Report of the informal consultation on

Myanmar Artemisinin Resistance Containment (MARC)

Nay Pyi Taw, 4-5 April, 2011

Contents

Executive Summary

Since around 2002, artemisinin-resistance has been known to occur near the Thai-Cambodian border. The recent emergence of artemisinin-resistant *P. falciparum* malaria in Myanmar is recognized as a serious threat to malaria control in the country and beyond. On this background, the Ministry of Health and WHO arranged an informal consultation to consolidate consensus among stakeholders on the framework to contain artemisinin resistant *P. falciparum* strains in Myanmar and to prepare for implementation. The meeting was attended by over 70 persons, representing the Ministry of Health at central and State/Division level, other ministries, research institutes, non-governmental organizations and other national and international partners. The meeting was opened by H.E., Minister of Health, who noted that malaria is one of the priority diseases in Myanmar. He emphasized that it is now of the greatest importance to prevent or significantly delay the further spread of artemisinin resistance and that this will require collaboration with other sectors and partners within the country and internationally.

Presentations

Artemisinin resistance in Cambodia is still much worse than anywhere else, but it is now emerging in other parts of the Greater Mekong Sub-region including eastern Myanmar. The best way of monitoring for the emergence and spread of artemisinin resistance is by tracking the proportion of patients with falciparum malaria, who are positive on day 3 after start of treatment with an ACT. One of the main problems for the global plan for artemisinin resistance containment is that 28 countries still allow the use of artemisinin monotherapy; also, fake and counterfeit drugs are widespread. Based on experiences from Cambodia and Thailand, **s**trategies for resistance containment should be differentiated according to a division of each country into three tiers, where tier 1 represents areas with evidence of artemisinin resistance, tier 2 areas, which are directly threatened by the problem and tier 3 is characterized by low risk of resistance.

The situation in Cambodia has similarities with that in Myanmar, but also differences, for example the health service access is more constrained in the extensive affected areas of Myanmar. In Cambodia, importance is given to Village Malaria Workers and Mobile Malaria Workers, which are supported with training, supplies and supervision from the public health services. However, the private sector was still the majority source for first consultation in 2009. There has been good uptake of LLINs in tier 1 and it seems that this has helped reduce transmission. In Thailand, the containment strategy aims at elimination of *P. falciparum*. The standard treatment for falciparum malaria in tier 1 is now atovaquone-proguanil.

In Myanmar, ACT became official policy in 2002. In 2009, results in certain areas gave rise to concern, as the day 3 positivity rates with artemether-lumefantrine and dihydroartemisinin-piperaquine were high in Kawthaung, Taninthary Region, while in Shwegyin, East Bago Region, where gold miners are the most significant risk group, there were problems with the former treatment. In 2010 findings in Mon State also indicated reduced increased day 3 positivity rates with dihydroartemisinin-piperaquine.

The Strategic framework on Myanmar artemisinin resistance containment (MARC) has as its goal: *To prevent or at minimum significantly delay the spread of artemisinin resistant parasites within the country and beyond its borders*. It has seven specific objectives in line with the Global Plan for Artemisinin Resistance Containment (GPARC). Monitoring and evaluation for MARC will need various

kinds of surveys to be carried out regularly. Proposed coordination mechanisms for MARC will include a MARC task force under the Malaria technical support group.

Group work

The participants split into groups to discuss detailed implementation issues relating to the five areas listed below. The groups presented their findings to the plenary, which in turn amended and endorsed the groups' conclusions.

Increasing access to diagnosis and treatment

Priority needs for public and private sectors were defined; it was recommended to rapidly phase out artemisinin-based monotherapy and the requirements for making this possible in a safe way were detailed.

Community-based interventions

Normally there should be one VHV per village; coordination of various actors was considered essential; the role of Village Health Committees was recalled. Finally, the relationship between village volunteers and private drug sellers was discussed in depth.

Massive and rapid scale-up of preventive measures

The coverage norm should be one LLIN/ITN per 2 persons. IRS would have a role but data on effectiveness of IRS in combination with LLINs should be generated. Mosquito repellents are considered a promising intervention, while long-lasting insecticidal hammock nets should be tried out.

Reaching migrants/mobile populations

These populations need to be mapped and classified in each township; for some, collaboration with the private sector will be essential, while in some cases it will be possible to select community volunteers in migrant groups. Screening points, mobile teams and malaria corners will also be important.

Surveillance, monitoring and evaluation

Indicators and monitoring methods were discussed. Role and norms of day 3 monitoring were clarified.

General Conclusions

1. "Village malaria volunteers" should normally be avoided; malaria services at village level should be the responsibility of village health volunteers.
2. In containment tier 1, there should normally be one volunteer per village, though with priority to villages located more than 5 km/1hr walk from a health facility; however, in the case of villages with small populations, it will be more rational to deploy one volunteer per 2-3 villages, if located close together. In tier 2, the norm should be 1 volunteer per village >5km/1hr walk away from a health facility.
3. Village volunteers should normally be given incentive for malaria work, related to their performance.

4. Village volunteers should provide diagnosis and treatment for malaria, which is free or so inexpensive that their services are more attractive than those provided through the private sector.
5. The elimination of oral AMT is urgent and a priority for MARC. Regulatory action and other measures must be initiated as soon as possible. Availability of oral artemisinin monotherapy should be monitored in public and private (including informal) facilities and should be close to zero no later than by 2015.
6. To safely stop the use of oral AMT for most suspected malaria cases, it should, as a first step, be replaced in the private sector market channel with an approved ACT + primaquine regimen subsidized to be affordable. This should be supported by communication of the need for specific diagnosis, treatment and adherence, to discourage treatment based on only clinical signs.
7. Quality-assured, affordable RDTs should be promoted at the lowest possible level of the private sector supply chain, in support of public, community-based and private services.
8. While the provision of improved malaria diagnosis and treatment through the informal private sector is a necessary early measure to eliminate monotherapy, effective control and resistance containment must in the long term rely on public sector and community-based services.
9. For IRS, work to identify alternatives to pyrethroids must be undertaken as soon as possible, so that at least in the long term, pyrethroids will be avoided for IRS.

The meeting formally endorsed the Strategic Framework for Artemisinin Resistance Containment in Myanmar (MARC) 2011-2015 with amendments corresponding to the above general conclusions and revisions of indicators as agreed by the meeting.

Next steps required for moving forward MARC implementation will include:

- An application to be submitted for Global Fund Round 11.
- Collaboration and coordination with partners (NNGOs, INGOs, related ministries, companies etc.) to be initiated by VBDC as soon as possible.
- The potential role of a regional project to be discussed a meeting in Kota Kinabalu, Malaysia, in May 2011.
- A detailed plan of operations for MARC with budget and timelines to be prepared by VBDC in collaboration with WHO and other partners over the next few months.

