles and pamphlets.

The approach will be tailored to the specific requirements of the target groups and to the specific requirements of elimination. Products will be multilingual wherever appropriate.

Key messages are likely to cover: care and use of LLINs and washing practices; the importance of sleeping under an LLIN; the importance of LLIN use in the forest; the importance of early diagnosis and treatment, the dangers of fake, sub-standard and inappropriate antimalarials; the importance of compliance with the full course of standby treatment; availability of services (advertising the location of and services provided by VHVs, BHSs etc.); the importance for the community of all cases receiving appropriate treatment in an elimination setting. Where appropriate, work will be carried out in partnership with a commercial advertising agency.

### *SE 2.12.4. Produce IEC materials.*

Produce key IEC materials (outsourced to a commercial advertising agency).

### *SE 2.12.5. Implement inter-personal communication (IPC).*

An IPC-based BCC programme will be delivered by Township hospital and BHS Health Staff, midwives, TBAs, VHVs and selected

communicators (e.g. community leaders etc.). Health practitioners and communicators in stratum 3 will be trained on malaria specific IPC skills (integrated into clinical training).

*SE 2.12.6. Implement village-based BCC.*

Township and BHS staff and VHVs will work together to implement village-based BCC campaigns during mass LLIN distribution. In addition, in selected villages VHVs will deliver monthly BCC messages through the PA system.

*SE 2.12.7 Implement mobile phone-based BCC.*

A mobile phone-based BCC programme will be implemented targeting migrants and mobile populations. BCC messages will target phone users in specific geographical areas that have been designated as high risk. Messages will include details of services available and contact numbers for local health workers and VHVs.

*SE 2.12.8. Manage 'World Malaria Day' event.*

Every year a large-scale community mobilization event will be held on World Malaria Day (25 April). This is an important opportunity for high level advocacy.

*SE 2.12.9. Implement mass media-based BCC.*

Mass media-based communications will be employed both at national and sub-national levels, taking full advantage of free opportunities where possible. Activities will include public service announcements on television and radio, participation in chat shows, articles in newspapers etc.

*SE 2.12.10. Support socialization of malaria.*

Socialization of malaria will be supported by encouraging religious, civil-social, charitable organizations, NGOs and village leaders to be fully involved in malaria elimination. A focal person for malaria socialization will be appointed in each State/Region entering the elimination phase.

In association with community leaders at each level, presentations will be made annually to key community groups (during their own scheduled meetings) to update them on malaria-related issues and gain their support for programme activities where necessary.

The programme will work similarly to encourage the private sector, private enterprises and professional associations to actively participate.

Coordination will be through quarterly teleconferencing between focal points at adjacent levels (Township to State/Region and State/Region to Central).

**SE 2.13. Carry out programmatic supervision and monitoring and evaluation.**

The programme will monitor progress and provide supportive supervision for public and private sector health care providers including VHVs (see M&E Plan).

Regular meetings of the M&E Technical Working Group will be supported.

A Malaria Indicator Survey will be conducted every 3 years until caseload falls below the level at which these surveys are appropriate.

An external/joint malaria programme review (MPR) will be conducted every 3 years.

## 2.6 Measuring progress and impact

### Monitoring and evaluation

The programme will monitor progress and provide supportive supervision for public sector health care providers (including community based volunteers). It will also support regular meetings of the M&E Technical Working Group. A Malaria Indicator Survey and a drug outlet survey will be conducted every 3 years. An external/joint malaria programme review (MPR) will be conducted in 2019.

M&E will focus on four key issues:

- monitoring the operational aspects of the programme, and measuring impact, outcome and process indicators to ensure that the activities are yielding desired results and moving the programme towards achieving its operational targets and objectives;
- monitoring changes in epidemiological indicators resulting from the activities implemented;
- appropriately interpreting results and informing revisions in policies or strategies, when needed, to help ensure progress; and
- documenting progress towards malaria elimination.

Information on coverage and quality of interventions, mapping out non-active residual and active foci of malaria, relevant eco-epidemiological data and first-line treatment efficacy will be a key focus.

The national programme will establish a malaria elimination database for Townships in the elimination phase. This will serve as the national repository for all information related to malaria elimination, and will include the following:

- National malaria case register: a single database of all individual case information from identified sources in the entire country, allowing detailed analysis and synthesis of epidemiological information and trends, which can help to guide the elimination programme over time.
- Laboratory register: a single database, linked to the patient register, which contains all pertinent information regarding malaria diagnosis of the patient. Comparison of the

laboratory and malaria patient registers allows cross-checking for completeness of case data.

- Entomological monitoring and vector-control records: a central repository of information related to entomological monitoring and application of chosen vector-control interventions.

Oversight of the malaria elimination database will be the responsibility of the National Malaria Elimination Committee, which is independent of the malaria programme.

