

National Strategic Plan Malaria Prevention and Control 2010-2016



Department of Health
Ministry of Health
REPUBLIC OF THE UNION OF MYANMAR
(Revised December 2014)

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Executive summary

According to the consensus among key stakeholders to extend one more year of National Strategic Plan (2010-2015) and carry out another process for next five-year NSP subsequently in TSG meeting conducted in February 2014, National malaria control programme of Myanmar and partners decided to extend the national strategic plan (NSP) to cover 2016 with minor changes. It makes the GFATM NFM/GFATM RAI and MARC projects fit into the Strategic plan timeframe. In addition, the document also incorporate recommendations and suggestions made by the external evaluation team's report, September 2012 in the revised strategies.

The TSG meetings in August and October 2014 further reviewed the entire document and endorsed it.

Three main strategic approaches in this NSP: 1) Advocacy for malaria elimination at three levels (ie; Ministerial level, WHO level and Operational level) 2) Intensify and expand MARC (Myanmar Artemisinin Resistance Containment); and 3) Participate in the Regional Artemisinin Initiative–RAI.

The goal of the NSP remains the same. Objectives were revised to reflect artemisinin resistance containment (MARC and RAI) and to address suggestions and recommendations made by the external evaluation team, August 2012. Detail in Section 3 page 6.

The treatment policy was revised in 2014 in order to respond to the artemisinin resistance containment and followed the WHO treatment guidelines. The minor changes were reflected in the Section 4.2.2

While key indicators remain the same, this version of NSP has incorporated RAI indicators at all three levels: impact, outcome, and output/coverage.

Target and budget have also been updated to cover 2016, Table 3.4 and Annex 8: Planned activities and budget.

1 Introduction

Malaria remains a leading cause of morbidity and mortality in the Republic of the Union of Myanmar. Considerable progress has been made over the past 10-15 years in reducing the burden. However, the disease is still a priority public health problem in the country. It occurs mainly in or near forests, but also in some coastal areas and plantations. Because of these environmental determinants, the malaria burden is particularly high among national races in remote areas and migrants, who seek economic opportunities in rural economic frontier areas, and the economic development activities such as forestry, mining, plantations and road-building. The significant reduction of malaria morbidity and mortality so far made in Myanmar is threatened by evolving complexity of the problem, especially multiple resistance of the parasites to antimalarial medications and the uncertainty about the financial basis for continued malaria control. The epidemiology of malaria, biology of vectors, socio-behavioural characteristics of the communities and geographical areas also present a challenge to achieve further progress in the implementation of malaria control interventions, making it necessary to develop and validate new implementation strategies.

This document seeks to present the malaria situation and its determinants in The Republic of the Union of Myanmar, the challenges of malaria control and strategies to be implemented to make a major impact on the burden from 2010 to 2016. It is hoped that this document will also help interested partners to intensify their support and increase their contributions to the fight against malaria in Myanmar, which has ramifications far beyond her national borders, partly because antimalarial drug resistance situation is severe and partly because the malaria problem is shared with neighbouring countries.

This document has been developed by the National Vector Borne Disease Control (VBDC) Programme of the Ministry of Health (MOH) in collaboration with bilateral and multilateral development partners, national and international non-governmental organizations. It draws on the policy and strategy documents on health and malaria control issued by the MOH and development partners. It is guided by the Myanmar National Health Policy and by the Regional Strategy for Malaria Control of the WHO Regional Office for South-East Asia (WHO/SEARO), which was updated in 2005.

The analysis of various background documents and reference materials, including the output of the Expanded Malaria Technical and Strategy Consultative Meeting in April 2009 at the beginning of this document and most recently from TSG meeting in February 2014 provided invaluable sources of information for developing the Strategic Plan.

The Vision

By 2016...

The Republic of the Union of Myanmar is on track to achieve the malaria-related Millennium Development Goals. Malaria mortality is below 25% of the 2005 level, and that malaria is no longer a barrier to socio-economic development.

All patients with malaria symptoms have access to early diagnosis and effective treatment. All people living in areas of malaria risk are able to protect themselves to reduce that risk. Malaria outbreaks are prevented or effectively controlled.

Those communities, where the malaria risk cannot, for ecological reasons, be eliminated, have the knowledge and capacity to implement malaria prevention and control interventions, thanks to the continued efforts of their leaders and health services, and support from government, civil society and development partners.

The State, Regional and Township Health Departments plan, implement, monitor and evaluate malaria control interventions with the Vector Borne Disease Control (VBDC) Programme determining policies and strategies, organizing training sessions, providing oversight and implementing surveillance, monitoring and evaluation activities at national level.

National Research Institutions develop and evaluate novel control tools and implementation strategies, and with the VBDC Programme regularly exchange findings and know-how with countries with similar problems.

Political will to control malaria at all levels and in all sectors concerned is based on a thorough understanding of the problem and its social and economic dimensions, the risks of resurgence and the benefits of sustained control. In a spirit of partnership and solidarity, the international community provides essential support to strengthen the national response against malaria, led by the Ministry of Health.

2 General Profile of Myanmar

2.1 *Geographic and socio-demographic features*

Myanmar 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. Lying between 09°32' N and 28°31'N latitudes and 92°10' E and 101°11' E longitudes, 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.

The country is divided administratively into 14 States¹ and Regions, and comprises 69 Districts, 330 Townships, 82 Sub-townships, 3,045 Wards, 13,267 Village Tracts and 67,285 Villages. The first level administrative area is the 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 divisions: the western hills, the central belt and the Shan plateau on the east, with a continuation of this high land in the Tanintharyi.

Three parallel chains of mountain ranges from north to south divide the country into three river systems: the Ayeyarwady, Sittaung and Thanlwin. Myanmar has abundant natural resources including land, water, forest, coal, mineral, marine resources, natural gas and petroleum. Great diversity exists between the regions due to the rugged terrain in the hilly north which makes communication difficult. In the southern plains and swampy marshlands, there are numerous rivers and tributaries criss-crossing the land in many places.

Myanmar enjoys a tropical climate with three distinct seasons: rainy, cold and hot seasons. 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.

At the time the NSP was developed (in 2009) the population of Myanmar in 2009-2010 was estimated at 59.13 million² with a growth rate of 1.29 percent. About 70 percent of the population resides in the rural areas, whereas the remaining are urban dwellers. The population density for the whole country is 86 per square kilometers and ranges from 15 to 666

¹ Health in Myanmar 2012

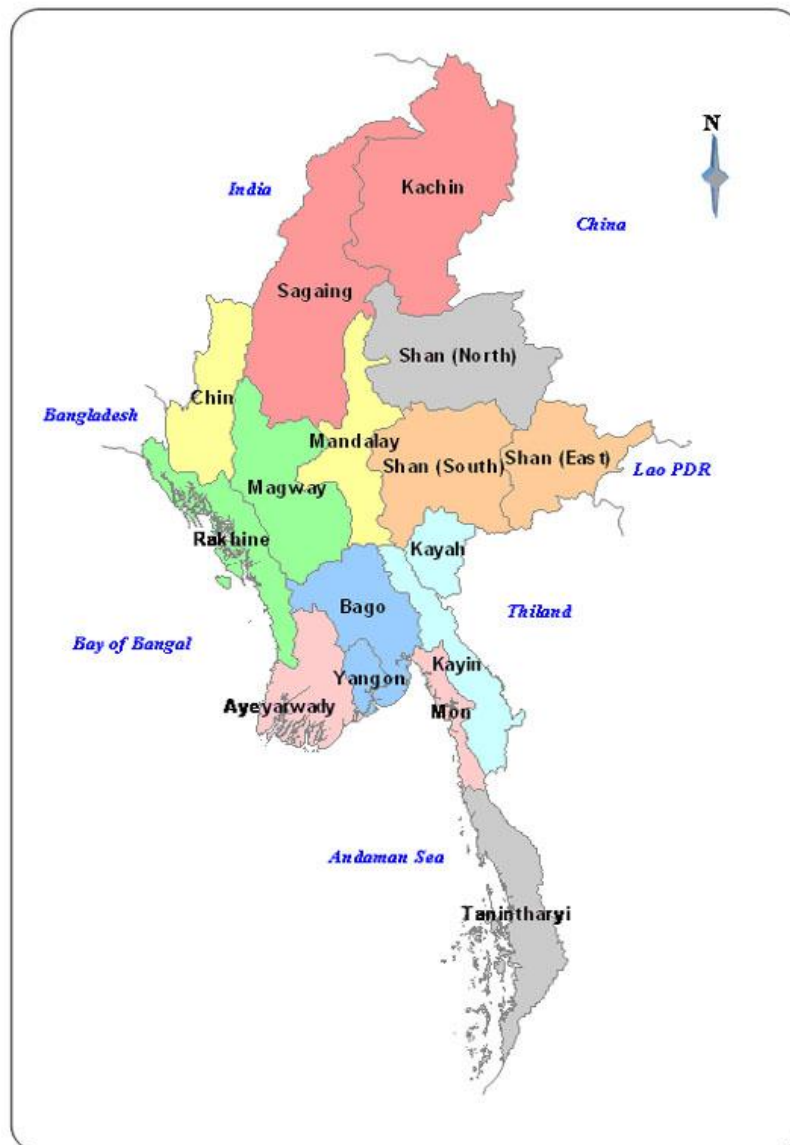
² Source: Planning Department, Ministry of National Planning and Economic Development

Remarks: HMIS and UN population is 48 million in 2010.

per square kilometers. According to the preliminary result of National Census conducted in 2014, total population of Myanmar is 51.42 million.

The Republic of Union of Myanmar is made up of 135 national groups speaking over 100 languages and dialects. The major ethnic groups are Kachin, Kayah, Kayin, Chin, Mon, Bamar, Rakhine and Shan. About 89.4% of the population is Buddhists whilst the rest are Christians, Muslims, Hindus and animists. Adult literacy rate for the year 2005 was 94.1% while school enrolment rate was 97.58%, increasing respectively from 79.7% and 67.13% in 1988.

Map 1 Location and administrative divisions of The Republic of the Union of Myanmar



Source: *Health in Myanmar 2008*

Remark: Shan state is divided into 3 (Eastern, Northern and Southern States) for ease of field implementation for health activities

Map 2 Country boundary and administrative division of the Republic of the Union of Myanmar in 2011



Source: Health in Myanmar 2012

2.2 Basic Demographic and Health Indicators (2009-2010)

Basic Demographic and Health Indicators	
Health Index	
Estimated Population (2009-2010) million	59.13*
Population Growth Rate (2009) (%)	1.29
Sex ratio (M/100F) (2009/2010)	98.89
Age distribution	
- less than 15 years (%)	31.86
- 15-59 years (%)	59.29
- 60 years and above (%)	8.85
Rural Population (%of total population) (%)	70
Crude Birth Rate (2009)* (per 1,000 population)	
- Urban	15.3
- Rural	16.6
Crude Death Rate (2009)* (per 1,000 population)	
- Urban	5.1
- Rural	5.8
Infant Mortality Rate (per 1,000 live births) (2009)**	
- Urban	25.7
- Rural	27.8
Under 5 Mortality Rate (per 1,000 live births) (2009)**	
- Union	36.53
- Urban	36.15
- Rural	41.08
Maternal Mortality Ratio(per 1,000 live births) (2009)**	
- Union	1.41
- Urban	1.13
- Rural	1.52
Average Life Expectancy (2009)** (per 1,000 live births)	
- Urban (Male)	65.5
(Female)	70.7
- Rural (Male)	64.1
(Female)	67.5
Average Adult Literacy Rate (2005)	94.1%

Source: Health in Myanmar, 2012, Ministry of Health

* HMIS and UN Population in 2010 is 48 million. National Census in 2014; total population is 51.42 million

** Provisional data

2.3 Health System

The Ministry of Health (MOH) is the major organization responsible for raising the health status of the people and accomplishes this through provision of comprehensive health services, *viz*; promotive, preventive, curative and rehabilitative measures. The MOH is headed by the Union Minister of Health who is assisted by two Deputy Ministers. The Ministry has seven functioning Departments, each under a Director General. These are Department of Health, Department of Medical Science, Department of Health Planning, Department of Medical Research (Lower Myanmar), Department of Medical Research (Upper Myanmar), Department of Food and Drug Administration 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.

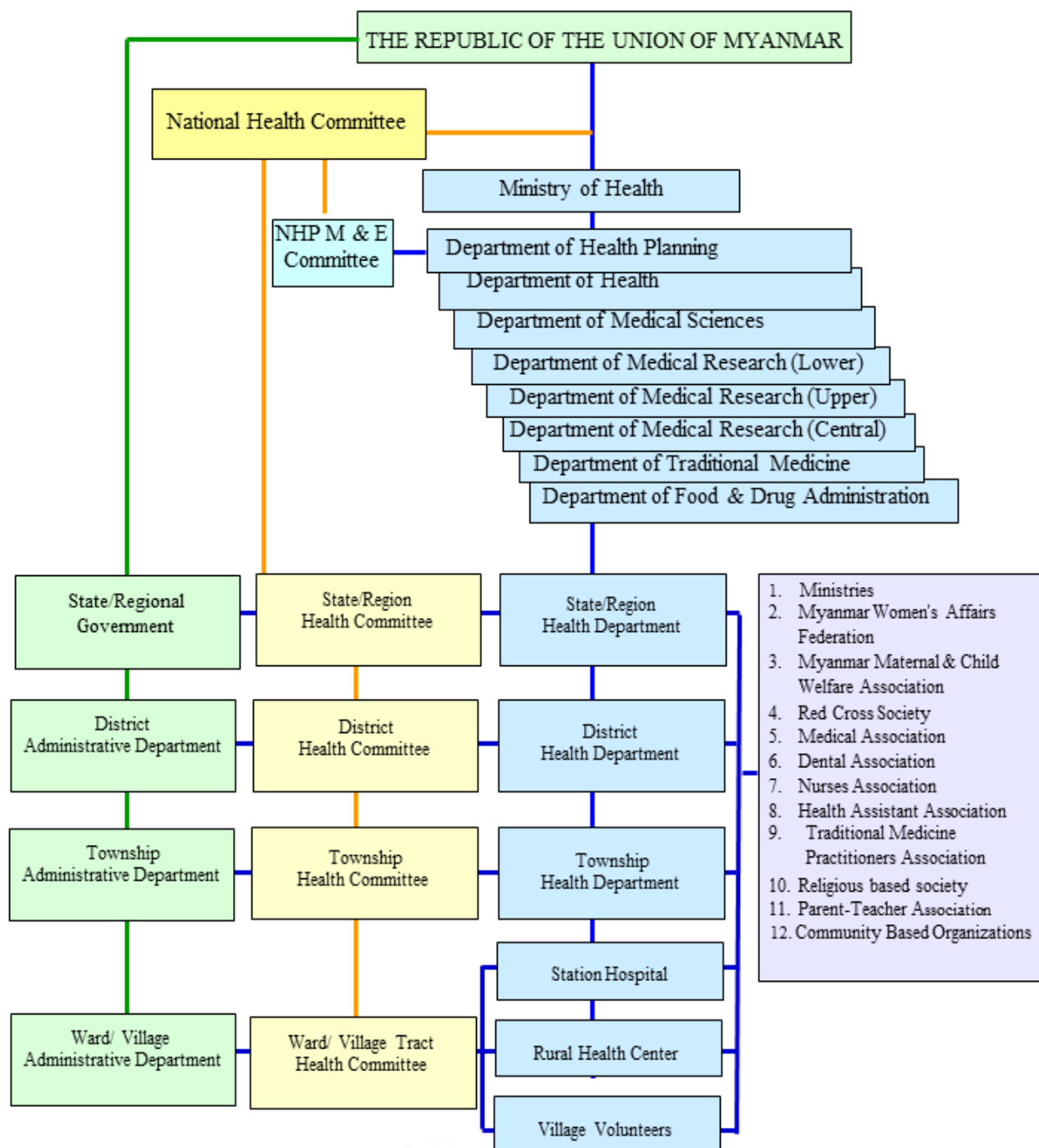
The MOH remains the major provider of comprehensive health care as well as the main organization of health care provision in Myanmar. It has a pluralistic mix of public and private system both in the financing and provision. Health care is organized and provided both by public and private providers. The Department of Health (DOH) as one of seven Departments under the MOH plays a major role in providing comprehensive health care throughout the country including remote and hard to reach border areas. The health system is organized hierarchically and in accordance with the country's administrative structure (**Figure 1**). Since 1978, health services integrated the vertical programmes into the Basic Health Services through the Primary Health Care approach. Some Ministries also provide health care, mainly curative, for their employees and families, namely Ministries of Labour, Employment & Social Security/ Defense/Mines/Industry/Energy/Home Affairs/ Social Welfare, Relief and Resettlement /Rail Transport/ Agriculture & Irrigation/Hotel & Tourism and Information.

The private, for profit, sector mainly provides ambulatory care though some also in recent years 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 Myanmar health system is the existence of traditional medicine along with allopathic medicine. Traditional medicine has been in existence since time immemorial and is well accepted and utilized by the people throughout the history.

In line with the National Health Policy, NGOs also contribute some service provision. Their roles are also becoming important as the needs for collaboration in health become more prominent. Sectoral collaboration and community participation is strong in Myanmar health system thanks to 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 the health programmes systematically and efficiently. Under

the guidance of the NHC, various health committees are established at each administrative level.

Figure 1 Organogram of Health Service Delivery System in Myanmar



Source: Health in Myanmar 2013

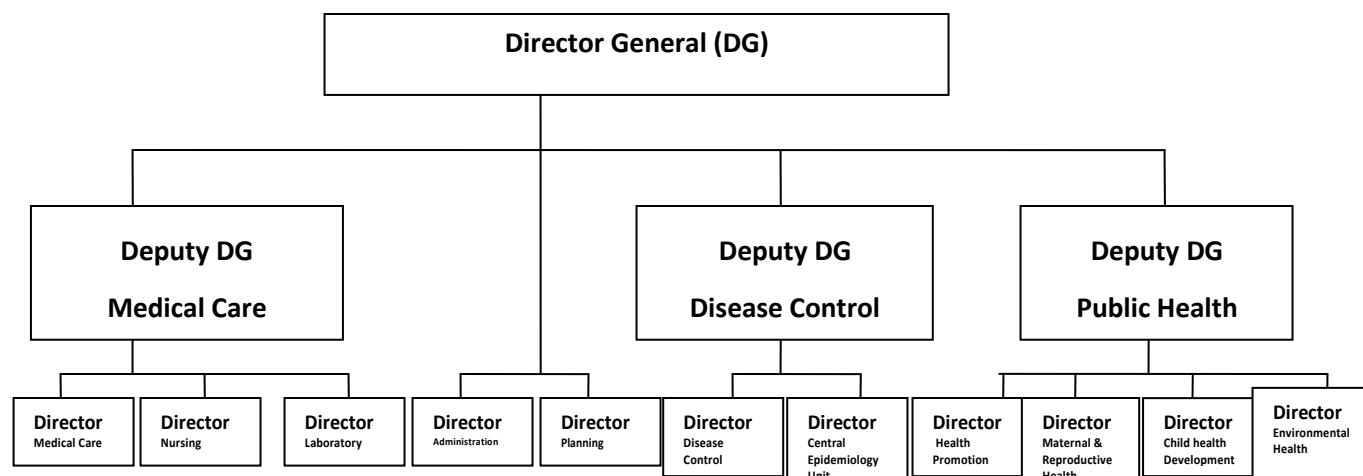
Remarks: The 3 Departments of Medical Research (Upper, Central and Lower) were merged into a single research department in early 2014.

The Department of Health (DOH) (**Figure 2**) is responsible for providing health care services to the entire population in the country. Under the supervision of the Director General (DG) and three Deputy Director Generals (Deputy DGs), there are eleven Directors leading and managing the following Divisions: Medical Care, Nursing, National Health Laboratory, Administration, Planning, Disease Control, Communicable Diseases, Health Promotion, Maternal and Reproductive Health, Child Health Development and Environmental Health.

The distribution of responsibilities among some of the Divisions relative to malaria control and prevention is as follows:

- The Medical Care Division is responsible for setting hospital specific goals and management of hospital services as well as medical supplies and equipment including medicines for all health institutions.
- The National Health Laboratory is responsible for routine laboratory investigation, special laboratory task force and public health work, training, research and quality assurance.
- The Disease Control Division covers prevention and control of infectious diseases, disease surveillance, outbreak investigation and response, and capacity building. The Division includes VBDC Programme headed by a Deputy Director. At national level, the programme is responsible for malaria, dengue, lymphatic filariasis, Chikungunya and Japanese encephalitis control. Most of the staff and resources of VBDC at all levels, except in the biggest cities of the country, are focused on malaria.
- The former Public Health Division is divided into 3 sections headed by one Director for each; Health Promotion, Maternal and Reproductive Health and Child Health Development responsible for primary health care and basic health services, nutrition, maternal and child health, reproductive health and school health services.
- The Food and Drug Administration Department is upgraded as a separate Department under MOH headed by Director General and responsible for the registration and quality control of medicines. The timeframe for registering prescription medicines on average is one and a half years, but there is a fast track procedure for urgently needed medicines. The Department also shares weekly information on counterfeit, sub-standard and unregistered medicines found on the market to all State and Divisional Directors.

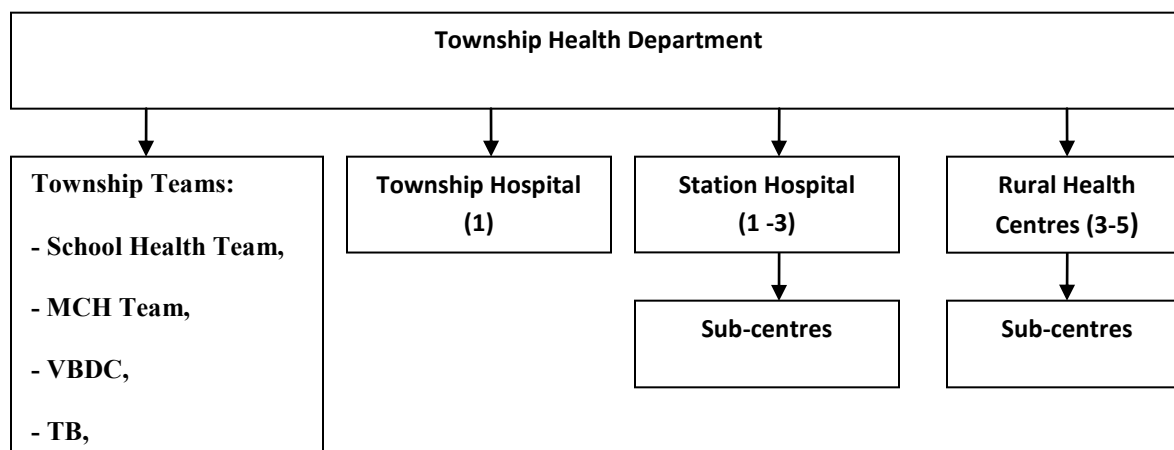
Figure 2 Organogram of the Department of Health



Source: DOH, 2014[updated after consultation with Director (Administration)]

A Township Health Department (**Figure 3**) has the following health facilities and manpower complement: a township hospital managed by the township medical officer, a station hospital managed by a Medical Officer, 4 to 5 rural health centres (RHCs) led by health assistants, and 4 to 5 sub-rural health centres per station hospital and RHC. A public health supervisor is assigned to township Hospital, station hospital and in each RHC. A lady health visitor is assigned to each RHC. Each sub-rural health centre has a midwife who delivers basic health services including malaria prevention and control.

Figure 3 Organogram of Township Health Department



Source: Ministry of Health, 2008

Community Health Workers (CHWs) have been trained in the last two decades. To date about 40,000 CHWs are already trained, and of these it is estimated that 50% are active. They are

neither employed by the Government nor paid any salary, which may explain their 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 domiciliary deliveries.

There has been a steady growth in the number of basic health facilities (**Table 1**) as well as health manpower (**Table 2**) during the recent past. The hospitals at regions, states, and districts are reasonably well staffed. The almost doubling in the number of midwives over a 20 year period should be noted, as these are key providers of basic health services in rural areas.

Table 1 Health Facility Development in Myanmar, 1988-2013

Health Facilities	1988-89	2008-09	2009-10	2010-11	2011-12	2012-13
Hospital (Public Sector)	631	846	871	924	987	1010
Ministry of Health	617	820	844	897	921	944
Other Ministries	14	26	27	27	66	66
Total No. of hospital beds	25,309	38,249	39,060	43,789	54,503	55,305
No. primary & secondary health centers	64	86	86	86	87	87
No. of maternal & child health centers	348	348	348	348	348	348
No. of rural health centres	1337	1,481	1,504	1,558	1,565	1,635
No. of school health teams	80	80	80	80	80	80
No. of traditional medicine hospitals	2	14	14	14	14	16
No. of traditional medicine clinics	89	237	237	237	237	237

Source: Health in Myanmar 2013

Table 2 Health Manpower Development in Myanmar, 1988-2013

Health Manpower	1988-89	2008-09	2009-10	2010-11	2011-12	2012-13*
Total number of doctors:	12,268	23,740	24,536	26,435	28,077	29,832
Public sector:	4,377	9,583	9,728	10,450	11,675	12,800
Co-operative & Private:	7,891	14,157	14,808	15,985	16,402	17,032
Dental Surgeons:	857	2,092	2,308	2,562	2,770	3,011
Public sector:	328	777	703	756	774	802
Co-operative & Private:	529	1,315	1,605	1,806	1,996	2,209
Nurses	8,349	22,855	24,242	25,644	26,928	28,254
Dental Nurses	96	244	262	287	316	344

Health Manpower	1988-89	2008-09	2009-10	2010-11	2011-12	2012-13*
Health Assistants	1,238	1,822	1,845	1,883	1,893	2,013
Lady Health Visitors	1,557	3,238	3,278	3,344	3,371	3,397
Midwives	8,121	18,543	19,051	19,556	20,044	20,617
Health Supervisor(1)	487	529	529	541	612	677
Health Supervisor(2)	674	1,484	1,645	2,080	1,718	1,850
Traditional Medicine Practitioners						
Public:	290	950	890	890	885	875
Private:	2,500	5,397	5,737	5,737	5,867	5,979

Source: Health in Myanmar 20013 (Provisional actual)*

Of 29,832 doctors in 2012-2013, 17,032 work as private practitioners and the rest in the public sector. Many doctors and other staff in public health service are engaged in private practice after their official working hours to supplement their income.

The Central Medical Stores Depot (CMSD) is the primary agency with regards to supplies procured through Government budget, UN agencies and other donors as well as donated supplies. They indent medical supplies from Yangon CMSD and notify respective Townships to get commodities or transit medical supply. Rural health centres store their supplies in small storerooms in the health centre building whilst the sub-rural health centers use lockable cupboards or storerooms.

Since 2002, in collaboration with DOH, UNICEF finances 35 Project Supply System Management Officers (SSMOs) to strengthen the supply and logistics system of the MOH. Their main duty is to monitor and supervise storage, distribution and utilization of all supplies and equipment.

Cost sharing funds are organized at township and community levels. The following medicines must be provided free of charge: TB medications, antimalarials, leprosy medications, iron and folic acid supplement, de-worming medications, scabicides, ORS and vitamin A tablets.

Private distribution channels are through recognized wholesalers or directly from registered pharmaceutical companies. General practitioners (GPs) procure their medicines mainly through this channel.

Government yearly increases health spending on both current and capital expenditures. Total government health expenditure increased from kyat 464.1million in 1988-89 to 63,796 million kyats in 2009-2010 and 100,824.6 million kyats in 2011-2012 (**Table 3**). Considering the high rates of inflation, it is difficult to assess the real trend.