Acronyms

ACD	Active case detection
ACT	Artemisinin-based combination therapy
ACPR	Adequate clinical and parasitological response
AL	Artemether-lumefantrine
AMT	(oral) artemisinin based monotherapy
BCC	Behaviour change communication
BHS	Basic health staff
BVBD	Bureau of Vector-borne Diseases (Thailand)
DHA	Dihydroartemisinin
DOT	Directly observed treatment
DWL	Durable (insecticidal) wall lining
FSAT	Focused screening and treatment
EDAT	Early diagnosis and adequate treatment
ETF	Early treatment failure
FDA	Food and Drug Administration (Myanmar)
FDC	Fixed dose combination
FOC	Free of charge
GMS	Greater Mekong Sub-region
GP	General practitioner
GPARC	Global Plan for Artemisinin Resistance Containment
HH	Household
IEC	Information, education and communication
INGO	International non-governmental organization
IOM	International Organization of Migration
IRS	Indoor residual spraying
ITN	Insecticide treated mosquito net
LCF	Late clinical failure
LPF	Late parasitological failure
LLIHN	Long lasting insecticidal hammock (mosquito) net
LLIN	Long lasting insecticidal mosquito net
MARC	Myanmar artemisinin resistance containment
MBCA	Myanmar Business Coalition against AIDS
MMA	Myanmar Medical Association
MSAT	Mass screening and treatment
NGO	Non-governmental organization
NMCP	National malaria control programme
NNGO	National non-governmental organization
PIP	Piperaquine
Pf	*Plasmodium falciparum*
PSI	Population Services International
RDT	Rapid diagnostic test for malaria
VBDC	Vector-borne diseases control programme (Myanmar)
VHV	Village health volunteer
WV	World Vision

1. Introduction

In the last decade, the treatment of uncomplicated falciparum malaria with oral artemisinin-based combination therapy (ACT) has proven an effective malaria control intervention, which plays an important role in mortality and morbidity reduction in Southeast Asia, and the benefits are beginning to be realized also in Africa, India and South America. In Myanmar, ACT has been the first line treatment for *Plasmodium falciparum* malaria since 2002. Unfortunately, there is growing evidence that artemisinin resistant parasites, which were first detected around the Thai-Cambodian border, occur also in other parts of the Greater Mekong Sub-region (GMS), especially eastern Myanmar. Further spread of artemisinin resistance could jeopardize global efforts to combat malaria. A framework to guide a robust and coordinated response to this threat has been under development since August 2010 by the Ministry of Health, Myanmar, in collaboration with WHO and other partners. It has been discussed at several meetings in late 2010 and undergone several revisions. On this background, the Ministry of Health and WHO arranged the informal consultation reported here with the following objectives:

General:

> *To consolidate a broad consensus among stakeholders on the framework to contain artemisinin resistant* P. falciparum *strains in Myanmar and prepare for implementation.*

Specific:

1) *To present and discuss the latest data/information on therapeutic efficacy of artemisinin drugs in the Greater Mekong Sub-region;*
2) *To share progress, challenges and lessons learned from the bi-country project to contain falciparum strains resistant to artemisinins on the Thai-Cambodian border;*
3) *To inform participants on the WHO-led global strategy to contain emerging falciparum resistance to artemisinin;*
4) *To secure consensus on the strategic framework and plan of action to contain resistance to artemisinin in Myanmar;*
5) *To prepare for the implementation of the Myanmar Artemisinin Resistance Containment Framework.*

The agenda of the meeting is presented in Annex 1. The meeting was attended by over 70 persons, representing the Ministry of Health at central and State/Division level, other Ministries, research institutes, national and international non-governmental organizations, bilateral and multilateral agencies and other national and international partners. The list of participants is in Annex 2.

2. Opening session

The meeting was opened by H.E., Minister of Health, Professor Pe Thet Khin. In his opening address, the Minister noted that malaria is one of the priority diseases in Myanmar, with 284 of 330 townships being endemic for the disease, and 70% of the population living in malaria risk areas. In 2009, there were more than 591,000 reported malaria cases and 1088 persons were reported to have died from the disease. Malaria predominantly affects people in forested areas and border areas, mobile populations as well as pregnant women and children under five years living in high risk areas. There has been some improvement in the situation due to the use of treated mosquito nets and artemisinin-based combination therapy, but there is now growing evidence that artemisinin resistance is present in Myanmar. Professor Pe Thet Khin emphasized that it is now of the greatest importance to prevent or significantly delay the further spread of artemisinin resistance. This will require collaboration with neighbouring countries, and Myanmar's active participation in ASEAN is

therefore important. It is also necessary to recruit the collaboration of other sectors including the ministries of construction, mining and others. The Myanmar Food and Drug Administration as well as the Ministry of Commerce must be involved to prevent the use of artemisinin monotherapy. The support from partners is important; it is expected that in 2011 it will be possible to obtain some initial donor support for implementing the Myanmar artemisinin resistance containment framework from the Three Diseases Fund.

Dr H.S.B.Tennakoon, Representative of WHO to Myanmar, noted that malaria is a priority health problem in Southeast Asia, and in the world. The Greater Mekong Sub-region has been the global epicentre for antimalarial drug resistance since the 1960s. Lately, as artemisinin resistance has emerged on the Cambodia – Thailand border, a strategy for containment has been developed. It has been implemented with great commitment by the two countries with WHO coordination and support from several partners including the Bill and Melinda Gates Foundation, the Global Fund and USAID. Recently, artemisinin resistance has emerged in eastern Myanmar. While more research on this is needed, it is the general opinion that a response must now be initiated. A strategic framework had been developed to this end. It would be discussed at the meeting, so that it could be finalized and implementation should start as soon as possible.

Dr Thimasarn presented the meeting objectives (see above). She observed that once the MARC document has been finalized and endorsed by the meeting, it should serve as the principal reference to guide all activities aiming to contain artemisinin resistance in Myanmar. The group work would focus on key issues for MARC implementation.

The meeting elected Dr Saw Lwin as chair and Drs Ye Htut and Khin Mon Mon as co-chairs. Dr Aung Thi was elected as rapporteur with Dr Allan Schapira as co-rapporteur.

3. Presentations

Antimalarial drug resistance at global level and in the Greater Mekong Sub-region
Dr Pascal Ringwald, WHO's Global Malaria Programme

The problem of artemisinin resistance in Cambodia is much worse than anywhere else, but still, within that country, limited to malaria-endemic areas south-west of the Tonle Sap axis. A number of studies in Cambodia and elsewhere have shown that artemisinin resistance is best detected by monitoring the proportion of patients with falciparum malaria, who are still positive on day 3 after start of treatment with an ACT. In the past, the proportion of day 3 positivity was always below 3%; it is considered that more than 10% day 3 positives indicates the presence of a problem. When interpreting such results it should be kept in mind that there are confounding factors, such as haemoglobinopathies (HbE) and splenectomy. Generally, the day 3 results reflect parasite susceptibility to the artemisinins and the day 28 and later results indicate susceptibility to the longer and slower acting synthetic partner drugs. So far, studies in South America and Africa do not suggest that artemisinin resistance is present there.