Progress will be measured using multiple data sources, including routine information systems, household and health facility surveys, and longitudinal studies. Indicators have been drawn from a set of indicators recommended by WHO.

## 2.7 Milestones and Targets

**by 2017**

Universal coverage with long-lasting insecticidal nets (LLINs) and/or selective indoor residual spraying (IRS) achieved for all populations in malaria transmission areas

**by 2018**

Robust epidemiological surveillance established in areas of high burden, including case reporting from village level

Incidence <1 per 1,000 population at risk in 5 states/regions

Prevention of re-establishment in 5 states/regions

Universal access to high quality malaria case management, including for high-risk mobile populations

A system established at national, all State/Region level to implement elimination-phase case-based surveillance in areas with low burden

**by 2019**

At least 2 States/Regions free of *falciparum* malaria transmission (i.e. Yangon and Mon)

Incidence <1 per 1,000 population at risk in at least 9 States/Regions (i.e. Yangon, Mon, Bago, Magway, Mandalay, Nay Pyi Taw territory, Shan, Kayin and Ayeyarwady)

**by 2020**

At least 5 States/Regions free of *falciparum* malaria transmission (i.e. Bago, Magway and Mandalay in addition to Yangon and Mon)

Incidence <1 per 1,000 population at risk in at all States/Regions (i.e. Kayah, Tanintharyi, Chin, Rakhine, Sagaing and Kachin in addition to Yangon, Mon, Bago, Magway, Mandalay, Nay Pyi Taw territory, Shan, Kayin and Ayeyarwady)

**by 2025**

*Falciparum* malaria free Myanmar

**2030**

**Malaria free Myanmar**

### 3. COST OF IMPLEMENTING THE STRATEGY

A detailed costing was carried out in 2015 to cover the period 2016-2020 based on activities that need to be conducted. It has been estimated that **a total of US\$ 461,751,565 will be required to implement the strategy 2016-2020.** US\$ 1.91 *per capita* at risk will be required each year.

The current funding landscape is shown in Table 3. Both GFATM grants (NFM and RAI) will be over by the end of 2016. The majority of programme implementation has been financed through these grants.

Government funding is mainly for infrastructure, payment of salaries of NMCP staff and supplies.

**Table 3. Current funding sources**

<b>Funding Organization</b>	<b>Amount (US \$)</b>	<b>Period</b>	<b>Implementing Agency</b>
Global Fund (NFM)	74.5 million	2013-2016	National Programme, local NGOs, international NGOs, faith based organizations and CBOs
Global Fund (RAI)	40 million	2014-2016	National Programme, local NGOs, international NGOs, faith based organizations and CBOs
3MDG	26.9 million	2016-2017	National Programme, local NGOs, international NGOs, faith based organizations and CBOs
JICA Technical and Grant Assistance to NMCP	5.8 million	2016-2020	NMCP and JICA
WHO, WHO-ERAR, DFAT, BMGF	789,740	2016-2020	National Programme and other stakeholders
ADB	15 million	2016-2020 (Processing)	National Programme and other stakeholders
PMI	42 million	2017-2020	NMCP and other stakeholders
CHAI	761,250	2016-2019	CHAI, NMCP and other stakeholders
UMB	23.8 million	2017-2020	NMCP, DMR and other stakeholders

The NMCP and other stakeholders are in the process of negotiating with ADB for funding and working with APLMA to identify funding mechanisms for the coming years. The NMCP also plans to apply for a GFATM grant for the period 2017-2020. Receiving additional funds from donor agencies will be crucial to the success of Myanmar's malaria elimination programme as it will be difficult for the government to substantially increase its budget allocation for the NMCP from current levels.

The U.S. President's Malaria Initiative (PMI) initiated its assistance in 2011 and a new five-year programme (2016-2021) is in preparation. PMI provides technical and financial support, in coordination with the NMCP and in collaboration with various implementing partners. Key areas of focus are: prevention (LLINs and malaria in pregnancy); case management; capacity building; supply chain management; and, monitoring and evaluation.

**Table 4. Estimated summary budget by interventions/supporting elements 2016-2020 (US \$)**

<b>Intervention/ Supporting Element</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
1. Case detection and effective management	20,284,728	25,463,282	19,739,750	20,499,792	19,534,770	<b>105,522,322</b>
2. Malaria prevention	37,318,118	46,845,181	21,223,392	23,775,392	2,738,592	<b>131,900,675</b>
3. Malaria case and entomological surveillance	6,322,657	7,936,789	7,316,376	8,529,882	7,687,159	<b>37,792,863</b>
SE1. Expanding research for innovation and improved delivery of services	1,865,102	2,341,250	2,227,250	2,227,250	2,227,250	<b>10,888,102</b>
SE2. Strengthening the enabling environment	28,592,485	40,012,860	33,607,734	37,148,986	36,285,538	<b>175,647,603</b>
<b>Total</b>	<b>94,383,090</b>	<b>122,599,362</b>	<b>84,114,502</b>	<b>92,181,302</b>	<b>68,473,309</b>	<b>461,751,565</b>

## 4. GOVERNANCE, COORDINATION AND LEADERSHIP

There is a general consensus that governance and coordination of malaria activities is essential, and must be improved.