Table 3 Government Health Expenditure, Myanmar, 1988-2012

	1988-89	2007-08	2008-09	2009-10	2010-11	2011-12*
Health Expenditure (million kyat)						
Current	347.1	38,368.1	41,362.7	47,275	60,601.0	73,060.3
Capital	117.0	10,379.2	10,080.7	16,521	24,743.7	27,764.3
Total	464.1	48,747.3	51,443.4	63,796	85,344.7	100,824.6
Per Capita Health Expenditure (kyat)	11.8	847.8	881.2	1,078.9	1,447.6	1,669.8

Source: Health in Myanmar 2013 (provisional actual)*

The health care delivery system is based on the principles of primary health care up to the community level with a committed and professional health work force, and strategies to make grossly inadequate resources stretch as far as possible are also been developed. However the need to review the extent to which the population at high risk, especially the ethnic minorities and the hardest to reach access the health care delivery system is important for further reduction of the malaria burden.

3 Malaria Situation

3.1 Mosquito vectors and ecological determinants of malaria

In Myanmar, out of 37 species of Anopheles so far recorded throughout the country, 6 have been found to be infected with malaria parasite based on entomological and parasitological evidences.

Primary vectors -	<i>An. minimus</i> and <i>An. dirus</i>
Local vectors -	<i>An. annularis</i> and <i>An. sundaicus</i>
Secondary vectors -	<i>An. culicifacies</i> and <i>An. philippinensis</i>

In addition to the above, it is suspected that (1) *An. sinensis* may also play a secondary role in malaria transmission: (2) *An. maculatus* is also suspected a secondary vector in the hilly and foothill areas of the country: (3) *An. aconitus* could also play a secondary role depending on the man/cattle ratio of a particular area: (4) *An. jeyporiensis* is to be regarded as possible vector wherever it occurs in abundance.

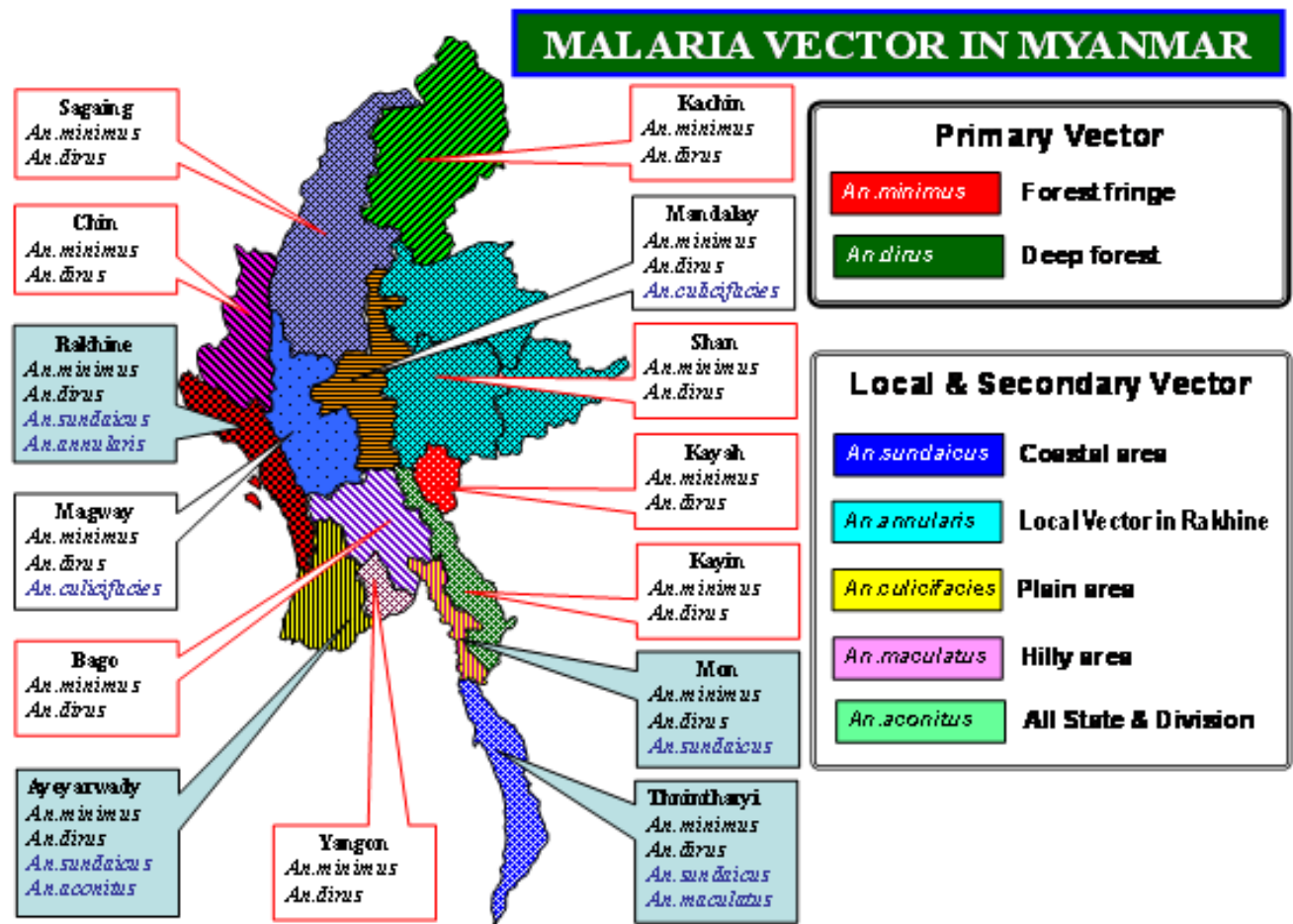
An. minimus

An. minimus is present nearly all over the hill tracts, foothill areas and also plain areas. It is present at varying altitudes up to 4000 ft above sea level. It is the primary vector responsible for stable malaria in foothill and forest fringe. Breeding is observed in slow running grass edged streams, seepages and rice field in hill tracts. In certain area of the dry zone area (Twintaung), Mayangyaung village, Hlegu township, Yangon region and Ywathit village, Taungoo township, Bago region, it is breeding in small shallow wells. According to the entomological survey, this species feeds preferable on man on and feeding is more intense first quarter of the night depending on season and locality. It is now exophagic and exophilic. It is also susceptible to deltamethrin and permethrin.

An. dirus

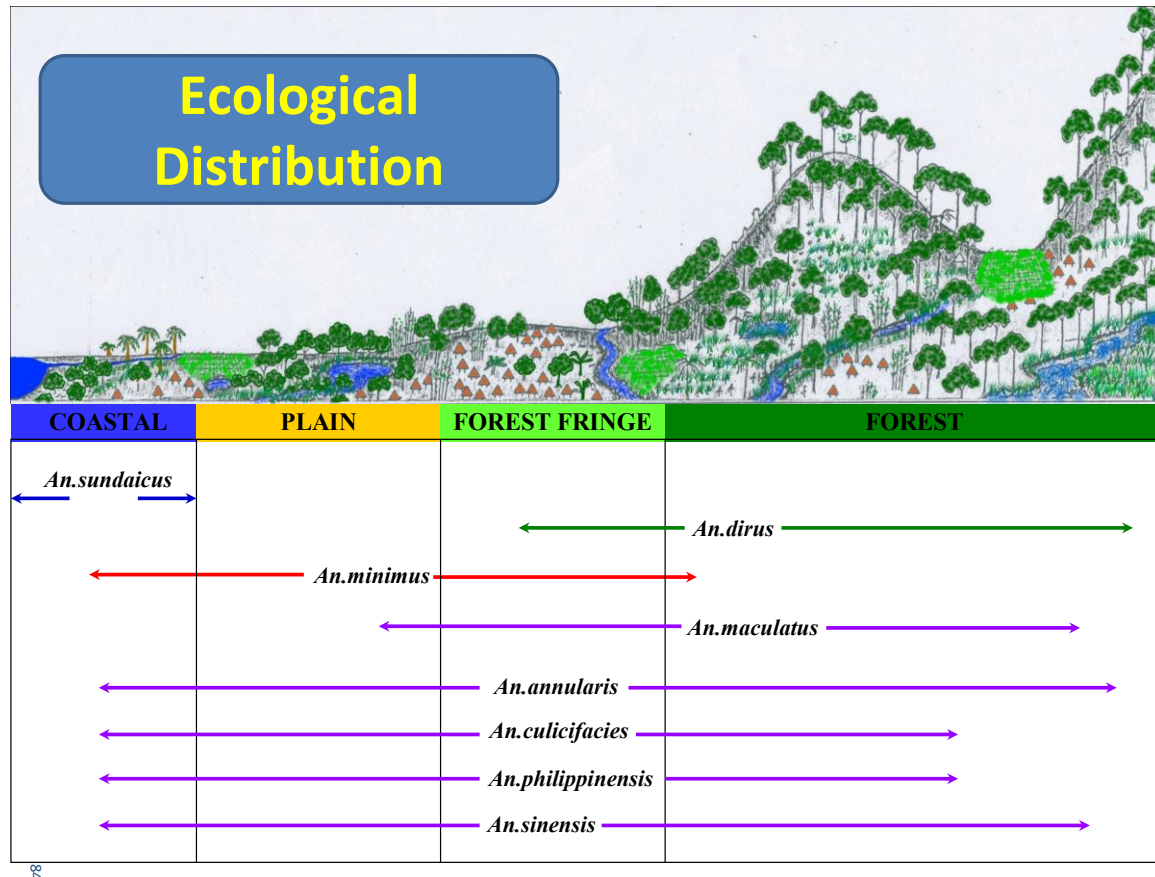
It is prevalent in thick forest and forest fringe. Breeding is found in pools, swamps, hoofmarks, and earthen wells under shade and also found in domestic wells in Mon, Kayin states and Tanintharyi region. This species is mainly anthropophilic, exophagic and exophilic. Biting activity varies from place to place and peak biting time was found to be first and second quarter of the night. It is the most prevalent during the raining season. It is susceptible to deltamethrin and permethrin.

Map 3 Malaria vectors in Myanmar



Source: Vector Borne Disease Control, Department of Health, Ministry of Health, 2012

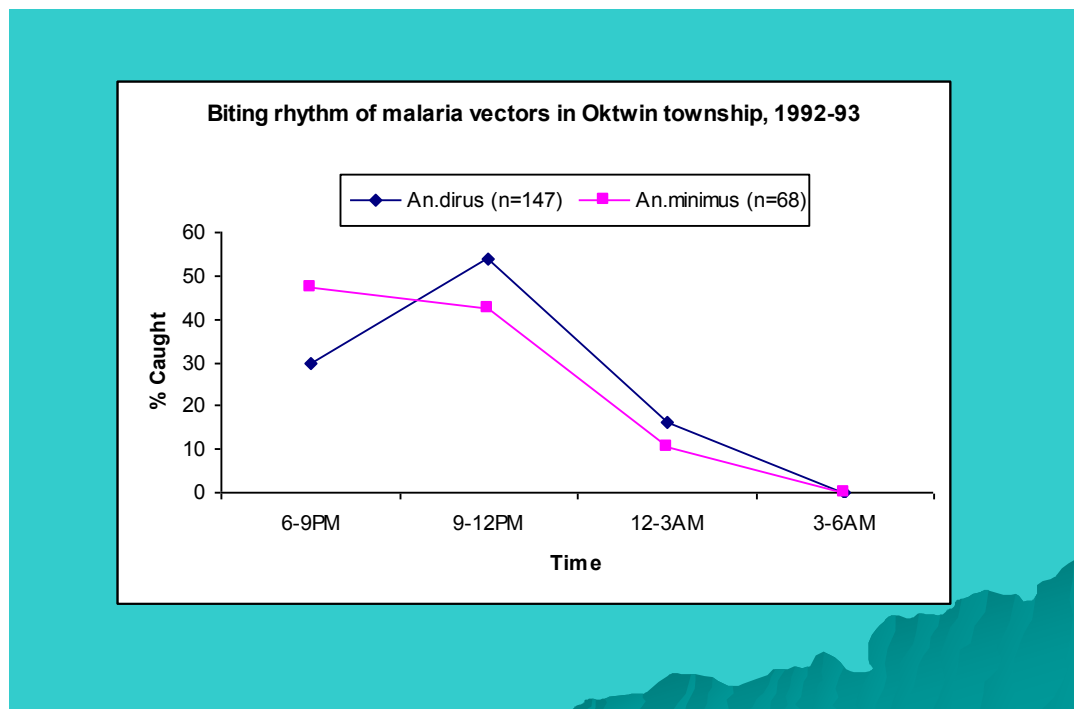
Figure 4 Vector habitats in Myanmar, 2012



Source: Vector Borne Disease Control, Department of Health, Ministry of Health, 2012

The primary vectors *An. dirus* complex (both forest and well breeding) and *An. minimus* complex are both generally anthropophilic. The habitats of the malaria vectors in Myanmar are shown in **Figure 4**. Both primary vectors can bite the whole night. The peak biting time is found at 6:00pm -12:00 midnight (**Figure 5**). The early biters, *An. minimus*, are generally nulliparous mosquitoes emerging from nearby slow running streams. In Myanmar, there may be more than one or two vectors in a Township in an ecological zone. For example, in Tanintharyi Region, malaria transmission is due to the combined infective bites of *An. dirus*, *An. minimus* and *An. sunaicus*. The proportion of infective bites among these three vectors may vary from Township to Township depending on the climatic (temperature, rainfall, humidity and wind speed) and environmental condition. Altitude also plays a major role due to the temperature getting cooler as the altitude above sea level increases. For example, in Shan State areas, 1000 meters above sea level will have very little *An. dirus*, and *An. minimus* may be the main vector responsible for malaria transmission.

Figure 5 Biting rhythm of primary malaria vectors, Oktwin Township, Bago Region, 1993



Source: Department of Medical Research (Lower Myanmar)

The vector density fluctuates with annual rainfall patterns. In some areas vector breeding sites may be flushed out with rainfall during the monsoons with higher density being reported post monsoon. The (peak) transmission season in Myanmar generally lies between March and December, although this varies according to rainfall, temperature and other factors.

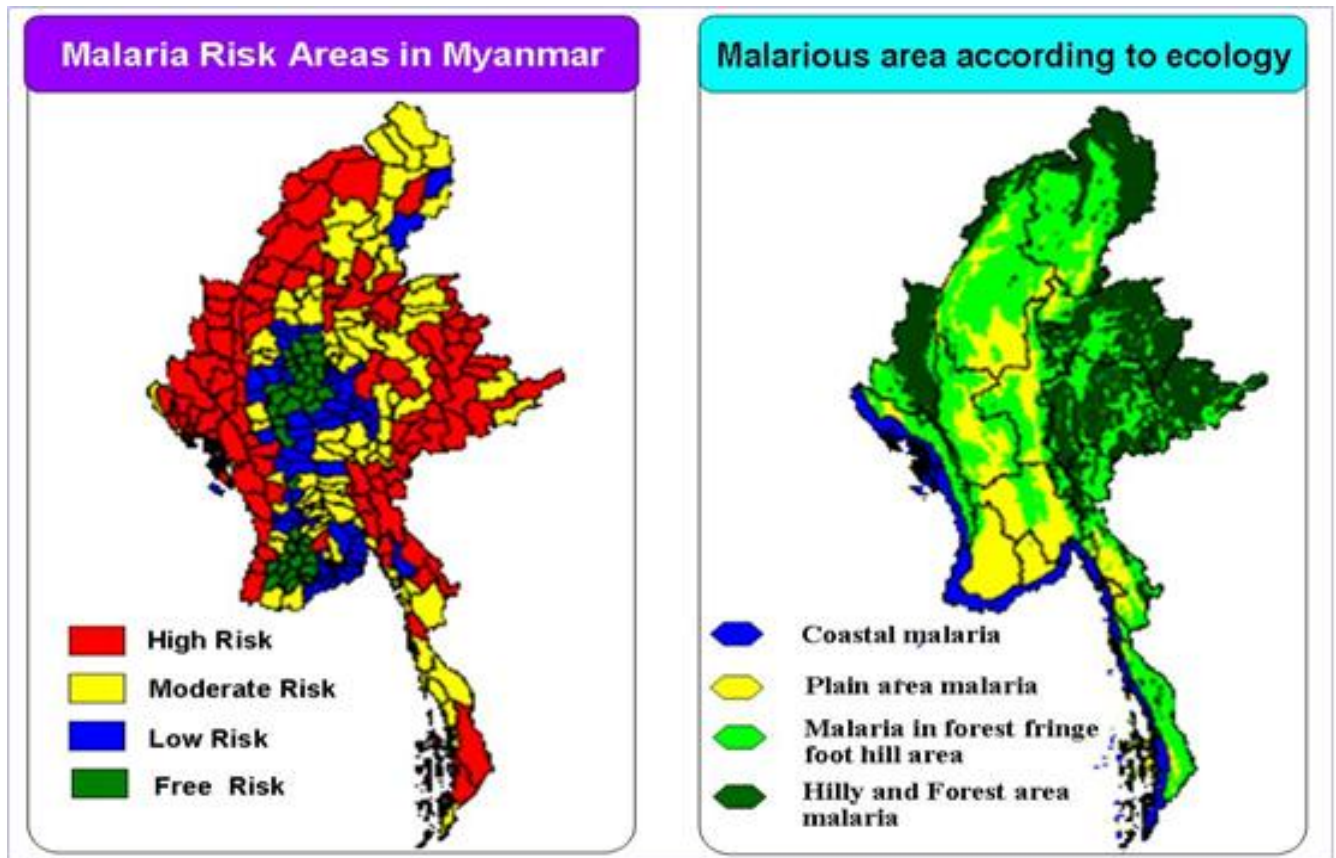
The characteristics of the vectors explain the geographical distribution of malaria in Myanmar. The forest environment, which is closely linked to hilly terrain, provides the ecology which is most conducive to malaria transmission. Deforestation reduces the malaria risk, when completed, but the process of deforestation is often associated with heavy exposure. Plantations may lead to re-emergence or emergence of malaria. Malaria transmission is, at most, sporadic in cultivated plain areas and is absent in urban areas. Some malaria transmission occurs in coastal areas, especially if the environment has been disturbed by, for example, aquaculture.

Some outbreaks are related to new ecological niches for important vectors, such as *An. minimus* breeding in shady wells in Sagaing Region, Budalin Township. These outbreaks arise from introduction of infection by migrant workers. Surveillance for such changing patterns is important.

3.2 Geographical distribution

Consistent with the knowledge about vector ecology (bionomics), the current geographical pattern reflects that most of the transmission occurs in forested foothill zones below 1000 meters altitude. Higher altitudes are usually too cold for malaria transmission, but the upper limit is highly variable and has possibly tended to move upwards in recent years. Many of these highland areas are close to international borders (Map 4).

Map 4 Malaria risk areas according to ecology in Myanmar, 2007



Based on an understanding of ecological determinants of malaria and long-term malaria data, the country has been divided into areas of no risk and low, moderate and high risk for malaria³

High Risk Area – stratum 1a: Holoendemic or Hyperendemic to malaria, parasite rates and spleen rates over 50% among children 2-9 yrs; with presence of primary vectors; located in the forest or hilly areas within 1 km from forest edge; remote/isolated areas; access to health facilities takes more than 3 hrs, with resettlement and seasonal workers, etc

Moderate Risk Area – stratum 1b: Mesoendemic to malaria, parasite rates and spleen rates between 11-50% among children 2-9 yrs; located between 1 – 1.5 kms from the edge of the forest; access to the nearest public health facility takes 1 – 3 hours by the most common means of travel available

Low Risk Area – stratum 1c: Hypoendemic to malaria, parasite rates and spleen rates not exceeding 10 %; plain areas or foothills located more than 1.5 km from edge of forest; access to health facilities takes less than 1 hr; less population movement to and from forest.

(Table 4) (See Annex 1) The proportion of the population living within high and moderate risk areas have fallen substantially since 1994 and especially since 2007. These changes may be one of the explanations for declining trend in incidence and mortality rates over the past 15 years. However, the high risk areas are the ones from where reliable information is most difficult to obtain. Further, it should be noted that within the high risk areas there are villages with little or no transmission, and similarly within the low risk areas there are also villages with high transmission, hence the need to undertake microstratification for more effective targeting of malaria prevention and control interventions.

Microstratification done in 2007 – 2008 in 80 townships already considered high risk indicated that 75% of population reside in malaria risk villages. This may or may not reflect the situation in other townships so microstratification in other townships should be done for better planning and targeting of interventions.

Table 4: Distribution of Population by Risk Areas, Myanmar in 1988 – 2011

Area/Year	1988	2007	2010	2011
High risk (%)	38	28	22	21
Moderate risk (%)	41	23	25	18
Low risk (%)	13	17	16	23
Free risk (%)	8	32	37	38

Source: Vector Borne Disease Control, Ministry of Health, 2011

Area classification is described in Annex 1

3.3 Social and economic determinants

Most malaria cases and deaths probably occur among people residing in villages near or in the forests. These people are usually national races (ethnic minority groups) living from subsistence agriculture supplemented by forest activities, such as cutting bamboo or rattan or production of charcoal. Generally, residence within 1 kilometer distance from the forest means that malaria transmission occurs in the village at least during part of the year, with all age-groups being at risk. If the village is located at somewhat greater distance from the forest, the risk is usually confined to adult men, who enter the forest periodically for agriculture, forest products gathering, hunting etc. These men usually go in groups and stay in the forest for several days in makeshift shelters that offer no protection from mosquito bites.

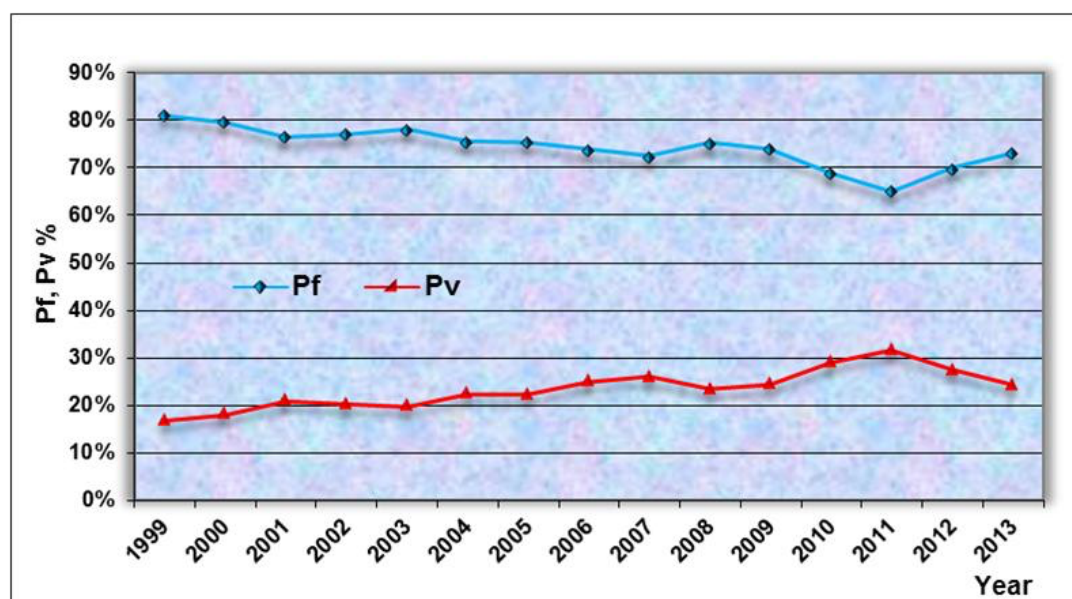
The other major risk group is migrants, who are often induced by economic opportunities such as logging or mining in forested areas or road or dam construction and maintenance and agricultural works such as rubber plantation, palm oil plantation in malarious areas. Displacement caused by dam construction may also lead to exposure. These population movements may be organized, in which case it is relatively easy to organize prevention and curative services. However, often the migrant groups are small, spontaneous and even clandestine and illegal, and mostly inaccessible to health services which makes it difficult to protect them.

Malaria risk also occurs in plantations, which offer forest-like environments such as rubber trees and palm oil trees. In such situations, it is usually relatively easy to organize control, but this then meets with technical obstacles in rubber plantations, where workers need to start before sunrise, when anophelinas are highly active.

3.4 Malaria parasites and resistance to antimalarials

There are two major species of Plasmodium; *P. falciparum* and *P. vivax* with occasional reports of *P. malariae* and *P. ovale*. *Plasmodium falciparum* accounts for 70% -80% of cases with a slight decline in occurrence of *P. falciparum* over the past decade (Figure 6).

Figure 6 Proportion of *Plasmodium falciparum* and *Plasmodium vivax* in Myanmar, 1999-2013



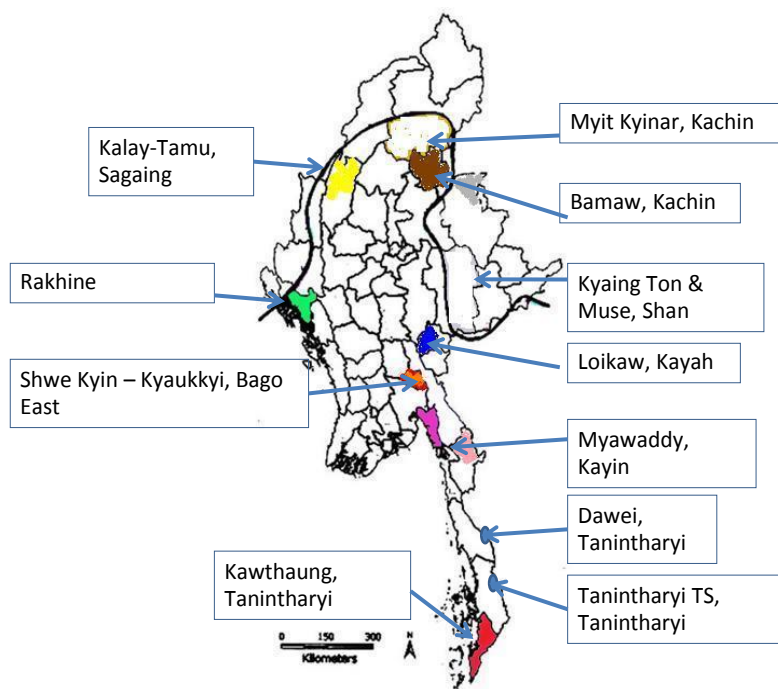
Source: 2013 Annual Report, Vector Borne Disease Control, Ministry of Health

Resistance of *P. falciparum* to chloroquine and sulphadoxine-pyrimethamine recorded as over 25% and to mefloquine as less than 10%. Failure rate of the combination artesunate-mefloquine remains at less than 5%. Prolonged clearance time in four subjects was also noted. Resistance levels vary between sites and over time at the same site. A wide variety of antimalarials with limited quality control are accessible such as artemisinin monotherapy or unqualified artemisinin combination therapy to patients through the private sector, thus increasing the chance of resistance to combination therapy medications in future if timely action is not instituted to contain the situation.

In the 1990s, the most severe parasite resistance (mefloquine resistant *Plasmodium falciparum*) in the world was observed in Thailand bordering with Myanmar. However the consistent deployment of ACTs mitigated the problem. Of late increasing number of treatment failure to artesunate-mefloquine combination as well as artemether-lumefantrine (Coartem®) emerged in western Cambodia.

In 2005-2006, Thailand and Cambodia reported strong evidence of the artemisinin resistant *falciparum* at the border between the two countries. Efforts to control/delay spreading of these parasites commenced in 2008. However, Myanmar detected early signs as strong evidence of suspected artemisinin resistance at several eastern states/regions. Therefore surveillance of parasite resistance and effective malaria control in Myanmar are of the greatest importance, also from an international viewpoint. Sentinel sites of therapeutic efficacies studies are shown in **Figure 7**.