The artemisinin resistance, which is emerging in the Mekong countries, will cause exposure to the synthetic ACT partner drugs and resistance will develop to those leading eventually to high ACT failure rates, as is already the case in some parts of Cambodia. The therapeutic efficacy of artemether-lumefantrine around the world is still above 90% almost everywhere; but in some parts of Cambodia it is now below 80%. As there are few antimalarial drugs in the pipeline, it is important to seek to contain artemisinin resistance. In response to questions from the audience, Dr Ringwald explained that the occurrence of artemether- lumefantrine resistance in Cambodia is patchy for

reasons, which are still not well understood. It is possible that inadequate absorption related to variations in diet could play a contributory role in some areas.

Global plan for artemisinin resistance containment (GPARC)
Dr Pascal Ringwald, WHO's Global Malaria Programme

The principles of GPARC are presented in Fig.1. Dr Ringwald recalled a number of constraints affecting this plan, for example: Many countries do not monitor ACTs efficacy in a routine manner. It is difficult to get artemisinin monotherapy effectively banned in all countries, as many governments claim that they do not have the means to regulate the pharmaceutical industry. Today, 28 countries still allow the use of oral artemisinin monotherapy and 39 companies are known still to produce them. There are widespread problems with fake and counterfeit drugs and with drugs, which have been stored for too long.

Many scientists support the hypothesis that the simultaneous use of multiple first line ACT therapies will delay resistance more than the use of a single ACT in a given area, but it is difficult to put this into practice.

According to GPARC, ACTs should be given only on the basis of specific diagnosis, but there is still no good model for use of RDTs in the informal private sector, where most people seek treatment in many countries. Vector control has a crucial role in containment, but neither indoor residual spraying nor insecticide treated nets are ideal tools in Southeast Asia.

Dr Ringwald went on to describe **experiences in containment from Cambodia and Thailand**. Strategies are differentiated according to a division of each country into three tiers, where tier 1 represents areas with evidence of artemisinin resistance, tier 2 areas, which are directly threatened by the problem and tier 3 is characterized by low risk of resistance. This classification has since been adopted in GPARC. The trialling of novel methods such as focused screening and treatment was presented, together with new methodologies for surveillance and the broad research agenda supporting resistance containment.

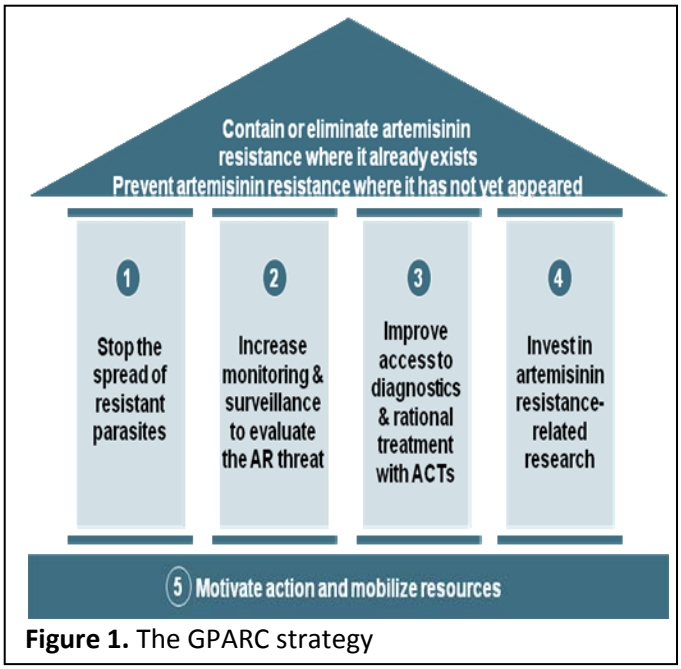


Figure 1. The GPARC strategy

Lessons learnt from containment specifically in Cambodia
Dr Sylvia Meek, Malaria Consortium, on behalf of Dr Kheng Sim, national malaria control programme, Cambodia, who could not attend

Dr Meek highlighted similarities and differences between the situations in Cambodia and Myanmar. In both countries, the private sector has been largely unregulated but provides substantial proportion of antimalarial treatments given, and reporting from it is very challenging; people are used to buying mosquito nets but market has not yet switched to LLINs; in both countries the surveillance systems need to develop more.

Among the differences she noted that malaria incidence is now lower in Cambodia and the containment tier 1 is not in areas of highest transmission; the Cambodian national programme has

grown in strength with substantial financial support in recent years and collaboration with a number of partners, some of them highly specialized; it has longer experience with use of parasitological diagnosis at facility level and by community workers; among some mobile populations, there is a long-standing habit of using hammocks, which has facilitated the promotion of insecticide treated hammock nets; Cambodia now has a substantial information base for planning from national cross-sectional surveys (2004 and 2007) and from health information system; finally, in Cambodia there are less problems with access to areas with resistance, and, the scale of the problem is much greater in Myanmar than in Cambodia (Table 1).

Table 1. Comparison of the populations in containment tiers 1 and 2 in Cambodia and Myanmar

	CAMBODIA	**MYANMAR proposed in MARC**
Tier 1	**0.27 million** (8 administrative districts in 5 operational districts in 4 provinces)	**4.8 million**
Tier 2	**4.02 million** (9 provinces, excluding town areas)	**6.0 million**
Total	**4.29 million** **(10 provinces, 5** operational districts**, 8** administrative districts**)**	**10.8 million**

Main lessons were presented according to the Cambodian containment programme's objectives:

Objective 1: To eliminate artemisinin resistant parasites by detecting all malaria cases in target areas and ensuring effective treatment and gametocyte clearance.

- In all targeted villages and areas for primary point of malaria care services in the containment area, the Village Malaria Worker and Mobile Malaria Workers are fully established;
- Enough staff is supported and deployed at all levels to implement the malaria containment intervention. Supervision is regular and systematized;
- Supplies (drugs and diagnostics) are delivered from Central Medical Store to operational districts and further to health facilities and village services regularly according to the supply management schedules for different levels;
- To reach all cases, strengthened health facilities and community network trained and equipped with RDTs, microscopy and treatment, provide a 24 hour service.

Objective 2: To decrease drug pressure for selection of artemisinin tolerant malaria parasites.

- Change in first-line treatment is meeting challenges as DHA-PIP prequalified suppliers are not available;
- After first year of containment project private sector care was still the majority source for first consultation (2009 survey), so it cannot be ignored;
- Private sector was providing parasitological diagnosis more than expected: in 2009 22% of people with fever in last two weeks had a diagnostic test and 46% of these were from the private sector;
- Enforcement of AMT ban seems to be working but needs substantial investment and commitment;
- The establishment of public health justice police in to the system indicated significant progress in law enforcement in public health;
- Fake and counterfeit drugs are still available, but much less than before;

- Development of IEC messages takes time so may delay uptake of new policies.

Objective 3: To prevent transmission of artemisinin tolerant malaria parasites by mosquito control and personal protection.

- High coverage of LLINs is critical to reducing transmission;
- Detailed macro and micro-planning for LLIN distribution, as well as use of management tools such as Rapid Coverage Monitoring have led to effective implementation and rapid and complete coverage of the population of tier 1 with LLINs;
- Challenge is to reach mobile populations
  - Partially addressed by hammock nets (which were perhaps first introduced in the country by the military) and IEC but difficult to measure
  - 2009 survey showed forest visitors **less likely** to use LLINs than others, although their effective coverage had reached 50%;
- Not all mobile populations are the same – need detailed information on where they are, where they get supplies;
- High use of bought nets is a good supplement but local suppliers need to be persuaded to supply LLINs in future – this market shift is possible – we are seeing it in Africa.