Myanmar established a strong and proactive **National Malaria Elimination Committee (NMEC)** responsible for monitoring progress and coordination. Efforts to strengthen coordination will focus on strategic planning, research, data sharing, resource mobilization, review mechanisms, communications and advocacy, oversight of implementation, division of labour and private sector engagement.

The NMEC has the Vice President as Patron, Minister for Health and Sports as Chairperson, two Deputy Ministers for Health as Vice-chairs and the Director General of the Department of Public Health (DOPH) as Secretary and the Deputy Director General (Disease Control) as joint Secretary. Members include the Deputy Ministers of 16 Ministries and government authority offices and Chairpersons of National NGOs. Altogether there are 35 members in the committee.

The NMEC has a Working Group and an Executive Working Group. Both have the Deputy Minister of Health and Sports and the Advisor of the President's Office as Patrons, are chaired by the Director General of DOPH and have the Director (Disease Control) as Secretary and two Deputy Directors (Malaria) as joint-Secretaries.

The **Working Group** has 60 members, that include Deputy DGs of all Ministries, all implementing partners of malaria, WHO as technical partner, all donors and all TSG members. Its roles are to: collaborate with national and international NGOs for development of elimination planning activities and implementation; assist in securing the aid and support; provide assistance and technical support for the implementation of operational research; and provide continuous guidance to achieve malaria elimination targets.

The **Executive Working Group** has 25 members, mainly from NMCP, State/Regional Public Health Department plus representatives of

Kachin, Kayin, Kayin-Ni, Mon and Shan Health Committees. Its roles are to: implement tasks associated with malaria elimination according to the policies laid down by the NMEC; lead and develop long-term and short-term plans and projects for malaria elimination; provide continuous monitoring and evaluation and reporting on implementation of activities; implement the staff capacity development plan; manage and supervise the systematic and effective utilization of funds received from the Government and international donors for the implementation of malaria elimination activities; supervise the enforcement of malaria elimination laws and legislations; provide technical guidance, monitoring and supervision in the implementation of operational research for malaria elimination; collaborate among local, international and regional organizations, health-related sectors both public and private, CBOs and voluntary organizations to enhance the implementation of programme activities; and assist in obtaining technical and financial support as required.

**The National Malaria Control Programme (NMCP)** will take the lead role in malaria transmission reduction and elimination providing support to States/Regions, Districts and Townships. De-centralization of implementation to States/Regions and Townships will be in alignment with the National Health Sector Strategy that ensures NMCP is directly responsible for providing funds and human resources for malaria elimination activities in the future.

## 5. Annexes

### *Annex 1. Development of the Strategy*

In September 2014, the Malaria Policy Advisory Committee of WHO (MPAC) reviewed the situation in the Greater Mekong Sub-region (GMS) (which includes Myanmar) and examined the findings of a recent malaria elimination feasibility study. It recommended that the countries in the GMS affected by artemisinin resistance should adopt the goal of elimination of *P. falciparum* by 2030, to counter the threat of multidrug resistance. MPAC further noted that success would require greater involvement of the private sector, ongoing operational research, and trialing and validation of novel interventions.

Following this recommendation, a draft strategy paper on the elimination of *P. falciparum* in the GMS was prepared by WHO. The paper was presented and discussed among representatives of the ministries of health of GMS countries, as well as partners, at a workshop in Phnom Penh, Cambodia, in November 2014. There was consensus at the workshop that time-bound elimination of not only *P. falciparum*, but of all species of human malaria, is feasible and should be pursued by all GMS countries, with coordinated support from interested partners. Staff from national malaria programmes worked together to propose specific time-bound targets for each country as well as for shared regions straddling borders.

As a result, a second draft of the strategy was prepared and discussed at national consultations during December 2014. This led to a third draft, which was reviewed at an informal consultation with partners on the emergency response to artemisinin resistance, held in Bangkok, Thailand, in February 2015. The version revised on the basis of this consultation was reviewed by MPAC in March 2015. The final version of the ‘Strategy for Malaria Elimination in the Greater Mekong Sub-region, 2015-30’ incorporated feedback from all of the consultations described above. It provided the framework for the strategies for malaria elimination in both the South East Asia and the Western Pacific Regions as well as for this NSP.

In-country work on the development of this NSP started with a meeting of the ‘Technical and Strategy Group for Malaria’ (TSG-Malaria) on 20 May 2015. This was followed by a ‘National Consultation Workshop on 24-25 September 2015, which was attended by 120 participants including MoHS representatives, WHO SEARO Regional Advisor (Malaria) and a number of international consultants.