Figure 7 Therapeutic efficacy study sentinel sites, Myanmar



During the early stage, the evidence of prolonged parasite clearance time (i.e. presence of malaria parasites on Day 3) was applied for monitoring of potential spreading of resistance parasites (**Table 5** below). Artemisinin resistance containment framework was developed and endorsed in 2011 (**Annex- 6**) in order to respond to this regional and even global threat. The Containment action commenced in Myanmar in 2011 and the same efforts are being pursued in other Mekong countries in 2012.

Table 5 Reports on Day 3 Parasitaemia of ACT in Myanmar (2009-2013)

Type of Antimalarial Drug	Study Site	% of Day3 Parasitaemia of <i>P. falciparum</i>				
		2009	2010	2011	2012	2013
Artemether-lumefantrine (Coartem®)	Shwekyin/Bago	10.2				
	Kawthaung/Tanintharyi	6.25	10.7			18.75
	Mon & Kayin				4.6	
	Kachin				3.9	
	Bamaw/Kachin				4.3	
	MyitKye Nar/Kachin				4.3	
	Eastern Shan State			2		
	Kayah (Loikaw)			11.8		
	Northern Shan State				7.3	
	Muse /Northern Shan State			7.7		
Dihydro-artemisinin/ Piperquine (Duocotexin®)	Kawthaung/Tanintharyi	18.75		20.6		
	Mon & Kayin			22.5		
	Kachin			3.5		
	MyitKye Nar/Kachin		1.8			
	Eastern Shan State			2.0		
	Kayah (Loikaw)					
	Northern Shan State					
Artesunate + Mefloquine	Muse/Northern Shan State			2.2		

3.5 Vector susceptibility to insecticides

Effective prevention and control of malaria requires thorough knowledge of the bionomics and distribution of malaria vectors. In this context, regular monitoring of vector bionomics and susceptibility to insecticides in sentinel sites is of high importance. Vectors are sensitive to pyrethroids and organophosphates (**Table 6**) whilst resistance of *An. annularis* to DDT has been documented in the Rakhine State. However in view of the fact that the data refers to 1997, regular monitoring and surveillance of vector bionomics and insecticide susceptibility in selected sentinel sites should be an integral component of the National Malaria Control Programme in Myanmar.

Table 6 Susceptibility status of Anopheline species to different insecticides in Myanmar, 2011-2013

Species	Insecticide		
	Organophosphate	Organochlorine	Pyrethroid
<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. sundaicus</i>	-	-	-
<i>An. annularis</i>	S	T	S
<i>An. sinensis</i>	S	S	R
<i>An. hyrcanus</i>	T	T	R

Legend: S= susceptible; T= tolerant; R= resistance.

Eleven sentinel sites were chosen for insecticides resistance monitoring in Myanmar. They are: 1. Loikaw township, Kayah state 2. Sittwe township, Rakhine state 3. Oaktwin township, Bago region 4. Mawlamyaing township, Mon state 5. Zayarthiri township, Naypyitaw 6. Pathein township, Ayeyarwady region 7. Taungoo township, Bago region 8. Indaw township, Sagaing region 9. Thabeikkyin township, Mandalay region 10. Monghsat township, Shan (East) and 11. Phaekhon township, Shan (South) respectively.

T with organochlorine for *An. annularis* and *An. aconitus* was found in Mingan ward, Sittwe township, Rakhine state, 2011.

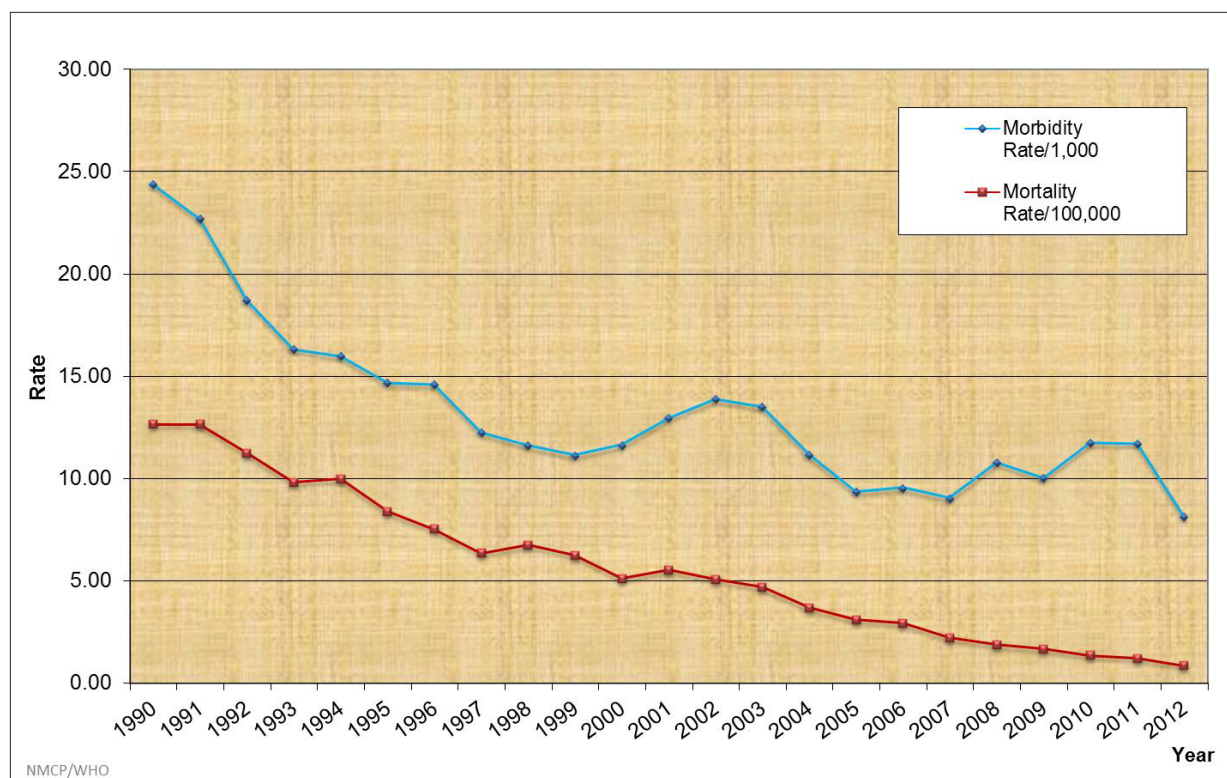
R with pyrethroid for *An. sinensis* was found in Mingan ward, Sittwe township, Rakhine state, 2013.

For *An. hyrcanus*, **T** with organophosphate and organochlorine was found in Yenikan village, Loikaw township, Kayah state, 2013. **R** with pyrethroid was also found in 20 miles, Oaktwin township, Bago region and Innwaing village, Mawlamyaing township, Mon state, 2011; Zayarthiri township, Naypyitaw and Mingan ward, Sittwe township, Rakhine state, 2013.

3.6 Recent trends in morbidity and mortality

The number of reported cases of clinically suspected malaria (CSM) in 2007 is 503,449. The annual incidence rate of reported cases of suspected malaria has fallen steadily since 1990, with a small upsurge from 1999 to 2003 and in 2010 and 2011 (**Figure 8**). The data needs to be interpreted cautiously because of the lack of information on cases that are self-treated or treated in the private sector. Moreover the case detection through the use of RDT was scaled up with the support from the Three Diseases Fund (3DF) during 2006-2011. The reported cases and deaths related to malaria patients who seek care in the public health sector, estimated from studies on treatment seeking behaviour to be 25 to 40 per cent of the total. On the other hand, not all the CSM cases are malaria; many are likely to be fevers due to viruses or other causes. Many high malaria transmission areas are still inaccessible for all or parts of the year. If the health facilities have good quality antimalarial drugs and give free of charge to the patients, there will be high utilization of public health services by community.

Figure 8: Annual Malaria Morbidity and Mortality Rates in Myanmar 1990-2012



Source: 2013 Annual Report, Vector Borne Disease Control, Ministry of Health

3.6.1 Hospital cases

The total number of hospital inpatients recorded as malaria steadily declined, 103,031 in 1999, 62,073 in 2005, and 43,602 in 2010 and further dropped to 26,881 in 2012 and 18,362 in 2013.

There is a corresponding fall reported for the proportion of inpatients with malaria. During this period the number of hospitals providing inpatient facilities in the public sector increased. Thus the fall in inpatient cases is not a result of any overall decrease in hospital admissions or hospital services. However, the data is based on clinically suspected malaria and diagnostic rigor may have increased. Taking all potential confounders into consideration, the decline in hospitalized cases provides strong evidence that the national level malaria burden has decreased and also be due to expanded malaria services in villages, and fewer people seek basic malaria care in hospitals.

3.6.2 Malaria deaths

Reported malaria deaths peaked in 1991 (>5,000) and then fell steadily; 3,744 deaths were reported for 1995, 1,261 for 2007 and 788 for 2010 (**Figure 8**). The reported number of deaths was lowest ever recorded (236-provisional figure) in 2013. The reported deaths relate to the malaria patients who seek care in the public health sector, estimated to be 25 to 40 per cent of the total. Most cases are either self-treated or treated by private formal and informal health practitioners. We can infer that the actual number of malaria deaths is much higher than the total reported within the formal health information system. Most deaths relate to delayed presentation for care, especially from the fourth day and later after onset of symptoms. Despite the underreporting of malaria deaths in Myanmar, those that are registered represent 33% per cent of all reported malaria deaths in the South-East Asia Region in 2010⁴. Among 6 countries in the Greater Mekong Sub-region (GMS) Myanmar reported highest number of malaria deaths in 2010 (75% of total malaria deaths⁵)

3.7 Malaria Outbreaks

The causes of outbreaks in Myanmar are usually multi-factorial, but population migration is recorded as the most frequent cause. They may erupt, when malaria is introduced by migrant workers (e.g. gold miners in Mandalay), while in other areas non-immune migrants may develop outbreak of malaria, moving to endemic areas (e.g. rubber plantation or palm workers in Tanintharyi or prawn farmers in Rakhine).

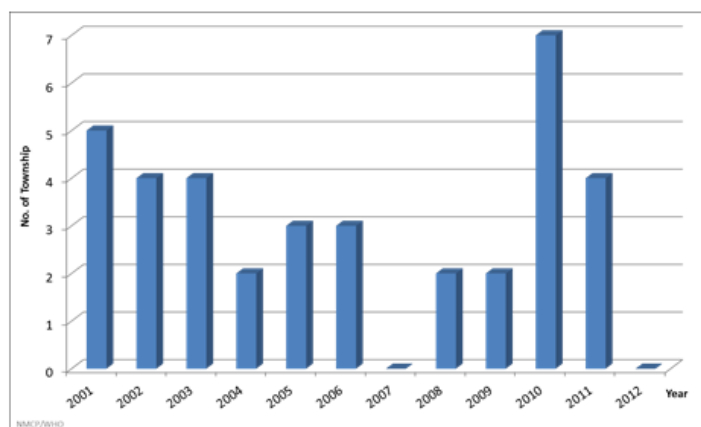
Analysis of recorded outbreaks is summarized in **Figure 9 and Table 7**. The number of outbreaks is lower in recent years, but one disastrous epidemic in 2001 was estimated to have caused nearly 1,000 deaths. However, the number of outbreaks decreased during last five years. No malaria outbreak was reported in 2007. Ecological surveillance and community-based surveillance were emphasized together with case detection, management and preventive measures mainly Indoor Residual Spray in development projects and mass

⁴Malaria Profile 2010: WHO SEARO

⁵Mekong Malaria Profile 2010: WHO Mekong malaria programme

treatment of existing mosquito nets. Early detection and reporting of increased number of malaria cases in certain areas can be done by both NMCP and partner agencies. Taking preventive action with IRS must be done by NMCP and distribution of LLIN for new settlers can be done by all partners. Case finding and treatment for prevention and control of outbreak should be done by all partners in collaborative effort. Field visits in 563 villages of 154 Townships were undertaken by VBDC field staff for implementation of activities for prevention of outbreaks. If malaria is reduced further in many central areas of the country more frequent outbreaks may be expected in the future but it is too early to forecast the probability of such events

Figure 9 **Number of malaria epidemics in Myanmar, 2001-2012**



Source: Vector Borne Disease Control, Ministry of Health, 2013

Table 7 Analysis of Malaria epidemics in Myanmar 2001-2012

Year	No. of Townships affected	No. of villages affected	No. of pop affected	No. of malaria cases	No. of deaths
2001	5	29	13,018	175	12
2002	4	12	11,440	146	1
2003	4	22	28,792	2,236	121
2004	2	4	9,117	366	0
2005	3	4	3,634	477	0
2006	3	17	12,030	1,567	13
2007	0	0	0	0	0
2008	2	2	3,422	212	2
2009	2	4	1,908	371	5
2010	7	8	11,053	2,326	1
2011	4	6	4,428	415	4
2012	0	0	0	0	0

3.8 Malaria distribution in men, women, pregnancy and children

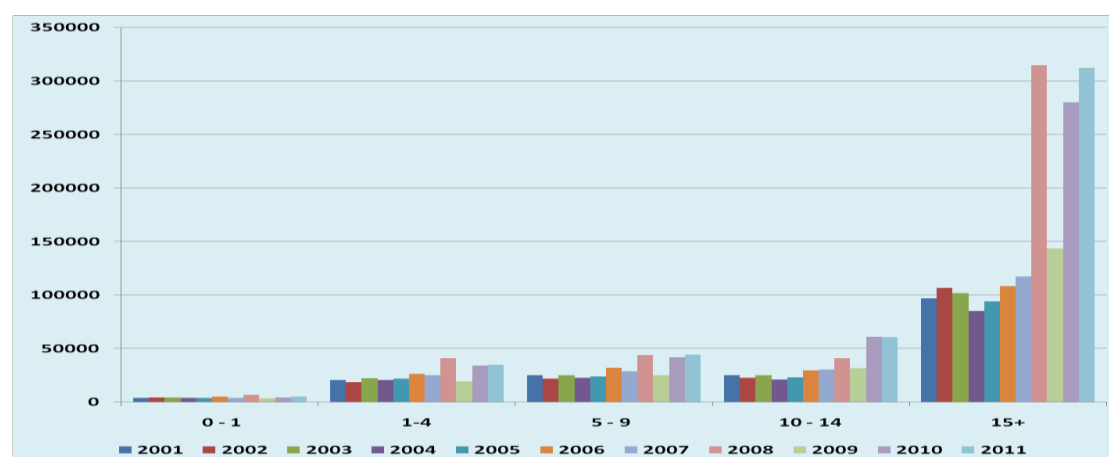
Overall, analysis of the age distribution of reported cases indicates a modest over-representation of young adults among reported malaria cases (**Figure 10 and Table 8**). At all ages below 75 years, males are reported with malaria more than females, with the sex ratio most extreme from 15-54 years.

Based on 2008 unpublished JICA malaria project data in Bago Region, of the 30,049 confirmed cases, 75% are males and 91% are 15 years old and above. Among the latter, 77% are males.

Malaria data base in 2011 indicated that male cases accounted for some 65% of total blood confirmed cases.

The predominance of adult males among malaria cases is a reflection of the high risk of malaria among them due to occupation (e.g., mining, forest related activities, construction, rubber tapping, etc.) that exposes them to malaria.

Figure 10 Age distribution of malaria cases in Myanmar, 2001-2011



Source: Vector Borne Disease Control, Ministry of Health, 2012

Table 8 Age distribution of malaria cases (confirmed by microscopy and RDTs) in 2010

Age group (year)	0-1		2-4		5-9		10-14		15 +		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Exam:	18,373	1.83	83,776	8.33	109,657	10.91	145,050	14.43	648,396	64.50	1,005,252
Positive	4,174	0.99	33,960	8.07	41,654	9.90	60,921	14.48	280,099	66.56	420,808

A review of 17 studies on malaria during pregnancy in Myanmar revealed that the prevalence of pregnant women with clinically suspected malaria was relatively low, contributing about 1-2%

to the total burden of outpatients and inpatients (*Mya Thida, 2002*). The prevalence of malaria parasites were found to be 11% of all antenatal care pregnant women and 12% of all delivery women in conducted in Tachileik, Eastern Shan State and in Thaton, Mon State (*Kay Thwe Han, 2005*). The States and Regions reporting the highest incidence are Rakhine, Kachin, and Kayah. Wide variations in the prevalence of malaria parasitaemia in women attending antenatal care services were reported, ranging from 3% in Tanintharyi Region to 37% along the Thai-Myanmar border, where the majority of the women were asymptomatic and infected with *P. falciparum*. Unfortunately, the high level of parasite resistance to sulphadoxine-pyrimethamine in this area precludes the use of Intermittent Preventive Treatment (IPT).

3.9 Estimation of the true malaria burden in Myanmar, 2006

A precise assessment of the true malaria burden in Myanmar would require a stratified sampling exercise with repeat cross-sectional surveys and sentinel longitudinal studies. This would be feasible and very costly. An alternative would be to use the methods employed in the World Malaria Report 2008 (*WHO/HTM/GMP/2008.1*).

Estimates of the number of malaria cases and fever suspected of being malaria were made by adjusting the reported malaria cases for reporting completeness, the extent of health service utilization and the likelihood that cases are parasite-positive whereas estimates for the number of malaria deaths were made by multiplying the estimated number of *P. falciparum* malaria cases by a fixed case fatality rate for countries outside Africa.

Reported malaria cases are the sum of confirmed cases (confirmed by slide examination or RDT) and probable and unconfirmed cases (cases that were not tested but treated as malaria). National programmes often collect data on the number of suspected cases, those tested, and those confirmed. Probable or unconfirmed cases are calculated by subtracting the number tested from the number suspected.

Reported malaria deaths include all deaths in health facilities that are attributed to malaria, whether or not confirmed by microscopy or by RDT. Reported malaria admissions include all malaria cases admitted to a health facility with a primary diagnosis of malaria, whether or not they are confirmed by microscopy.

Based on the above methods, the estimated and reported malaria cases and deaths for Myanmar by 2006 are summarized below.

The estimated malaria cases and deaths in Myanmar by 2006 were:

Population:	48,379,208
Fever cases:	18,848,076

Malaria cases: 4,209,000

Malaria deaths: 9,000

The reported probable and confirmed malaria cases in Myanmar by 2006 were as follows:

Outpatient malaria cases: 475,297

Inpatient malaria cases: 62,813

Malaria attributed deaths: 1,647

Based on the above estimate and based on the proportion of malaria per age group and gender reported by VBDC in 2005, the estimated malaria episodes per age group and gender are shown in **Table 9**.

Table 9 Estimated malaria episodes by age group and by gender			
Population Groups	Estimated Number*	Source of Data*	Year of Estimate
Episodes of malaria in past 12 months (all population, all ages)	4,209,000	VBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Women > 54 years	125,849	VBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Women 15 - 54 years	980,697	VBDC-WHO	2009 (based on estimated cases in 2006)
Pregnant women infected with malaria in the past 12 months	38,302	VBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Men > 54 years	143,948	VBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Men 15 - 54 years	1,595,211	VBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Girls 5 - 14 years	361,553	sVBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Boys 5 - 14 years	444,470	VBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Girls 0 - 4 years	248,752	VBDC-WHO	2009 (based on estimated cases in 2006)
Episodes of malaria in past 12 months: Boys 0 - 4 years	303,048	VBDC-WHO	2009 (based on estimated cases in 2006)

*The total estimated malaria cases in Myanmar are based on the World Malaria Report 2008 (WHO/HTM/GMP/2008.1; p93). The number of malaria episodes per age group and gender was estimated based on the proportion of malaria per age

group and gender reported by VBDC in 2005.

3.10 Estimation of malaria burden based on data in 2010

WHO provided an updated estimation of malaria burden based on data in 2010 (**Table 10**). No. of cases reported by the Ministry of Health is adjusted and taken into account the following factors: (i) incompleteness in reporting systems (ii) patients seeking treatment in the private sector, self-medicating or not seeking treatment at all, and (iii) potential over-diagnosis through the lack of laboratory confirmation of cases. Calculation is shown in **Table 11**.

Table 10 Estimates of malaria burden in Myanmar in 2010

Items	Population	Remarks
Population	48,010,000	UN population
Estimated number of malaria cases*	1,505,635	Range: 1.35 to 1.66 million
Estimated number of malaria deaths*	3203	Range: 2867 to 3539

*Estimates were made based on country data in 2010. (Not inclusive of INGOs/partners data of 3MDG partners 'data of 2012 and 2013 under MARC and GF PRs - 2012, 13 data)

Table 11 Calculation of estimates of malaria cases and deaths, Myanmar (WHO 2011)

Data Reported by Myanmar in 2010			<u>Notes</u>
A	Total reported cases	649,522	Includes confirmed and "probable" Includes confirmed by microscopy and RDT (excludes community diagnosed cases) As reported in WMR 2011
B	Confirmed cases	420,808	
C	Slide positivity rate (SPR)	37.5%	
D	Reporting completeness	87%	
E	% of cases due to <i>P. falciparum</i>	71%	
Household survey data on where people seek treatment for fever			Myanmar 2000
F	% fever cases using public sector	35%	
G	% fever cases using private sector	46%	
H	% fever cases staying at home	19%	
Case fatality rate for malaria cases due to <i>P. falciparum</i>			CFR assumed for all <i>P. falciparum</i> cases arising, generally 0.15% to 0.45% outside
K	Case fatality rate	0.30%	

Estimated Number of Cases Using Method 1

Estimated number of confirmed cases attending public sector health facilities

B	Confirmed malaria cases reported	420,808
A-B	Total unconfirmed ("probable") cases	228,714
C*(A-B)	Estimated confirmed cases in unconfirmed	85,784
(B+(C*(A-B)))/D = X	Total estimated confirmed cases at government health facilities	582,290

*Africa
(mean 0.3%) and 0.225% to
0.675% for African countries
(mean 0.45%)*

*As reported by malaria control
program above*

Apply SPR to "probable" cases

Adjust for reporting completeness

Estimated number of confirmed cases attending private sector from household survey

Y = X * G/F	Confirmed malaria cases using private sector	765,295
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*Using ratio of public: private
sector from household survey*

Estimated number of confirmed cases staying at home from household survey

Z1 = 0	Confirmed malaria cases among those not seeking treatment (lower limit)	0
Z2 = X * H/F	Confirmed malaria cases among those not seeking treatment (upper limit)	316,100
Z = (Z1 + Z2)/2	Confirmed malaria cases among those not seeking treatment (point estimate)	158,050

*Assuming all malaria cases seek
treatment (i.e. fever cases that
stay at home are not malaria)
Assuming those who stay at home
are just as likely to be malaria as
those who seek treatment*

*Mid-point of upper and lower
limits*

Total estimated number of cases

I1 = X + Y + Z1	Total number of cases (lower limit)	1,347,585
I2 = X + Y + Z2	Total number of cases (upper limit)	1,663,685
I = X + Y + Z	Total number of cases (point estimate)	1,505,635

*Total of cases in public sector +
private sector*

+ those not seeking treatment

Estimated number of *P. falciparum* cases

J1 = I1 * E	Total number of <i>P. falciparum</i> cases (lower limit)	955,585
J2 = I2 * E	Total number of <i>P. falciparum</i> cases (upper limit)	1,179,735
J = I2 * E	Total number of <i>P. falciparum</i> cases (point estimate)	1,067,660

*Total number of cases multiplied
by*

*percentage due to *P. falciparum**

Estimated Number of Deaths Using Method 1

$M1 = J1 * K$	Estimated number of deaths (lower limit)	2,867	Number of <i>P. falciparum</i> cases multiplied
$M2 = J2 * K$	Estimated number of deaths (upper limit)	3,539	by case fatality rate
$M = J * K$	Estimated number of deaths (point estimate)	3,203	

3.11 Drug Resistance Problem in Myanmar

The Thailand-Myanmar border has long been associated with the development of antimalarial drug resistance, first to chloroquine (1950s), sulphadoxine-pyrimethamine (1970s) and mefloquine (1990s). Artemisinin derivatives were introduced and endorsed in the first National Treatment Policy of Myanmar in 2002. However the scaled up of artemisinin based combination therapy was seen during the implementation of the Three Diseases Fund (3DF) Project which commenced in 2006 and followed by the support from the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM) starting in 2011 and MARC/3DF project in 2011.

In 2009-2010, Myanmar reported suspected artemisinin resistance that was believed to flow from the Thai-Cambodia multi-drug resistant foci. The evidence of artemisinin resistance characterized by prolonged parasite clearance time was observed in several sentinels of routine therapeutic efficacy studies on antimalarial drugs. The suspected evidence was observed in several states/regions border with Thailand. Based on WHO working definition (2011) for detection of artemisinin resistance, the country classified areas according to evidence of artemisinin resistance as follows:

WHO's working definition for detection of artemisinin resistance (2011)

- an increase in parasite clearance time, as evidenced by 10% of cases with parasites detectable on Day 3 after treatment with an ACT (suspected resistance); or
- Treatment failure after treatment with an oral artemisinin-based combination therapy with adequate antimalarial blood concentration, as evidenced by the persistence of parasites for 7 days, or the presence of parasites at Day 3 and recrudescence within 28/42 days (confirmed resistance).

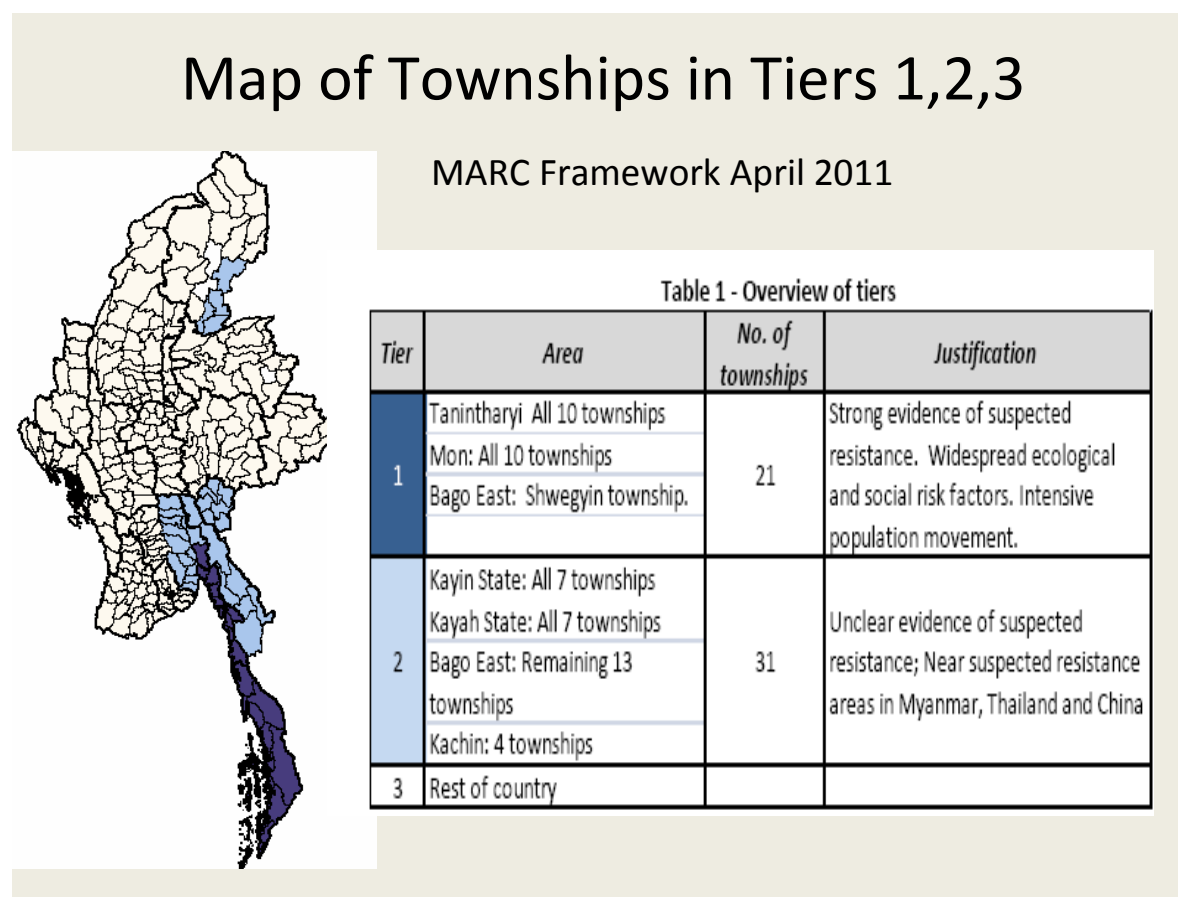
Absolute confirmation of artemisinin resistance can be established only when artemisinins are used alone, preferably with measures of the artemisinin blood concentration. A generic marker of artemisinin resistance has not yet been identified, so that it is impossible to confirm the presence of artemisinin resistance in a molecular marker study.