Objective 4: To limit the spread of artemisinin tolerant malaria parasites by mobile/migrant populations.

- One of the biggest challenges to containment;
- Need very tailored approaches based on reliable evidence;
- Need innovation;
- Took time but now Cambodia is gaining momentum.

Objective 5: To support containment/elimination of artemisinin tolerant parasites through comprehensive behaviour change communication (BCC), community mobilization and advocacy.

- Mass media campaigns were found in 2009 survey to be main source of information – look for any change in 2010;
- Source of information is only part of the approach – how to achieve community mobilization?
- Positive Deviance studies – promising approach?

Objective 6: To undertake basic and operational research to fill knowledge gaps and ensure that strategies applied are evidence-based.

- Mass Screening and Treatment (**MSAT**) was tested but found not feasible;
- Focused Screening and Treatment (**FSAT**) is now being tested;
- Sentinel surveillance for detecting delayed falciparum parasite clearance on day 3 after initial treatment has been established and implemented in selected health facilities and community in collaboration with partners;
- The reporting system for **day 3 positivity status** is developed and successfully tested. Data can be sent, using SMS to the central server; the computer system will operate automatically for analysis and feedback;
- Determining **residual effect of LLIN/LLIHN** in the field using *Anopheles dirus* and *minimus* from 2 sentinel sites (Pailin and Pursat).

Objective 7: To provide effective management and coordination to enable rapid and high quality implementation of the strategy at country level.

- Series of provincial cross-border meetings promoted full understanding of strategies by implementers;
- Good information for monitoring and evaluation is critical;

- Some promising signs but more data needed; 2010 survey results will be important;
- The programme has now established a village malaria database, which is of crucial importance for the containment strategy;
- Sustained cooperation and coordination between all partners, donors and other partners are needed for effective implementation of the containment project;
- The heavy workload, multiple and overlapping responsibilities, conflicting schedules, limited capacity and burden of implementing several projects impede the ability of program to implement containment activities. This could be rectified through close coordination with all counterparts.

Lessons from containment in Thailand
Dr Wichai Satimai, Director, Bureau of Vector-Borne Disease, Ministry of Public Health, Thailand.

Dr Satimai explained the epidemiological situation in Thailand and the containment strategy, which aims at elimination of *P.falciparum*. The programme emphasizes directly observed treatment (DOT); like in Cambodia, emphasis is given to the services for various migrant groups, for example through special clinics at border crossings. However, implementation of DOT is difficult especially among mobile populations. The standard treatment for *P. falciparum* malaria is now atovaquone-proguanil in all hospitals (3), malaria posts (8) and malaria clinics (9) in tier 1.

The programme distributes LLINs, LLIHNs and repellents. It is estimated that in tier 1 the LLIN/ITN coverage rate is 63%. Monitoring of the residual effect of LLIN/LLIHN in two sentinel sites showed 100% mortality rate of Anophelines. Susceptibility study for the major vector to synthetic pyrethroid showed that *Anopheles minimus* is still fully susceptible to Deltamethrin. The susceptibility to Permethrin is evaluated. IRS is applied in villages, where indigenous malaria cases are detected.

The main challenges and next steps are as follows:
- Populations' high mobility resulted in difficulty to follow up cases;
- Case investigation among migrants is incomplete due to language barriers;
- Strengthening the mechanism to ensure adequate treatment and follow up for positive cases both within and outside country is necessary;
- About 73% of *Pf* cases adhered to ACT, BVBD plan to train physicians in 2011. Incentives for DOT are under consideration;
- Due to the dramatic decrease of Pf in zone 1, management of the remaining with atovaquone-proguanil is essential;
- *P.vivax* is becoming the majority species, thus managements and control of it is critical.

In the discussion after the presentations on Cambodia and Thailand, it was noted that in Myanmar the problem with some mobile groups is that they go to bed very late, for example because they stay outside the home to watch videos etc. IEC is of the greatest importance and materials need to be translated to a number of local languages. It was agreed that mosquito repellents seem to bear promise; a small study in Myanmar carried out by IOM has also given encouraging results. It was noted that in Myanmar, most people going to the forest never use mosquito nets, in contrast to people, whose home is in forest villages; however, experiences from Cambodia suggest that habits can change, at least to some extent.

Several Myanmar speakers echoed the important role of village volunteers and the importance of them being properly supervised and supplied.

Dr Ye Htut, Deputy Director-General, Department of Medical Research, Lower Myanmar, presented data on **antimalarial drug resistance in Myanmar**. He recalled that ACT became official policy in

Myanmar in 2002. Initially the preferred ACT was artesunate plus mefloquine. Results with this combination (% ACPR) have been as shown in Table 2.

Table 2. Artesunate plus mefloquine ACPR (%) in Myanmar, 2004-6

	Kawthaung	Kalay	Rakhine	Ayeyarwaddy	Mandalay	Tarcheleik	Kayin	N. Shan
2004		98.2	85.3	95.6	97.9	100	100	96.2
2005	100		91.1	100				
2006	98.2			95.7				

Later, artemether-lumefantrine became the preferred treatment. Results are shown in Table 3.

Table 3. Artemether-lumefantrine ACPR (%) in Myanmar, 2004-6

	Kawthaung	Myitkyina	Rakhine	Ayeyarwaddy	Mandalay	Tarcheleik	Kayin
2004			97.9	100	97.9	100	94.7
2005	98.3		96.3	100			
2006	91.7	96.1		96.1	96.3		

In 2009, results in Shwegyin, East Bago Region, and Kawthaung, Tanintharyi Region, gave rise to concern (Table 4).

Table 4. Therapeutic efficacy test results with artemether-lumefantrine (AL) and dihydroartemisinin-piperaquine (DHA-PIP) in Shwegyin, East Bago, and Kawthaung, Tanintharyi, 2009

	AL		**DHA-PIP**	
	Shwegyin	**Kawthaung**	**Shwegyin**	**Kawthaung**
ETF	1 (1.1%)	0	0	0
LCF	0	3 (3.9%)	0	2 (2.5%)
LPF	1 (1.1%)	1 (1.3%)	0	2 (2.5%)
ACPR (28-day) not PCR adjusted	**84 (98%)**	**74 (95%)**	**100%**	**76 (95%)**
Total analysis: 28-day	86	78	72	80
Withdrawn	0	2		1
Lost to follow-up	2	0	0	0
TOTAL	88	80	72	81
Day 1: % parasitaemia	72 (85.7%)	52 (66.7%)	51 (71.8%)	76 (92.8%)
Day 2: % parasitaemia	30 (35.7%)	30 (38.5%)	15 (21.1%)	54 (66.7%)
Day 3: % parasitaemia	**8 (9.5%)**	**8 (10.3%)**	**3 (4.2%)**	**24 (29.6%)**
Day 0: % gametocytaemia	29 (34.5%)	28 (35.8%)	14 (19.7%)	11 (13.6%)
Day 7: % gametocytaemia	8 (9.5%)	**1 (1.3%)**	6 (8.5%)	**3 (3.7%)**
Slide validation	Done	Done	Done	Done

A considerable number of studies with various combinations were presented. Nearly all of these showed an ACPR of ACTs (except with amodiaquine) above 95%. However in 2010 in Thanphyuzayat in Mon State, it was found that 23% of patients were positive on day 3 after treatment with dihydroartemisinin-piperaquine (Duocotecxin®), see below.