Drafts of various sections of the NSP were circulated amongst stakeholders in October 2015, and in November/December the first draft of the overall NSP document was prepared by NMCP in partnership with WHO and in consultation with the Director (Disease Control). On 22 December 2015 this draft was disseminated to partners. A final draft incorporating feedback from all relevant stakeholders was prepared with WHO assistance in February 2016.

The strategic planning process has thus been broad based and inclusive of all relevant partners. The strategy fully supports Sustainable Development Goal (SDG) 3, to ‘Ensure healthy lives and promote well-being of all at all ages’. As well as serving to guide planning and implementation, this strategy provides a tool with which to apply for funding, both domestic and external.

## Annex 2. The WHO Global Technical Strategy for Malaria 2016–2030 at a glance

<b>VISION - A WORLD FREE OF MALARIA</b>			
<b>Goals</b>	<b>Milestones</b>		<b>Targets 2030</b>
	2020	2025	
1. Reduce malaria mortality rates globally compared with 2015	> 40%	> 75%	> 90%
2. Reduce malaria case incidence globally compared with 2015	> 40%	> 75%	> 90%
3. Eliminate malaria from countries in which malaria was transmitted in 2015	At least 10 countries	At least 20 countries	At least 35 countries
4. Prevent re-establishment of malaria in all countries that are <b>malaria-free</b>	Re-establishment prevented	Re-establishment prevented	Re-establishment prevented
<p><b>Principles</b></p> <ul style="list-style-type: none"> <li>• All countries can accelerate efforts towards elimination through combinations of interventions tailored to local contexts.</li> <li>• Country ownership and leadership with involvement and participation of communities, are essential to accelerating progress through a multi-sectoral approach.</li> <li>• Improved surveillance, monitoring and evaluation, as well as stratification by malaria disease burden, are required to optimize the implementation of malaria interventions.</li> <li>• Equity in access to services, especially for the most vulnerable and hard-to-reach populations, is essential.</li> <li>• Innovation in tools and implementation approaches will enable countries to maximize their progression along the path to elimination.</li> </ul>			
<p><b>Strategic framework</b></p> <ul style="list-style-type: none"> <li>• Comprising three major pillars, with two supporting elements: (1) innovation and research and (2) a strong enabling environment.</li> </ul>			
<p><b>Maximize impact of today's life saving tools</b></p> <ul style="list-style-type: none"> <li>• Pillar 1. Ensure universal access to malaria prevention, diagnosis and treatment;</li> <li>• Pillar 2. Accelerate efforts towards elimination and attainment of malaria-free status;</li> <li>• Pillar 3. Transform malaria surveillance into a core intervention.</li> </ul>			
<p><b>Supporting element 1: Harnessing innovation and expanding research</b></p> <ul style="list-style-type: none"> <li>• Basic research to foster innovation and the development of new and improved tools;</li> <li>• Implementation of research to optimize impact and cost-effectiveness of existing tools and strategies;</li> <li>• Action to facilitate rapid uptake of new tools, intervention and strategies.</li> </ul>			
<p><b>Supporting element 2: Strengthening the enabling environment</b></p> <ul style="list-style-type: none"> <li>• Strong political and financial commitments</li> <li>• Multisectoral approaches, and cross-border and regional collaborations</li> <li>• Stewardship of entire health system including the private sector, with strong regulatory support</li> <li>• Capacity development including effective programme management and research.</li> </ul>			

[Source: The WHO Global technical strategy for malaria 2016–2030]

## Annex 3. A brief overview of Artemisinin Resistance

Artemisinin resistance is broadly defined as ‘delayed parasite clearance following treatment with an artesunate monotherapy, or after treatment with an artemisinin-based combination therapy (ACT)’; so far only partial artemisinin resistance has been found but total artemisinin resistance could develop.

Delayed parasite clearance due to artemisinin resistance does not lead to ACT treatment failure unless there is also resistance to the partner drug. This has only been observed in Cambodia and Thailand, where there is resistance to piperaquine and mefloquine. Artemisinin resistance could facilitate the development or selection of partner drug resistance. Further research is needed to evaluate its exact role in this regard.

### *Molecular markers of artemisinin resistance*

Mutations in the propeller domain of a kelch gene on *P. falciparum*’s chromosome 13 are associated with delayed parasite clearance in the presence of artemisinin both *in vitro* and *in vivo*<sup>12</sup>. The identification of this ‘K13’ marker of artemisinin resistance has allowed for a definition of both suspected and confirmed artemisinin resistance that includes information on the genotype:

**Suspected artemisinin resistance:** ‘A high prevalence of the delayed parasite clearance phenotype, or high prevalence of K13 mutants’;

**Confirmed artemisinin resistance:** ‘A combination of delayed parasite clearance and K13 resistance associated mutations in a single patient’<sup>13</sup>.