Zonation of Myanmar as per WHO Global Plan for Artemisinin Resistance Containment (GPARC) in 2011. All affected states with strong evidence of suspected resistance included Shwegyin

township in Bago (East) Region, all 10 townships in Tanintharyi Region and all 10 townships in Mon State (altogether 21 townships) are classified as Tier 1.

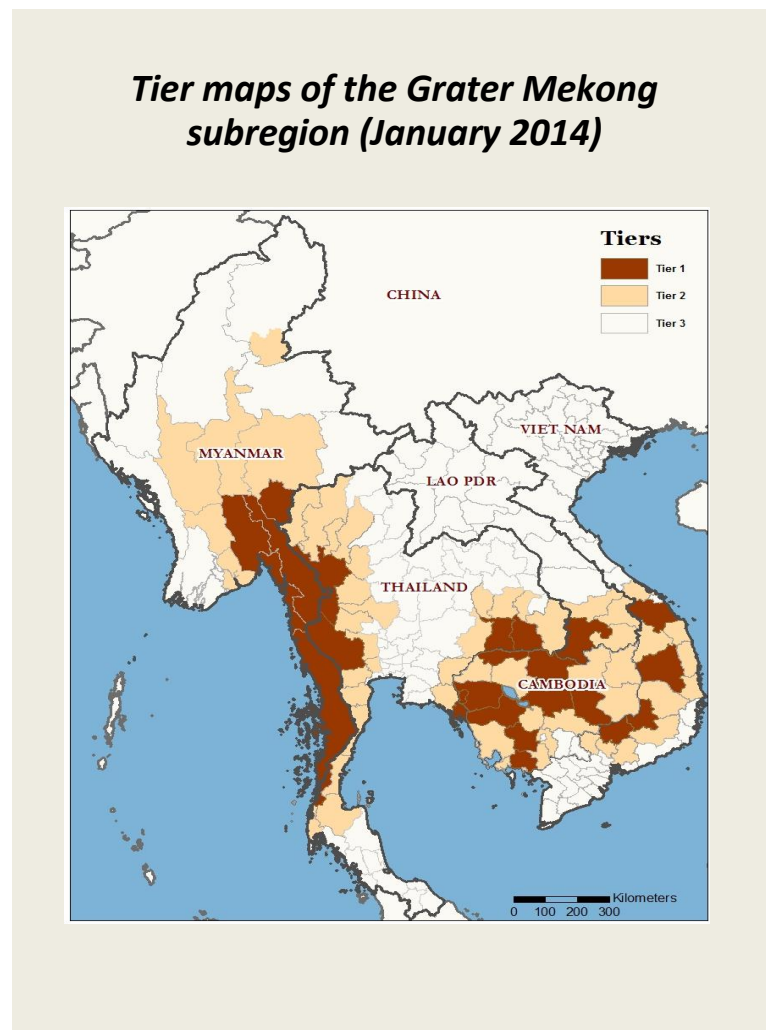
Tier 2 which was classified as area with unclear evidence of suspected resistance or having boundary with Tier 1 areas. This included all 7 townships of Kayin state, all 7 townships of Kayah state and remaining 13 townships of Bago East (altogether 31 townships) as the **Map 5**.

Map 5 Zonation according to artemisinin resistance in 2011



According to the TES findings in 2012, it is still on discussion stage among partners to update the Zonation of the drug resistant areas. The Malaria Technical and Strategy Group (TSG) meeting held at February 2014 accepted the revised Zonation i.e.; all 52 townships mentioned above will be in Tier 1 and the adjacent States and Regions of Tier 1 will be Tier 2, so Southern Shan State, Mandalay, Magway, Bago West and Yangon Regions are reclassified as Tier 2. The revised zonation of the Greater Mekong Sub-Region (GMS) is shown in the map below (Figure: The recent finding (reference) indicated that emergence of Artemisinin resistance foci might be independent.

Map 6 Tier maps of the Greater Mekong Sub-region (January 2014)



4 National response to malaria problem

4.1 Policies and interventions

The malaria control strategy in Myanmar is in accordance with the Global Malaria Control Strategy promoted by WHO and adopted at the Ministerial Meeting in Amsterdam in 1992, namely:

- a. To provide early diagnosis and prompt treatment of malaria, wherever it occurs.
- b. To plan and implement selective and sustainable preventive measures, including vector control.
- c. To prevent or detect early, or contain malaria epidemics.
- d. To strengthen local capacity in basic and applied research to permit and promote the regular assessment of countries' malaria situation, in particular the ecological, social and economic determinants of the disease.

They also reflect the Regional Strategy for Malaria Control in the WHO Region for South-East Asia (WHO/SEARO 2005), based on the following guiding principles:

- a. Advocacy for Asian malaria.
- b. Revamping surveillance.
- c. Strengthening planning and management.
- d. Reaching out and empowering the population at risk of malaria, recognizing that malaria has become limited to distinct groups such as remote populations, ethnic minorities and migrants.
- e. Establishing and sustaining broader partnerships with other disciplines, sectors and organizations.
- f. Developing specific strategies to tackle *Plasmodium vivax* malaria.
- g. Increasing coverage and proper use of insecticide-treated nets (ITNs) as a part of Integrated Vector Management (IVM).

In 2010, due to the emergence of Artemisinin resistance in several states/regions at the border with Thailand (e.g. Thanintharyi, Mon and Bago East, etc) a strategy to contain resistance was developed through consultation with partners. The Myanmar Artemisinin Resistance Containment Framework (MARC) was endorsed in April 2011. The detailed containment strategy is shown in a separate document⁶. The Containment is regarded as a part of the National Malaria Control Strategy. The interventions under the containment operations are primarily targeted in the artemisinin affected areas.

⁶Myanmar Artemisinin Resistance Containment (MARC) Framework, MOH/WHO 4-5 April 2011

4.2 Review of the national malaria control programme performance

4.2.1 Prevention by vector control methods

Based on the available entomological information in Myanmar, integrated vector control measures are necessary. Wide scale use of ITNs/LLINs is a key malaria prevention strategy and complementary to other appropriate vector control strategies.

4.2.1.1 Insecticide-treated nets/Long-lasting insecticidal nets (ITNs/LLINs)

A national policy and implementation strategy to scale-up the appropriate use of ITNs/LLINs for malaria prevention and control in Myanmar was developed in 2003 and updated in 2009. The objective is to ensure that 80 per cent of the populations in moderate and high risk areas are protected by ITNs/LLINs by the year 2015. In 2011, due to the emergence of the Artemisinin resistant *P. falciparum* in the southern part of Myanmar, it was recommended to interrupt transmission of *P. falciparum* by universal (100%) coverage and usage of insecticide treated bed nets (either long-lasting insecticidal nets or treated conventional nets) in all targeted areas (Tier 1 areas). Long-lasting Insecticidal Nets (LLIN or ITN) can importantly reduce malaria transmission, but its efficacy will depend on intensity of transmission (the higher the more effective), vector behaviour (in- or outdoor biting, time of maximum biting rates), human behaviour (outdoor social and occupational activities) and other factors. In addition, it is critical that insecticide-treated nets are provided to mobile and migrant population groups by all partners. In order to maximize protection and interrupt malaria transmission NMCP also combined indoor residual spraying with ITN/LLIN. Started in 2011, NMCP carried out annual spraying rounds in highly endemic villages in tier 1 area.

Previously, populations in these risk areas were identified and mapped through survey for micro-stratification. Aside from free treatment of existing mosquito nets before the start of the peak transmission season, the following complementary strategies are recommended to reach this goal and target:

- a. Free distribution of ITNs/LLINs to populations at risk.
- b. Social marketing for demand creation and stimulating the local commercial market.
- c. Emergency relief for displaced populations affected by natural or human-made disasters in malaria-risk areas.

In many areas in Myanmar, there is a culture of mosquito net use but this is highly variable, with low ownership and use rates among some of the population groups, most exposed to malaria. Families purchase nets from the local market, at prices ranging from about USD 3.00 for a single net to USD 5-6.00 for a family size net. This cost however is likely to be a barrier to net ownership for the poorest families.

Experience in the past fifteen years in different parts of the world, including Myanmar, showed that ITNs/LLINs are effective against malaria. Based on five community-randomized trials, a Cochrane review concluded that, when full coverage is achieved, ITNs reduce all-cause child mortality by 17% on average compared with no nets (relative rate (RR) 0.83, 95% confidence interval (CI) 0.76–0.90), in sub-Saharan Africa (1). This implies that, in general, 5.5 lives could be saved per year for every 1000 children under 5 years of age protected.

The review also concluded that ITNs reduce clinical episodes of uncomplicated malaria caused by *Plasmodium falciparum* and *Plasmodium vivax* by 50% (range 39–62%), as well as reducing the prevalence of high-density parasitaemia. One study showed a 45% reduction in the incidence of severe malaria. Protection against forest malaria has recently been demonstrated in the Amazon region and in Cambodia (2), which confirms that personal protection against malaria is an important aspect of the action of ITNs/LLINs.

A recent review of ITN/LLIN programmes/projects in South-East Asia and the Pacific indicated that there are *a priori* no epidemiological zones or "malaria types" or vectors for which ITNs/LLINs would not contribute to malaria control. Where ITNs/LLINs appear to fail, this is in many cases due to human behaviour factors related to coverage, proper and consistent use of ITNs/LLINs. These barriers are not insurmountable; appropriate policy and effective implementation of sound strategies could overcome them.

Local studies have shown that the use of ITNs/LLINs is effective and acceptable particularly in areas where the vectors are *An. dirus* and *An. minimus*. One study in a coastal area gave disappointing results, probably due to early biting of the main vector there, *An. sundaicus*. However, *An. minimus* and *An. dirus* are the principal vectors in the moderate and high risk areas and together are responsible for the vast majority of malaria cases.

Many families in Myanmar do already use mosquito nets, but the coverage is highly variable. In 2002, a situation analysis in 15 townships in the eastern part of the country revealed that 81 to 97 per cent of families owned mosquito nets, and on average each family owns 2 mosquito nets of various sizes and materials (4). In other parts of the country, mosquito net ownership is as low as 20% and as high as 90% (4). Washing of mosquito nets is not so frequent to significantly limit the effectiveness of the insecticide on the nets.

Recent study in Mandalay Region and Northern Shan State showed that of the 1,859 households surveyed, 1,633 (87.8%) use at least one mosquito net, 68% - 85% slept inside a mosquito net the night before the survey, and 85.8% (range: 81% – 93%) of the nets used were purchased with private money (i.e., not provided by the project). A survey in 2008 in 160 malaria endemic and hard-to-reach villages in Chin State, Kachin State and Sagaing Region showed that 91% of households owned mosquito nets and on an average each household has 2 mosquito nets.

A periodic net survey was conducted in 2011 in 9731 households from 40 villages in 9 states/regions revealed that 93.2% of households owned any kind of mosquito net (treated and retreated). Of those who owned mosquito net, 24.5% owned one net, 34.5% owned 2 nets, 23.6% owned 3 nets and 17.4% owned four or more nets. Total mosquito net ownership per person was lower in Rakhine State and Shan State than in other regions and it was the highest in Mon State and Bago Region (>98%). It was found that 20% of households had at least one LLIN/ITN. An average of 17.6% of population slept under the ITN/LLIN in the previous night (highest in Rakhine and lowest in Sagaing, 34.1% and 2.6% respectively)

To protect the populations at risk in remote communities where retreatment of mosquito nets is difficult and ownership often low, provision of long-lasting insecticidal nets (LLINs) is essential. Identification and estimation of these groups for targeted distribution of LLINs will be done through microstratification of malaria endemic areas in consultation with the Township and Village Health committees.

VBDC purchased insecticides for retreatment and conducted retreatment campaigns in targeted high risk areas in cooperation with WHO. UNICEF distributed about 240,000 ITNs to populations at risk since 2002. There is also a UNICEF-supported “Crash Programme” of Universal Children Immunization (UCI) operating in 50 townships where access to health services is particularly difficult. In these areas, “Supplementary Outreach Services (SOS)” are provided to increase immunization coverage. This strategy now provides retreatment of existing bed nets services as well as distribution of LLINs. INGOs such as CESVI, World Concern, and Care have all been involved in ITN and retreatment activities. PSI is implementing ITN social marketing projects, including the sale of deltamethrin retreatment kits - “SupaTab®”. However, few families in rural areas access these products due to fact that families have to pay for the products and they also do not perceive the benefits of retreatment. PSI discontinued social marketing of deltamethrin tablet (K-O- Tab®) in 2014 and distributed only LLINs. The outputs related to insecticide treatment of existing mosquito nets as well as the numbers of LLINs distributed are reflected in **Table 12**. However the “effective” coverage of the endemic population in the country is therefore still low (5.65% and 19.99% of households have at least one ITN/LLIN in 2008 and 2011, respectively). The net coverage in subsequent years has increased significantly.

Table 12 Number of mosquito nets treated and LLINs distributed Myanmar, 2003-2011

ITN Program in Myanmar

Year	S/D	Tsp	Village	Household	Population	Distribution of LLIN	Impregnation of Treated nets		
							No. of nets Treated	Permethrin 50%EC(L)	KO Tab
2003	13	35	682	264735	1257163	60895	76802	615	0
2004	12	50	1146	95506	488467	62631	118441	948	0
2005	12	46	593	310331	1165207	14295	208591	0	208591
2006	17	65	3095	362142	1717810	0	453890	0	453890
2007	13	39	2608	235353	1212684	127384	202630	0	202630
2008	12	53	3827	431498	1337052	71605	374079	0	374079
2009	15	89	8356	812419	4048480	213027	1115725		1115725
2010	14	91	5396	554843	2078154	329421	448843		448843
2011	16	98	7685	738922	3449641	551107	1062723		1062723

KO Tab = Deltamethrin 25% [1.6 gm]

Source: Vector Borne Disease Control, Ministry of Health, 2012

A periodic net survey conducted in 2012 in six states and seven regions covering 12,334 households in 445 villages of 51 townships revealed that 97.3% had any kind of nets. In all States and Regions, at least 94% of the population slept under mosquito nets. In Rakhine State, the practice of sleeping under mosquito nets among heads (87.9%) of the households and the wives (91.9%) was lower than other Regions and this finding is similar to the finding in 2011. The proportion of sleeping under the mosquito net among over five years children was at least 92% which is higher than the proportion in 2011. The coverage of the ownership of at least one LLIN/ITN was 73.5% of households and 63.8% slept under LLIN/ITN last night. The result showed a notably high increase in the ownership of at least one LLIN/ITN (19.9%) and sleeping under LLIN/ITN last night (17.6%) reported in the similar survey conducted in 2011.

In view of the existing body of evidence and the burden of malaria as a public health problem in Myanmar, rapid scale-up of the appropriate use of ITNs/LLINs is planned to be undertaken in the most malarious areas, except where there is clear evidence that ITNs/LLINs do not contribute to malaria prevention.

With reference to long lasting insecticidal nets (LLINs) and conventional insecticide-treated nets (ITNs), there is evidence that the former is becoming cheaper (due to increasing supplies) and are more cost-effective as operational cost of retreatment is not required. In the meantime mass treatment of existing nets with long-lasting insecticidal tablets is another option since

millions of nets already exist and mass treatment could be easily done. Although it was considered earlier, NMCP has chosen LLIN for distribution instead of retreatment of nets with long lasting insecticide tablets in the second phase of GF Round 9 (2013 onward) because of LLIN is more cost-effective (LLIN has almost equal price as long lasting insecticidal tablets and there is no operational cost for retreatment for 3 years). Therefore, treatment and retreatment of existing bed nets activity by NMCP has been generally stopped since 2013. PSI also discontinued retreatment of nets and completely shifted to LLIN in 2014.

Conclusions

Although mosquito net ownership is high, there are concerns regarding whether existing nets are being used properly and in a consistent manner to achieve effective malaria prevention. Malaria control staff observed that, in general, existing mosquito nets are not carried when men go to the forest for work. Sometimes this is because workers travel by themselves and leave their families at home, and therefore prefer to leave the nets behind for the family to use. There is also the issue of the quantity of supplies that need to be carried when traveling for work. Sometimes whole families temporarily migrate from lowlands flooded during rainy season to the forest where they are at high risk of malaria, and who bring with them their mosquito nets needing to be treated.

The NMCP also encounters considerable difficulties in estimating and locating the highly varied, often not organized groups of migrants, who could have been protected with ITNs/LLINs at the right time and place. In drug resistance containment areas, LLINs were distributed to the migrants by NMCP and some INGOs that are working at the particular sites.

The national policy and implementation strategy to scale-up ITNs/ LLINs for malaria control (2003) has been updated (**Annex 2**) taking into account changes in the national, regional and global policies, lessons learned, and available new products. This review will also include the need to focus now on full coverage of populations in high and moderate malaria risk areas with ITNs/LLINs. The policy of distribution of LLIN is 1 LLIN for 2 person* and it is applied to all population at risk, not differentiated among areas (i.e. regardless of level of malaria risk). For operational purpose it was suggested that budgeting for procurement of LLINs at the ratio of 1 LLIN for 1.8 persons.

There is need for operational research into:

- a. Innovative vector control methods and strategies to protect migrant and forest-related workers in view of the current low ITNs/LLINs coverage level among this population at risk of malaria.
- b. Vector ecology and impact of interventions as *An. sudaicus* is primarily an exophillic and exophagic vector, raising questions relating to the effectiveness of ITNs/LLINs and IRS in areas where this vector predominates.

To assess the continued effectiveness of vector control interventions in Myanmar, vector susceptibility monitoring to pyrethroids and other insecticides will be critical to adequately inform the NMCP, particularly the selection of insecticides for vector control.

4.2.1.2 Indoor Residual Spraying (IRS) and other vector control methods

Regular IRS was suspended since 1993 due to various reasons (i.e. high operational and insecticide cost, vector resistance to insecticide, community acceptability, supervision, environmental pollution, amongst others). Selective IRS is indicated for rapid containment during outbreaks and epidemic prone situation for outbreak prevention in new settlements, development projects in malaria risk areas and localized areas of multiple drug resistant *P. falciparum* malaria by NMCP.

The number of outbreaks decreased during the last five years. No malaria outbreak was reported in 2007 [Table 13 (a)]. Field visits in 563 villages of 154 townships were undertaken by VBDC field staff for implementation of activities for prevention of outbreaks. Ecological surveillance and community-based surveillance were undertaken.

Other vector control measures such as larvivorous fish and environmental management are applied in very limited areas, where experience has indicated that they are effective.

Table 13 (a) Outputs of Indoor residual spraying in Myanmar, 2007

Indoor Residual Spray Activity in Myanmar

Year	S/D	Tsp	Villages	Camp	House & Structures	Population Covered	Used of DDT75% [kg]	Used of Malathion 50%EC[L]
2003	8	20	53	17	7932	44075	2772	209
2004	7	19	19	29	4165	19764	1945	-
2005	4	13	48	17	4934	32840	2472	-
2006	4	6	32	4	6116	33391	1119	247
2007	5	10	9	9	1484	6536	245	-

Source: Vector Borne Disease Control, Ministry of Health, 2009

IRS in combination with ITN/LLIN is recommended in artemisinin resistance affected areas (Ref: MARC Framework April 2011) in order to maximize protection to population at risk. IRS activities from 2009-2013 was updated in Table (13-b). The NMCP adopted the insecticide policy on delay of insecticide resistance and considered choosing insecticides for IRS different

from what is being used for ITN/LLIN. However, till now the insecticides used for IRS remains synthetic pyrethroids (same as ITN/LLIN) until there is enough field evidence on safety and efficacy of other chemical classes.

Table 13 (b) Outputs of Indoor residual spraying in Myanmar, 2009-2013

Year	S / R	Tsp	Village	Camp	Houses & Structures	Population Covered	DDT Use (Kg)	Malathion Use (Lt)	Alphacy-permethrin (Fendona®) (Kg)
2009	6	9	6	12	1580	8871	330	-	32
2010	4	9	25	3	2497	10639	1084	-	91
2011	1	2	2	3	331	1036	-	-	21
2012	4	6	58	1434	9368	56414	-	320	318
2013	2	2	2	2	680	3902	50	843	-

Source: National Malaria Control Programme, Ministry of Health, 2014

Conclusion

The policy of selective IRS is still unchanged focusing in areas of outbreaks, development projects in endemic areas and new settlements. IRS is recommended to apply in combination with ITN/LLIN in artemisinin resistance affected areas in order to maximize protection to population at risk. But there is no clear cut instruction on choosing villages or size of areas to be sprayed. Up till now, villages with high number of malaria cases in drug resistance containment areas were chosen for spraying in combination with LLIN distribution.

4.2.2 Disease management

Early diagnosis and prompt effective treatment is the main intervention to reduce the duration and severity of malarial disease and prevent malaria mortality. Due to high levels of parasite resistance in Myanmar, only artemisinin-based combination therapy (ACT) can be considered effective for falciparum malaria. ACTs offer the advantage that they kill all parasite stages, thus preventing treated humans from transmitting parasites to mosquitoes. In contrast, vivax malaria can, despite the documentation of rare cases of resistance, still be treated with chloroquine. To avoid relapses, it is necessary to supplement chloroquine treatment with 14 days of primaquine.

In 2002, the national malaria treatment policy was developed, and this was updated in 2008 (*Annex 3*). Treatment guidelines and guidelines for clinical management of severe malaria were also developed and widely distributed to general practitioners. The policy was based on the following principles:

- a. Falciparum malaria cases should be treated with ACTs. The preferred ACT is artesunate + mefloquine. Since 2005, artemether-lumefantrine has been deployed as an alternative ACT.
- b. Vivax malaria cases should be treated with chloroquine for 3 days and primaquine for 14 days to prevent relapse.
- c. Malaria during pregnancy is treated with quinine + clindamycin in the first trimester, and ACTs in the second and third trimesters.
- d. Severe malaria is treated with quinine, artesunate or artemether.
- e. If confirmatory diagnosis is not available, clinically suspected malaria cases should be treated with ACT in high transmission areas.
- f. Microscopy of blood-slides is the preferred diagnostic tool, but is currently available only up to the township level, though in some areas also at station hospitals as well as some rural health centre (RHCs).
- g. Rapid diagnostic test (RDT) (HRP2-based) for detection of falciparum malaria should be used, where microscopy is not available.
- h. Given financial and operational constraints, the priority is to deploy RDTs and ACTs to townships with the highest malaria burden.
- i. Diagnosis and treatment of malaria is free in the public sector.

In early 2011, minor revisions of drug policy were made as follows:

- 1) A single dose of primaquine is prescribed to all blood confirmed falciparum cases
- 2) All vivax malaria cases detected by village health volunteers should receive chloroquine and primaquine . An eight week dosage of primaquine is preferred in order to reduce risk of intravascular haemolysis in G-6-PD deficiency patients.

In December 2014, drug policy was further updated as follows:

- 1) Three ACTs (AL, DP and AM) continued to be recommended for treatment of *P. falciparum* cases and only their fixed dose combinations are endorsed
- 2) Artemisinin monotherapy was completely removed from second-line drug for *P. falciparum* treatment failure cases and substituted by an alternate ACT or a 7-day course of quinine in combination with doxycycline or clindamycin or tetracycline
- 3) A single dose of primaquine at the dosage of 0.75 mg/kg is prescribed to all blood confirmed falciparum cases and mixed infections with Pf on Day 0 without prior G6PD deficiency test.

- 4) Directly observed therapy (DOT) is introduced for all Pf cases in artemisinin resistance affected areas.
- 5) All *P. vivax* cases are treated with chloroquine and 14 days primaquine in all instances, except treatment of *P. vivax* by volunteers that 8-week course is applied. Contraindication of primaquine in infants under 6 month, pregnant women and G6PD deficiency patients remained unchanged.
- 6) Observation of Day 3 parasitaemia is introduced and encouraged especially in artemisinin resistance suspected areas.
- 7) ACTs are recommended for pregnant women who have severe falciparum malaria in the first trimester
- 8) Standby treatment is recommended among migrants in remote areas where diagnostic facilities are not available. However RDT is strongly recommended. The drug of choice is one of the recommended ACTs.

(Details in **Annexes 3 and 4**)

4.2.2.1 Diagnosis

Prior to 2010, diagnosis based on clinical history and physical examination was widely practiced due to difficult access to both microscopy and RDTs. Even in facilities with microscopy and RDTs, health care providers treated malaria patients based on clinical diagnosis. At present time, records indicate that there are at least 700 malaria microscopy centres nationwide, plus the basic laboratory services in 330 township hospitals shifting clinical diagnosis to confirmed diagnosis by microscopy or RDT. However, it is estimated that only about 60% are fully functional, and the quality needs to be further strengthened. The number of microscopes distributed in 2006 was 720. The five year (2001 to 2005) average number of smears examined and cases detected were 461,725 and 166,900, respectively, with average positivity rate of 36%. A quality assurance system operated jointly by the National Health Laboratory (NHL) and VBDC was initiated in 2005 with support from WHO and JICA, and it is being further strengthened with support from WHO Mekong Malaria Programme and the Asian Collaborative Training Network for Malaria (ACTMalaria) starting in 2009. It is continued to be strengthened with the support of the 9th round Global Fund and New Funding Model.

The NMCP is one of the biggest users of RDTs in the Greater Mekong Sub-region. The programme promotes the use of RDTs by trained health care providers in peripheral health facilities without microscopy, by trained village health volunteers (VHV), and in hospitals during the period when microscopists are not available. Private medical practitioners are also encouraged to use RDTs. The reported number of RDTs distributed by the programme increased from 18,000 in 2001 to 60,925 in 2005, 504,050 in 2006, over 800,000 in 2011 and 958,925 in 2013. However, systematic recording and reporting of results started only in 2005 in 12 townships supported by WHO. When RDTs were introduced into the country, only falciparum RDTs were available and some clinically suspected cases whose RDT results were negative were treated with chloroquine (probable cases). In 2011 the Combo type RDTs that

can detect *P. falciparum* and *P. vivax* (or non- Pf species) were introduced to substitute falciparum RDTs.

Regarding the quality assurance of RDTs, the NMCP in collaboration with Department of Medical Research and with support from WHO, set up a quality assurance system. Only WHO prequalified RDTs should be procured. Transport and storage of RDTs are important for the quality of RDTs. Starting from 2011 a number of cooler boxes were distributed for pilot testing for storage of RDTs as well as drugs in remote health facilities (RHCs, SCs). This simple tool was proven practical and effective in many countries especially Cambodia.