Table 5. Therapeutic efficacy test results with artemether-lumefantrine (Coartem®) and dihydroartemisinin-piperaquine (Duocotecxin®) in four sites in Myanmar, 2010

	Coartem ®			Duocotecxin ®	
	Rakhine	Myawaddy	Kaw Thaung	Thanphyuzayat	Rakhine
number of patients	81	75	85	80	80
28days completed	81	74	84	75	80
Clinical & parasitological failure	3	4	5	2	1
Loss follow-up	0	1	1	5	0
% parasitaemia Day1	31 (38.3%)	61(79.2%)	75 (88.2%)	74(92.5%)	39 (48.7%)
% parasitaemia Day2	1 (1.2%)	22(28.6%)	38 (44.7%)	43(53.7%)	3 (3.7%)
% parasitaemia Day3	0	3(3.9%)	0 (0%)	19(23.7%)	0
Day 0: % gametocytaemia	12 (14.8%)	14 (18.2%)	25 (29.4%)	6(7.5%)	9 (11.2%)
Day 7: % gametocytaemia	3 (3.7%)	6(7.8%)	0 (0%)	0 (0%)	5 (6.2%)
Treatment outcome					
ACPR	78 (96.3%)	70 (94.6%)	79 (94.04%)	73(97.3%)	79 (98.7%)
ETF	0	0	0	0	0
LCF	2	0	4	0	1
LPF	1	4	1	2	0

The meeting expressed strong agreement with Dr Ye Thut's recommendation of systematic quality control and regulation for antimalarial drugs as well as RDTs.

The malaria situation in relation to gold mining workers in Shwegyin Township, Bago Region.
Dr Tun Min, regional officer, Bago Region

The township includes plains and hilly, forested areas and has a total population of 87,421. While there is no clear trend in the incidence of malaria, there has been a steady reduction in recorded malaria deaths from 23 in 2004, to 2 in 2010. Gold panning is more strongly associated with malaria than any other occupation, although agro-forestry (*taungyi*) also is high risk. The control strategy includes LLINs and early diagnosis and adequate treatment (EDAT) provided through health staff and village volunteers. Additional activities planned for the future include:

- Establish check point clinics to detect and treat malaria cases among migrants and local community.
- Establish network between state and regional VBDC teams for tracing, checking and treating migrant workers.
- Checking of day 3 parasitaemia in malaria parasite positive patients at health centres with microscopes.
- Training to village health volunteers for EDAT & prevention of malaria (One VHV for every village, except village with BHS).
- Training to health care providers of migrant workers for EDAT & prevention of malaria. (Cooperate with gold mine companies).
- Strengthen health education activities to rural community and migrant workers.
- Indoor residual spray to structures in high risk villages.
- Special mobile teams for EDAT & prevention of malaria for migrant workers in gold mines area.

- Increase ACD activities in other townships for more coverage of EDAT to malaria patients.

Dr Meek drew attention to the need for regular replacement of LLIN in such situations, both because nets get worn and because new waves of migrants must be protected as soon as they arrive. Several speakers noted the importance of working with private companies in such scenarios. Dr Ye Thut pointed out the need for communication directed towards all parties: companies, miners, general population etc. Dr Myat Phone Kyaw noted that it is necessary to distinguish between companies, usually big, which retain long-term work forces, and others, which move their workers after a certain time.

Strategic framework on Myanmar artemisinin resistance containment (MARC)
Dr Khin Mon Mon, Director VBDC.

Dr Khin Mon Mon explained the process for the development of the document, which started in August 2010, and noted that in 2011 it had been reframed in line with GPARC. The goal is:
To prevent or at minimum significantly delay the spread of artemisinin resistant parasites within the country and beyond its borders.
The specific objectives are:

1. *To improve access to and use of early diagnosis and quality treatment according to the national treatment guidelines*
2. *To decrease drug pressure for selection of artemisinin resistant malaria parasites by stopping the use of artemisinin mono-therapies and substandard/fake drugs*
3. *To limit the transmission of malaria by vector control and personal protection*
4. *To increase migrant/mobile populations' access to and use of malaria diagnosis, treatment and vector control measures including personal protection*
5. *To support containment of artemisinin resistant parasites through advocacy and BCC/IEC*
6. *To conduct studies and do operational research to support the development of evidence-based containment policies and strategies*
7. *To provide effective management and coordination to enable rapid and high quality implementation of the containment strategy.*

She went on to present the activities of the framework according to the objectives. Four main issues in the framework were discussed by the meeting in the first day plenary, during the group work on the second day and at the group work presentations in the plenary. These were: (a) Community-based malaria services, (b) Treatment of malaria in the informal private sector and the banning of monotherapy; (c) The norm for coverage with long-lasting insecticidal nets (LLINs) or conventional insecticide treated nets (ITNs); (d) The role of indoor residual spraying (IRS) and the selection of insecticides for it. The conclusions of these discussions have been integrated into the MARC strategic framework as revised by the meeting. They are presented in this report in Section 5.

Monitoring and evaluation of the MARC
Ms Charlotte Rasmussen, WHO Representative office, Myanmar

Methods and indicators of monitoring and evaluation were presented. The first priority for containment would be strengthening of malaria surveillance (surveillance of antimalarial drug resistance being considered a separate topic). In additional, regular surveys would be required, namely:

- Health facility surveys
- Household surveys
- Drug outlet surveys

- Township mapping of migrants
- Micro-stratification with prevalence surveys

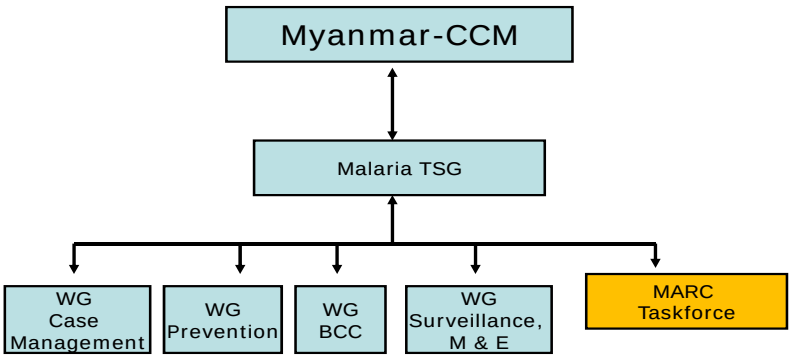
Most of the indicators for MARC would be identical to those of malaria control and the meeting agreed that as much as possible, the introduction of new or modified indicators should be avoided. However, it would be important to track key indicators separately for migrant groups.

