National Strategic Plan
Malaria Prevention and Control
2010-2015

Department of Health
Ministry of Health
REPUBLIC OF THE UNION OF MYANMAR
(Revised September 2012)

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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 over the next five years. 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 resistance to antimalarial medications is the most severe in the world, 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 provided an invaluable source of information for developing the Strategic Plan.

The Vision

By 2015…

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 States[1] 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 Ayeyarwaddy, 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.

The population of Myanmar in 2009-2010 is estimated at 59.13 million[2] 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 per square kilometers.

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

[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

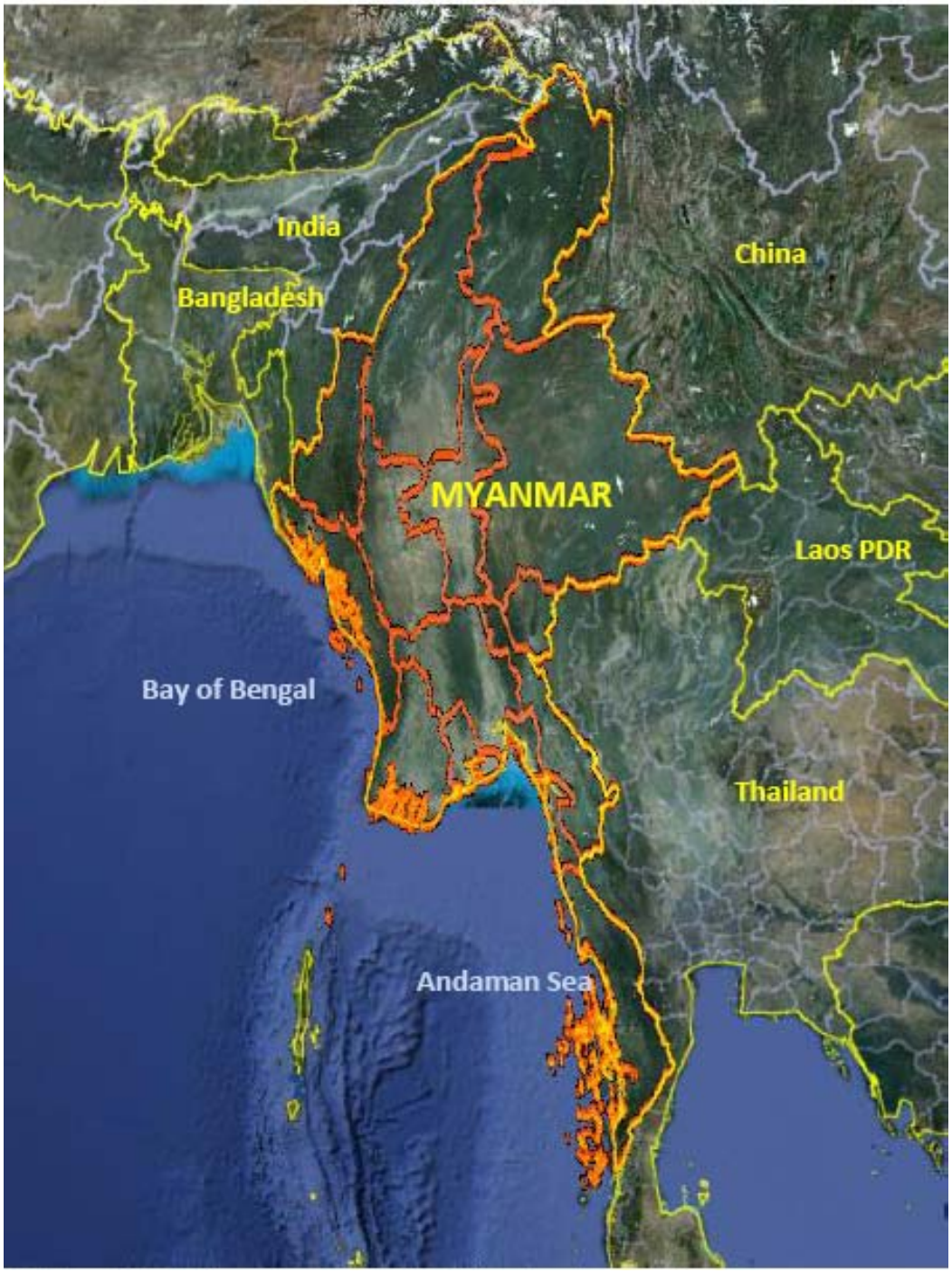
was 94.1% while school enrolment rate was 97.58%, increasing respectively from 79.7% and 67.13% in 1988.

Map 1. Location and administrative divisions of the 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

Map 2 Country boundary and administrative division of the Republic of 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 (%) - 15-59 years (%) - 60 years and above (%)	 31.86 59.29 8.85
Rural Population (%of total population) (%)	70
Crude Birth Rate (2009)* (per 1,000 population) - Urban - Rural	 15.3 16.6
Crude Death Rate (2009)* (per 1,000 population) - Urban - Rural	 5.1 5.8
Infant Mortality Rate (per 1,000 live births) (2009)** - Urban - Rural	 25.7 27.8
Under 5 Mortality Rate (per 1,000 live births) (2009)** - Union - Urban - Rural	 36.53 36.15 41.08
Maternal Mortality Ratio(per 1,000 live births) (2009)** - Union - Urban - Rural	 1.41 1.13 1.52
Average Life Expectancy (2009)** (per 1,000 live births) - Urban (Male) (Female) - Rural (Male) (Female)	 65.5 70.7 64.1 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 millions.*
*** 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

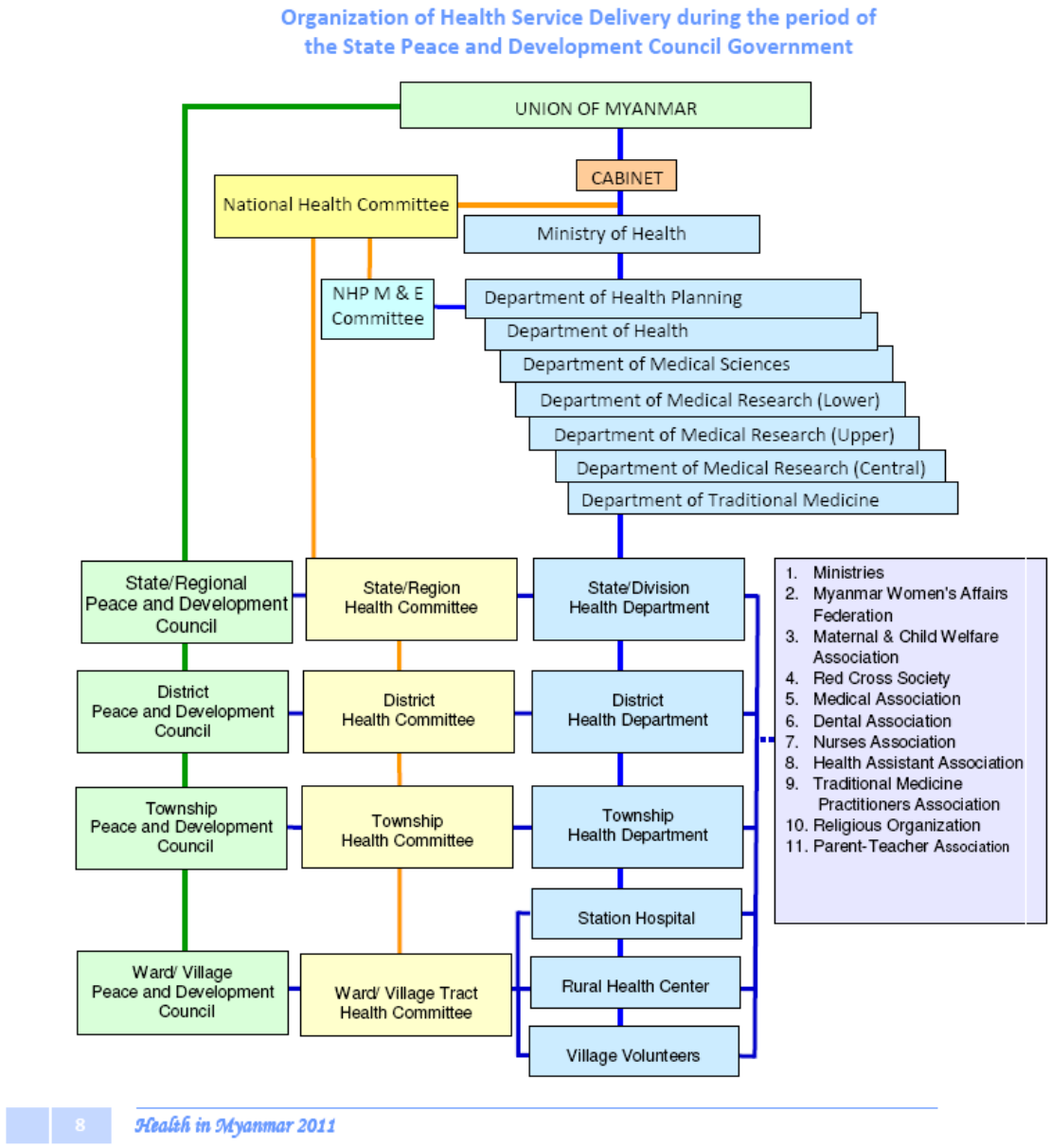
Ministry has seven functioning Departments, each under a Director General. They are Department of Health Planning, Department of Health, Department of Medical Science, Department of Medical Research (Lower Myanmar), Department of Medical Research (Upper Myanmar), Department of Medical Research (Central Myanmar) 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 Defense, Railways, Mines, Industry, Energy, Home Affairs and Transport.