Conclusion

Previously, the coverage of diagnosis of malaria by microscopy and RDTs was low both in the public and private sectors. In the environment of constrained resources, limited availability of effective antimalarial medicines and looming prevalence of multidrug resistant *Plasmodium falciparum*, verifiable diagnosis of malaria is critical. But, after 2005, the utilization of Pf RDT by both public and private sectors increased due to increasing number of volunteers in all partners with support of the 3DF/3MDG. Starting from 2011, with the support of the 9th round Global Fund, Combo RDTs has replaced *P. falciparum* RDTs following the recommendation of TSG meeting in 2010. It is useful in circumstance where microscopy is not readily available (e.g. at the community level) for *Plasmodium vivax* malaria detection. It is also useful for phasing out clinical diagnosis and treatment of clinically suspected cases. However, the quality assurance/control of both microscopy and RDTs is of concern to all implementing partners.

4.2.2.2 Treatment practices

The policy on the use of ACTs was adopted in 2002, and updated in 2008 (*please see Annex 3*). However, the adherence to the malaria treatment policy is not uniform due to their limited availability and high costs. Approximately 60 - 75% of suspected malaria patients receive treatment from private sector. Various kinds of antimalarial medicines are available in the private sector (private clinics, medicine stores and vendors), including artemisinin derivatives. Reports indicate that substandard and/or fake artemisinin products are widely available in the private market. Artesunate and artemether medicines are widely used as monotherapy. The use of injections even for those who tolerate oral medications is common both in the public and private sectors.

ACTs are distributed to malaria endemic townships and in hospitals throughout the country. Antimalarial medicines are imported into the country from different sources, with the support of a number of international partners (GFATM, JICA, MSF, PSI, UNICEF, WHO, amongst others). The NMCP is responsible for forecasting antimalarial medicines and other supplies based on epidemiological data and past consumption. The programme also provides and distributes antimalarial medicines, RDTs, laboratory accessories and other supplies to township level

through State/Region Malaria Control Teams. The reported ACT treatment courses distributed by the NMCP increased during the past three years from 22,972 in 2004, to 32,312 in 2005, 275,067 in 2006 and the latest figure in 2013, 374,607. These do not, however, include the quantity used by INGOs and the private sector.

According to the rough calculation of the programme (at the starting of the 9th round GFATM), the average number of probable and confirmed malaria cases is 700,000. If only 50 per cent of cases do attend the public sector health facilities, based on the treatment seeking behaviour study, then the total estimated cases per year are $700,000 \times 2 = 1,400,000$ cases. In the World Malaria Report 2008 (*WHO/HTM/GMP/2008.1*), the estimate number of malaria cases in 2006 was 4,209,000 million. The better estimation should be obtained from health facility survey.

Adherence to malaria treatment guidelines is a challenge in public sector, even among doctors. Similar challenge exists in private sector. MMA and WHO, with support from Three Diseases Fund, are working together to address those challenges.

Conclusion

Only about 25% – 40% of suspected malaria patients seek care in the public health facilities in Myanmar. It is evident that there is a need to improve the quality of malaria diagnosis and treatment practices, both in the public and private sectors.

4.2.2.3 Quality control of antimalarials

The quality of antimalarials is more compromised in the private sector than in government services, where most antimalarial medicines are supplied by reliable sources (UN and bilateral agencies). Samples of antimalarials are not regularly collected for testing due to financial and human resources (e.g. qualified pharmacists) constraints. The antimalarial medicine quality monitoring project (supported by JICA and WHO) started in 2004. Three Minilab[®] test kits were provided to VBDC. WHO provided high performance liquid chromatography (HPLC) to FDA. A group of VBDC staff were trained to perform sampling and screening tests on antimalarial medicines up to 2012. But, after the development of Department of Food and Drug Administration (separated from DOH), these tasks are carried out by the staffs of FDA Department. United States Pharmacopeia (USP) has started to perform quality control of medicines including antimalarials in collaboration with FDA Department since 2013. More Minilab[®] test kits were provided through the 3DF/3MDG, GFATM (RAI Project) as well as donated by several donors in 2013-2014. During the same period USP through financial support of USAID-PMI provided technical support on training FDA staff on various aspects.

4.2.2.4 Financing in public services

The major sources of finance for health are the Government and the private households. Government annually increased health spending on both current and capital. Total

Government health expenditure increased from kyats 464.1 million in 1988-89 to 100,824.6 million kyats in 2011-2012 (**Table 3**). In principle, most malaria patients receive diagnosis and treatment free of charge from the public sector. Hospitals can also give essential drugs and basic laboratory tests in free of charge in 2013-2014.

4.2.2.5 Training

In 2006, the programme made huge investments in training private practitioners (50), volunteers (140), microscopists (720) and basic health staff (10,951), with support from JICA, UNICEF, WHO and GFATM. Different numbers of trainees were reported in 2013, with support of the 9th round Global Fund, such as 5871 hospital staffs, 470 VBDC staffs, 3156 volunteers and 5612 times of Continuing Medical Education sessions were conducted. VBDC staffs such as malaria supervisors and permanent spraymen were also locally trained. VBDC staff also received technical assistance and some financial support for training through Asian Collaborative Training Network for Malaria (ACT Malaria)⁷. More investments are needed to train the Basic Health Staffs, hospital medical officers and the private general practitioners on case management of malaria in accord with the national malaria treatment guidelines.

4.2.3 Malaria surveillance and information systems

4.2.3.1 Surveillance and management information systems

Malaria is one of the 17 Diseases under National Surveillance (DUNS) in the integrated disease surveillance system reported monthly through the Department of Health. Another information system through the Department of Health Planning includes sentinel surveillance from 29 township hospitals. However, VBDC also has a separate reporting system. Though it is widely recognized that parallel systems are far from optimal, the VBDC system is needed to collect timely, detailed and complete information used for planning and monitoring.

The VBDC reporting includes malaria morbidity and mortality data, laboratory activities for malaria diagnostic and other prevention and control activities, and is prepared on a monthly basis by the basic health staff under the supervision and guidance of the Township Medical Officer. The reports are sent to respective state/regional VBDC teams as well as to the central VBDC for special activities such as LLIN distribution.

The VBDC is working on improving the timeliness of the data consolidation and analysis to support decision making, planning and resource allocation. Furthermore, plans are being developed to ensure that data collected by the NGOs in their malaria projects are included in the township and national reports.

⁷<http://www.actmalaria.net/home/>

A malaria sentinel Therapeutic Efficacy Surveillance (TES) system at 6 sites was established in 2003 jointly by VBDC and the Departments of Medical Research with the support from WHO. In 2009, the sites were increased to 7. In 2010-2011, there were three participating research institutes, Departments of Medical Research, Upper and Lower Myanmar and the Defense Services Medical Research Centre. More details on the monitoring and evaluation can be seen in the National Monitoring and Evaluation plan 2010-2015 (**Annex 7**).

4.2.3.2 Microstratification

Malaria is a focal disease; thus, it is essential in malaria control to identify the areas and populations at high risk, which must be prioritized for preventive measures. Over the past 2 years, the VBDC, UNICEF and WHO developed an approach to microstratification, which reflects practical experiences from the country and other South-east Asian countries with similar problems. 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. The malarious areas are then sub-classified as high, moderate or low risk. This approach has been pilot-tested and refined in collaboration with VBDC, UNICEF, and WHO. With support from UNICEF, micro-stratification was finished in 80 townships with high malaria burdens (**Table 14**). It is now included in the UNICEF support to malaria control in 80 townships, in training courses, and stratification exercises carried out “bottom-up” from sub-rural health centre level to state/regional level. The criteria for classification are described in detail in **Annex 1**. As indicated in **Table 17**, this classification then makes it possible to determine interventions, the target populations and prioritize them. It thereby provides a basis for micro and macroplanning as well as allocation of resources.

Table 14 Results of Microstratification in 80 Townships, Myanmar, 2007-2008

Results of Micro-stratification in 80 townships					
Sr.	Stratum	Villages	Households	Population	%
I	Stratum 1 (Malarious Area)				
	1. a (High risk villages)	5,727	440,009	2,596,030	25
	1. b (Moderate risk villages)	3,961	475,248	2,897,630	28
	1. c (Low risk villages)	3,129	409,187	2,437,786	23
	Total Malarious Area	12,817	1,324,444	7,931,446	76
II	Stratum 2 (Potential Malarious Area)	1,858	227,455	1,306,152	13
III	Stratum 3 (Non Malarious Area)	1,503	195,991	1,152,508	11

Results of Micro-stratification in 80 townships					
Sr.	Stratum	Villages	Households	Population	%
	Total 80 Tsp	16,178	1,747,890	10,390,106	100

Source: Vector Borne Disease Control, Ministry of Health, 2009

In 2011, with the financial support from the 9th round GFATM, similar survey was conducted in 50 townships in 14 states (except Magway and Kayah) and results are displayed in **Table 15**.

Table 15 Results of microstratification in 50 Townships, Myanmar in 2011

Results of Micro-stratification in 50 townships					
Sr.	Stratum	Villages	Households	Population	%
I	Stratum 1 (Malarious Area)				
	1. a (High risk villages)	1,249	127,785	707,458	12
	1. b (Moderate risk villages)	862	113,028	632,869	11
	1. c (Low risk villages)	604	89,610	445,126	8
	Total Malarious Area	2,715	330,423	1,785,453	31
II	Stratum 2 (Potential Malarious Area)	930	86,350	454,688	8
III	Stratum 3 (Non Malarious Area)	3,675	703,297	3,592,354	61
	Total 50 Tsp	7,320	1,120,070	5,832,495	100

Source: Vector Borne Disease Control, Ministry of Health, 2012

Based on field survey results, criteria of microstratification and projection the VBDC estimated the population at risk in Myanmar as below (**Table 16**).

Table 16: Population Living Under Various Malaria Risk Areas in State/Region (2011)

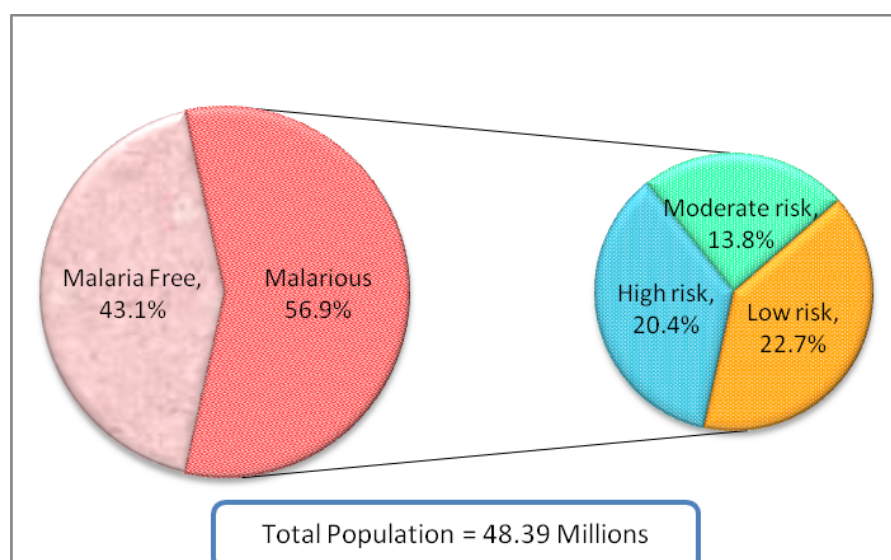
Sr	State/ Region	High Risk			Moderate Risk			Low Risk			No Risk			TOTAL	
		Ward/ Village	Population	%	Ward/ Village	Population	%	Ward/ Village	Population	%	Ward/ Village	Population	%	Ward/ Village	Population
1	<i>Kachin</i>	33/ 1028	889414		51/ 31	382848		26/ 33	242156		17/0	106282		127/1092	1620700
2	<i>Kayah</i>		125142	41.7		94845	31.6		79692	26.6			0		299679
3	<i>Kayin</i>	803	540424	37.0	559	490067	33.6	475	429613	29.4	0	0	0	0	1460104
4	<i>Chin</i>	200	315031	66.1	164	150745	31.6	59	10898	2.3			0	474	476674
5	<i>Mon</i>	138	64111	3.04	197	154030	7.3	664	1006066	47.7	382	886696	42.0	1381	2110903
6	<i>Rakhine</i>	1494	692795	22.0	1249	1070952	34.0	1251	1383901	43.9	0	0	0	3994	3147648
7	<i>ESS</i>	0	104878	17.1	0	81522	13.3	0	425573	69.5	0	0	0	0	611973
8	<i>SSS</i>	101/ 3410	1503126	63.07	46 / 781	688945	28.9	8 / 456	191288	8.0			0	154 / 4772	2383359
9	<i>NSS</i>		704848	34.3	858	809956	39.4	588	217891	10.6	29	321043	15.6	0	2053738
10	<i>Sagaing</i>	0	1804327	34.9	0	976025	18.9	0	2384757	46.2	0	0		0	5165109
11	<i>Tanintharyi</i>	750	624339	44.5	357	402197	28.6	148	293628	20.9	33	83671	5.9	1289	1403835
12	<i>Bago East</i>	360	228338		351	265641		712	566864		1474	1844236		2897	2905079
13	<i>Bago West</i>	0/ 953	423853	21.2	0/744	317063	15.8	0/ 1429	677745	33.9	96/686	580184	29.0	96/3794	1998845
14	<i>Magway</i>	757	418991	9.6	2483	2049902	46.8	601	566555	12.9	1140	1343339	30.7	4981	4378787
15	<i>Mandalay</i>	9/ 1267	1083479	17.3	65/61	238809	3.8	61/ 177	1644091	26.2	273/2207	3313277	52.7	408/5528	6279656
16	<i>Yangon</i>	154	89537	1.5	68/1841	42836	0.7	258/0	37501	0.6	326/2067	5799539	97.1	2477	5969413
17	<i>Ayarwaddy</i>	1637	769503	12.2	712	515090	8.2	1625	734282	11.6	7554	4298104	68.0	10510	6316979
Grand-total			10382136	21.4		8731473	17.9		10892501	22.4		18576371	38.2		48582481

Source: Vector Borne Disease Control, Ministry of Health, 2012: Population size is based on HMIS.

Remark: The 9th round GFATM project was initially planned based on this micro-stratification.

Distribution of population at risk according to microstratification in 2012 is shown in Figure 11.

Figure 11 Proportion of population at risk of malaria, Myanmar 2012.



Source: VBDC annual report 2012

Table 17 Recommended interventions by stratum classification

Stratification		Key Interventions				
		Insecticide treatment of existing mosquito nets & promotion of their use	Provision & promotion of the use of LLINs	Indoor residual spraying	Early diagnosis & appropriate treatment	Behavior change communications
Stratum 1 Malarious villages	Stratum 1a High risk villages	Yes, 1 st priority	Yes, first priority	In selected areas, 1 st priority	Yes	Yes
	Stratum 1b Moderate risk villages	Yes, 2 nd priority	Yes, 2 nd priority	In selected areas, 2 nd priority	Yes	Yes
	Stratum 1c Low risk villages	Yes, 3 rd priority	To encourage to buy their own LLINs	In case of outbreak	Yes	Yes
		Combination of ITN/LLIN and IRS in artemisinin resistance affected areas				
Stratum 2 Potentially malarious villages		Yes, for those who will temporarily stay in malarious villages	To encourage those who would stay temporarily in endemic areas to buy	In case of outbreak	Yes	Yes

Stratification	Key Interventions				
	Insecticide treatment of existing mosquito nets & promotion of their use	Provision & promotion of the use of LLINs	Indoor residual spraying	Early diagnosis & appropriate treatment	Behavior change communications
		their own LLINs			
Stratum 3 Non-malarious villages	Yes, for those who will temporarily stay in malarious villages	To encourage those who would stay temporarily in endemic areas to buy their own LLINs	No	Yes	Yes

Source: Vector Borne Disease Control, Ministry of Health, 2011

4.2.4 Behaviour Change Communications, and Social Mobilization

One of the main strategies for malaria control programme in Myanmar is Information, Education and Communication (IEC). It aims to educate and raise awareness of the target population for the malaria prevention and control. Advocacy is also an important part of the BCC to mobilize support for malaria prevention and control programme.

WHO, UNICEF and JICA support the NMCP in all aspects of malaria control, including IEC issues. There are various IEC materials, for example posters, pamphlets and television spots. Some of them were produced in six main languages, including Shan and Kayin. WHO worked with NMCP to develop IEC strategy and tools for the Shan (in Eastern Shan State). UNICEF assisted NMCP and PSI to develop a communication programme focusing behaviour change in malaria prevention through mobile video unit and conduct BCC sessions at community level. JICA developed an IEC plan for the Ko Kant ethnic groups in Northern Shan State and selected population in Bago Region. There are also several national NGOs that can play important roles in malaria control and prevention.

In 2007, WHO, in collaboration with VBDC and in consultation with agencies working in malaria control, developed a *“Communication and Social Mobilization for Malaria Prevention and Control in Myanmar” (Annex 5)*. It serves as the framework for BCC activities since then. Moreover, WHO hired BCC consultants (national and international) to support partners in BCC training and in designing their BCC strategy and materials.

In 2012, the External Programme Review Team recommended as follows:

Regarding Advocacy;

- (1) Advocacy should be clearly defined to distinguish it from IEC and BCC.
- (2) More advocacy efforts should be directed towards other sectors within Myanmar (such as tourism) and cross-border cooperation.
- (3) Advocacy should be included in a revised communication and social mobilization strategy for malaria prevention and control in Myanmar (budget, human resource requirements, and implementation strategies)

Regarding IEC/BCC;

- (1) The WHO plan for communication and social mobilization for malaria prevention and control in Myanmar should be updated in close collaboration with the NMCP.
- (2) All stakeholders, including public and private sector media operators and the Health Education Bureau should be included in IEC/BCC.
- (3) The VBDC should be provided with the resources to coordinate implementation of the plan. Overall coordination should not be outsourced to NGOs, but include them as partners.

According to the recommendations, NMCP – prepared the “Addendum of Communication and Social Mobilization for Malaria Prevention and Control in Myanmar” (**Annex 5.1**)

5. Stakeholder analysis

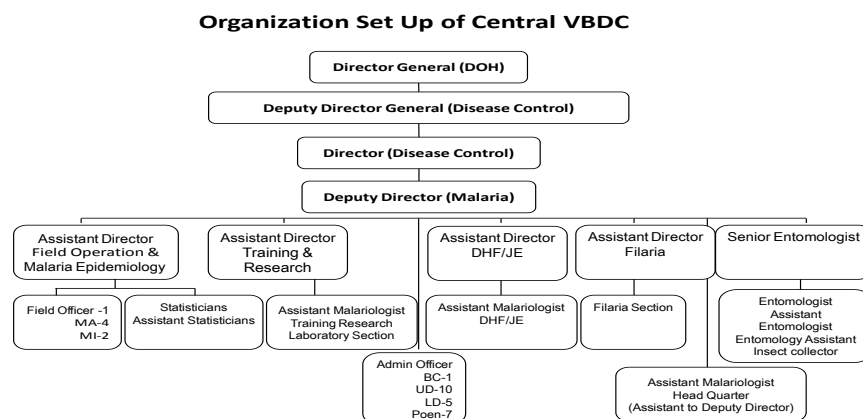
5.1 Vector Borne Disease Control Programme (VBDC), Ministry of Health

The National Malaria Control Programme (NMCP) is implemented by the VBDC Programme, which is part of the Department of Health of the Ministry of Health.

At central level (**Figure 12**), the VBDC programme is mandated to formulate plans, policies, standards and norms related to malaria control, provide training, conduct operational research, control of outbreaks, and provide consultative and advisory services to implementing agencies. In recent years, VBDC issued a national antimalarial treatment policy, standard case definitions, core epidemiological and operational indicators and implementation strategies for scaling-up insecticide-treated nets (ITNs).

A Malaria Technical and Advisory Group (TAG) was established by the Department of Health in collaboration with WHO in 2002. The TAG has evolved into the Malaria Technical and Strategy Group (TSG) in 2005. Its mandate includes formulation of policies regarding treatment, the use of ITNs and the management of malaria during pregnancy, as well as the appropriate selection and use of RDTs, quality assurance of microscopy, and the selection of indicators for monitoring and evaluation of the programme and recommend them for approval by MOH.

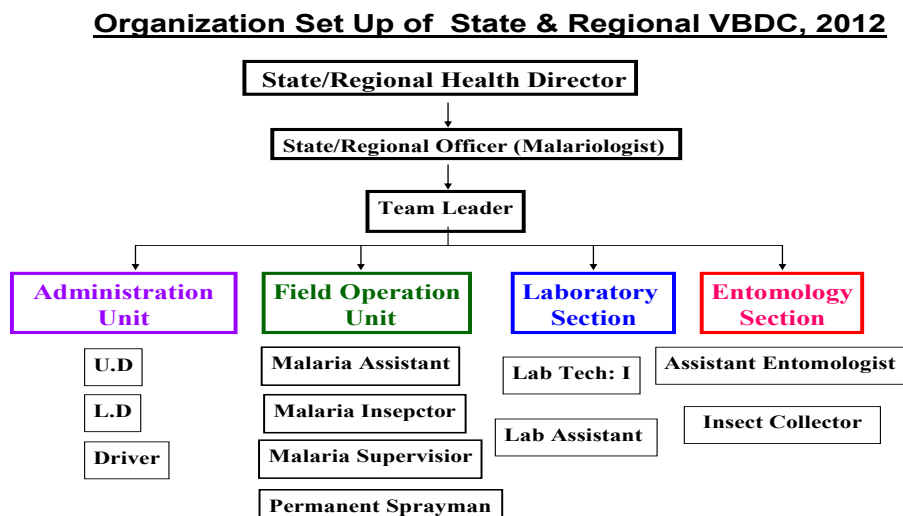
Figure 12 Organogram of the Central Level of VBDC, Myanmar, 2012



Source: Vector Borne Disease Control, Ministry of Health, 2012

At state/regional level (**Figure 13**), VBDC is responsible for the control of malaria, under the supervision of the State/Regional Health Director. The Medical Officers lead the State and Regional level VBDC teams which consist of field sections, laboratory sections and entomological sections. These teams have responsibilities for supervision, and monitoring of implementation at lower levels.

Figure 13 Organogram of the State/Regional Level of VBDC, Myanmar, 2012

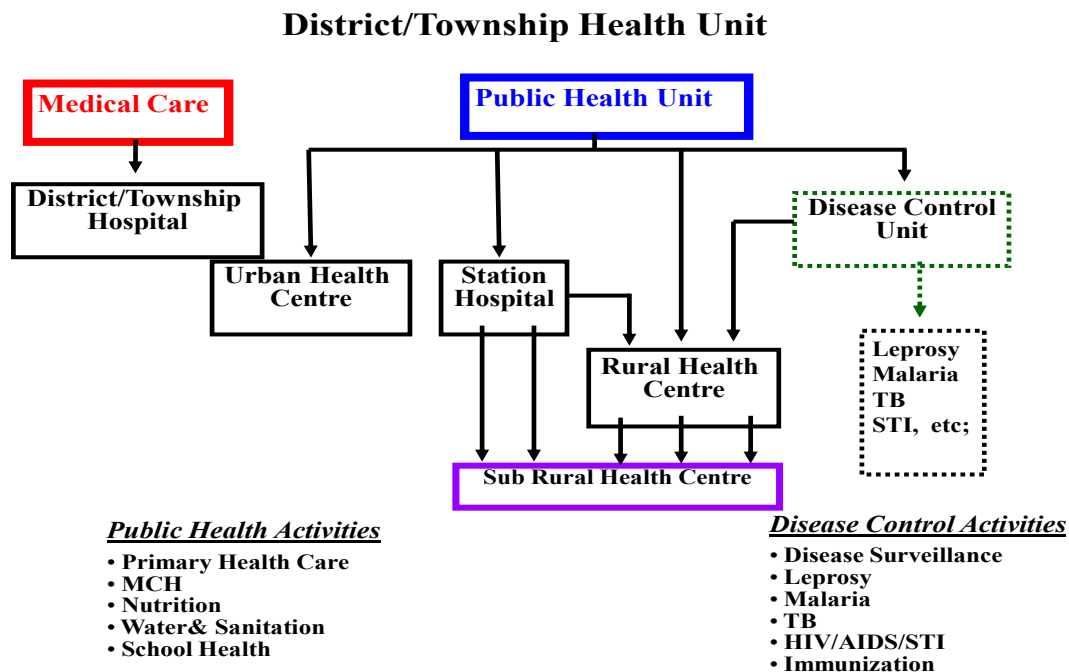


Source: Vector Borne Disease Control, Ministry of Health, 2012

At district/township level (**Figure 14**), the malaria control programme is integrated into the basic health services, where the township medical officers supervise the implementation of malaria control and prevention interventions within the townships, station hospitals, RHCs and sub-centres. The VBDC staff compliment in each endemic township comprises a malaria assistant (MA), malaria inspector (MI), malaria supervisor (MS) and permanent sprayman (PS).

A laboratory technician is posted to each township hospital and selected station hospitals to perform basic laboratory services including malaria microscopy. In all station hospitals and in some selected RHCs, VBDC established malaria microscopy services. The quality of microscopy remains to be objectively assessed but anecdotal reports indicate that only about 50% of the established services are fully functional.

Figure 14 Organogram of the District/Township Level of VBDC, Myanmar, 2012



Source: Vector Borne Disease Control, Ministry of Health, 2012

Beyond the sub-centres, the basic health services are provided through outreach work by the health workers and health volunteers. Some of the special activities are implemented by the State/Regional VBDC team.

The details of the VBDC human resource complement are summarized in **Table 18**, which indicates the number of sanctioned post of which about 60-70% are filled. Thus, the real total staff complement would be around 1,600, a figure, which compares reasonably well with that of neighbouring countries based on the size of the malaria risk population. Difficulties in transport and communication limit the scope of supervisory and coordination role that senior VBDC staff can play in improving malaria control.

Table 18 Manpower compliment, VBDC, Ministry of Health, Myanmar, 2011

Manpower of VBDC staff at Central, State/Region and township Level

Sr	Designation	Central	State/Region	Township	Total
1	Deputy Director	1	-	-	1
2	Malariologist (Assistant Director)	4	9	-	13
3	Senior Entomologist	1	-	-	1
4	Senior Medical Officer	2	-	-	2
5	Administrative Officer	1	-	-	1
6	Medical Officer	4	12	-	16
7	Statistician	1	-	-	1
8	Entomologist	6	1	-	7
9	Field Operational Officer	1	-	-	1
10	Medical Technologist	2	-	-	2
11	Branch Clerk	1	-	-	1
12	Assistant Statistician	2	-	-	2
13	Sub-Assistant Engineer	1	-	-	1
14	Assistant Entomologist	4	15	-	19
15	Malaria Assistant	3	22	25	50
16	Senior Technician	1	-	-	1
17	Health Assistant	1	-	-	1
18	UD Clerk(Account)	4	8	-	12
19	Store Clerk	2	4	-	6
20	Technician Grade I	11	34	-	45
21	Malaria Inspector	2	22	82	106
22	Mosquito Inspector	4	-	-	4
23	Upper Division Clerk	5	-	-	5
24	Ento: Technician	2	-	-	2
25	LD Clerk (Account)	-	2	-	2
26	Ento: Assistant	3	5	-	8
27	Technician Grade II	8	-	-	8
28	Mosquito Dissector(Filaria)	1	-	-	1
29	Microscopist(Filaria)	1	-	-	1
30	Lower Division Clerk	5	10	-	15
31	Typist	4	3	-	7
32	Insect Collector	11	35	-	46
33	Malaria Supervisor	2	46	517	565
34	Soravman(Permanent)	16	84	350	450
35	Soravman(Temporary)	22	-	780	802
36	Others	85	102	-	187
Total		224	414	1754	2392

Source: VBDC, 2011

Conclusion

To allow for more effective response to the malaria problem in Myanmar as well as to increase the effectiveness of VBDC, decentralization of management to the operational level of the health care delivery system i.e. the township level is critical. This will ultimately lead to improved management practices through greater delegation of responsibility and authority. It should be noted that the latter needs to include district and township level management capacity strengthening interventions. In addition, operation support to VBDC, such transport, would additionally contribute of the improved effectiveness of VBDC.