Proposed coordination mechanisms
Dr Krongthong Thimasarn, WHO Representative Office, Myanmar

A coordination structure was proposed as shown in Fig. 2. The MARC task force would be a new element with the following terms of reference:

- provide overall guidance in planning, implementation, monitoring and evaluation of MARC;
- review project proposals on MARC and recommend for funding;
- review MARC project progress and technical achievements;
- mobilize political commitment and financial support through advocacy;
- regularly update the TSG; and
- through the TSG update the M-CCM and seek their guidance.

Fig. 2. Myanmar Artemisinin Resistance Containment - Coordination Structure



The membership of the task force was also presented. The meeting expressed satisfaction with this mechanism; there was consensus that strong coordination is crucial to the containment effort.

While the meeting expressed general support for the MARC framework as presented, with its monitoring and evaluation mechanisms and indicators as well as the proposed coordination mechanism, it was agreed at the end of day 1, that the formal endorsement should only take place at the end of day 2, as more amendments might be proposed in consequence of the group work, although it was well understood that this would focus on implementation.

4. Group work

On the second day of the meeting, the participants were divided into five groups. In the afternoon, the group discussions were presented to the plenary for further deliberation. The main points and conclusions following the plenary discussions are presented for each group.

Group I – increasing access to diagnosis and treatment

a) In public sector

1. Many medical officers are still not well acquainted with national guidelines, including the need for specific diagnosis and ensuring adherence to a full course of treatment. This should be addressed by rapid, complete and systematic dissemination of latest guidelines, and training and supervision to promote provider adherence to guidelines;
2. It was also considered important to rapidly strengthen the motivation of health staff for providing appropriate case management, and it was suggested to consider an incentive scheme for that purpose;
3. There is an urgent need to strengthen and maintain supply chain management at all levels.

b) In private sector

1. Awareness raising on malaria, transmission, diagnosis and management, right to have free testing has high priority;
2. Strengthen and maintain supply chain management at all levels;
3. Strengthen and expand appropriate malaria case management in the private sector according to both PSI's and MMA's models;
4. Encourage GPs to strictly follow national guidelines;
5. Supply RDTs and ACTs at subsidized rates through appropriate channels to all level including registered pharmacies, GPs, trained volunteers, VHVs etc.

It was recognized that promoting or enforcing the use of RDTs at the lowest level of private sector would be one of the major challenges, and the following options were discussed.

- Consider for village health volunteers, who have shops, to be trained and supervised;
- Consider training drug sellers on RDT testing, storage of RDTs and ACTs, selling right doses of ACTs with supervision through private channels;
- Supply RDTs at very low, subsidized price to trained drug sellers and FOC for volunteers;
- Consider actions to motivate and recognize model drug sellers.

To rapidly phase out monotherapy, the following actions were suggested:

- Request big pharmaceutical companies to voluntarily stop selling oral mono-therapy once subsidized ACTs supply is adequate.
- Speed up the supply of ACTs with subsidized price, which should be FDC, to pharmaceutical companies all over the country.
- BCC activities for awareness of appropriate use of RDTs and ACTs.

c) Role of the FDA

The FDA would have a key role in 2011, for surveillance on fake drugs and mono-therapy at all levels. This would need to be supported by:

- Collaboration from other actors in the health system;
- Training of staff;
- External and internal technical and financial support;
- More efficient review and registration process without compromising statutory requirements on documentation.

Group 2 - Community-based interventions

How to expand role of existing/new VHVs?

- VHVs should be selected according to defined criteria;

- Normally there should be one VHV per village, but during scale-up process, priority is given to hard-to-reach villages;
- Capacity building with standardized training package.

Expanded roles for malaria prevention and case management

- Awareness raising
- Distribution of mosquito nets
- Mass treatment of nets, retreatment
- Net survey
- Assist IRS if necessary
- Diagnosis and treatment of uncomplicated cases according to national guidelines
- Referral of severe cases, RDT negative fever cases and infants (treated for malaria and then referred)
- Surveillance (case tracing, early detection of epidemics), other data collection and reporting, for example on mosquito nets, breeding sources etc.
- Supported by Village health committee, for example for referral of severe cases;
- Regular, at least monthly, supervision by midwife or by BHS.

How to avoid overlapping of VHVs under several NGOs

- Regular State, Division and township level cooperation and coordination (public, private and NGOs)
- Township level meeting for detailed mapping for targeted villages
- Mapping for who is doing what

How to empower communities to be more proactive in controlling malaria and contain resistance

- Village Health Committees that are free of political influence (non-profit, non-religious, non-political) should participate in planning, assessing needs, prioritizing villages, selecting VHs, assisting in implementation, monitoring and assisting in referral;
- Give in-kind incentive like visit tour, bicycles to the committees;
- Provision of the committees with funds for maintenance and for referral.

The plenary discussion on the interaction between community health volunteers and state, NGO and private actors acknowledged that a community volunteer could in some circumstances obtain supplies from private sources, even if profit oriented, provided mark-ups on subsidized communities were controlled. It was also recognized that, conversely, respected drug-sellers could be obvious candidates for village health volunteers. However, it was pointed out that mixed schemes could carry a risk of drug sellers using free supplies from public health channels to boost their sales of products with no health benefits. Some participants argued that it would be better to maintain a clear distinction between village volunteers as the extension workers of the public health system and commercial drug sellers, who could be obtain subsidized products and training through private channels. However, most speakers argued for a flexible approach and monitoring and operational research to accompany the development of innovative schemes.

Group 3 - Massive and rapid scale up of preventive measures

How to rapid scale up LLIN in Tier 1 in year 1

- All partners need to work closely together (PSI,IOM,WV,NMCP and others) to prepare a well coordinated plan;
- The volume of LLINs should be calculated based on an assumption of 2 persons per LLIN;

- For planning and implementation at community level, it would be practical, for VBDC to prepare a simple algorithm indicating the number of LLINs to be provided according to number of persons per household;
- Basic data, such as no. of HHs should be assembled rapidly, as well as no. of LLINs and tablets for impregnation, which are available for distribution by different partners;
- Inventories of mobile and hard to reach populations should be established township by township;
- LLINs should reach townships before the rainy season and procurement timed accordingly;
- VBDC staff should be mobilized from non-MARC townships to MARC townships;
- Within the township, budget should include transport, cost of distribution, M&E;
- If LLIN would arrive late, in rainy season, there must be a contingency plan with budget twice the usual cost,
- Before distribution, there should be advocacy meeting as well as BCC campaign to ensure effective usage and maintenance of LLIN/ITN;
- Supervision is essential to have good quality ITN operations;
- A focal person from company should control LLIN distribution for workers.

LLIN *vs.* retreatment

- LLINs are relatively costly, but the best solution for households with no nets and hard to reach groups. They are simple to distribute.
- Long-lasting insecticide tablets are less expensive, and in areas with high net ownership, this would be first choice. This would typically be the case in urban areas.
- There is a need for a study to compare efficacy and effectiveness of LLINs and tablets for insecticide treatment.