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



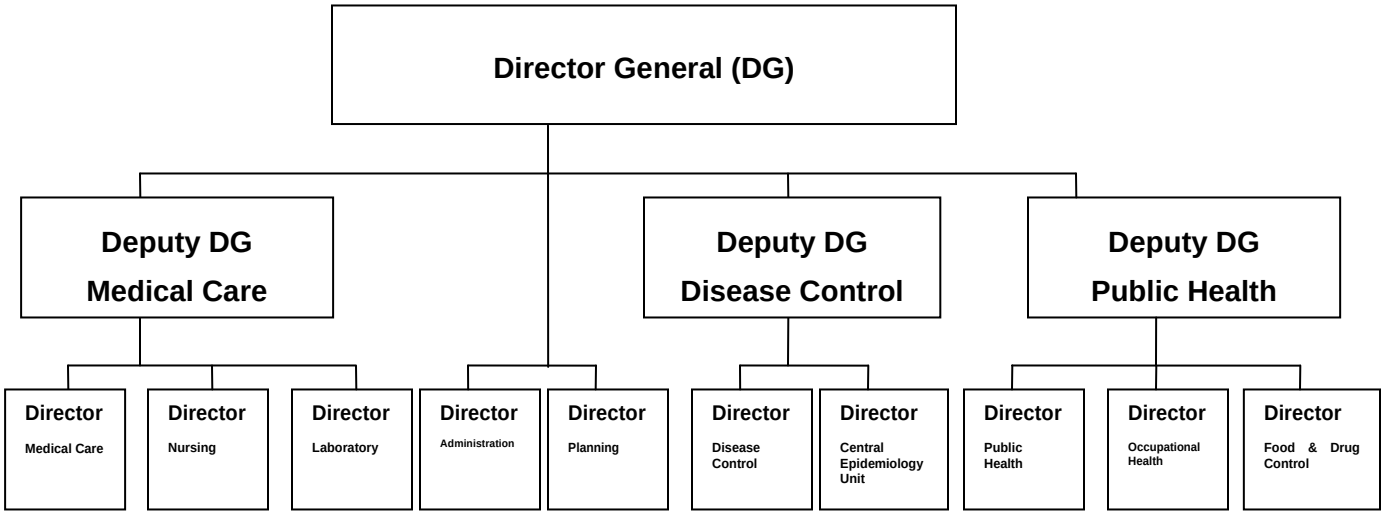
Source: Health in Myanmar 2011

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 nine Directors leading and managing the following Divisions: Medical Care, Nursing, National Health Laboratory, Administration, Planning, Disease Control, Public Health, Occupational Health, and Food and Drug Administration.

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 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 Public Health Division is responsible for primary health care and basic health services, nutrition, environmental sanitation, maternal and child health and school health services.
- The Food and Drug Administration Division is 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 Division also shares weekly information on counterfeit, sub-standard and unregistered medicines found on the market to all State and Divisional Directors.

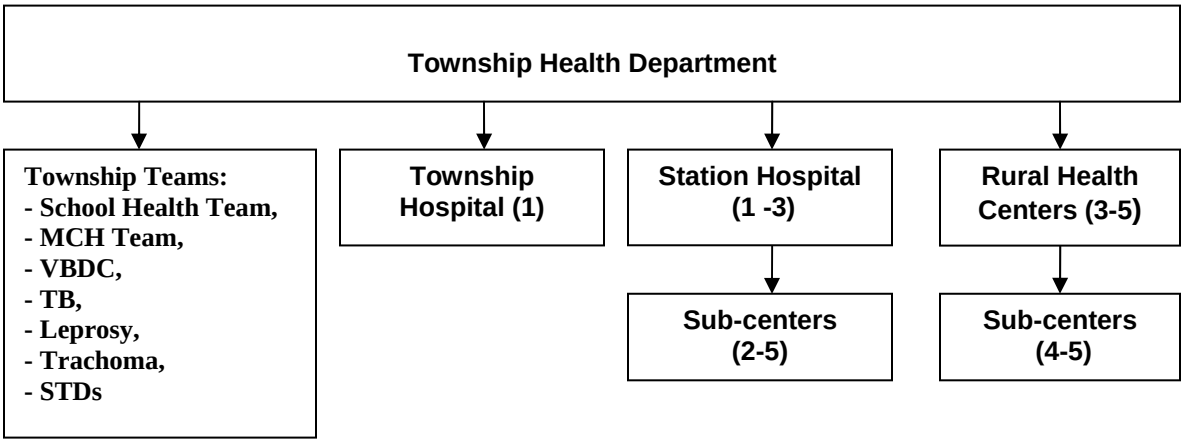
Figure 2. Organogram of the Department of Health



Source: Ministry of Health, 2008

A Township Health Department **(Figure 3)** has the following health facilities and manpower compliment: a Township Hospital managed by the Township Medical Officer, a Station Hospital managed by a Medical Officer, 4 to 5 Rural Health Centers (RHCs) led by Health Assistants, and 4 to 5 Sub-rural Health Centers 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 center 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, 1988-2012

Health Facilities	1988-89	2007-08	2008-09	2009-10	2010-11	2011-12
Hospital (Public Sector)	631	839	846	871	924	987
Ministry of Health	617	813	820	844	897	921
Other Ministries	14	26	26	27	27	66
Total no of hospital beds	25,309	36,949	38,249	39,060	43,789	54,5035
No primary & secondary health centers	64	86	86	86	86	87
No of maternal & child health centers	348	348	348	348	348	348
No of rural health centers	1337	1,473	1,481	1,504	1,558	1,565
No of school health teams	80	80	80	80	80	80
No traditional medicine hospitals	2	14	14	14	14	14
No of traditional medicine clinics	89	237	237	237	237	237

Source: Health in Myanmar 2012

Table 2. Health Manpower Development in Myanmar, 1988-2012

Health Manpower	1988-89	2007-08	2008-09	2009-10	2010-11	2011-12
Total number of doctors: Public sector: Co-operative & Private:	12,268 4,377 7,891	21,799 7,976 13,823	23,740 9,583 14,157	24,536 9,728 14,808	26,435 10,927 15,508	28,077 11,460 16,617
Dental Surgeons: Public sector: Co-operative & Private:	857 328 529	1,867 793 1,074	2,092 777 1,315	2,308 703 1,605	2,562 813 1,749	2,770 848 1,922
Nurses	8,349	22,027	22,855	24,242	25,644	26,928
Dental Nurses	96	177	244	262	287	316
Health Assistants	1,238	1,788	1,822	1,845	1,899	1,536
Lady Health Visitors	1,557	3,197	3,238	3,278	3,344	3,371
Midwives	8,121	18,098	18,543	19,051	19,556	20,044
Health Supervisor(1)	487	529	529	529	541	612
Health Supervisor(2)	674	1,444	1,484	1,645	2,080	1,718
Traditional Medicine Practitioners Public: Private:	290 2,500	945 5,163	950 5,397	890 5,737	890 , 5737	885 5,867

Source: Health in Myanmar 20012

Of 28,077 doctors in 2011-2012, 16,617 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 Centers store their supplies in small storerooms 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 464.1 million in 1988-89 to 63,796 million kyats in 2009-2010 and 86,547 million kyats in 2010-2011 **(Table 3)**. Considering the high rates of inflation, it is difficult to assess the real trend.

Table 3. Government Health Expenditure, Myanmar, 1988 - 2010.

	1988-89	2007-08	2008-09	2009-10	2010-11
Health Expenditure (million kyat)					
Current	347.1	38,368.1	41,362.7	47,275	60,096
Capital	117.0	10,379.2	10,080.7	16,521	26,451
Total	**464.1**	**48,747.3**	**51,443.4**	**63,796**	**86,547**
Per Capita Health Expenditure (kyat)	11.8	847.8	881.2	1,078.9	1,447.7