5.2 *International partners*

5.2.1 The United Nations Children's Fund (UNICEF)

During 2001-2005, UNICEF supported NMCP to improve quality and access to integrated basic health care package, treatment of diarrhea, ARI, parasitic diseases, malaria, dengue and tuberculosis. Some of the resources were obtained through fund raising activities from JICA and AUSAID. UNICEF provided inputs to 80 Townships with a population of 10 million, and 50 of these include high transmission areas. UNICEF supplied large quantities of ITNs, re-treatment kits and IEC materials. UNICEF promotes innovative strategies for procurement and distribution, with supportive supervision and monitoring. Since 2006, malaria control is a distinct project within UNICEF. Microstratification at township level has now become the main tool for planning, monitoring and evaluation which promotes decentralized planning. In this context, capacity strengthening strategies are being developed. Data generated with support from UNICEF comprised national under five mortality survey in 2003, maternal mortality survey in 2005 and national micronutrient survey in 2005. UNICEF has provided significant and practical support, especially with regards to addressing issues of better monitoring of supplies through supplies monitoring officers. This is indeed helpful in terms of greater national accountability for assistance.

5.2.2 Japan International Cooperation Agency (JICA)

There is very limited bilateral support, although some countries indirectly provide support through multilateral and INGO mechanisms. JICA has a special programme of support, addressing key bottlenecks to better malaria control. A long-term expert is provided since June 2003, with short-term experts (about four per year) in epidemiology, social anthropology, community health and quality control for diagnosis, visiting the country. A community-based project is supported in Oak Pho Township in West Bago Region. Based on a malariometric survey, entomological and socio behavioural studies, the Township is stratified into the following:

- a. high transmission area with transmission in the villages;
- b. moderate transmission areas with only seasonal malaria;
- c. malaria in male forest workers and temporary migrants;
- d. low transmission areas; and
- e. non-transmission areas.

The project has successfully piloted the use of RDTs and ACTs as well as promotion and re-treatment of ITNs by CHWs. The use of insecticide-treated blankets is now being explored for people entering the forest. JICA has also strengthened the epidemic preparedness in the Myanmar-China border area in Kokant Special Region, and provided training on Geographical Information System (GIS) in collaboration with WHO, as well as supported FDA with a thin layer chromatography for quality control of medicines. JICA's support also focuses on better understanding of the risk factors for malaria in the changing environment, developing township capacity for planning and management and testing the efficacy of interventions. While the project is of a small-scale nature, it provides valuable information for the national programme.

5.2.3 The World Health Organization (WHO)

WHO provides technical collaboration through two International Staff (Medical Officer and Technical Officer) and three National Professional Officers as well as staff and consultants from the WHO Regional Office for South-East Asia (WHO/SEARO), the Mekong Malaria Programme (based in Bangkok) and the Global Malaria Programme (GMP) of WHO Headquarters (WHO/HQs). Since 2013, the Mekong Malaria Programme has been transformed to the Regional Network on Emergency Response to Artemisinin Resistance (ERAR) in the Greater Mekong Sub-region (GMS) with the Regional Coordinator based in Phnom Penh of Cambodia which serves as a regional hub of ERAR. This collaboration comprises assistance in preparing a strategic plan, a national malaria treatment policy, a national ITN policy, recommendation on malaria control during pregnancy, monitoring and evaluation. Further, this collaboration contributed to research capability strengthening in the area of monitoring parasite resistance and quality of antimalarials, small grant proposal development for TDR, GFATM, MARC and Regional Artemisinin resistance Initiative (RAI) proposals. WHO also provides support in the area of local and overseas training in different areas of malaria prevention and control. Over many years, WHO supports cross-border collaboration, especially between Myanmar and Thailand. During 2004-2006 WHO administered a grant from Germany for procurement and distribution of RDTs and ACTs. WHO provides essential support to the programme, and its role as an external neutral source of technical advice and a facilitator among other partners is critical given the limited engagement of outside support and the limited access afforded to partners.

5.2.4 International Organization for Migration (IOM)

IOM is working in Mon State and Kayin State for implementation of prevention and case management through community volunteers through malaria microscopy units and mobile clinics. IOM distributes LLINs and implements mass net treatment campaigns, improves and expands early malaria diagnosis and treatment to migrant people in remote and hard to reach areas.

5.2.5 International Non-Governmental Organizations (INGOs)

More than 30 INGOs work in the health sector in Myanmar. Several INGOs are involved in malaria control activities as well as artemisinin resistance containment. Under UNOPS (as Principal Recipient of the Global Fund-New Funding Model); National Malaria Control Programme (NMCP), along with several national NGOs such as Myanmar Council of Churches (MCC), Myanmar Red Cross Society (MRCS) and Myanmar Medical Association (MMA) are working for the intensified malaria control activities. UNOPS is also taking responsibility as Principal Recipient (PR) of the Regional Artemisinin Initiative (RAI) in GMS under which NMCP, MMA, Merlin, American Refugee Committee (ARC) and Medical Action Myanmar (MAM) are working for the country component of the RAI project. Under the Save the Children (PR of the Global Fund-New Funding Model for INGOs), Cesvi, Health Poverty Action, International Organization for Migration (IOM), Malteser International, Population Services International (PSI), Save the Children International-Myanmar/ Merlin and World Vision International are working for the intensified malaria control activities. The partners of the 3MDG are MAM, World Concern (WC), Burnet Institute, Community Partners International (CPI, etc.) The CPI is mainly working with CBOs/ local NGOs so that it can also reflect in civil society chapter. University Research Co., LLC and Malaria Consortium are also new partners in 2012 and 2013 respectively.

University Research Co., LLC (URC)

URC is currently implementing the USAID-President Malaria Initiative (PMI) supported project on Control and Prevention of Malaria (CAP-Malaria). The geographical distribution and the area of work of INGOs working on malaria are shown in **Map 7**. The contributions of INGOs include diagnosis and treatment through mobile clinics and fixed health facilities, support to MOH structures for malaria diagnosis capacity development and malaria treatment, and diagnosis and treatment through community health workers (CHW). Quality assurance of malaria microscopy, quality assurance in franchise networks, supervision, monitoring and evaluation at the field and central levels are also included.

Community Partners International (CPI)

Community Partners International (CPI) has experience in working with ethnic based organizations and community based organizations for more than 15 years in different

types of public health interventions. In 2013, CPI started its operation officially in Myanmar and launched a malaria control programme under 3MDG support, which brings (previously) border-based ethnic health organizations such as Karen Department of Health and Welfare (KDHW), Mon National Health Committee (MNHC), Karenni Mobile Health Committee (KnMHC), Burma Medical Association (BMA), into mainstream Myanmar Artemisinin Resistance Containment (MARC) strategy. Besides, faith-based organizations such as Kachin Baptist Convention and Karen Baptist Convention also participate in this programme. As of September 2014, CPI is reaching more than 200,000 population in ethnic areas for malaria control activity.

Burnet Institute

Burnet Institute is also working with CBOs/religious organization called Karuna Medical and Social Service working in 9 townships of MARC Tier 1 and 2 areas.

Malaria Consortium

In 2013, Malaria Consortium opened an office in Yangon and implemented projects in the following areas: Surveillance, monitoring and evaluation, disease prevention and treatment, drug and insecticide resistance management, health systems strengthening and quality of services, operational research, and malaria elimination. Malaria Consortium delivers sustainable, evidence-based health programmes that combat preventable communicable diseases, including malaria and neglected tropical diseases, and childhood illnesses.

Cesvi

Cesvi is working for intensified malaria control activities in Northern Shan State, Mandalay Region and Kachin State. The organization trained and supported 720 volunteers to implement malaria prevention and case management services, distributed LLIN and conducted advocacy and social mobilization for LLIN distribution, bed net impregnation campaign, and uptake of early diagnosis and treatment services.

Health Poverty Action

This organization is working at Kachin State and Shan State continuing implementation of malaria activities started under PR China Global Fund grant. They mainly target underserved populations for both malaria prevention and control activities and support 80 health centers, 80 private providers, 10 mobile teams and 430 village volunteers to deliver services.

Malteser International

Malteser is working at Maungdaw Township in Rakhine State. Malaria activities being carried out are case detection, diagnosis and treatment of malaria through 40 CHWs. Two mobile teams comprising 1 nurse and 1 health educator will closely supervise and support the work of the CHWs, including clinical examination of patients if and when required and distribution of LLIN to targeted villages.

Population Services International (PSI)

PSI is working several states/regions, such as Ayeyarwady, Bago, Chin, Kachin, Kayin, Magway, Mandalay, Rakhine, Sagaing, Shan and Yangon. Its main roles are communication campaign, implementation and support on social marketing of RDTs and antimalarial drugs, building capacity of and implementing diagnosis and case management through 850 private practitioners and over 1000 volunteers.

Save the Children International-Myanmar/ Merlin⁸

Save the Children International – Myanmar is working at Sagaing Region, Chin State and Magway Region. The activities are implementation of malaria prevention and case management focused on ethnic groups, hard to reach areas and high risk population; distribution of LLIN, mass treatment campaigns and community mobilization activities through volunteers and village health teams. It supports and trains 575 community health workers and 1000 village health team members.

Save the Children also serves as the second Principal Recipient⁹ of 9th Round GFATM grant (subsequently topped up by the New Funding Model Grant in 2013) and distributes grants to INGO subrecipients.

World Vision International (WVI)

This organization is working at Tanintharyi Region, Kayah State and Chin State. WVI implements malaria prevention and case management in MARC areas through 350 volunteers, develops and delivers behavior change communication activities, trains and supports community health volunteers and health committees to improve case detection, treatment and control.

United State Pharmacopeial Convention (USP)

The United States Pharmacopeial Convention (USP) a nonprofit scientific organization based in USA. USP has opened its office in Myanmar in 2013 and works in collaboration with FDA Department for promoting the quality of medicine programme (PQM) including antimalarials drugs.

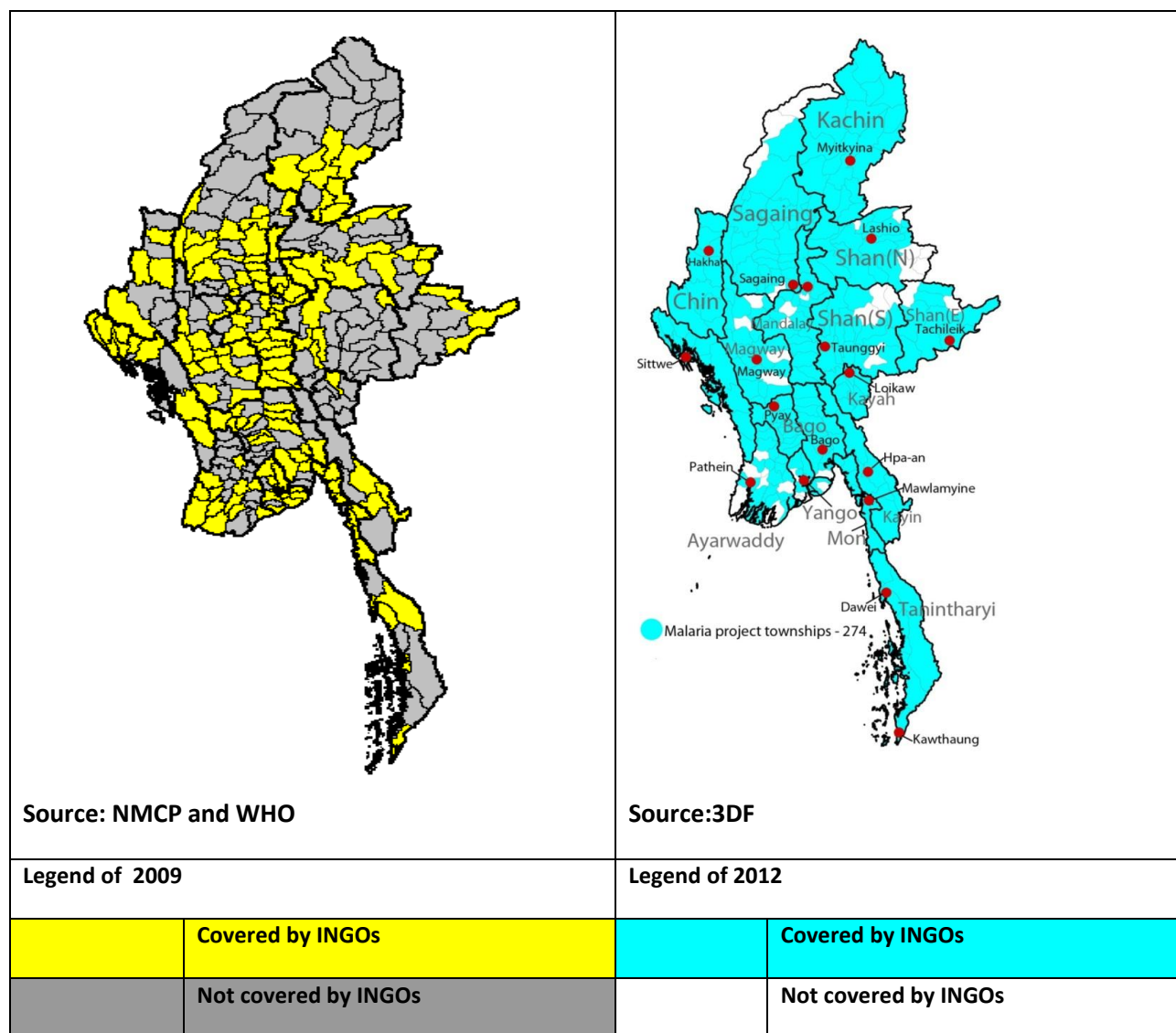
- Besides INGOs that are based in Myanmar, there is an INGO that contribute to malaria control but do not have local office in Myanmar is Asian Collaborative Training Network for Malaria (ACTMalaria). It is a network founded in 1996 by the National Malaria Control Programmes of 10 countries. At present there are 11 member countries and the network has 2 main roles; providing collaborative training for member countries to meet the needs of malaria control in Southeast Asia and

⁸ Merlin merged with Save the Children International – Myanmar in 2013

⁹ There are 2 principal recipients for the 9th Round GFATM: UNOPS and Save the Children

Mekong valley; improving communications among member countries on malaria problems affecting common borders.

Map 7 Geographical distribution of INGOs, Myanmar, 2009 and 2012



5.2.6 Three Millennium Development Goal (3MDG) Fund¹⁰

The Three Millennium Development Goal (3MDG) Fund is a Multi Donor Trust Fund primarily established as 'The Three Diseases Fund -3DF in August 2006, following the termination of the Global Fund projects on 3 diseases in 2005. The six primary donors of 3 Diseases Fund are: European Commission (EC), Department for International Development (DFID) of U.K., Australia's Aid Programme (AusAID), Norway, Netherlands and Sweden. The overall objective is *to reduce the burden of communicable disease in Myanmar*. Its purpose is to resource a programme of activities to reduce transmission and enhance provision of treatment and care for HIV & AIDS, TB and malaria for the most

¹⁰ 3MDG is the 2nd phase of 3DF (2006-2012)

in need populations. The Donor consortium has appointed a Fund Board to act as a working committee on behalf of the donors. The Fund Board has oversight of the Fund Manager, UNOPS, and is responsible for development and operational aspects of the 3DF. Until 2010 (prior to the return of GFATM with its 9th round grants) 3DF was the biggest source of financial support for malaria control in Myanmar.

In 2013, the 3DF under its name in the second phase as '3MDG' has broadened its scope to cover 3 health related Millennium Development Goals (MDGs 3, 4 and 5) which include maternal, new born, child health programmes, and health system strengthening as well as continue to support the 3 diseases (HIV/AIDS, Tuberculosis and Malaria). Since January 2013, 3MDG has been contributing to the containment of artemisinin resistance in Myanmar (following the support of 3DF on rolling out containment during July 2011 to December 2012). It is the second largest financial support for malaria control in Myanmar.

5.2.7. President's Malaria Initiative (PMI)

The US Government through USAID has supported malaria control efforts in the GMS since 2000. This work has focused primarily on antimalarial drug resistance monitoring and drug quality surveillance. In 2011, the President's Malaria Initiative (PMI) expanded to the Mekong with the overall goal of limiting the spread of multidrug resistant malaria in the Region. More specifically, PMI aims 1) to strengthen malaria prevention and control interventions in focused areas with existing or emerging artemisinin resistant malaria; 2) to ensure effective drug efficacy surveillance networks to monitor artemisinin resistant malaria throughout the GMS, and 3) to monitor the quality of antimalarial drugs throughout the GMS and build country capacity to curtail the availability of sub-standard or counterfeit drugs.

In support of the National Malaria Strategic Plan, PMI works closely with the National Malaria Control Programme and in collaboration with other development and implementing partners to intensify and scale-up malaria case management, control, and elimination efforts in selected geographic areas with emerging artemisinin resistance. In addition to improving the quality of malaria services provided at health facilities (both public and private), communities, and hard-to-reach populations, PMI generates strategic information through strengthening of monitoring, evaluation, surveillance, and operational research, including monitoring for antimalarial drug quality and therapeutic efficacy.

While initial PMI priority intervention areas focused on specific border areas between Thailand, Cambodia and Myanmar, PMI remains vigilant of the changing epidemiology and emergence and spread of artemisinin resistance, which could jeopardize the utility of our currently most effective antimalarial drug as well as undermine all the progress achieved in the past decade in the region and beyond.

5.3 National civil society partners

There are some 23 national NGOs in the country: Mass Membership Organizations (2), Professional Organizations (4), Faith-based (12) and Community-based Organizations (5). They focus on a broad range of activities such as health care assistance, education assistance, community development as well as environmental reservation in different geographic areas of the country.

The strength and capacity of the national NGOs differ from one to the other as described in subsequent paragraphs. Even though the national NGOs have different infrastructure, resources and background, they have a vision to provide humanitarian assistance to the Myanmar people especially to the vulnerable sectors of society. NGOs have valuable ability to overcome the language barrier work at the grass roots level. They can facilitate, mobilize and empower the communities to deliver the prevention message as well as promote awareness to maximize the malaria control activities. Eventually, the community and professional leaders of national NGOs can serve as change agents to influence the national policy that ultimately leads to sustainable and successful malaria control programme. National NGOs that have extensive geographic coverage especially in difficult to reach areas are able to reach the population that live outside of the usual health service delivery networks. Since there is a difficulty to control malaria in difficult and hard to reach areas especially in border areas as well as in hilly areas, NGOs are able to contribute to the delivery of malaria control services.

5.3.1 Myanmar Maternal and Child Welfare Association (MMCWA)

This is a national entity with a mission to promote the health and well-being of mothers and children. The MMCWA has 1.13 million Life members and 3.2 million Ordinary members. It is active in all townships of the country. It helps in malaria prevention and control activities including education on ITN/LLIN and support for patient referral. The Association should also be useful in mobilizing additional resources locally to help those who cannot afford the treatment of malaria or ITNs.

5.3.2 Myanmar Women's Affairs Federation (MWAf)

MWAF has huge membership throughout the country. Although their main mission is to look after the concerns of women, they are also very supportive of health programmes. Just like other national NGOs, the members are being mobilized for mass campaigns such as immunizations, mass drug administration, dengue control, and malaria control.

5.3.3 Myanmar Red Cross Society (MRCS)

MRCS has its aim in alleviation of human suffering, including health promotion, disease prevention and provision of help to those in distress. MRCS's vision is to be the leading community-based humanitarian organization throughout Myanmar, acting with and for the most vulnerable people at all times. It is well organized at national, state/regional

and township levels. The Township Red Cross Branch is headed by the Township Medical Officer. MRCS has more than 48,000 Life members and 33,000 Ordinary members. MRCS volunteers respond to the needs of the Department of Health in supporting community level activities.

The MRCS maintains good relations with UN agencies, for which it has been an implementing partner, with NGOs, and public information media. MRCS is able to mobilize volunteers quickly from its extensive nationwide network for community health activities, and has been a key partner for the VBDC in mobilizing communities for bednet surveys, ITN distribution and re-treatment campaigns. MRCS has been implementing a malaria prevention project in 19 townships with funding from the IFRC during 2008-2009.

5.3.4. Myanmar Medical Association (MMA)

MMA is a national professional membership organization established in 1949 and a registered NGO. All MMA members are medical professionals mobilized for the prevention, diagnosis and treatment of a range of health problems. Currently, it has over 10,000 members in 76 branches nationwide. MMA has been working with WHO and the VBDC in malaria prevention and case management since 2000. With funding from the 3DF and technical support from WHO, the MMA is implementing its “Quality Diagnosis and Standard Treatment of Malaria” (QDSTM) project with 163 trained Quality GPs in 46 highly endemic townships across 12 states and regions. In 2014, MMA covers 123 townships in which 453 quality GPs, 14 fixed and mobile clinics and 407 volunteers working for QDSTM. It provides continuing medical education activities for clinicians on malaria. The MMA is a member of the Malaria TSG and its contribution is helpful in evolving public-private partnership in malaria control.

5.3.5. Myanmar Health Assistants Association (MHAA)

Myanmar Health Assistants Association is also national professional organization. All MHAA members are Health Assistants (both retired and in-service) and working for diagnosis and treatment of malaria through volunteers at villages. They work in Rakhine, Bago, Kayah and Kayin states. They have involved in community based malaria control activities and MARC national response with the fund support of 3DF since 2009. They are still working closely with NMCP to achieve goal and standing as key partners in country.

5.3.6. Faith-based Organizations (FBOs)

Another window of opportunity is reaching out to the community through religious groups. Since 50 percent of national NGOs are faith-based organizations, malaria control efforts could be exercised through a platform of religious leaders that would bring together Buddhists, Christians, Muslims and Hindus to mobilize communities. They could be mobilized to encourage communities at risk to take individual and collective actions to prevent and control malaria such as Myanmar Council of Churches.

Myanmar Council of Churches (MCC)

Myanmar Council of Churches (MCC) is actively involved in empowering their volunteers for malaria control in hard to reach villages since 2005. With support from GFATM (in 2005) and since 2006 from 3DF and WHO, MCC has been implementing community-based malaria prevention and control in 160 hard-to-reach villages in eight townships across Chin State, Kachin State and Sagaing Region. MCC empowers village health volunteers to mobilize communities for prevention, including ITN/LLIN, early diagnosis and appropriate treatment in line with the national guidelines.

5.3.7 Community – based Organization (CBO)

Friends for Health (FFH) is a community –based NGO network, working in collaboration with the Global Health Access Programme (GHAP) and receives financial support from USAID President Malaria Initiative (PMI), DFID and other private foundations. FFH worked with CBOs/ FBOs such as Metta Moe (Moegok), Phaung Daw Oo (Mandalay), YMCA (Mandalay), Kachin Baptist Convention, Karen Baptist Convention for community-based malaria control activities in endemic areas. There are several community-based NGOs contribute to malaria control in Myanmar that receive 3DF grants such as PDO etc.

Conclusion

National NGOs such as the MMCWA, MAAF and MRCS with very large membership provide a huge human resource, to promote the use of ITNs/LLINs, to support mass treatment of mosquito nets with insecticide-tablets, promote early treatment seeking behavior and adherence to treatment.

5.4 Donors

In addition to the partners, there are several outstanding donors providing financial support to malaria control and containment of artemisinin resistance. This includes donor consortium that supports through 3DF/3MDG as mentioned in earlier section, the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), President Malaria Initiative (PMI), Bill and Melinda Gates Foundation (BMGF), etc.

5.5. Inter-sectoral collaboration

Malaria risk in Myanmar is linked to population mobility induced by economic activity or security, notably development projects including dam construction, mining, logging, road maintenance, and associated migration for work or resettlement. High risk occupations in endemic areas include farming at forest fringes, and forest entry for wood and bamboo cutting, charcoal preparation and other activities. The risk is also high in the mobile

population across the international borders, hence the need for inter-sectoral structure and mechanism to contribute to the national response to malaria.

The National Health Committee has a mandate to promote inter-sectoral collaboration and cooperation for health at the national level. At local level, the Township Health Committee has the mandate to promote and ensure such collaboration and cooperation. In the high risk zone, the Forestry Department collaborates with the Department of Health in training CHWs to perform RDT testing and distribute ACTs under supervision. The Forestry Department also promotes the use of ITNs for malaria prevention. At a dam site where an outbreak of malaria occurred the relevant Department established a clinic for the labour force as a strategy to protect them from malaria and offer facilities for diagnosis and treatment. Technical support was provided by VBDC. Collaboration with the Education Department is promising and can help to mobilize students in malaria control. However malaria is a part of the secondary school curriculum only and not that of the primary schools.

The current situation is that many economic activities, especially in frontier areas, are not effectively regulated. In such areas, entrepreneurs, especially in smaller and temporary ventures are not motivated to invest much in health protection and care for the labour force. Their understanding and appreciation of the threats of vector-borne diseases and the latter's prevention is weak or non-existent. Consequently, inter-sectoral collaboration for malaria control is difficult to establish.

5.6 Partnership structures

The National Malaria Control Programme and its partners collaborated and exchanged information before the advent of Roll Back Malaria. Gradually as the perceived complexity of the problem and the resources increased, the regularity of the interaction increased. In 2003 the partnership became more structured with the process of developing and managing the 3rd Round Global Fund proposal which was submitted in 2004. The Malaria TSG that includes malaria control partners was established and coordinated by the Ministry of Health. It meets regularly and prepares joint annual operational plans. Within this group, a core group comprising JICA, UNICEF, VBDC and WHO held periodic meetings for improved coordination. The partnership further strengthened with the application and implementation of the Bridge Fund and 3-Diseases Fund Projects. There is, however, still a need for functional Working Groups and for quarterly monitoring meetings and annual malaria review and planning conference of all partners and stakeholders to share information and best practices.

5.7 Conclusions

Different partners have different comparative advantages and strengths in Myanmar. As transaction costs are high, there are important actual and potential synergies, if partners

will work together over a long period in an effective partnership, different from being in partnership to avoid overlaps and duplication of efforts. It is evident that the MOH is the authority to determine policies and strategic directions. However, it is also helpful to appreciate the value of the VBDC programme, as a unified programme within the health system with huge capacity for achieving high coverage with interventions through collaboration with the basic health services and national NGOs as well as other sectors. MMA initiated an interesting strategy of engaging the private health sector. But it remains to be seen to what extent this experience can be brought to bear on the informal health sector. International partners bring added value, by introducing innovations, being a supportive but critical voice, doing operational research and trying out new approaches and setting high standards of performance in pilot settings.

6. Achievements, priority problems and challenges, options and strategic directions in malaria control in Myanmar

Based on the preceding sections, it can be concluded that malaria control in Myanmar can build on some clear achievements, but must also brace for some tough challenges and threats.