Vector control options beyond insecticidal/treated nets

- Combination of LLIN/ITN and IRS should be preceded by entomological studies, e.g. vector bionomics, Insecticide susceptibility, and studies of local human behavior;
- Such combination should be implemented selectively to allow evaluation by comparing areas with and without IRS;
- Then change to regular operations, if studies show evidence;
- DWL (Durable Wall Lining) should be tried in camps and new settlements with incomplete structures;
- Repellents should be given to people with late sleeping habits and night-time workers;
- Operational research should be done for LLIHNs in Myanmar.

Group 4 - Reaching the migrant/mobile population

Definitions

- **Migrant** - a person who moves, but stays in one place for more than one month
- **Mobile** - a person who moves from one place to another within one month

How to map migrants

- Review and updating of existing data needs to start with an exploration of the availability of data sources;
- Migrants/mobile populations must be classified as associated with government, private companies or independent;
- Advocacy and data/information collection must be done in collaboration with Ministries of Agriculture, Mining, Construction, Forestry, Defense, Fisheries, Hydroelectric Power Energy, Home Affairs and private companies belonging to different sectors;
- Data will also be available through special screening points, which will be set up for example by IOM (Mon State), MBCA;

- VBDC will lead the collection and sharing of data. A coordination body between authorities, VBDC, private sectors and NGOs must be established;
- Timing for updating of data will be defined (based on operational research).

Establishing community health workers among migrants

- Select the appropriate person
- Exploring ways for sustainability
  - Incentive, award, appreciation
  - Quarterly meeting, experience sharing

Reaching small group migrants

- Local authorities;
- Basic Health Staff and VHVs;
- Screening points;
- Mobile teams with fixed schedule;
- Malaria corners (integration with other existing public health programmes).

How to solve non-utilization of LLINs

- Specific BCC interventions after rapid need assessment, e.g- FGD (focus group discussions), KAP;
- Operational research (impregnated clothes, blankets, curtains, durable wall lining);
- Promotion of taking responsibility for own health, with reinforcement by community leaders.
- Provision of repellents, where appropriate.

Suggestions

- The rich experiences of Cambodian and Thai programmes should be studied;[1]
- Treatment cards could be useful to collect data on the mobility of malaria patients;
- Operational research study on migrant population dynamics;
- Cross border containment and referral systems should be considered;
- Raising awareness through campaigns including media campaigns;
- Best Practices and lessons learnt should be documented.

Group 5 – Surveillance monitoring and Evaluation

This group reviewed and revised indicators. The revised indicators are not presented in this report, because they are in the MARC framework document as revised following the informal consultation.

Dr Ringwald drew attention to the importance of **monitoring of parasitaemia on day 3 of ACT treatment** in areas, where the results will have consequences, thus:

- Once artemisinin resistance has been found in a country, the rationale/purpose of conducting D3 positivity monitoring is primarily to obtain a better mapping of the extent of artemisinin resistance. This mapping should then lead to improved targeting and adaptation of interventions.
- The studies should therefore be conducted as priority in tiers 2 (especially) and 3.
- The treatment must be given as DOT.
- The microscopy must be rigorously quality controlled. This implies for example that if there is a significant difference between the findings of two microscopists, then a third microscopist must examine the slide in question.

[1] http://www.malariaconsortium.org/userfiles/file/Resistance-Resources/IEC_BCC_Meeting Report_10Oct09.pdf

5. General conclusions

Conclusions from plenary discussions of some main issues concerning the strategic framework for MARC as such as well as its implementation:

(a) Community-based malaria services

1. "Village malaria volunteers" should normally be avoided; malaria services at village level should be the responsibility of village health volunteers.
2. While it is difficult to give hard and fast rules about the density of these volunteers, the meeting agreed that in containment tier 1, there should normally be one volunteer per village, though with priority to villages located more than 5 km/1hr walk from a health facility; however, in the case of villages with small populations, it will be more rational to deploy one volunteer per 2-3 villages, if located close together. In tier 2, the norm should be 1 volunteer per village >5km/1hr walk away from a health facility.
3. Village volunteers should normally be given some kind of incentive for malaria work, related to their performance.
4. It should be ensured that they provide diagnosis and treatment for malaria, which is free (normally) or so inexpensive that their services are more attractive than those provided through the private sector.

(b) Treatment of malaria in the informal private sector and the elimination of AMT

1. The elimination of oral artemisinin based monotherapy (AMT) is urgent and a priority for MARC. Regulatory action and other measures must be initiated as soon as possible. Availability of oral artemisinin monotherapy should be monitored in public and private (including of course informal) facilities and should be close to zero no later than by 2015.
2. To safely stop the use of oral AMT for most suspected malaria cases, it should, as a first step, be replaced in the private sector market channel with an approved ACT (FDC) + primaquine regimen subsidized to be affordable to malaria patients in remote areas. This should be supported by communication of the need for specific diagnosis, treatment and adherence to a full course of ACT, in order to discourage treatment based on only clinical signs.
3. Quality-assured, affordable_RDTs should be promoted at the lowest possible level of the private sector supply chain, in support of public, community-based and private services.
4. Recognizing the difficulties of enforcing proper and safe use of rapid tests in the informal private sector, it was suggested that in some situations, a drug seller in a village could be the de facto village malaria volunteer. While the potential of this concept is acknowledged, it was also pointed out that the mixing of roles of a profit oriented drug seller and of a volunteer could be problematic; therefore, such schemes should be monitored closely.
5. While the provision of improved malaria diagnosis and treatment through the informal private sector is a necessary early measure to eliminate monotherapy, effective control and resistance containment must in the long term rely on public sector and community-based services.

(c) The norm for coverage with long-lasting insecticidal nets (LLINs) or conventional insecticide treated nets (ITNs).

As a norm, operations should aim at providing one net per two persons. Thus in monitoring, the proportion of households with at least one effective net per two persons should be tracked.

(d) The role of indoor residual spraying (IRS) and the selection of insecticides for it

1. While the meeting concurred that it was relevant to try to limit transmission in tier 1 by applying IRS together with LLIN/ITN, it was agreed that initially, IRS should be carried out selectively in such a fashion that it would be possible to evaluate its effectiveness by comparing with similar unsprayed areas.
2. While the use of synthetic pyrethroids for IRS would be problematic, because the potential development of resistance to synthetic pyrethroids could jeopardize the effectiveness of LLIN/ITNs, it was considered difficult to identify acceptable, affordable and safe alternatives. However, work to identify such alternatives must be undertaken as soon as possible, so that at least in the long term, pyrethroids will be avoided for IRS.

Finalization and endorsement of "MARC"

Following these discussions, the meeting formally and emphatically endorsed the Strategic Framework for Artemisinin Resistance Containment in Myanmar (MARC) 2011-2015 with amendments corresponding to the above conclusions and revisions of indicators as agreed by the meeting.

Next steps required for moving forward MARC implementation
Plenary discussion led by Dr Khin Mon Mon

- An application will be submitted for Global Fund Round 11, and it is recalled that this will have to be based on performance for Round 9. A round 11 proposal might include strengthening of health systems.
- Collaboration and coordination with partners (NNGOs, INGOs, related ministries, companies etc.) will be initiated by VBDC as soon as possible.
- The potential role of a regional project will be discussed a meeting in Kota Kinabalu, Malaysia, in May 2011.
- A detailed plan of operations for MARC with budget and timelines will be prepared by VBDC in collaboration with WHO and other partners over the next few months.