Source: Health in Myanmar 2012

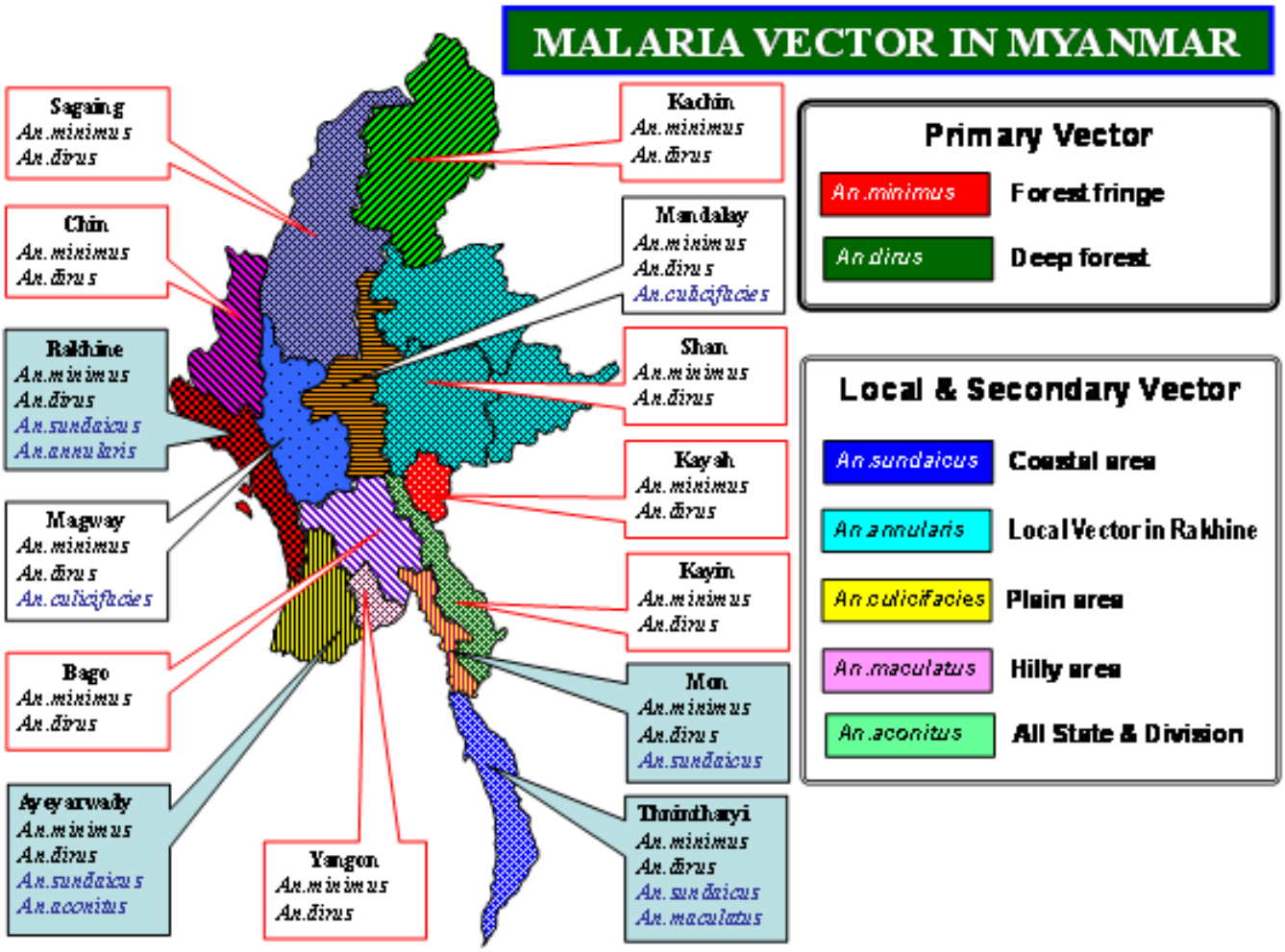
The health care delivery system is based on the principles of primary health care up to the community level with a committed and professional health work force, and strategies to make grossly inadequate resources stretch as far as possible are also been developed. However the need to review the extent 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

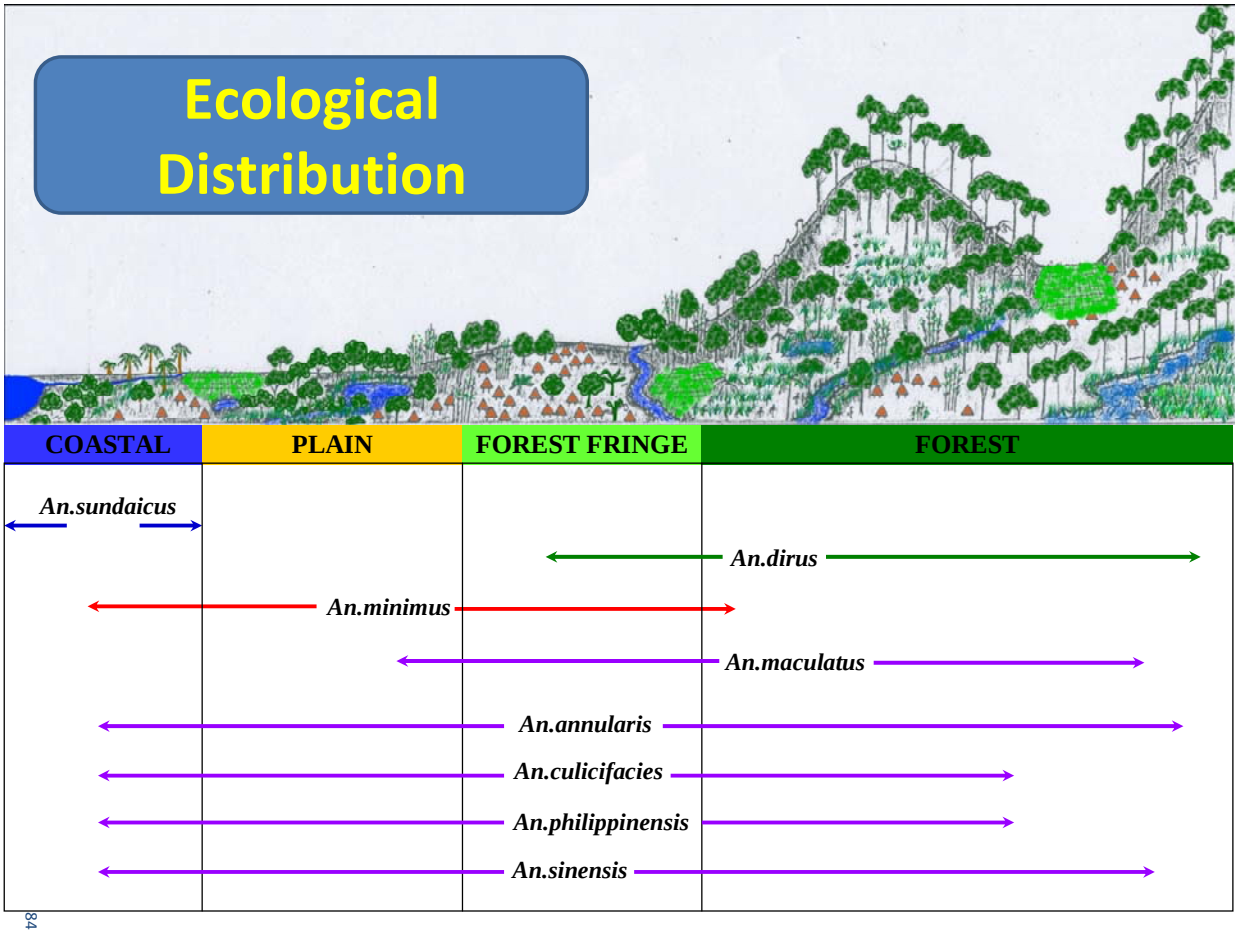
Out of 37 species of anophline mosquitoes in Myanmar, 8 species are malaria vectors **(Map 3)**, classified into primary (*An. dirus* and *An. minimus; sporozoite rates 2-4%)*, secondary (*An. annularis, An. sundaicus, An. culicifacies; sporozoite rates 1-2%*), and suspected vectors (*An. aconitus, An. maculatus, An. vagus; sporozoite rates* <1%) based on their relation to malaria, e.g. sporozoite rates.

Map 3. Malaria vectors in Myanmar, 2007



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

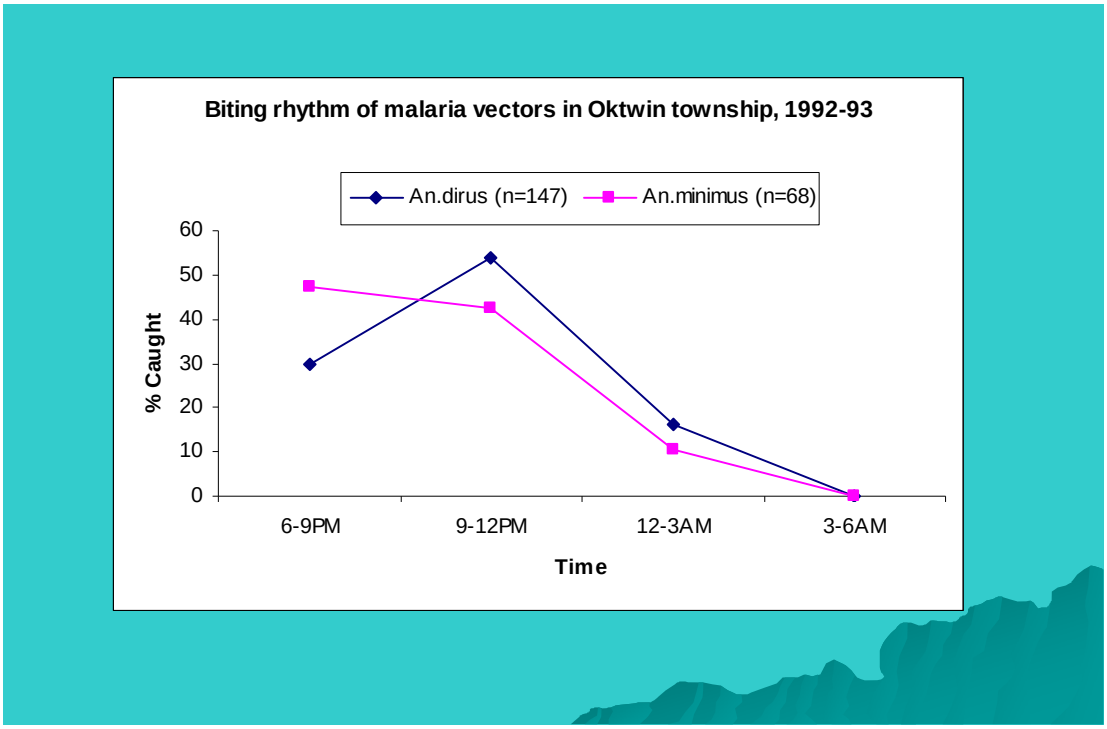
Figure 4. Vector habitats in Myanmar, 2007



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**. Although both primary vectors are late biters, *An. minimus* is also an early biter (bites equally in the first and second quarters of the night **(Figure 5)**. The early *An. minimus* biters are generally nulliparous mosquitoes emerging from nearby slow moving 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. sundaicus*. 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 Division, 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.