Confounding factors in these definitions include the effect of partner drugs, immunity, insufficient levels of drug in the blood and non-validated K13 mutations. Drug resistance surveillance based on genetic epidemiology should allow much more extensive geographical coverage than that provided by therapeutic efficacy studies (TES) as the system is based on the analysis of easy to collect filter paper blood spots.

### *Monitoring therapeutic efficacy of ACTs*

Routine monitoring of the therapeutic efficacy of ACTs is essential for making timely changes to treatment policy; it can also help to detect early changes in *P. falciparum* susceptibility to antimalarial drugs. WHO currently recommends monitoring the efficacy of first-line and second-line ACTs every 2 years in all *falciparum*-endemic countries. The results of TES make it possible to determine the:

- *proportion of patients who are parasitemic on day 3*, which is currently the indicator of choice for routine monitoring to identify suspected artemisinin resistance in *P. falciparum*; and
- *proportion of treatment failure* by 28-day or 42-day follow-up (depending on the partner drug half-life in the specific ACT); a treatment failure rate exceeding 10% should prompt a change in the national antimalarial treatment policy.

If artemisinin resistance is suspected because of slow clearance in a clinical trial or TES, genetic epidemiological studies (e.g. K13 marker analysis) should be prioritized. If resistance is suspected based on a survey with molecular data only, it should be confirmed by studies that combine information on the clinical phenotype (delayed parasite clearance) and the genotype from the same parasite strain.

<sup>12</sup> Ariey F, et al: A molecular marker of artemisinin-resistant *Plasmodium falciparum* malaria. Nature 2013, 505:50–55.

<sup>13</sup> As the list of mutations associated with artemisinin resistance is still growing, the definition of artemisinin resistance is likely to continue to evolve.

## Annex 4. Health care system in Myanmar

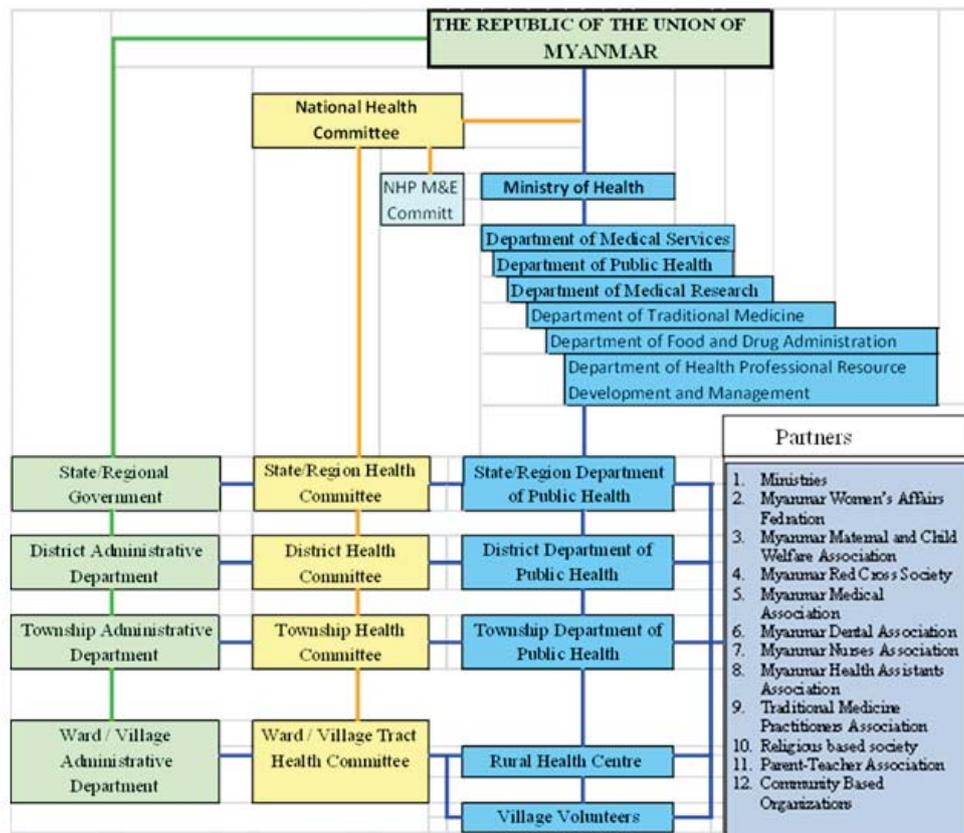
The Ministry of Health and Sports (MOHS) is responsible for improving the health status of the people through provision of comprehensive health services, covering promotive, preventive, curative and rehabilitative services. The MOHS is under the Union Minister of Health and Sports. The Ministry has six functioning Departments, each under a Director General: Department of Medical Services, Department of Public Health, Department of Medical Research, Department of Food and Drug Administration, Department of Health Professional Resource Development and Management and Department of Traditional Medicine. All these Departments are further divided according to their functions and responsibilities. Collaboration with related Departments and social organizations is promoted by the Ministry and maximum community participation in health activities is also encouraged.