6.1 *Major achievements in malaria control 2000 – 2014*

- a. The malaria burden, especially in terms of hospitalized cases and deaths has declined; the number of hospitalized cases was about 150,000 in 1990, 43,602 in 2010, 33,732 in 2011 and 26,881 in 2012. Total malaria deaths (in-patients) have declined continuously, reportedly 675 in 2010, 581 in 2011, and 403 in 2012. The provisional figure of malaria deaths in 2013 was 236 (the lowest ever recorded). This decline started in the early 1990s and can only be partially explained by specific malaria control interventions, as these have been relatively modest and focal until the most recent years. Additional likely explanations are demographic changes, better general health services, deforestation and increased availability and affordability of more effective antimalarial medicines in both the public and the private sectors.
- b. The national malaria treatment policy was revised in 2002 and updated in 2008, in 2011 (Annex- 3). It was again updated in December 2014. The treatment policy is based on local solid data on parasite resistance to antimalarial medicines, and is updated according to international standards with RDTs and ACTs as the main pillars. This policy was supported with supply of the essential commodities, whilst implementation started at the periphery of the health services, in some places even by CHWs. In 2006, about half a million RDTs and a quarter million ACT treatment courses were distributed through the public services.
- c. Improved quality of malaria data was observed, in terms of accuracy, reliability and timeliness. In addition, from 2010 onward, due to supports from partners and 3DF and subsequently by GFATM, most reported cases is no longer clinical suspected cases, but confirmed cases, either by RDT or laboratory-confirmed. Data collection at RHCs and SCs have been improved by provision of standard case register forms, computers, training and recruitment of data assistants at state/regional level and township level in 3DF/3DMG-MARC and GFATM-RAI project areas. Malaria data are computerized and analyzed. However, there is room for improvement especially the inclusion of data from NGOs, private health sector and non-health sectors.

- d. Research data established a baseline on treatment-seeking behaviour and use of mosquito nets. The availability of mosquito nets in the population was mapped.
- e. The role of formal and informal private health care providers is recognized and they are beginning to be involved in improved disease management through training and innovative social franchising project.
- f. A policy document on achieving high coverage with ITN/LLIN was produced. The distribution of free LLINs to high-risk groups already started whilst mass retreatment campaigns of conventional mosquito nets was undertaken for several years. In 2008, 2.3 million people or 5.65% of the total population in malaria risk areas were protected with ITN/LLIN. The net survey conducted in 2011 revealed that about 20% of households had at least one ITN/LLN and 17.6% of population slept under ITN/LLIN in the previous night. The survey was conducted prior to the mass distribution of LLINs and retreatment of nets. The periodic net survey conducted in six states and seven regions in 2012 indicated higher coverage and utilization of nets (refer to the previous section- 4.2). The coverage of the ownership of at least one LLIN/ITN was 73.5% of households and 63.8% slept under LLIN/ITN last night. The result showed a notably high increase in the ownership of at least one LLIN/ITN (19.9%) and sleeping under LLIN/ITN last night (17.6%) reported in the similar survey conducted in 2011
- g. A method for microstratification was developed which is now used for both micro-and macroplanning, especially for identifying target populations for ITNs.
- h. A quality assurance system for RDTs was set up and for microscopy it is being revitalized. Cooler box, a practical tool for field use, was introduced to states/regions for storage of RDT and drugs in remote health facilities in 2012. However, it was not popular among users. A core group of microscopists were validated by external experts and most of them are rated as experts and trainers.
- i. Seven sentinel sites for monitoring efficacy of malaria medicines are being monitored every other year. The early detecting of artemisinin resistance in some eastern states/region enabled the programme (with full support from partners, donors) to take immediate actions in containing the resistant parasites commenced in 2011.
- j. Community-based malaria prevention and control expanded, and lessons learned are being shared between implementing partners. Not only in the villages, but also in the worksites volunteers were recruited to deliver services for malaria prevention and control.
- k. Coverage of quality diagnosis and treatment in the private sector through the private general practitioners engaged by MMA and PSI has expanded.
- l. Township Health Departments in at least 100 townships now conduct situation analysis and develop annual plan for malaria prevention and control.

- m. Overall coverage of interventions has improved with support of 3DF/3MDG and followed by the 9th round GFATM as well as other funding sources but much more are needed.
- n. Initiation of the containment of falciparum resistance to artemisinin—MARC—Strategic framework for artemisinin resistance containment in Myanmar in April 2011. Artemisinin resistance is a major threat to global malaria control and elimination efforts. Myanmar detected the first indication of the artemisinin resistance in 2009 in the eastern part of the country, bordering Thailand.

While it has been merely 30 months after the first implementation of MARC (July 2011), the project has achieved its two goals: First, malaria mortality and morbidity has declined in MARC target areas in the two years; and Second, TES results, as well as day 3 parasitaemia studies, detected no new suspected resistance in Tier 3, but results in the containment areas along the eastern border of Myanmar are still inconclusive due to high population movement across this border and inaccessibility in conflict areas¹¹.

6.2 Priority problems to be addressed to ensure further progress

- a. It is important to ensure continuous and increased funding to allow services with quality supplies to be maintained and expanded. Interruption of supplies for RDTs, ACTs, retreatment of mosquito nets and LLINs will have grave consequences in terms of rebound outbreaks with the affected populations losing confidence in their health services. This will ultimately lead them to revert to unqualified providers of care as well as relying on imported medicines of uncertain quality.
- b. The programme encounters considerable difficulties in estimating and accessing the highly varied, often not organized groups of migrants, who could have been protected with ITNs/LLINs, if the ITNs/LLINs or long-lasting insecticidal retreatment kits were delivered to them at the right time and place. This poses challenges to rapid scaling-up of LLINs targeting high risk groups with low mosquito net ownership as well as scaling-up mass treatment of available mosquito nets within the at risk populations.
- c. It is observed that, in general, existing mosquito nets are not carried when men go to the forest for work for various reasons. It is therefore necessary to identify, validate and implement innovative vector control tools and strategies for people entering forests, who are unable to carry ITNs/LLINs with them.
- d. Malaria risk in Myanmar is linked to population mobility induced by economic activity or security, notably development projects. This implies that other sectors

¹¹ *Containing artemisinin resistance of Plasmodium falciparum in Myanmar: achievements, challenges and the way forward: Thar Tun Kyaw et al; WHO SEA Journal of Public Health; Jan-Mar 2014: 3(1)*

do contribute to the malaria burden. Therefore it is important to mobilize those sectors e.g. mining, forestry, agriculture, irrigation, dam construction, etc, to proactively protect their workers at risk by providing adequate prevention and control facilities for them.

- e. It is observed that the current management practices are not conducive to sharing out the workload by greater delegation of responsibility and authority. In order to ensure absorptive capacity for scaling-up malaria programme interventions, it is necessary to ensure that VBDC staff has the means and capacity to manage and supervise operations according to the updated programme guidelines, in particular to ensure that micro-stratification is carried out with quality in all endemic townships.
- f. Sharing information as well as updates on available data have been identified as a weakness, hence the need to set up effective operational information systems including repeat household and health facility surveys.
- g. It is estimated that only about 50 per cent of microscopy centres are fully functional and that the quality needs to be improved. Further, the quality of antimalarials is more compromised in the private sector where the majority of patients seek care. It is, therefore, necessary to strengthen the quality assurance systems both for medicines and microscopy if further progress is to be achieved.

6.3 *Main threats to further progress*

- a. Major, unplanned population movements, especially by non-immune people into endemic areas.
- b. Further sale and use of fake and counterfeit antimalarial medicines.
- c. Emergence of artemisinin resistance at several eastern states/regions
- d. Inadequate funding or poor donor support for malaria control

6.4 *Options*

There are few options to choose from in the present situation. Disease management could potentially save more lives, but disease prevention will also prevent cases from occurring with ensuing positive effects on the health system and on productivity. Besides, vector control will reduce the size of the parasite population, delaying emergence and spread of artemisinin resistance, hence the need for a balanced combination of prevention and treatment strategies.

With reference to long-lasting insecticidal nets (LLINs) and conventional insecticide-treated nets (ITNs), there is now evidence that the former are becoming cheaper in the long-term and are more cost-effective. In the meantime mass treatment of existing nets with long lasting insecticidal insecticides is an option since millions of nets already exist and mass treatment could be easily done. To realize their full potential, LLINs should be

deployed as a vector control intervention, which implies that the NMCP objective should be full coverage of all population groups in high and moderate risk areas where LLINs are the chosen method for malaria prevention.

The NMCP has established priorities on the basis of the geographical distribution of the malaria burden. The high and moderate risk populations are therefore those, where high coverage with LLINs is most likely to be highly cost-effective, because more cases per person protected will be covered.

Given resource constraints, it will be rational to target LLINs to high-risk populations. With more funding, moderate risk villages should be identified and targeted for LLINs. In the long run, when more funds are available, it should aim to protect all population at risk of malaria.

As NMCP had in the past successfully maintained coverage through regular treatment of conventional mosquito nets, populations in high and moderate risk areas may continue to treat their conventional nets with long-lasting treatment technologies.

The NMCP will increase LLIN coverage rapidly in the high and moderate risk areas through mass free or highly subsidized distribution schemes.

The population coverage of ITN/LLIN should be at minimum of **80%**. In the artemisinin resistant affected areas, the coverage of ITN/LLIN is strongly recommended at **100%**.

Indoor Residual Spraying (IRS) is complementary to LLINs, which can be cost-effective, especially in situations of high risk for concentrated populations like in labour settlements. The condition for use is that people spend most of the night indoor and that the walls are sprayable. IRS in combination with ITN/LLIN is recommended in artemisinin resistance affected areas, in order to maximize protection to affected population.

Other vector control measures could be supplemental. There is no solid evidence that biological or chemical larviciding are effective on an operational scale against *An. minimus* or *An. dirus*. Large-scale environmental management would in principle be the best measure for control of malaria in coastal areas, but the required inter-sectoral collaboration could be difficult to obtain, unless the potential economic benefits for the concerned sectors (agriculture, aquaculture and tourism) are ascertained. At present, this would be an area for research.

Vector control is well suited for integrated approaches because some vectors are responsible for multiple diseases, and some interventions are effective against several vectors. In reviewing the different types of applicable vector-control interventions in Myanmar, it is necessary for the NMCP to consider the Integrated Vector Management (IVM) approach which is “a rational decision-making process for the optimal use of

resources for vector control”. However implementation of IVM does require institutional arrangements, regulatory frameworks, decision-making criteria, and procedures that can be applied at the lowest administrative level. It also requires decision-making skills that support inter-sectoral action and are able to establish vector control and health-based targets. The cost effectiveness of vector-control measures is central to IVM.

For case management, greater emphasis to expansion of microscopy services is an option to consider which might have some impact on quality of disease management for most of the risk population. In the given circumstance, it is more rational to improve quality of microscopy where it exists and vigorously expand RDT use where microscopy is not feasible. Introduction of RDT for *Plasmodium vivax* can be considered but the currently available products cost about USD 0.5 more than RDTs for *Plasmodium falciparum* alone. Thus, in contrast to RDTs for *Plasmodium falciparum*, RDTs for *Plasmodium vivax* are not cost-effective and do have a rather low sensitivity (about 70%). Recently, the Combo RDTs that can detect Pf and non-Pf are available at affordable price and with adequate quality (sensitivity and specificity). Due to relatively high proportion of *P. vivax* in the country, it is essential to switch from Pf RDT to Combo RDT. Combo RDTs have been introduced and scaled up by NMCP, NGOs, and INGOs in 2011. As quality of RDTs is a major concern, procurement of pre-qualified RDTs and establishing RDT quality control system are essential.

Volunteers are not paid and the salaries of public sector staff are low. User fees for cost-recovery are not accepted for communicable disease control in Myanmar. In this context, there is a risk of relatively expensive products getting diverted to the private sector. In this context it is necessary to explore mechanisms acceptable in the context of Myanmar to motivate these critically important health workers.

Where early diagnosis and appropriate treatment (EDAT) is expanded through volunteers, it must be considered that in the long run, people will not be attracted to a service, which is limited to management of malaria. It will be necessary for the volunteers to acquire some skills about managing other causes of fever and common childhood illnesses.

Although good quality case management in the public sector will increase the attraction of patients, the private sector will still play an important role. A clear objective of ensuring EDAT for all malaria patients should encourage NMCP to collaborate with all health service outlets utilized by the different risk populations. Further monitoring of treatment-seeking behaviour may lead to targeting pharmacies and medicine vendors with RDTs. However, the most remote populations may be served better by volunteers than by private providers because of the lack of economic incentive for the latter. Identifying the best approaches to ensure access for remote and poor populations will be

an incremental learning process that must be conducted jointly by malaria control partners.

6.5 Strategic directions for malaria prevention and control in Myanmar

Based on the above, the following will be the strategic directions for malaria prevention and control over the next six years (2011-2016).

6.5.1 Population-centered public health approach, prioritizing the most vulnerable populations and adapting strategies to their characteristics

The populations at highest risk of malaria belong to national races living in remote areas and migrant groups with some overlap between the two. Precise identification, estimation and mapping of the different populations at risk and understanding their risk behaviour, economy and health service access is essential for scaling-up interventions towards full coverage and for optimizing cost-effectiveness through prioritization according to level of risk. Gradually, the use of epidemiological statistics and ecological determinants as presently applied for microstratification will be supplemented by social science research to understand risk and health-seeking behaviours. GIS will be useful for refining microstratification, especially by overlaying maps of malaria risk with health services access.

6.5.2 Evidence-based malaria control, anchored on strong health systems and contributing to strengthening health systems

Pilot projects and operational research for policy and strategy development and to improve delivery of interventions provide new experiences and critical data to malaria control. At the same time, it is essential that service delivery is continuous and equitable. Where the conventional public and private health services and their projections cannot provide adequate coverage, innovative approaches such as sustainable outreach services and kits provided to small groups or individuals moving to forests will need to be deployed.

Microstratification needs to be updated annually to take into account lessons learnt in implementation and changes in risk populations and risk behaviour in each township. The Programme is therefore now being decentralized with the Township Health Department as the focal point for planning, implementation, monitoring and evaluation. As shown by experiences from disease control programmes around the world, decentralization leads to improvement, provided the district level (i.e. the township in Myanmar) is well supported by experienced public health professionals from higher levels in the health system. Thus, the NMCP needs to be strengthened to help ensuring

an efficient, equitable and well coordinated national response to malaria. This includes the use of updated information technology and management practices.

6.5.3 Malaria control implemented by a well-coordinated partnership led by the Ministry of Health

The stakeholder analysis shows that different malaria control partners have different comparative advantages. A true partnership is more than coordination and exchange of experiences to avoid overlap, but must be based on solidarity and trust as well as transparency in a framework of regular joint planning and monitoring exercises.

6.5.4 Community-based malaria control

Full involvement of the communities at risk and their leaders, particularly the Township and Village Health Committees are essential for successful malaria control. They must be empowered to ensure their proactive and sustainable participation. Local NGOs, FBOs and the voluntary health workers must be mobilized to actively participate in planning and implementing malaria control.

6.5.5 Malaria control in the context of socio-economic development

Malaria is not just a health problem; it is also a socio-economic development issue. Collaboration between Ministry of Health and the Ministries of Forestry, Agriculture, Irrigation, Mining, Construction, Home Affairs and Defense is required to prevent or mitigate the potential negative impact of development projects. Malaria control must continue to be a priority component of the National Health Plan, Rural Development Plan, Border Area Development Plan and other development initiatives. At township level, the Peace and Development Committee is well placed as the focal body for coordination and participation of these sectors. The Ministry of Education is also an important partner for improving and expanding education on malaria control in schools.

6.5.6 Advocacy for support in malaria control at three levels

- a) Top level: Ministry of Health:
 - i) Intersectoral and cross-border cooperation towards malaria among ministries involved in economic development:
 - (1) Tourism, forestry, economic development, women and children development, etc.;
 - (2) A mechanism for cooperation established;
 - ii) Laws and regulations: ban of production and use of monotherapy;
 - iii) Public policies that supports malaria control elimination, e.g. policies towards business establishment
 - iv) Enforcement of law and regulations towards malaria prevention and control;
 - v) Technically appropriate channeling of external funds for malaria.

- b) WHO's role in advocacy
 - i) Incorporate malaria elimination strategies into the NSP's longer goal, and short term goal in areas where possible;
 - ii) Implement social and behavioral change strategies for malaria (original **Annex 5** with supplement);
 - iii) Advocate for private formal health sector's cooperation in malaria control
 - iv) Follow national drug policy
 - v) Report of malaria cases.
- c) Operational level
 - i) Community ownership of malaria programme:
 - ii) Maintaining gains, and improve community ownership, on malaria self protection;
 - iii) Increase community roles and ownership in community case management;
 - iv) Towards equal partnership at state/regional in planning malaria control;

6.5.7. Intensify and expand artemisinin resistance containment activities

Growing concerns of the emergence of malaria parasite resistant to artemisinin since 2009 in Kawthaung, NMCP and partners tried to develop Myanmar Artemisinin Resistance Containment (MARC) framework which was endorsed by the Ministry of Health in April 2011 for implementation in 2011 to 2015. Activities commenced in July 2011 to June 2012 as Year 1 and July 2012 to June 2013 as Year 2. MARC framework follows Global Plan for Artemisinin Resistance Containment (GPARC) and lessons learned from Cambodia and Thailand. Multiple implementing partners (IPs) were working in the project areas; 21 townships of Tier 1 area and 31 townships of Tier 2 areas. The goals of the containment are:

- To prevent or at minimum, significantly delay the spread of artemisinin-resistant parasites within the country and beyond its border; and
- To reduce transmission, morbidity and mortality of *Plasmodium falciparum* malaria, with priority to areas threatened by artemisinin resistance.

There are (7) objectives for MARC, i.e.;

1. To improve access to and use of early diagnosis and quality treatment according to the national treatment guidelines
2. To decrease drug pressure for selection of artemisinin resistant malaria parasites by stopping the use of artemisinin mono-therapies and sub-standard/fake drugs
3. To limit the transmission of malaria by vector control and personal protection
4. To increase migrant/mobile populations' access to and use of malaria diagnosis, treatment and vector control measures including personal protection
5. To support containment of artemisinin resistant parasites through advocacy and BCC/IEC

6. To conduct studies, especially operational research to support the development of evidence-based containment policies and strategies
7. To provide effective management and coordination to enable rapid and high quality implementation of the containment strategy

Challenges are still to be faced, however, activities are to be more intensified and expanded to be able to show outcome and impact of the project. External Review Team also recommended that *“The impact of MARC on malaria transmission in the states/regions of implementation should be stringently monitored and responsive strategies adopted to ensure containment of artemisinin-resistant P. falciparum malaria”*. From 2014 onward containment of artemisinin resistance in Myanmar will become an integral part of the efforts under the Greater Mekong Sub-region (GMS) artemisinin resistance containment project, with funding from GFATM and BMGF. 3MDG will continue to provide additional funding for artemisinin resistance containment activities in Myanmar beyond 2013, possibly until 2016, focusing on three main activities: 1) malaria survey, 2) improved access to diagnosis and treatment to target populations in containment areas, and 3) provision of locally appropriate vector control measures and personal protection.

The overall goal of the GMS artemisinin resistance containment project (Regional Artemisinin Initiative – RAI) is to protect the effectiveness of artemisinin as an effective treatment for *P. falciparum* malaria. This will be done by eliminating artemisinin resistant *P. falciparum* parasites in the places where they are already known to exist and thereby prevent their spread while at the same time to detect and contain any new foci of transmission that may emerge.

The followings activities will be implemented in Greater Mekong Regional project (RAI) of Myanmar:

Strategic approaches

1. Vector control and personal protection through ITN/LLIN, other insecticide treated materials and IRS
2. Case management through facility based case management, integrated community case management, treatment of mobile and migrant populations and private sector’s clients
3. Strengthened surveillance system towards elimination by adding additional surveillance strategies such as therapeutic efficacy studies and monitoring of Artemisinin resistance molecular marker (K13 propeller), introduction of epidemiological case and focal investigation
4. BCC approaches with special focus on high-risk population and mobile migrant populations.
5. Support operational research activities related to artemisinin resistance containment
6. Contributing to the Greater Mekong Sub-Region (GMS) Containment activities

Vector Control;

- Focal IRS will be performed for new/migrant settlements, as well as in response to foci of Day 3 parasitaemia and in response to any outbreaks. It is planned to increase the geographical coverage of focal responsive IRS. Insecticide (50 barrels of alpha-cypermethrin per year) will be procured together with protective clothes and replacement spray pumps as required. In longer term, other chemical classes rather than synthetic pyrethroids should be deployed for IRS in order to delay emergence of insecticide resistance.
- Distribution of long-lasting Insecticidal net (LLIN) to cover 100% in stratum 1 areas for progressive roll-out of 2.2 million LLINs in Tier 1 (strata 1a and 1b) and Tier 2 (stratum 1a) to achieve 32% coverage by 2016 (68% gap remaining). Before mass distribution of LLINs, there will be micro-planning meetings at township level to help ensure that overlap is avoided. Additional LLINs will also be provided to mobile populations. The distribution will be provided as a package together with standby treatment.

Case Management & Surveillance

- Regarding case management, *facility-based case management and integrated community based management* will be carried out.
- *Active case finding* in 1a and 1b Strata in Tier 1 and 2 areas plus screening at screening points. It is envisaged to detect malaria cases from hard to reach, inaccessible areas. It is planned to send *mobile teams* to screen and treat patients, to conduct entomological surveillance, BCC etc.
- In addition to this activity it is planned to increase the number of screening centres along the border and at key entry points to forest, plantations etc. Currently there are 20 screening centres funded by 3MDG. It is planned and necessary to increase the number of screening points in response to new development projects in the country.
- Mass blood surveys will also be conducted in Stratum 1c in both Tiers 1 and 2. It is envisaged to detect low parasitaemia in low transmission areas.
- Community volunteers (1 per village) will be recruited to provide diagnosis and treatment services for malaria together with screening, directly-observed therapy (DOT) and follow-up. These volunteers will also be responsible for BCC and ultimately they will be trained to diagnose and treat diarrhoea and acute respiratory tract infections as well as malaria. Under 3MDG project, there are 35 volunteers per township but due to non-availability of funds beyond 2013, this activity will cease if not supported. Furthermore, currently there are not enough volunteers as there are approximately 200 villages per township.

- Investigation of all falciparum malaria cases in low endemic areas, comprehensive response package to all falciparum malaria cases investigated and administration of modified DOT for the treatment of Pf patients are new activities to be conducted.
- Implementation measures to *quality assurance* and quality control of rapid diagnostic tests (RDTs), antimalarial drugs and microscopy. Scale up availability of quality assured artemisinin-based combination therapy (ACT) and RDT in the private sector (including banning of ACT monotherapy).
- FDA has to take responsibility in monitoring drug quality, banning monotherapy, upgrading its QA lab, training inspectors and procuring minilabs. In addition it will support the promotion and provision of subsidized RDTs and ACT through the private sector.
- Strengthening drug resistance monitoring through therapeutic efficacy studies (TES) in wider geographical areas with inclusion of monitoring of Day 3 parasitaemia. Whenever it is possible, study of molecular markers (K13) for artemisinin resistance should always be included in order to precisely monitor spreading of artemisinin resistance. Application of new/modern technology such as GIS and mathematical modeling, web-based surveillance, etc. is encouraged.

IEC/BCC

- Artemisinin resistance containment specific BCC activities covering all relevant aspects of malaria elimination including LLIN distribution, improved utilization of nets in different settings, population screening and compliance with the full treatment regimen (including low dose primaquine).

Targeting mobile migrant populations

- Special activities to contain drug resistant *P. falciparum* (Pf) malaria among mobile and migrant population will be included. The containment interventions listed in the above sessions for general population should be applied with special emphasis to mobile migrant population. Increasing access to these populations and understanding their social behaviors are keys for success.

Operational Research

- Research focusing on issues of high operational significance to the elimination of resistant falciparum malaria will be conducted such as: the significance of Day 3 parasitaemia; operations research relating to the provision of hammock nets for mobile and migrant populations; risk behaviour in migrant workers; entomological research and microstratification of malaria risk in 52 townships.

6.5.8. Malaria Control to Pre-elimination

According to the milestone of National Malaria Control Programme, Myanmar started its pilot project of malaria control in 1951, implemented Antimalaria Programme in 1953, carried out Malaria Eradication Programme in 1957 and returned to Malaria Control Programme in 1973. Since then, Myanmar has launched malaria control programme. Albeit programme achievements become in progress with declining malaria mortality and morbidity trends, it is still far from nation-wise elimination of malaria. But the strategic directions of malaria control activities being carried out in artemisinin resistance containment project areas [such as; Investigation of all Pf malaria cases in low endemic areas, comprehensive response package to all Pf malaria cases investigated and administration of modified direct observed therapy (DOT) for the treatment of Pf patients] intended to pre-elimination. NMCP tries to start with Pre-elimination of certain areas that meets with the specified criteria (e.g.; slide positivity rate becomes less than 5%) control programme will move to sub-national elimination.

7. Goal, objectives, assumptions, key indicators and targets

7.1 Goal

The Goal of malaria control in Myanmar is to reduce malaria morbidity and mortality by at least 60 per cent by 2016 (baseline: 2007 data), and contribute towards socio-economic development and the Millennium Development Goals (MDGs).

7.2 Objectives

Objectives are set according to the National Malaria Control Strategies laid down after adopting the Global Malaria Control Strategies, i.e.;

1. Providing information, education & communication regarding malaria prevention and control up to the grass-root level of the community
2. Promoting personal protective measures and/or introducing environmental measures as principle methods and application of chemical and biological methods in selected areas depending on local epidemiological condition and available resources
3. Prevention, early detection and containment of epidemics
4. Provision of early diagnosis and appropriate treatment
5. Promote capacity building and programme management of malaria control programme (human, financial and technical)
6. Strengthen the partnership by means of intra- and inter-sectoral cooperation and collaboration with public sector, private sector, local & international NGOs, UN agencies and neighboring countries
7. Intensify community participation, involvement and empowerment
8. Promote basic and applied field research

7.2.1 Objective 1

By 2016, at least 90% of the people in all malaria risk villages in 284 malaria endemic townships and 100% of population living in artemisinin resistance containment areas, are protected against malaria by using insecticide-treated nets/long-lasting insecticidal nets complemented with another appropriate vector control methods, where applicable

7.2.2 Objective 2

By 2016, malaria cases in each township receive quality diagnosis and appropriate treatment in accordance with national guidelines preferably within 24 hours after appearance of symptoms.

7.2.3 Objective 3

By 2016, in 284 malaria endemic townships, the communities at risk of malaria actively participate in planning and implementing malaria prevention and control interventions.

7.2.4 Objective 4

By 2016, the Township Health Department in 284 malaria endemic townships are capable of planning, implementing, monitoring and evaluating malaria prevention and control program with management and technical support from higher levels.

7.2.5 Objective 5

To contain artemisinin resistance and eventually eliminate *P. falciparum* malaria in artemisinin resistance affected areas and at the same time prevent, early detect and contain epidemics by taking care of mobile and migrant populations

7.2.6 Objective 6

Strengthen the partnership by means of intra- and inter-sectoral cooperation and collaboration with public sector, private sector, local & international NGOs, UN agencies and neighboring countries and promote basic and applied field research

7.3 Target calculation and assumptions (As of July 2014)

		2010	2011	2012	2013	2014	2015	2016
1. Total population		48,010,000	48,582,481	49,209,195	50,486,981	50,468,981	51,138,263	51,797,947
2. Population growth rate multiplier (latest info in 2009 ¹²)		1.0202	1.29	1.29 ¹³	1.29	1.29	1.29	1.29
3. Population at risk (proportion based on 2011 stratification)	Proportion							
High risk	0.25	12,002,500	12,145,620	12,302,299	12,460,999	12,617,245	12,784,566	12,949,487
Medium risk	0.27	12,962,700	13,117,270	3,321,621	13,457,878	13,626,625	13,807,331	13,985,446
Low risk	0.23	11,042,300	11,173,971	11,318,115	11,464,119	11,607,866	11,761,800	11,913,528
Potential risk	0.13	6,241,300	6,315,723	6,397,195	6,479,719	6,560,968	6,647,974	6,733,733
No risk	0.12	5,761,200	5,829,898	5,905,103	5,981,279	6,056,278	6,136,592	6,215,754
4. Estimated number of cases annually with the current level of support ¹⁴		1,505,635 ¹⁵						
5. Expected reduction (%) resulting from impact of intensified malaria control			3	12	20	20	20	20

Remarks: Total population is based on HMIS and UN population which is lower than Health in Myanmar 2012. Adjustment will be made after final figures of the national consensus in 2014 are available.