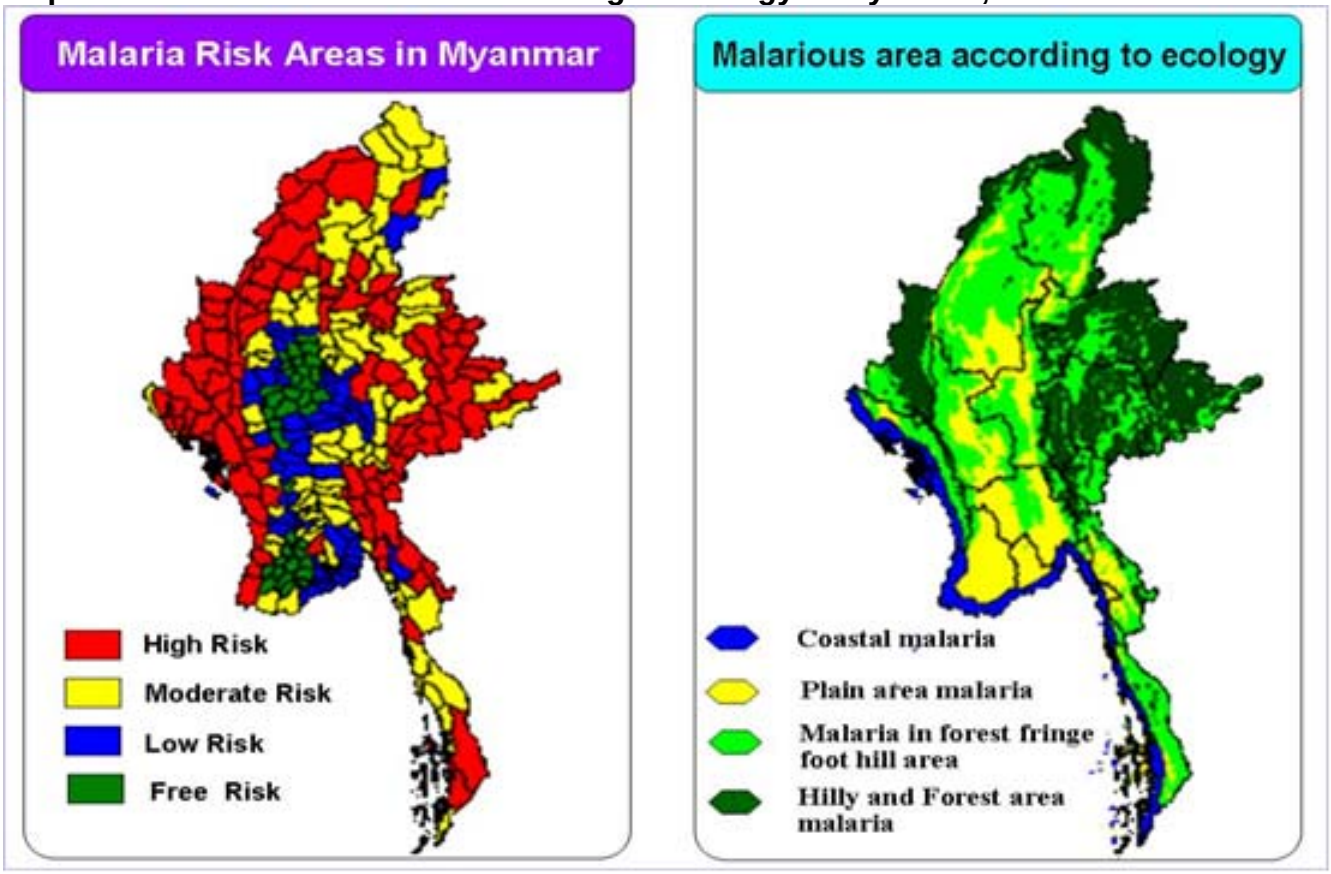
Some outbreaks are related to new ecological niches for important vectors, such as *An. minimus* breeding in shady wells in Sagaing Region, Budalin Township. These outbreaks arise from introduction of infection by migrant workers. Surveillance for such changing patterns is important.

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 malaria **(Table 4)**. 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.

Micro-stratification 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 micro-stratification 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 produce 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.

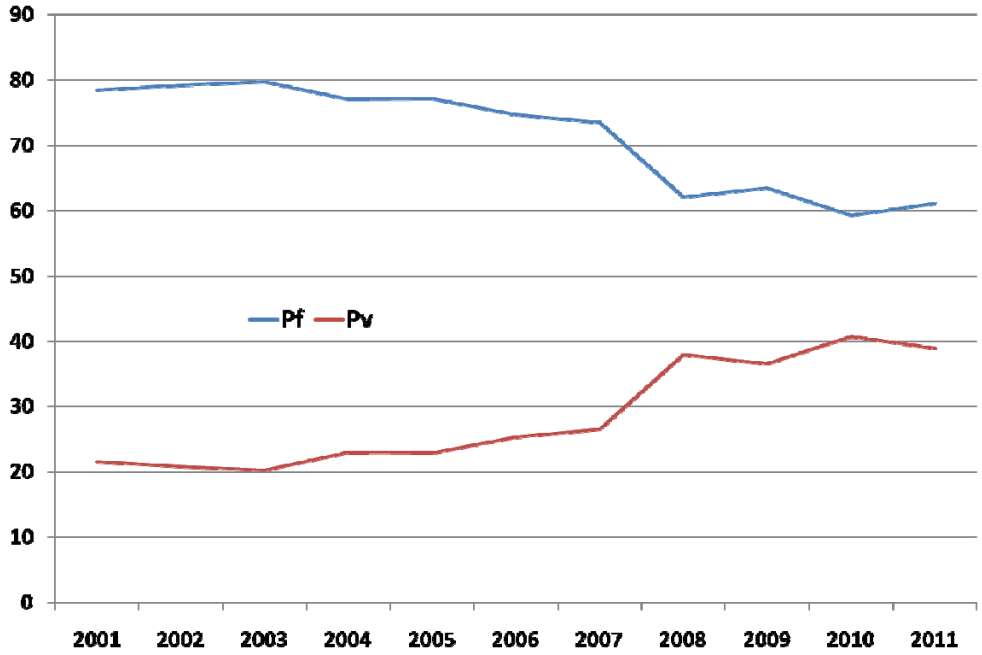
The other major risk group is migrants, who are often induced by economic opportunities such as logging or mining in forested areas or road or dam construction and maintenance. Displacement caused by dam construction may also lead to exposure. These population movements may be organized, in which case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

Malaria risk also occurs in plantations, which offer forest-like environments such as rubber trees and oil palms. 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 anophelenes 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, P. ovale and the fifth human malaria parasites, P. knowlesi. P. falciparum* accounts for 70% -80% of cases with a slight decline in occurrence of *P. falciparum* over the past decade **(Figure 6)**.

Figure 6. *Plasmodium falciparum* and *Plasmodium vivax* ratio in Myanmar, 2001-2011



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

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%. Prolong clearance time in four subjects were 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. Myanmar nationals are among the miners of gems in western Cambodia. Resistance strains are reportedly carried by people from Cambodia to the Thai-Myanmar border.

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. Artemisinin resistance containment framework was developed in 2010 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

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 5)** 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 5 . Susceptibility status of anopheline species to different insecticides in Myanmar, 1997

Species	Insecticide		
	Organophosphate	Organochlorine	Pyrethroid
An. minimus	S	S	S
An. dirus	S	T	S
An. culicifacies	S	R	S
An. aconitus	S	R	S
An. sundaicus	S	S	S
An. annularis	S	R	S
An. hyrcanus	S	R	S

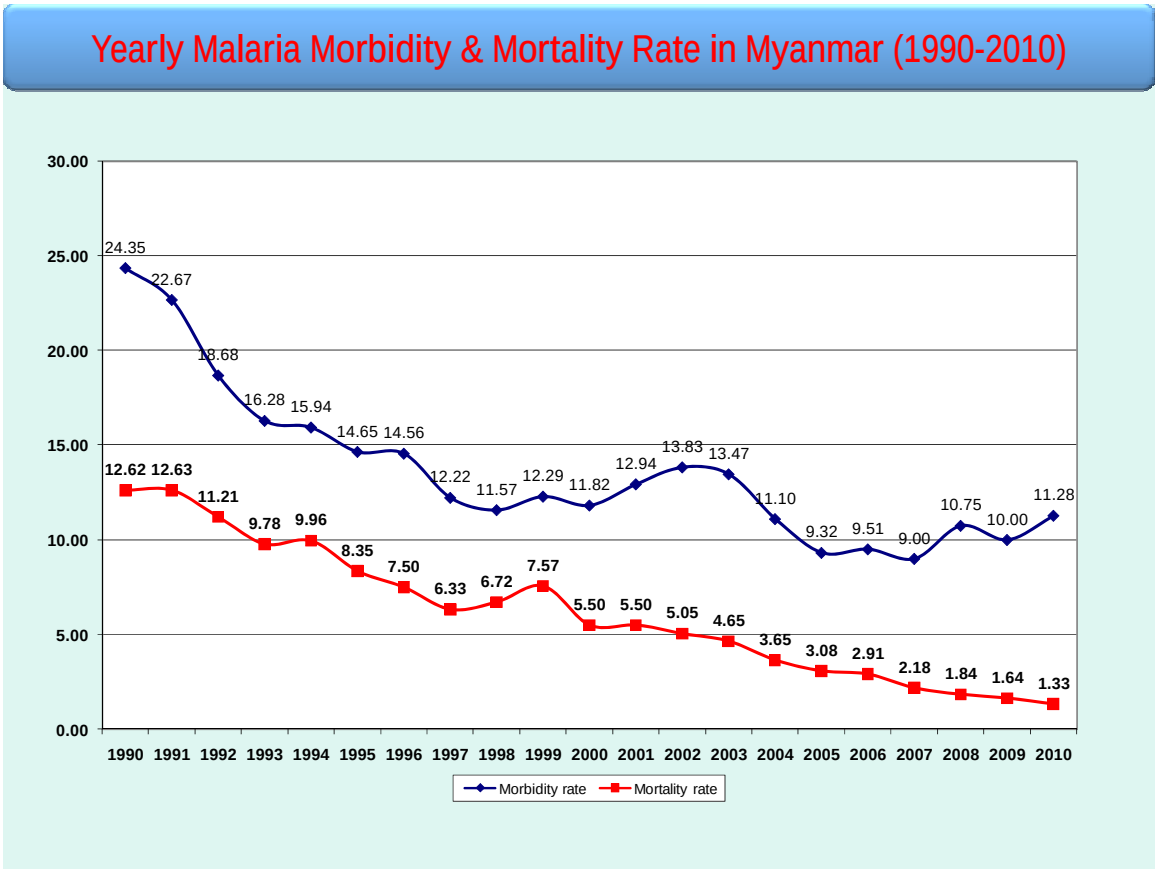
Legend: S = susceptible; T = tolerant; R = resistant.