The MOHS remains the major provider of comprehensive health care as well as the main organization for health care provision in Myanmar. It has a pluralistic mix of public and private sectors both in financing and provision. Health care is organized and provided both by public and private providers. The Department of Public Health plays a major role in providing comprehensive health care throughout the country including remote and hard-to-reach border areas. Since 1978, health services have been integrated with vertical programmes streamlining into Basic Health Services through the Primary Health Care approach. Some Ministries also provide health care, mainly curative, for their employees and families.

The private for-profit sector mainly provides ambulatory care though some, in recent years, also provide institutional care. Funding and provision of care is fragmented. They are regulated in conformity with the provisions of the law relating to Private Health Care Services. One unique and important feature of the Myanmar health system is the existence of traditional medicine along with allopathic medicine. Traditional medicine is well accepted and utilized by the people.

In line with the National Health Policy, NGOs also contribute to provision of services. Their roles are becoming important as the needs for collaboration in health become more prominent. Sectoral collaboration and community participation is strong in the Myanmar health system, a result of the establishment of the National Health Committee (NHC) in 1989. It is a high level inter-ministerial and policy-making body concerning health matters. It takes the leadership role and gives guidance in implementing health programmes systematically and efficiently. Under the guidance of the NHC, various health committees are established at each administrative level (Figure 1).

Figure 1. Organization of health services in Myanmar.



*[adapted from Health in Myanmar 2014]*

The Ministry of Health and Sports has formed 3 task forces and 12 working groups, including a working group on communicable diseases, for formulation of short term and long term plans and to foresee and address emerging health issues.

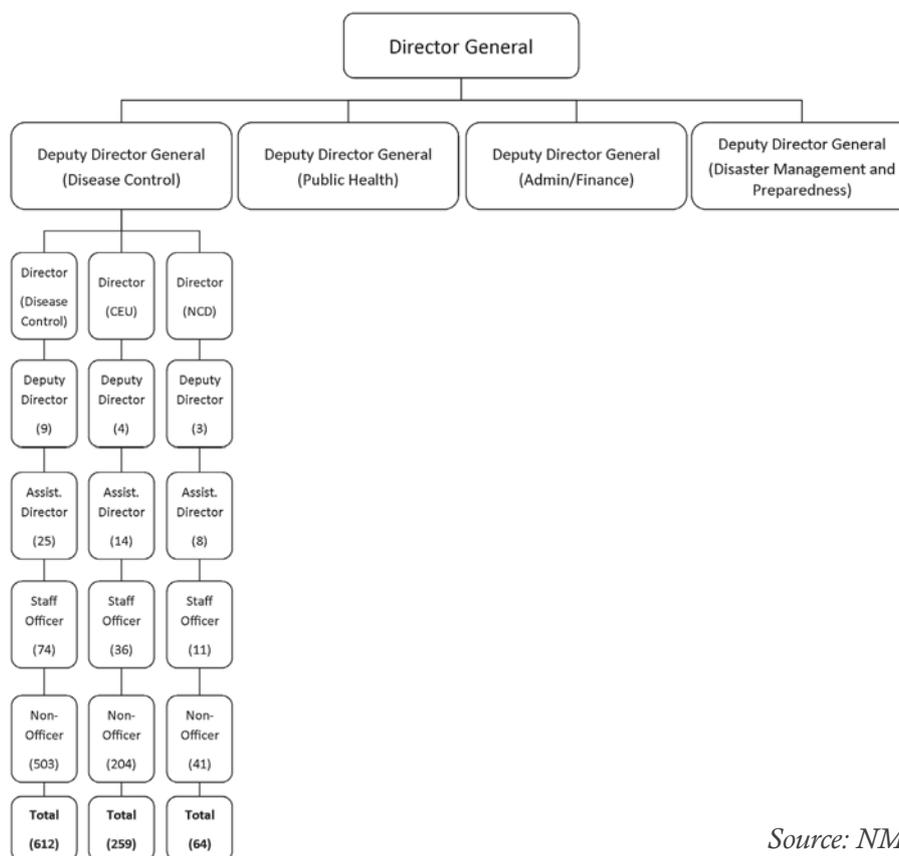
The ‘Myanmar Health Sector Coordinating Committee’ (M-HSCC) (an expansion of the GF specific ‘Myanmar-Country Coordinating Mechanism’) was established in 2013 to govern with increased transparency on health matters. Its creation ensured broad consultation of both government and non-government sectors.