¹² Health in Myanmar 2012

¹³ Based on PGR in 2009 until new data is available

¹⁴ GF and 3DF/3MDG, etc.

¹⁵ Estimated by WHO in 2012 based on country data in 2010

8 Activities and outputs for each objective

8.1 Objective 1

By 2016, at least 90% of the people living in all malaria risk villages in 284 malaria endemic townships, and 100% of population living in Artemisinin resistance containment areas, are protected against malaria by using insecticide-treated nets/long-lasting insecticidal nets complemented with another appropriate vector control methods, where applicable.

8.1.1 Protection by the use of LLINs

All population living in malaria risk areas in 284 endemic townships are targets for scaling up LLINs/ITNs.

The LLIN strategy is based on three tactical variants, applied village-wise:

- a. For high and moderate risk villages: distribution of LLINs to achieve full coverage of at risk populations through mass campaigns.
- b. For high risk villages in the event of resource constraints: distribution of LLINs to achieve full coverage of populations at risk through mass campaigns.
- c. For high and moderate risk villages: mass retreatment of available mosquito nets with insecticide and preferably long-lasting insecticidal retreatment kits.
- d. For all population at risk in artemisinin resistance affected areas (Tier 1: of MARC framework): distribution of LLINs and aim at 100% population coverage. Priority is given to migrant population.

The identification of the target populations for LLIN implementation will be through micro-stratification in all 284 malaria endemic townships with target population coverage of 90%. For the artemisinin resistance affected areas, Tier 1 areas (with strong evidence of resistance) are of highest priority. The target population coverage is 100%. The zonation of areas according to artemisinin resistance should be updated on yearly basis.

As fund is always insufficient, for full coverage of entire population, LLIN delivery will be provided for full coverage in stratum 1a (High risk). The number of LLINs required will be based on 1 LLIN per 1.8 persons. (Please see **Annex - 8** for budget calculation and assumptions)

The key activities will be:

- a. Microstratification.
- b. Household survey in high-risk villages.
- c. Microplanning for mass LLIN delivery and/or treatment of mosquito nets.
- d. Community mobilization in each village for mass treatment of mosquito nets or LLIN delivery.
- e. Behaviour change communication targeting use of ITNs/LLINs.
- f. Mass treatment of mosquito nets, once a year, just before the transmission season, or delivery of LLINs, with two LLINs on average per household (one LLIN can cover

- 2.5 persons on average and the mean household size is 5 persons, but in artemisinin resistance containment areas, it aims to cover 1.8 person/ 1 LLIN) .
- g. Follow-up monitoring and behaviour change communication.
 - h. Planning replacement strategy for LLINs after 3 years

Mass retreatment of nets with long-lasting insecticides was undertaken once in two years (the frequency to be adjusted depending on the resistance of the insecticides). For non-long lasting insecticide, nets should be retreated at least yearly. When possible and opportune, retreatment campaigns and LLIN delivery were combined with such activities as measles immunization or mass drug administration for filariasis elimination. These activities were done at fixed points in each village, planned in each Township under the supervision of VBDC staff and carried out by basic health staff, trained volunteers, and local NGO members.

However, retreatment of nets with insecticide tablet or long lasting Insecticidal tablet was phased out in 2013. There was a programme shift to LLIN distribution and replacing with new LLIN after 3 years.

Provision of retreatment and especially LLINs will be accompanied and followed by intensive IEC/BCC to ensure that ITNs/LLINs are properly hung and used every night when sleeping. Whenever possible, people who go to the forest will be encouraged to carry ITNs/LLINs with them. Health education will be provided at the community level by volunteers, NGOs, CHWs, AMWs and health promoters.

8.1.2 Personal protection

Other preventive measures for special groups such as forest related workers and those engaged in rubber tapping will be studied. Experience will be shared with neighbouring countries, with similar problems.

A trial on insecticide-treated blankets for people entering forests is currently being designed and the results would be made available soon. A trial on the use of repellents by rubber plantation workers will be commissioned from a national research institute.

8.1.3 Selective application of indoor residual spraying (IRS)

Indoor Residual Spraying will be done in development project sites, resettlement areas and other epidemic prone areas to prevent and contain malaria outbreaks. The choice of insecticide will be in accordance with the national policy that takes into account safety, efficacy, cost, availability, susceptibility, etc.

Other vector control measures such as biological control, larviciding and environmental management will be undertaken as appropriate.

The key activities will be:

- a. Identification of risk populations.
- b. Microplanning including geographic reconnaissance.
- c. Community mobilization in each village for IRS.
- d. Behaviour change communication targeting householders.
- e. Logistics: ensuring supplies, equipment and transport.
- f. Training/retraining of spray teams.
- g. Supervision.
- h. Indoor Residual Spraying in targeted areas.
- i. Follow-up monitoring and documentation.

8.2 Objective 2

By 2016, malaria cases in each township receive quality diagnosis and appropriate treatment in accordance with national guidelines preferably within 24 hours after appearance of symptoms.

8.2.1 Strengthening and expanding case management in the public sector

It is expected that over the 6 year period, the public sector and its projections will be able to scale-up its coverage to test at least 60% of suspected malaria cases and provide effective treatment according to national malaria treatment guidelines.

The key activities are:

8.2.1.1 Supply of RDTs to all health facilities in malaria risk areas in each township as well as services managed by NGOs, CHWs and other volunteers. Recently, Combo RDTs that can differentiate falciparum and non-falciparum are available at affordable price and with acceptable sensitivity and specificity. Combo RDTs should be procured instead of Pf RDTs.

The essential tasks are:

1. Procurement of adequate supplies (*please refer to targets per year in section 7.3*)
2. Microplanning from Township level.
3. Logistics management including the use of simple cooler boxes for RDTs
4. Production of chart guidelines in Myanmar language based on WHO materials.
5. Training and supervision of staff and volunteers as part of malaria case management training.

8.2.1.2 Quality assurance system for RDTs

Only pre-qualified Combo RDTs should be procured for use. A system has already been started based on checking received lots of RDTs and collection of samples in the field. This will be expanded in line with the scale-up efforts in collaboration with VBDC and DMR, supported by WHO.

8.2.1.3 Quality malaria microscopy services in Townships, Station Hospitals and selected RHCs.

Quality assurance will be strengthened to ensure quality diagnosis by microscopy, mainly as a back up to RDT diagnosis and for special situations. At present, the microscopy network comprises about 700 microscopy points.

A core group of technical staff from NHL and VBDC will be supported to conduct:

- a. Periodic maintenance and repairs of microscopes;
- b. Supervision according to a SOP protocol.
- c. Quality assurance based on sending out slides.
- d. Training & retraining targeting polyvalent microscopists and laboratory technicians.

8.2.1.4 Provision of antimalarial medicines.

ACT recommended as per national policy for treatment of malaria will be provided. The quantity to be procured should be enough for the target coverage as per estimation. The distribution will be done through the channels described above according to township micro-plans.

8.2.1.5 Training on malaria case management

Training for the different categories of health staff in the public sector directly involved in patient care will entail:

- a. The expansion of the already available training curriculum through cascade training will be pursued.
- b. Developing a protocol for supervision based on SOPs.

Continuing medical education will be done to help maintain the knowledge and skills of the staff.

8.2.1.6 Village health volunteers

Empowering village health volunteers on malaria case management and management of other common conditions, where access to health facilities is difficult.

1. Voluntary health workers/local NGO members will be trained.
2. They will be provided with RDTs, medicines and other supplies.
3. If they are not already trained in the management of other febrile illnesses and common childhood conditions, they will be provided such training. For this, a special curriculum based on the community-IMCI concept will be prepared.
4. They will be supervised to detect and treat malaria.

8.2.1.7 Health staff motivation

Mechanisms will be identified to allow health staff to be remunerated for their services without creating a barrier for poor patients.

Operational research may be done on the following: To improve motivation and the quality of implementation, health staff may be allowed to apply a small service charge for delivering ITNs/LLINs or performing a RDT test. Such a charge should be low enough for end-users to afford and high enough to be an incentive for health workers to provide services to the target groups and give necessary information. The advantage of service charges over cost-recovery is that administration is easier, as the funds should stay in the health facility. However, service-charge systems require precise regulation, direct communication from the programme to the end-users and effective supervision.

8.2.1.8 Operating mobile clinics/outreach services in selected areas

Mobile clinics/outreach services will be carried out to reach out to remote communities where access to trained health care providers is difficult and where there are no trained volunteers yet. INGOs currently doing these will be supported to sustain and expand their coverage, and where INGOs are not working, such services will be set up by VBDC, as needed.

8.2.1.9 Establishing malaria clinics in strategic hard to reach areas

Where there are large congregations of migrant labourers, transmission of malaria and inadequate access to health services, and in remote endemic villages where populations from neighbouring villages converge, VBDC and/or partners will establish “malaria clinics” to provide immediate diagnosis, appropriate treatment and counseling on malaria. Operational research on “standby treatment” will be done for forest-related workers and other mobile groups.

8.2.1.10 Behavior change communication

This will be further strengthened to improve treatment seeking and adherence to treatment and done through various channels: interpersonal, mass media, in schools, mobile teams, etc.

8.2.2 Expansion of appropriate case management by improving the practices of the private sector

8.2.2.1 Engaging the private medical practitioners

The existing social franchising of private medical practitioners by *Population Services International* (PSI) will be further expanded or strengthened. It will be adapted by the Myanmar Medical Association (MMA) to further improve coverage. Aside from provision of quality training, antimalarials, RDTs and job aids, supportive supervision, monitoring and evaluation will be strengthened to sustain the quality of services. Training of private medical practitioners will be strengthened and expanded through MMA and INGOs.

8.2.2.2 Schemes for improving practices beyond medical practitioners

Based on the experience with private medical practitioners and further information on treatment-seeking behaviour derived from population surveys, additional schemes targeting medicine vendors and pharmacies will be designed and implemented.

8.2.3 Combating fake/counterfeit drugs and banning of artemisinin based monotherapy

1. The Food and Drug Administration (FDA), which has been strengthened through provision of equipment and training, will regularly take samples for testing from public and private stores and pharmacies.
2. VBDC will monitor quality of medicines at peripheral facilities and outlets using *Minilab*® test kits.
3. The private pharmaceutical companies will be engaged to help ensure the availability of quality assured recommended antimalarial medicines in the private sector.
4. The public pharmacies will be educated on the dangers of fake/counterfeit medicines, and on the availability and rational use of quality medicines.
5. The use of artemisinin monotherapy for treatment of malaria has been banned in Myanmar. FDA has stopped registration and renewal of any licenses of artemisinin monotherapy. All existing licenses of artemisinin monotherapy have expired on December 2012. It is assumed that from 2012 onward all artemisinin monotherapies will be withdrawn/phased out from markets. The FDA has to strengthen its regulatory action to ensure completely phase-out of monotherapy.

8.3 Objective 3

By 2016, in 284 malaria endemic townships (270 priority townships) the communities at risk actively participate in planning and implementing malaria prevention and control interventions.

8.3.1 Empowerment of village and Township health committees

Each township and village has a health committee with multi-sector representation. These committees will be revitalized to catalyze proactive participation of the communities at risk and other sectors on malaria prevention and control. The key activities include:

1. Advocacy and social mobilization.
2. Malaria Week Celebration.
3. Orientation and planning workshops.
4. Local resource mobilization and communication.

VBDC with partners in the Department of Health (IEC related) and national and international NGOs will prepare a toolkit for this purpose, have it tried out in 3 townships with different conditions and thereafter promote its use during supervisory visits and at state/regional workshops. The supervisory visits to the townships will always include a meeting with the Township Health Committee.

The tool-kit will include:

- a. Basic information on malaria with emphasis on intersectoral aspects in the form of a brochure.

- b. Guidance on advocacy and BCC for malaria control.
- c. Training material on conducting LLIN distribution and ITN re-treatment.
- d. Training material on malaria case management at village level.
- e. Training material on community-based malaria surveillance.
- f. Training material and SOPs on supervision of CHWs for malaria prevention and control.

8.3.2 Empowerment of village health volunteers and/or local NGO members

Community volunteers and local NGO members will be empowered to implement behaviour change communication, mobilize communities for ITN implementation and to serve as surveillance agents who will report any epidemic prone situations (e.g., congregation of migrant labour, resettlement) and any increase of fever cases or RDT positive malaria cases in their villages. Some of them, particularly those in villages where access to health facilities is difficult, will be trained also on case detection and treatment (*as described under objective 2*).

The key activities will be:

- a. Training of voluntary health workers and/or local NGO workers by township staff according to the toolkit.
- b. Supervision, based on bench-marks such as the volunteer having discussed prevention and treatment with village leaders and malaria patients.
- c. Community-based surveillance, monitoring and evaluation.

In relation to community-based surveillance, the CHW/volunteer will be trained to draw monthly graph of the number of RDTs used and the number of positive tests. He/she will be able to detect an outbreak early and the community will be able to monitor its malaria situation (for example verifying lower positivity rates following interventions).

8.3.3 Behaviour change communication

A cohesive IEC strategy and plan for NMCP will be developed based on experience from each agency with emphasis on the role of the national NGOs, which have organizational structure from centre down to grass-root level. A national consultant will be employed to refine and operationalize the strategy, which will be driven by behavioural objectives (see below).

Materials will be developed for implementation through:

- community support groups;
- trained voluntary health workers;
- local NGO members;
- health staff;
- school health teams;
- mass media, etc.

The behaviours to be promoted are:

- secure mosquito nets;

- have nets treated with long-lasting insecticidal treatment kits at least once a year before transmission season, unless they are LLINs;
- wash nets only when really necessary, and if they are not LLINs just before retreatment;
- sleep inside ITNs every night, especially in transmission season;
- bring ITN to forest and sleep under it there;
- seek early treatment from trained health care providers with a test in case of fever, demand free treatment, if the test shows malaria;
- adhere to standard treatment, and return to provider, if no improvement, symptoms get worse or recur.

Educational and communication tools will be adapted for specific target groups, for example:

- different national races;
- forest agriculture and gathering;
- migrant workers;
- pregnant women, mothers.

8.4 Objective 4

By 2016, the Township Health Department in 284 malaria endemic townships (270 priority townships) are capable of planning, implementing, monitoring and evaluating malaria prevention and control programme with management and technical support from higher levels.

8.4.1 Training for Township level

Capacity development for malaria control will be done with focus at township level. The township health department should have the capacity to assess the malaria situation, and then plan, implement, monitor and evaluate their own programme. They will be supported from central and state/division levels. In this regard, training of technical staff will be supported.

As township level will be crucial for malaria prevention and control, a comprehensive curriculum for township level staff will be developed and taught by VBDC at national and state/regional levels.

It will include:

- Malariology;
- Microstratification including use of GIS and spread-sheets;
- Logistics of malaria control supplies;
- Behaviour change communication and inter-sectoral collaboration;
- Monitoring and evaluation.
- Planning and management

Over time, the fundamental microstratification method will be refined by mapping various health facilities and development projects overlaying on malaria and population distribution so as to gradually improve the deployment of human and material resources.

8.4.2 Revitalizing the work-force of malaria control programme at Central and State/Regional levels

Given that the programme has suffered severe depletion of its human resources at high level, additional technical staff (Medical Officers/Team Leaders) will be recruited on long-term contract basis. They would be integrated in the permanent work-force when this becomes administratively possible. These staff members must have experience in the following areas:

- public health with some experience in malaria control;
- entomology and vector control;
- epidemiology;
- logistics management;
- information management;
- training;
- BCC;
- laboratory support for vector-borne disease control including quality assurance;
- maintenance of microscopes;
- pesticide management and spray equipment maintenance.

8.4.3 Improving management practices

A management information system consultant will be recruited to review all management instruments and tools and draft standard operating procedures for management, especially taking into account the new needs related to monitoring RDTs, ACTs and LLINs.

Computers and connectivity will be provided for VBDC down to township level. Training and epidemiology and management will incorporate spreadsheets, GIS (Health Mapper) and for state/regional level, EPI-INFO software. Access to resource materials and sharing of information through the internet will be improved. Management information system will be fully computerized at central and state/regional levels and in selected districts and townships.

8.4.4 Strengthening supportive supervision and monitoring

The introduction of new management tools will be accompanied by an intensive training for all national, state and regional level VBDC staff in supportive supervision and monitoring. More details on supportive supervision and monitoring can be found in the National Monitoring and Evaluation Plan in **Annex 7**.

8.4.5 Strengthening of prevention, early detection and containment of outbreaks

The following activities will be undertaken to improve the response:

1. Community-based surveillance.
2. With the use of GPS, epidemic prone areas will be mapped every year and prioritized for control.

3. Strategic stockpiles of insecticide and equipment will be established and maintained at central level.
4. SOPs will be prepared for dealing with suspected outbreaks and for postmortem reports on outbreaks, which must be included in the annual national report on malaria control.

8.4.6 Evidence-based planning, research and policy development

Annual operational plans will be prepared according to guidelines at national, state/regional and township levels. They will be based on township level microstratification as the key input.

Research will be further strengthened to inform policy development. The Malaria Technical and Strategy Group (TSG) will develop research agenda that responds to the needs of the programme. Some of the key issues to be addressed include:

1. Development and validation of tools and delivery mechanisms for effective prevention and case management of malaria among migrant workers /forest related workers, ethnic groups and pregnant women.
2. Drug resistance monitoring (including *P. vivax*) institutionalized in sentinel sites.
3. Effective strategies for eliminating fake and counterfeit medicines.
4. Mosquito behavior change, insecticide resistance, risk of importation of vectors.
5. Studies on alternative vector control that reduces reliance on insecticides.
6. Assessment of novel tools such as suppositories, *P. vivax* rapid tests, insecticide-treated hammock-nets.
7. Economics of intersectoral action for malaria prevention and control, e.g. in plantations and coastal areas.

If the need arises, the TSG that comprises National and International Experts will be convened by MOH in collaboration of WHO to recommend/revise policy to address key technical issues on malaria.

8.4.7 Strengthened stewardship and partnership

The VBDC is guided by a National Malaria Technical Advisory Group. It will meet four times a year to review plans, progress and policies and ad-hoc as necessary.

The TSG includes all partners and it will likewise be convened quarterly. Its mandate will be enhanced to ensure transparency by a requirement for all partners to present their plans, budgets, and progress reports.

The Core Group of the TSG convenes monthly (or on ad-hoc basis) to review any arising issues and problems. It comprises VBDC, WHO, UNICEF and JICA. It is responsible for preparing an annual national operational plan including the contributions of all partners and submitting it for approval by MOH, the Technical Advisory Group and the Technical and Strategy Group.

Over the coming years, as management becomes more streamlined, the meetings of the Core Group will be reduced to bi-monthly and greater flexibility in its membership will be ensured.

8.4.8 Advocacy at national level

8.4.8.1 General advocacy strategy and plan

A national consultant will be recruited for designing an advocacy strategy to target high-level decision-makers in the different sectors as well as the general public outside malaria endemic areas. This consultancy will include an outline of materials to be prepared, channels to be used and proposals for producers to be contracted.

8.4.8.2 A brochure for the Township Peace and Development Committee

A brochure on malaria control and inter-sectoral action will be developed for the Township Peace and Development Committee. It will include material explaining how economic development activities can lead to increased malaria risk and how entrepreneurs can by themselves and in collaboration with the health sector mitigate such risks. Thus, the Peace and Health Committee and Township health staff can use the brochure as a tool to engage the private sectors and development projects.

8.4.8.3 School education on malaria

Currently, malaria is part of the high school curriculum, but not the primary school curriculum. Most children in high-risk areas attend only primary school. Therefore, the curriculum will be adapted for use in primary schools.

8.5 Objective 5

The following activities will be undertaken to fulfill the objective 5:

- 8.5.1 Vector control and personal protection through ITN/LLIN, in combination with other insecticide treated materials and IRS in some strategic areas of containment
- 8.5.2 Case management through facility-based case management, integrated community case management, treatment of mobile and migrant populations and private sector's clients through mobile teams (MAST) in hardest to reach areas
- 8.5.3 Strengthened surveillance system towards elimination by adding additional surveillance strategies such as therapeutic efficacy studies and monitoring of Artemisinin resistance molecular marker (K13 propeller), introduction of epidemiological case and focal investigation
- 8.5.4 Establishment of community based surveillance system of mobility pattern of migrant population so as to carry out necessary measures for malaria prevention and control
- 8.5.5 BCC approaches with special focus on high-risk population and mobile migrant populations in combination with social marketing of quality antimalarials and LLIN
- 8.5.6 Monitoring on private sector outlets stocking oral artemisinin-based monotherapies

8.6 Objective 6

The following activities will be undertaken to fulfil the objective 6:

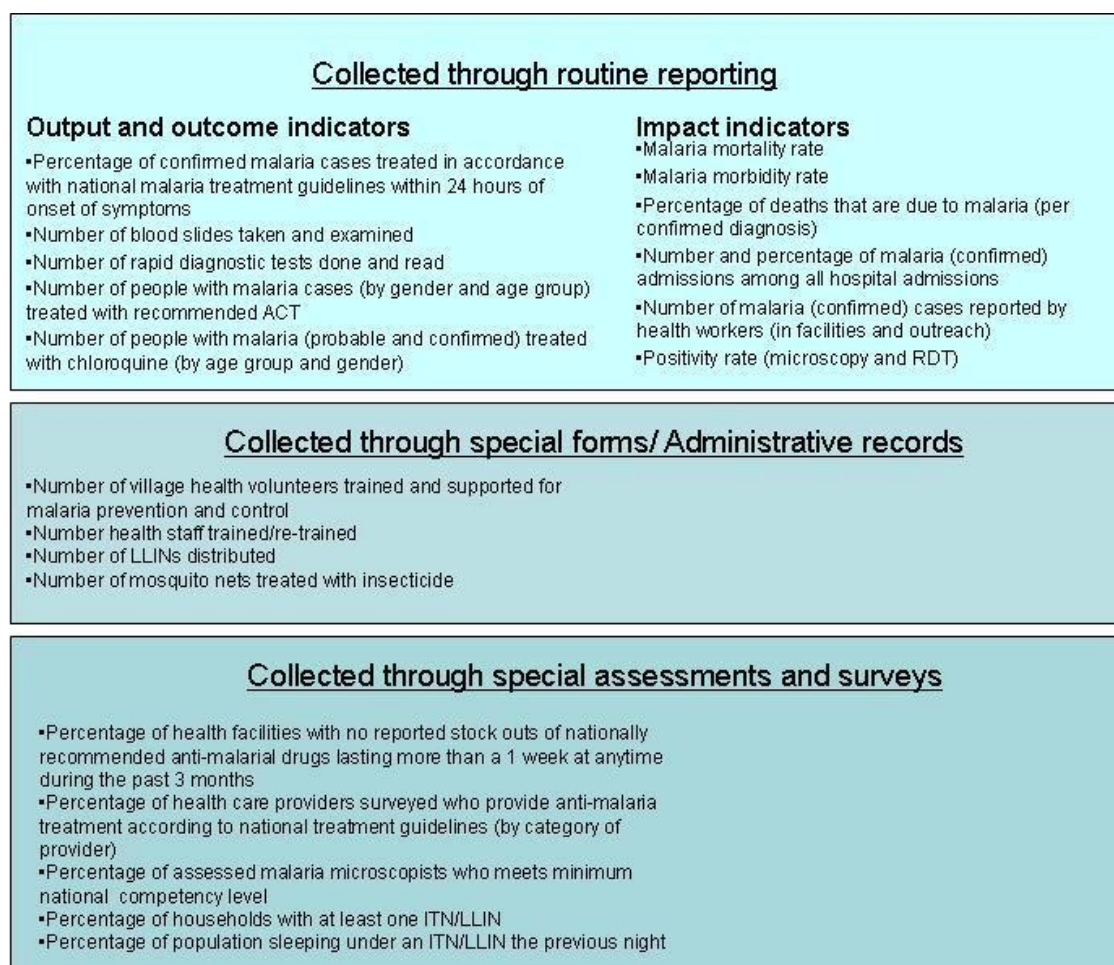
- 8.6.1 Contributing to the Greater Mekong Sub-Region (GMS) Containment activities through intercountry cooperation
- 8.6.2 Twin-city collaboration on malaria prevention and control
- 8.6.3 Support operational research activities related to artemisinin resistance containment

9 Monitoring and Evaluation

Having updated and reliable information on the malaria situation and the programme performance and achievements, is essential. The information used is mainly collected through the routine reporting system, surveys and assessments. Important information is, however, also gathered through evaluation and supportive supervision. Regular evaluation is important to ensure that implementation is going as planned and enable any necessary changes in the planning. Supportive supervision focus on meeting staff needs for management support, logistics, and training.

A total of 20 indicators are used to monitored and report on output, outcome and impact. These indicators can be seen in the figure below and are described in more detail in the National Monitoring and Evaluation Plan (**Annex 7**).

Figure 15–M&E Indicators



The existing health information system will be further strengthened to capture data from public sector, NGOs, private practitioners and trained village health volunteers, in order to have comprehensive information on the malaria situation in the country. This will be undertaken as follows:

Building technical capacity to collect, monitor and evaluate data

- In collaboration with Malaria TSG, VBDC and its partner agencies will update and harmonize the data collection form to be used at service delivery points (community and health facility levels) to enable tracking of progress, monitoring of outcomes and evaluation of impact. Data categories will include age and sex distribution and location.
- The training / refresher training of health care providers and the volunteers will include the use of the data collection form.
- Training of the Township Health Department staff will be focus not only on data collection, but also on data utilization for planning, resource allocation, and decision making.
- Increased Data Quality Assurance will help further improve the data available and provide information on where improvements are needed

Strengthening and expanding existing chains of information

- Within the public sector, Basic Health Staff will submit completed forms to their respective Township Health Department authorities every month (as practiced currently).
- The VBDC field staff or focal person at township level will forward the completed forms to the State/Regional VBDC Office where the data will be encoded.
- Within 4 – 6 weeks after each reporting month, a printed output will be sent back to the Township Health Departments and a soft copy will be forwarded to VBDC at central level.
- State/Regional VBDC Team will analyze the data on quarterly and annual basis and send feedback to each Township Health Department; similarly central VBDC will analyze the data and send feedback to states/regions.
- Each implementing partner will submit quarterly reports, with monthly breakdown, to the Township Health Department where they have a project, and VBDC will incorporate the data with overall data collected in the township.
- Under the leadership of DOH, the Malaria TSG will conduct quarterly and annual M & E meetings together with implementing partners

Because of the development of new project like artemisinin resistance containment, new indicators for M&E have to be developed and to be used for the surveillance of activities and special surveys for achievement. New indicators were developed and added to the existing ones. Detail of the added indicators can be found in **Annex 7.1** - Addendum to **Annex 7**.

10. Planned activities and budget

Planned activities and budget is shown in **Annex 8**