Source: External Review of National Malaria Programme, Myanmar, 2005

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 **(Figure 7)**. 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 was scaled up with the support from the Three Diseases Fund 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. The use of the public health services depends on the availability of effective antimalarials.

Figure 7: Annual Malaria Morbidity and Mortality Rates in Myanmar 1990-2010



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

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 34,043 in 2011. 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.

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 7)**. The reported number of deaths was lowest ever recorded (581) in 2011. 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

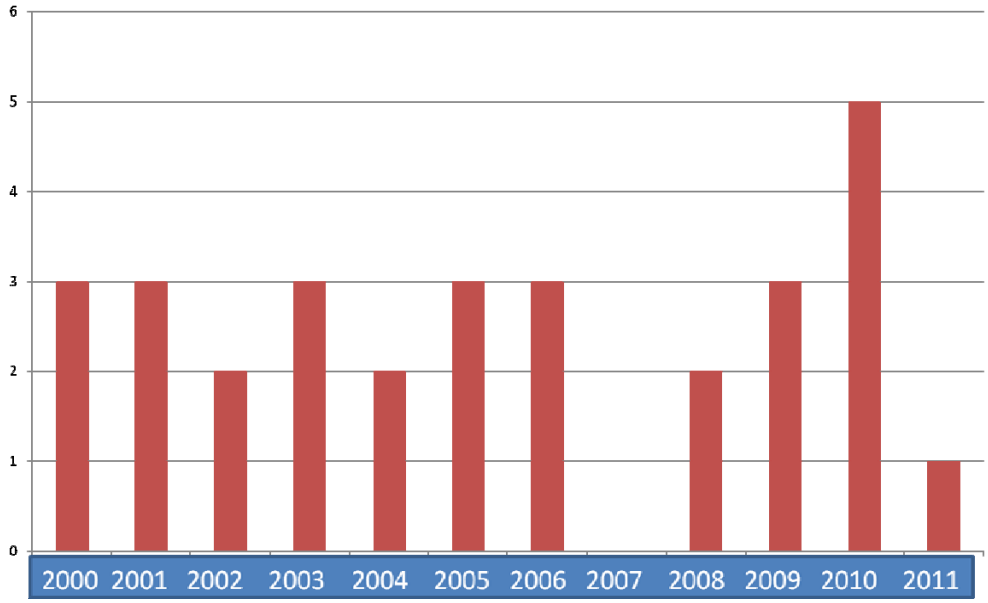
after onset of symptoms. Despite the underreporting of malaria deaths in Myanmar, those that are registered represent 33% per cent of all reported malaria deaths in the South-East Asia Region in 2010[3]. Among 6 countries in the Greater Mekong Sub-region (GMS) Myanmar reported highest number of malaria deaths in 2010 (75% of total malaria deaths[4])

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 8 and Table 6**. 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 treatment of existing mosquito nets. 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 8 Number of malaria epidemics in Myanmar, 2001-2011



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

[3] Malaria Profile 2010: WHO SEARO

[4] Mekong Malaria Profile 2010: WHO Mekong malaria programme)

Table 6. Analysis of Malaria epidemics in Myanmar 2001-2011

.

Year	No. of Townships affected	No. of villages affected	No. of pop affected	No. of malaria cases	No. of deaths
2001	5	30	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	-
2005	3	4	3,634	477	-
2006	3	17	12,030	1,567	13
2007	0	0	0	0	0
2008	2	2	3,422	212	2
2009	2	2	1,908	371	5
2010	7	8	11,053	2,326	1
2011	3	5	4,428	416	4

3.8 Malaria distribution in men, women, pregnancy and children

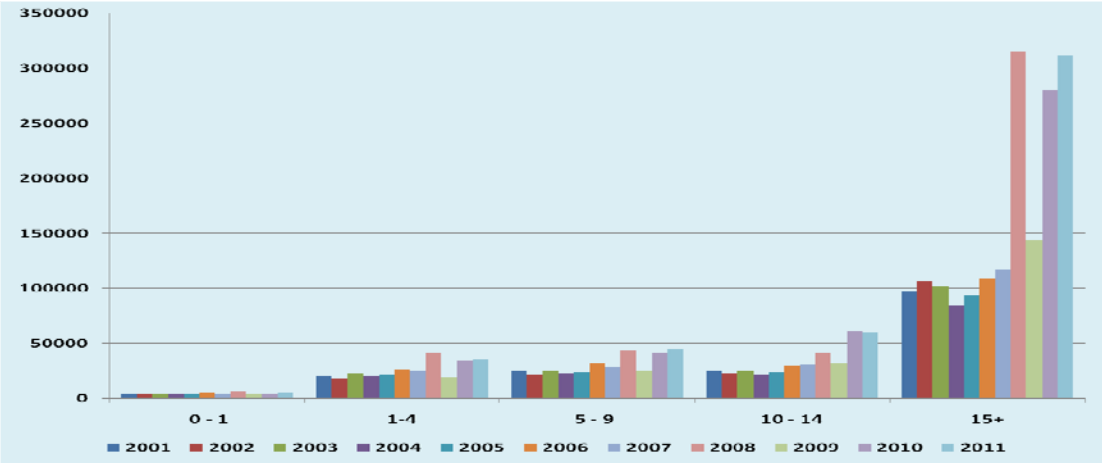
Overall, analysis of the age distribution of reported cases indicates a modest over-representation of young adults among reported malaria cases **(Figure 9 and Table 7)**. At all ages below 75 years, males are reported with malaria more than females, with the sex ratio most extreme from 15-54 years.

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 9. Age distribution of malaria cases in Myanmar, 2001-2011



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

Table 7 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
		%		%		%		%		%	
Exam	18,373	1.83	83,776	8.33	109,657	10.91	145,050	14.43	648,396	64.50	1,005,252
Pos	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 10.97% of all antenatal care pregnant women and 11.85% 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 Tanintheryi 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 Assessment 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.

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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 8.**

Table 8. 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	VBDC-WHO	2009 (based on estimated cased 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**.** 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. Generally, the total number of cases, M, lies within the range:

Table 9. Estimates of malaria burden in Myanmar in 2010 (unpublished data WHO 2012)

Items		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.

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 document[5]. 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.

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.

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

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. Populations in these risk areas are now identified and mapped through microstratification. Aside from free mass 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 19.99% 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” 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 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. The outputs related to insecticide treatment of existing mosquito nets as well as the numbers of LLINs distributed are reflected in **Table 10**. 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).

Table 10. 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

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 retreatment cost 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

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 programme 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, if the ITNs/LLINs or long-lasting insecticidal retreatment kits were delivered to them at the right time and place.

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.

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 at risk population.
b. Vector ecology and impact of interventions as *An. sundaicus* 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 programme, particularly the selection of insecticides for vector control.

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

Routine 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 outbreak prevention in new settlements and development projects in malaria risk areas, high outbreak risk areas and localized areas of multiple parasite resistant *P. falciparum* malaria.

IRS is the preferred intervention to control outbreaks and to prevent them in development projects in endemic areas, certain border areas and new settlements. The number of houses/dwelling units sprayed has declined from 7,932 in 2003 to 1,484 in 2007 **(Table 11)**. The continuation or withdrawal of IRS depends on local entomological and epidemiological situation.

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.

The number of outbreaks decreased during last five years. No malaria outbreak was reported in 2007. 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 11. 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

Conclusion

IRS should be considered only on a limited and focused basis in areas of outbreaks, development projects in endemic areas and new settlements because of issues related to capacity, costs and logistics. IRS is recommended to apply in combination with ITN/LLIN in artemisinin resistance affected areas in order to maximize protection to population at risk.

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, CSM malaria 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 RHCs.
g. 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

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

4.2.2.1 Diagnosis

Diagnosis based on clinical history and physical examination is still widely practiced due to difficult access to both microscopy and RDTs. Even in facilities with microscopy and RDTs, health care providers do treat malaria patients based on clinical diagnosis. Records indicate that there are at least 700 malaria microscopy centers nationwide, plus the basic laboratory services in 325 Township hospitals. 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 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 Program and ACTMalaria starting in 2009.