In line with the National Health Plan and its supporting strategies, the M-HSCC has 7 TSGs including one for malaria. TSGs support the M-HSCC in its oversight of the National Health Plan and its supporting strategies. The Malaria TSG is led by the Department of Disease Control with the Deputy Director General as patron, Director Disease Control as chair, the Deputy Director Malaria (Central VBDC) as vice-chair. Secretarial support is provided by WHO. Their mandate is to provide technical guidance in the development of national strategies, to provide coordination among partners, and to provide clarity on major technical and policy issues. The TSG meets periodically to discuss, review and endorse certain proposals, reports and other documents and carry out the assignments given to them and provide broad oversight of the implementation of grants and projects as required. All formal activities/meetings are documented and reported to the M-HSCC Secretariat.

The TSG-Malaria appoints a working group (the Core Group for TSG-Malaria) to deal with specific tasks. This Core Group is made up of a mix of M-HSCC members and non-M-HSCC members from the TSG selected based on the area of work in question and the expertise of the candidates. The TSG works closely with the M-HSCC Executive Working Group to provide the best support to the M-HSCC to perform its oversight function. Membership of the TSG is open to those engaged in programmatic and technical issues.

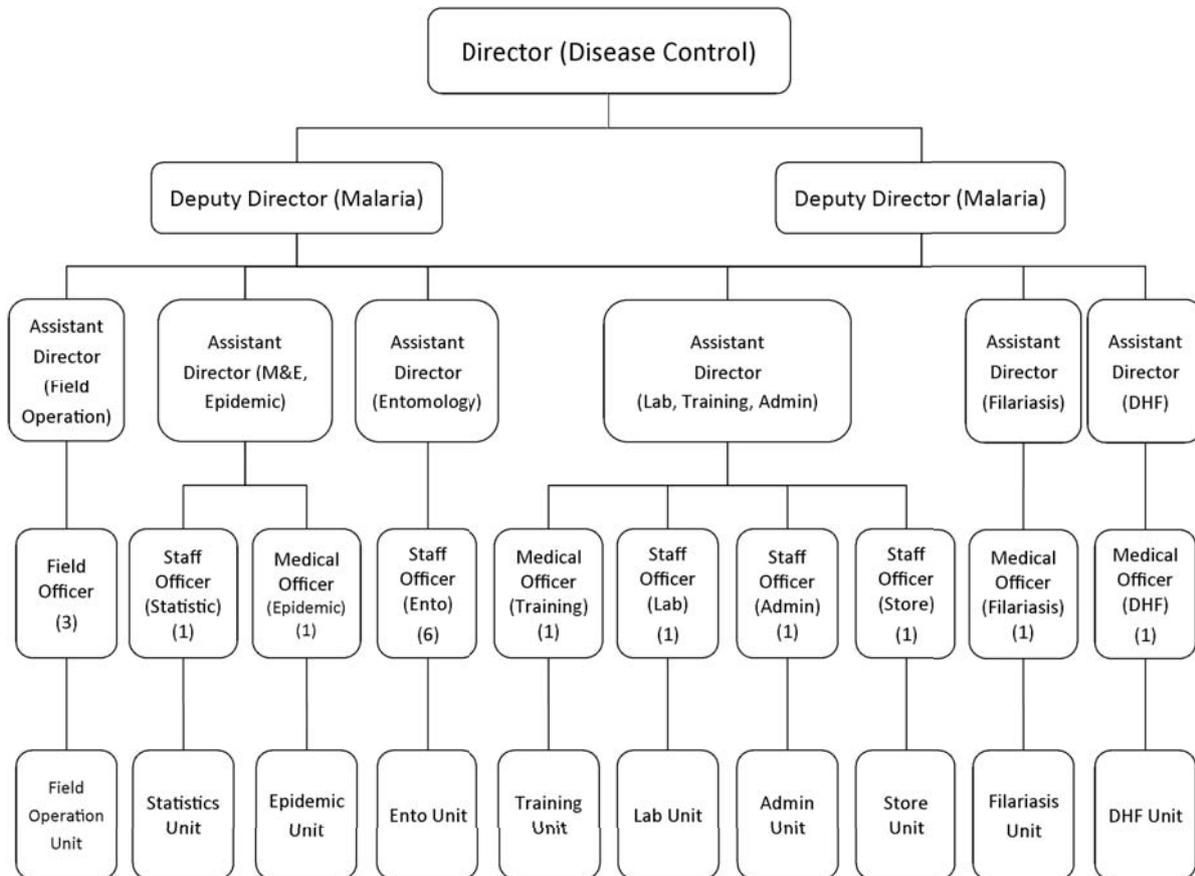
The Department of Public Health (DOPH) (Figure 2) is responsible for providing health care services including malaria prevention and control under the supervision of the Director General (DG) and four Deputy Director Generals (Deputy DGs). The Department of Public Health consists of a Public Health Section and a Disease Control section; the latter headed by Director (Disease Control) covers prevention and control of Malaria, TB, HIV/AIDS, Leprosy and Trachoma and Prevention of Blindness programmes. This section is responsible for the prevention and control of respective diseases including disease surveillance, outbreak investigation and response, and capacity building and operational research.