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, 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 and over 800,000 in 2011. 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

The coverage of diagnosis of malaria by microscopy and RDTs is low both in the public and private sector. 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.

Combo RDTs should be deployed instead of Faciparum RDTs due to high proportion of *P. vivax*. It is useful in circumstance where microscopy is not readily available (e.g. at the community level) for *Plasmodium vivax* malaria detection.

The quality assurance/control of both microscopy and RDTs is of concern to the programme and 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 2).* 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 Townships 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. These do not, however, include the quantity used by INGOs and the private sector.

According to the rough calculation of the programme, 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 x 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.

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 agencies and bilateral). 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 chrotmatography (HPLC) to FDA. A group of VBDC staff were trained to perform sampling and screening tests on antimalarial medicines. However the actual implementation is yet to be fully realized.

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 464.1million in 1988-89 to 86,547 million kyats in 2010-2011 **(Table 3)**.

In principle, most malaria patients receive diagnosis and treatment free of charge from the public sector. However, those who can afford to pay are requested to contribute to the Revolving Drug Fund (RDF). Most if not all hospitals have a RDF; they sell medicines, including those provided by UN Agencies, to patients and use the money thus earned to replenish their stocks. Hospitals are free to decide on which medicines to purchase from these funds and from where to purchase. Patients, who cannot afford, are exempted. Many RHCs also have a revolving fund. It is worth noting that, with few exceptions, the availability of RDTs and ACTs in the public sector is largely dependent on external support.

Cost sharing mechanism and revolving funds are attractive mechanisms but there are difficulties in operating them.

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 (in 2005). Key VBDC staff as well as some hospital staff had overseas training on malaria case management. In addition, other VBDC staff were also trained locally as well as overseas on malaria epidemiology, vector control, antimalarial medicine resistance monitoring and programme management. VBDC staff also received technical assistance and some financial support for training through Asian Collaborative Training Network for Malaria (ACTMalaria)[6]. More investments are

[6] http://www.actmalaria.net/home/

needed to train the Basic Health Staff, 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 national diseases under surveillance in the integrated disease surveillance system reported monthly through the Department of Health Planning. This reporting 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.

Valuable data are collected in every health facility and monthly reports are submitted to the Township Health Department. The VBDC is working on improving the timeliness of the data consolidation and analyses 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.

A malaria sentinel therapeutic efficacy surveillance 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 increase 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 Micro-stratification

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 12)**. 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 subrural health center level to State/Regional level. The criteria for

classification are described in detail in **Annex 1**. As indicated in **Table 15**, 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 12. Results of microstratification in 80 Townships, Myanmar

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
	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 9^{tth} Round GFATM, similar survey was conducted in 50 townships in 14 states (except Magway and Kayah) and results are displayed in **Table 13.**

Table 13. 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 14)**

Table 14: 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	Kachin	33/ 1028	889414		51/ 31	382848		26/ 33	242156		17/0	106282		127/1092	1620700
2	Kayah		125142	41.7		94845	31.6		79692	26.6			0		299679
3	Kayin	803	540424	37.0	559	490067	33.6	475	429613	29.4	0	0	0	0	1460104
4	Chin	200	315031	66.1	164	150745	31.6	59	10898	2.3			0	474	476674
5	Mon	138	64111	3.04	197	154030	7.3	664	1006066	47.7	382	886696	42.0	1381	2110903
6	Rakhine	1494	692795	22.0	1249	1070952	34.0	1251	1383901	43.9	0	0	0	3994	3147648
7	ESS	0	104878	17.1	0	81522	13.3	0	425573	69.5	0	0	0	0	611973
8	SSS	101/ 3410	1503126	63.07	46 / 781	688945	28.9	8 / 456	191288	8.0			0	154 / 4772	2383359
9	NSS		704848	34.3	858	809956	39.4	588	217891	10.6	29	321043	15.6	0	2053738
10	Sagaing	0	1804327	34.9	0	976025	18.9	0	2384757	46.2	0	0		0	5165109
11	Tanintharyi	750	624339	44.5	357	402197	28.6	148	293628	20.9	33	83671	5.9	1289	1403835
12	Bago E	360	228338		351	265641		712	566864		1474	1844236		2897	2905079
13	Bago W	0/ 953	423853	21.2	0/744	317063	15.8	0/ 1429	677745	33.9	96/686	580184	29.0	96/3794	1998845
14	Magway	757	418991	9.6	2483	2049902	46.8	601	566555	12.9	1140	1343339	30.7	4981	4378787
15	Mandalay	9/ 1267	1083479	17.3	65/61	238809	3.8	61/ 177	1644091	26.2	273/2207	3313277	52.7	408/5528	6279656
16	Yangon	154	89537	1.5	68/1841	42836	0.7	258/0	37501	0.6	326/2067	5799539	97.1	2477	5969413
17	Ayarwaddy	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

Table 15. 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, 1st priority	Yes, first priority	In selected areas, 1st priority	Yes	Yes
	Stratum 1b Moderate risk villages	Yes, 2nd priority	Yes, second priority	In selected areas, 2nd priority	Yes	Yes
	Stratum 1c Low risk villages	Yes, 3rd priority	To encourage to buy their own LLINs	In case of outbreak	Yes	Yes
		Combination of ITN/LLIN and IRS in artemisinins 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 their own LLINs	In case of outbreak	Yes	Yes
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 IEC to mobilize support for malaria prevention and control programme.

WHO, UNICEF and JICA support the NMCP in malaria control in all aspects, 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 Karen. 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 Kang 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.

5 Stakeholder analysis

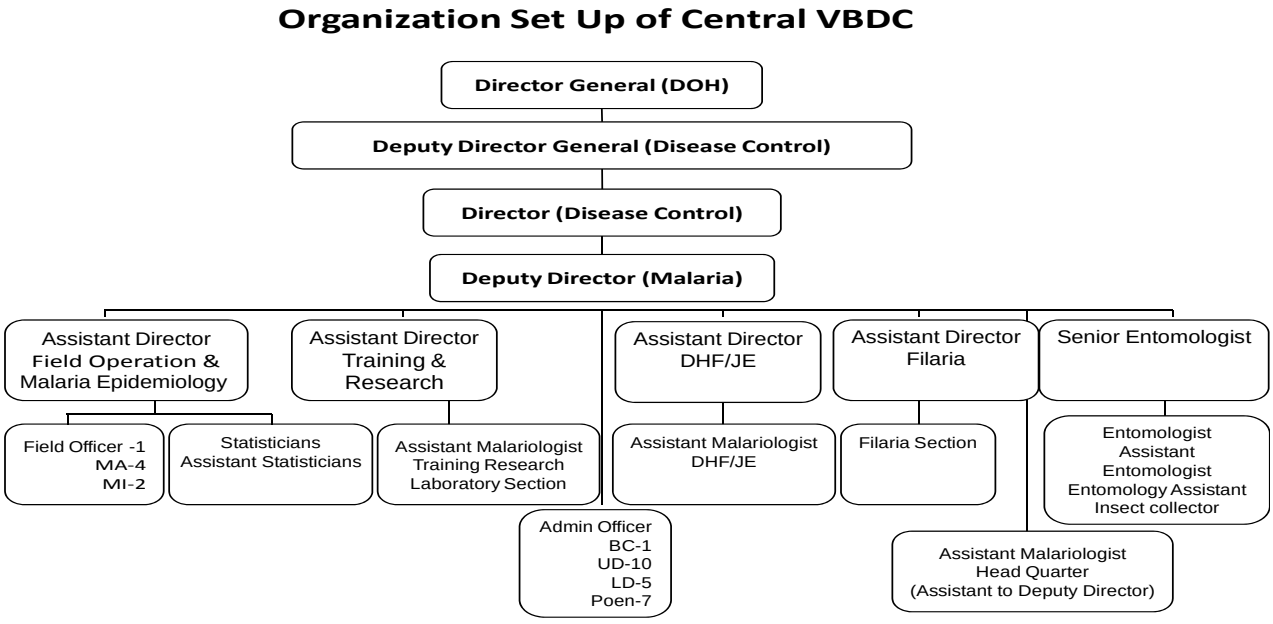
5.1 Vector Borne Disease Control Programme (VBDC), Ministry of Health

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 10)**, 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 10. Organogram of the Central Level of VBDC, Myanmar, 2012

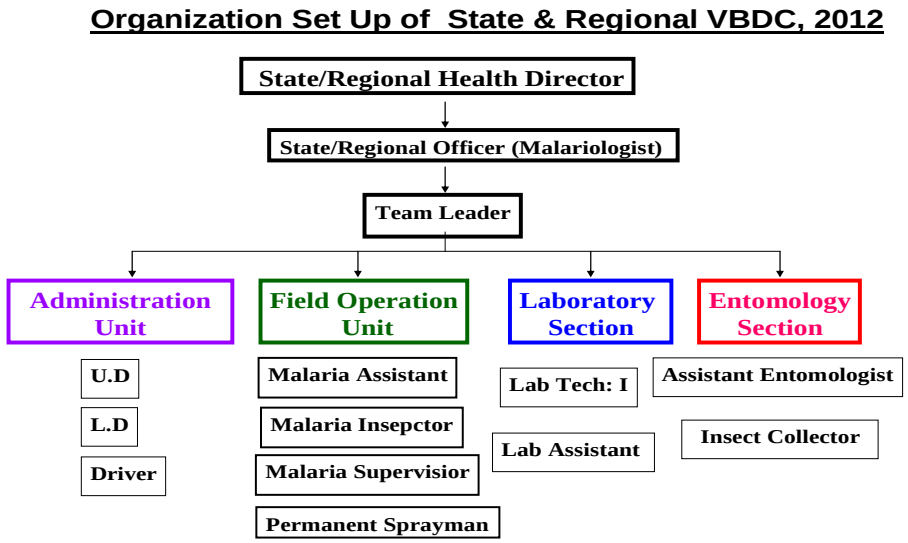


Source: Vector Borne Disease Control, Ministry of Health, 2012

At State/Regional level **(Figure 11)**, 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 11. Organogram of the State/Regional Level of VBDC, Myanmar, 2012

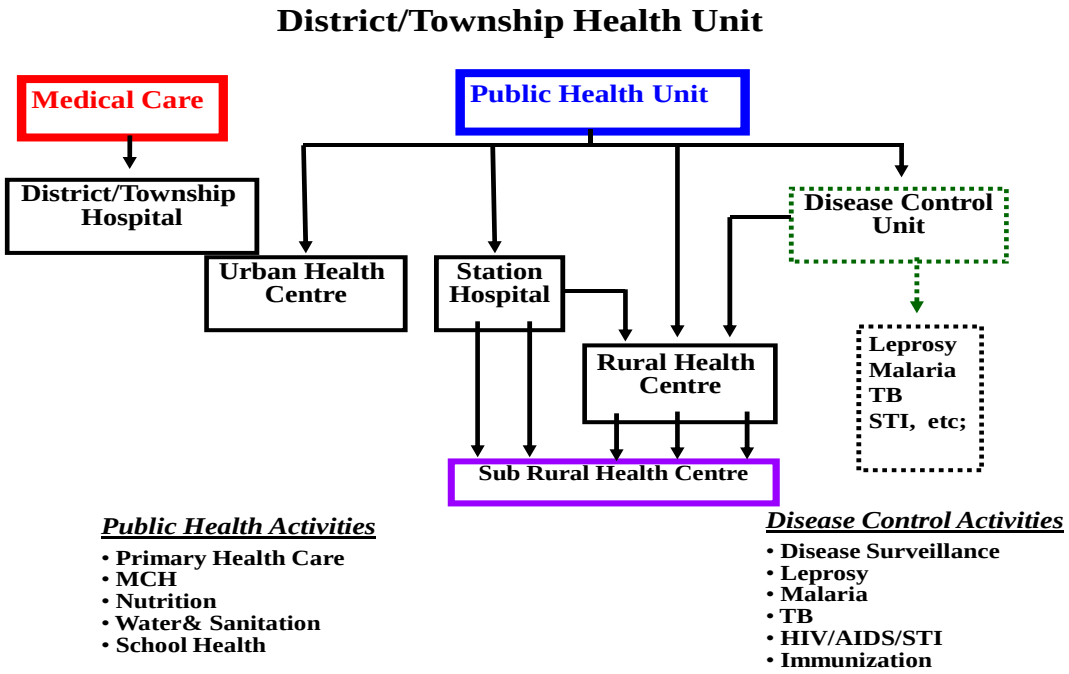


Source: Vector Borne Disease Control, Ministry of Health, 2012

At District/Township level **(Figure 12)**, 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 subcenters. The VDBC staff compliment in each endemic Township comprises a malaria assistant, malaria inspector, malaria supervisor, malaria spray man and sometimes laboratory technician.

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 12. Organogram of the District/Township Level of VBDC, Myanmar, 2012



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

Beyond the subcenters, 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 16**, which indicates the number of sanctioned post of which about 60-70% are filled. Thus, the real total staff compliment 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 16. 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	Sprayman(Permanent)	16	84	350	450
35	Sprayman(Tempory)	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 Japanese 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. 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. no 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 Kokang 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 programme 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 an International Medical 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). 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 and GFATM 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 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: CESVI, Maltesar, Merlin, MSF-Holland (AZG), MSF-France and MSF-Switzerland, Save the Children, PSI, MAM, World Concern, World Vision, AHRN, CARE, AFXB and the newly registered INGO – University Research Co (URC). URC is currently implementing the USAID-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 5**. 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 CHWs. Quality assurance of malaria microscopy, quality assurance in franchise networks, supervision, monitoring and evaluation at the field and central levels are also included. All INGOs provide health education. Three INGOs are involved in organizing retreatment campaigns of mosquito nets whilst two employ mass media for IEC on malaria.

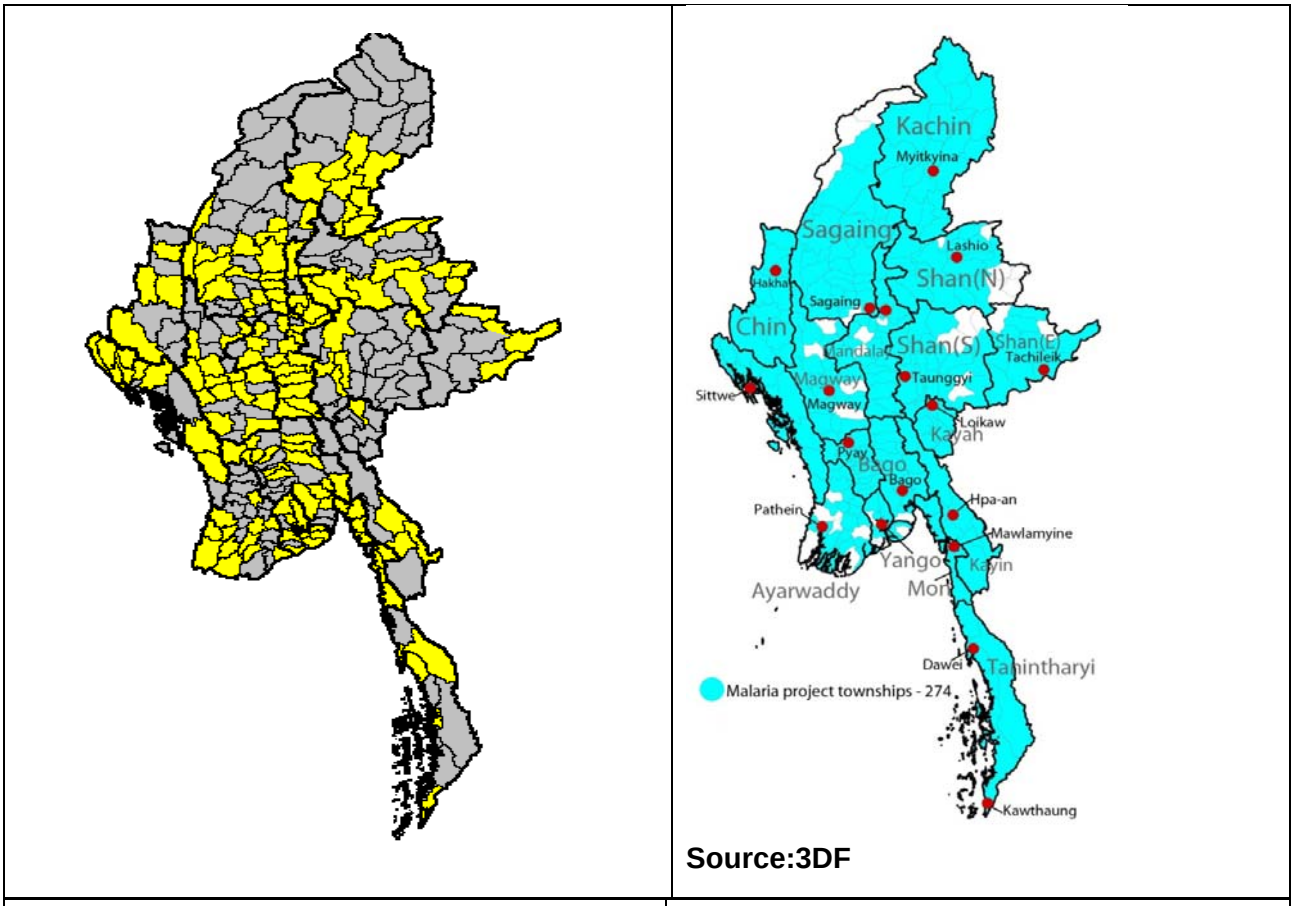
The INGOs involved in health development work include health education through CHWs (all), diagnosis and treatment of malaria (2), medical support (1), advocacy for ITNs (4), and treatment of mosquito nets (2).

The best practices on malaria control include performing quality assurance system for malaria microscopy, with excellent quality control results over time, good clinical practices, especially through the mobile clinics, quality assurance in the franchise clinic network and supervision, monitoring and evaluation of field projects.

The key challenges that INGOs face in implementing malaria control projects include access constraints, appropriate and quality malaria treatment delivery, collaboration with partners, financial constraint and weakness of the coordination mechanisms.

Besides INGOs that are based in Myanmar, there is a number of INGOs that contribute to malaria control but do not have local office in Myanmar. This includes United States Pharmacopeia (USP), Malaria Consortium, Asian Collaborative Training Network on Malaria (ACTMalaria), etc.

Map 5. Geographical distribution of INGOs, Myanmar, 2009 and 2012



Legend		Legend	
	Covered by INGOs		Covered by INGOs
	Not covered by INGOs		Not covered by INGOs

5.2.5 Three Diseases Fund

The Three Disease Fund (3DF) is a Multi Donor Trust Fund established in August 2006, following the termination of the Global Fund. The six donors 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 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 3DF is the biggest source of financial support for malaria control in Myanmar.

5.2.6. International organization for migration (IOM)

As a UN agency IOM plays important role in studying migration patterns and migrants behaviour in the artemisinin resistance containment operation. IOM also implemented malaria control in providing malaria diagnosis, treatment and prevention.