**Figure 2. Organogram of DOPH (Emphasis on Disease Control section).**



The National Malaria Control Programme (NMCP) is under the VBDC Programme and headed by two Deputy Directors; one for Malaria and one for DHF, filariasis and other vector borne diseases (Figure 3). Since 1978, the VBDC programme has been responsible for control of malaria, dengue, lymphatic filariasis, chikungunya and Japanese encephalitis. Most of the staff and resources of VBDC at all levels, except in the bigger cities are focused on malaria.

**Figure 3. Organogram of Central VBDC.**



*Source: NMCP, DOPH, 2015*

The NMCP works particularly closely with the following government departments in order to implement key activities:

- The Department of Medical Services (which is responsible for medical supplies and management of hospital services) to collect hospital data on malaria morbidity and mortality.
- The National Health Laboratory (NHL) to implement quality assurance of hospital-based malaria microscopy.
- The Food and Drug Administration Department for registration of antimalarials, quality control of antimalarials, control of counterfeit, sub-standard and unregistered antimalarials and implementing the ban on oral artemisinin monotherapy (in collaboration with PSI).

**Township level**

The Township Public Health Department is headed by the Township Public Health Officer, who functions as the Assistant Director level. There are two medical officers (one for Disease Control and one for Public Health) and one Administrative officer under him/her. Four to five rural health centers (RHCs) (managed by a health assistant with a lady health visitor and a midwife), and four to five sub-RHCs (managed by a midwife with a public health supervisor II) come under the control of the Township Public Health Department.

**Table 1. Health facilities development in Myanmar.***Health Facilities, 2013-2014**Source: Health in Myanmar 2014*

Total no. of Hospitals (Public sector)	No. of Hospitals under MoHS	No. of Hospitals under other Ministries	Total no. of Hospital Beds	No. of Primary and Secondary Health Centres
1056	988	68	56,748	87
No. of Maternal and Child Health Centres	No. of Rural Health Centres	No. of School Health Teams	No. of Traditional Medicine Hospitals	No. of Traditional Medicine Clinics
348	1684	80	16	243

**Human resources**

There has been a steady growth in the number of basic health facilities and human resources for health in recent years. The hospitals in States/Regions and Districts are reasonably well staffed. The number of midwives has almost doubled over a 20 year period; midwives are the key providers of basic health services in rural areas.

Of the 31,542 doctors in 2013-2014, 18,443 worked as private practitioners and the rest in the public sector. Many doctors and other staff in the public health service are engaged in private practice after official working hours to supplement their income.

**Table 2. Human resources for health development.***Health Manpower, 2013-2014**Source: Health in Myanmar 2014*

Total no. of Doctors (Public)	Total no. of Doctors (Cooperative & private)	Nurses	Health Assistants	Lady Health Visitors
13099	31542 18443	29532	2062	3467
Midwives	Health Supervisors 1	Health Supervisors 2	Traditional Medicine Practitioners (Public)	Traditional Medicine Practitioners (Cooperative & Private)
21435	652	4998	1048	5915

During the last two decades about 40,000 community health workers (CHWs) have been trained, and it is estimated that 38% of these are still active. They are volunteers who are neither employed by the Government nor paid any salary, which accounts for their relatively high attrition rate. The CHWs are trained to provide health education, treat minor illnesses and assist in the control of infectious diseases. Amongst the voluntary workers are auxiliary midwives who are trained for deliveries at home.

Another group of volunteers, the 'Village Health Volunteers' (VHVs) are the mainstay of malaria control activities at village level. VHVs are provided 2 to 5 days training (depending on needs) on malaria diagnosis and treatment. Some are also engaged in preventive work such as LLIN distribution and health education depending on the organization (NGOs, INGOs) that supports them. The quality of supervision provided for VHV varies considerably from one agency to another (and this is likely reflected in data quality) and so efforts are now underway to standardize the approach and make improvements where necessary.

## *Annex 5. Status of insecticide resistance in Myanmar*

Species	Insecticide		
	Organophosphate (malathion)	Organochlorine (DDT)	Pyrethroids (various)
<i>An. minimus</i>	-	S	S
<i>An. dirus</i>	S	S	S
<i>An. maculatus</i>	S	S	S
<i>An. philippinensis</i>	-	-	S
<i>An. aconitus</i>	S	T	S
<i>An. sondaicus</i>	-	-	-
<i>An. annularis</i>	S	T	S
<i>An. sinensis</i>	S	S	R
<i>An. hyrcanus</i>	T	T	R

S = Sensitive

R = Resistant

T = Tolerant





**World Health  
Organization**