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. 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 ITNs and support for patients referred. 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 as its aim the 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 Townships 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.

5.3.3 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 Three Diseases Fund and technical support from WHO, the MMA is implementing its "Quality Diagnosis and Standard Treatment of Malaria" project with 163 trained Quality GPs in 46 highly endemic townships across 12 States and Divisions. 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.

5.3.4 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.

For example, the 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 Three Diseases Fund 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.

5.3.5 Community – based Organization (CBO)

Friends for Health (FFH) is a community –based NGO working in collaboration with the Global Health Access Programme (GHAP) and receives financial support from USAID President Malaria Initiative (PMI) and DFID. FFH implements in townships along the eastern border with Thailand. There are several community-based NGOs contribute to malaria control in Myanmar that receive 3DF grants such as PDO, YUTH, etc.

Conclusion

National NGOs such as the MMCWA, MWAF 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 the Three Diseases Fund as mentioned in earlier section, the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), USAID-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 intersectoral 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 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, intersectoral 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 Round 3 GFATM 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 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 – 2011

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 and about 40,233 in 2010. Total malaria deaths (in-patients) has declined continuously, reportedly 675 in 2010 and 581 in 2011 (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, decreased population mobility as a result of economic progress 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 and 2011. The new 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. This was further scaled up in 2011 with support from the 9th round GFATM and 3DF. More than 800,000 RDTs were used by the public sector

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. Malaria data are computerized and analyzed. However, there is room for improvement.

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 ITNs/LLINs 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 ITNs/LLINs. The latest 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.

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, has been introduced to States/Regions for storage of RDT and drugs in remote health facilities. A core group of microscopists were validated be 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.

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 do situation analysis and develop annual plan for malaria prevention and control.

m. Overall coverage of interventions has improved with support of the Three Diseases Fund and followed by the 9th round GFATM as well as other funding sources but much more are needed.

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 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 centers 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 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 indoors 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 intersectoral 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, 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 five years.

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.

Micro-stratification 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 ensure 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.

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 50 per cent by 2015 (baseline: 2007 data), and contribute towards socio-economic development and the Millennium Development Goals.

7.2 Objectives

7.2.1 Objective 1

By 2015, at least 80% of the people in high and moderate risk villages in 284 malaria endemic townships (212 priority townships) 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 2015, 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 2015, in 284 malaria endemic townships (270 priority townships) the communities at risk actively participate in planning and implementing malaria prevention and control interventions.

7.2.4 Objective 4

By 2015, the Township Health Department in 284 malaria endemic townships (270 priority townships) are capable of planning, implementing, monitoring and evaluating malaria prevention and control program with management and technical support from higher levels.

7.3 Target Calculations and Assumptions (as of September 2012)

		2010	2011	2012	2013	2014	2015
(1) Total population		48,010,000	***48,582,481***	49,209,195	49,843,994	50,486,981	51,138,263
(2) Population growth rate multiplier(latest info in 2009)*		1.0202	1.29	1.2^	1.29^	1.29^	1.29^
(4) Population at risk	Proportion						
(proportion based on 2011 stratification)		42,248,800	42,752,583	43,304,092	43,862,714	44,428,543	45,001,672
High risk	0.25	12,002,500	12,145,620	12,302,299	12,460,998	12,621,745	12,784,566
Medium risk	0.27	12,962,700	13,117,270	13,286,483	13,457,878	13,631,485	13,807,331
Low risk	0.23	11,042,300	11,173,971	11,318,115	11,464,119	11,612,006	11,761,801
Potential risk	0.13	6,241,300	6,315,723	6,397,195	6,479,719	6,563,308	6,647,974
No risk	0.12	5,761,200	5,829,898	5,905,103	5,981,279	6,058,438	6,136,592
(5) Estimated number of cases annually with the current level of support^^		1,505,635**	1,506,057	1,377,857	1,246,100	1,009,740	818,212
(6) Expected reduction (%) resulting from impact of intensified malaria control			3	12	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 national census in 2015

*Health in Myanmar 2012

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

^ based on PGR in 2009 until new data is available

^^GF and 3DF/3MDG etc

8 Activities and outputs for each objective

8.1 Objective 1

By 2015, at least 80% of the people in high and moderate risk villages in 284 malaria endemic townships (212 priority townships) are protected against malaria by using insecticide-treated nets/long-lasting insecticidal nets complemented with another appropriate vector control methods, where applicable.
In artemisinin resistance affected areas, the target coverage is 100% of total population at risk

8.1.1 Protection by the use of LLINs

Of the 284 total endemic townships, 212 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 or retreatment of nets with long lasting insecticide retreatment kits 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 high and moderate risk villages of the 212 priority Townships. All high and moderate risk villages in the 212 priority Townships will be targeted. For the artemisinin resistance affected areas, Tier 1 areas (with strong evidence of resistance) are of highest priority. 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 two and a half persons. Please see Annex 8 for budget calculation and assumptions.

The key activities will be:
a. Micro-stratification.
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).
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 will be 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 will be combined with such activities as measles immunization or mass drug administration for filariasis elimination. These activities are 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.

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 2015, 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 cool 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. re/training 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 the Myanmar Medical Association 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 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 license of artemisinin monotherapy will be expired by December 2012. It is assumed that in 2012 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 2015, 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 c, the CHW/volunteer will be trained to graph monthly 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 2015, the Township Health Department in 284 malaria endemic townships (270 priority townships) are capable of planning, implementing, monitoring and evaluating malaria prevention and control program 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 program. The will be supported from central and state/division levels. In this regard, training of technical staff will be supported.

As the 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 intersectoral 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 (HealthMapper) and for State/Regional level, EPI-INFO. 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 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 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

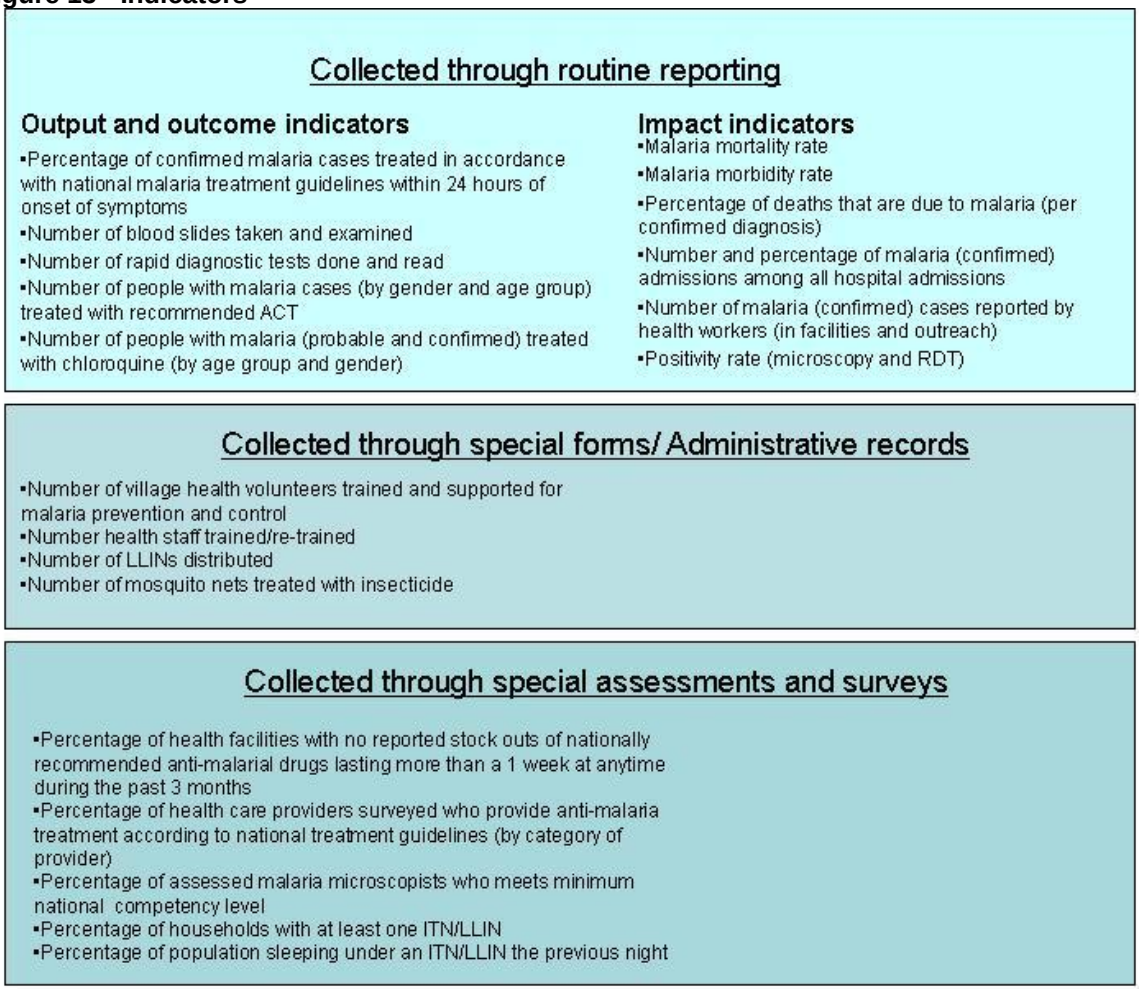
Currently, malaria is part of the high school curriculum, but not the primary school curriculum. Most children in high-risk areas attend only primary school. Therefore, the curriculum will be adapted for use in primary schools.

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 13 - 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 State/Region.
- 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

10. Planned activities and budget

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