Annex 1. Programme of the meeting

Day 1 – Monday, 4 April 2011		
A.M.	Opening Address	HE The Minister of Health
	Opening remarks	Dr H.S.B. Tennakoon, WHO
	Introduction of participants	Dr Krongthong Thimasarn
	Nomination of chairperson and rapporteur	Dr Tennakoon
	Expected outcomes and agenda	Dr Krongthong Thimasarn
	Update situation on drug resistance at global level and in the Greater Mekong Sub-region	Dr Pascal Ringwald
	Overview of the Global Plan for Artemisinin Resistance Containment (GPARC) Cambodia-Thailand containment project - progress made and remaining challenges	Dr Pascal Ringwald
	Lessons learned from Containment in Cambodia	Dr Sylvia Meek on behalf of Dr Kheng Sim
	Lessons learned from Containment in Thailand	Dr Wichai Satimai
P.M.	Drug resistance in Myanmar	Dr Ye Htut
	Malaria situation in relation to gold mining workers in Shwegyin township (East Bago Region)	Dr Tun Min
	Overview of MARC framework	Dr Khin Mon Mon
	Monitoring and Evaluation of the MARC strategic framework	Ms Charlotte Rasmussen
	Proposed coordination mechanisms	Dr Krongthong Thimasarn
	Plenary discussion on MARC strategic framework	Chairman
Day 2 – Tuesday, 4 April 2011		
A.M.	Group work on implementation of MARC: 1. Increasing access to diagnosis and treatment 2. Community-based interventions 3. Massive and rapid scale-up of preventive measures Reaching the migrant/mobile population 4. Monitoring and Evaluation	
P.M.	Presentation of group work outcomes to plenary for discussion	Dr Khin Mon Mon
	Plenary discussion on MARC strategic framework followed by its endorsement by the meeting	
	Next steps, concluding remarks and closure of meeting	

Annex 2. List of participants

Ministry of Health, Myanmar	
Dr Saw Lwin	Deputy Director General, Diseases Control, Department of Health
Dr Win Maung	Director (Disease Control)
Dr Kyaw Lin	Director (FDA)
Dr Tin Wal Wah	Assistant Director, (FDA)
Dr Khin Mon Mon	Director (Malaria)
Dr Ni Ni Aye	Deputy Director (VBDC)
Dr Aung Thi	Assistant Director (VBDC)
Dr Marlar Soe	Assistant Director (VBDC)
Dr Kyi Lwin	Assistant Director (VBDC)
Dr Nu Nu Khin	Assistant Director (VBDC)
Dr Tet Toe Tun	Medical Officer (VBDC)
Dr Hla Min Thein	Medical Officer (VBDC)
Dr Ngwe San	Regional health Director (Bago Region)
Dr Htay Naung	State Health Director (Kayin State)
Dr Than Win	State Health Director (Kayah State)
Dr Sai San Win	State Health Director (Northern Shan State)
Dr Myint Aung	State Health Director (Southern Shan State)
Dr Khin San Aye	Public Health Officer, Mon State
Dr San San Thi	District Medical Officer, Kawthaung District
Dr Tin Tun Oo	Team Leader (Tanintharyi Region)
Dr Nyan Sint	Regional Officer (Mon State)
Dr Htay Myint Aung	Regional Officer (Magway Region)
Dr Aung Aung Myo	Team leader (Southern Shan State)
Dr Sai Naw Ngin	Regional Officer (Eastern Shan State)
Dr Toe Aung	Team Leader (Northern Shan State)
Dr Tun Min	Regional Officer (Bago Region)
Dr Wint Phyu Than	Team Leader (Bago West)
Dr Khin Nan Lon	Regional Officer (Ayeyarwaddy Region)
Dr Myat Min Tun	Team Leader (Ayeyarwaddy Region)
U Win Myint	Malaria Assistant (VBDC Kachin State)
Dr. Ye Htut	Deputy Director-General, Department of Medical Research, Lower Myanmar
Dr. Myat Phone Kyaw	Deputy Director, Parasitology Division, Department of Medical Research, Lower Myanmar
Dr. Khin Lin	Director, Research, Parasitology and Entomology, Department of Medical Research, Upper Myanmar
Dr Chan Nyein Maung	Department of Medical Research, Central Myanmar
Ministry of Construction	
Dr Win Thant	Chief Medical Officer
Ministry of Agriculture	
U Myint Shwe	Second General Manager
Ministry of Defence	
Lt. Col. Dr Khin Phyu Pyar	Consultant Physician, Head of Clinical Research Unit (Malaria) No. (1), Defence Services, General Hospital (DSGH) Mingaladon
Major Sai Aik Hla	Physician, DSGH
Private Sector	
Dr Soe Aung Myint	In-charge Doctor, Yuzana Palm Oil Plantation Project

Dr Tin Sandar Zaw	Quality Assurance Manager, AA Medical Ltd
National /International NGOs	
Dr Myo Min	Project Manager (QDSTM), Myanmar Medical Association (MMA)
Dr Soe Aung	Myanmar Medical Association (MMA)
Dr Khin Maung Wyn	Project Manger (MCC-Malaria), Myanmar Council of Churches (MCC)
Dr Khin Myo Myint	Deputy Head of Health Division, Myanmar Red Cross Society (MRCS)
Dr. Khin Aye Aye	Excecutive Director, Myanmar Business Coalition on AIDS (MBCA)
Mr Aung Khin	President, Myanmar Health Assistant Association (MHAA)
Dr May Aung Lin	National Coordinator, CESVI/ Myanmar
Dr Thet Aung	Health Specialist, World Vision/ Myanmar
Mr John D. Hetherington	Country Director, Population Services International (PSI)/ Myanmar
Dr Frank Smithuis	Medical Consultant, Association Francois-Xavier Bagnoud, Myanmar
Dr Hlaing Min Swe	Child Survival Director, Save the Children/Myanmar
Dr Esther Sedano	Deputy Director Program Implementation, GFATM, Save the Children /Myanmar
Dr Maria Sunga Guevarra	Medical Coordinator, AZG-Médecins Sans Frontières-Holland/Myanmar
Dr Chris White	Malaria Technical Advisor (Asia), Population Services International (PSI) Washington, DC, USA
Dr Sylvia Meek	Technical Director, Malaria Consortium, London, UK
UN agencies	
Mr Mikko Lainejoki	Chief Executive Officer, Three Diseases Fund Management Office, UNOPS, Myanmar
Dr Attila Molnar	UNOPS-GFATM, Myanmar
Dr Aye Yu Soe	Public Health Officer (TB and Malaria), Three Diseases Fund Management Office UNOPS, Myanmar
Dr. Aye Aye Than	IOM, Myanmar
Dr Nant Tin Tin Shwe	Programme Associate, IOM, Myanmar
Dr Aung Naing Cho	Malaria Consultant, IOM, Myanmar
Dr. Aung Kyaw Zaw	UNICEF, Myanmar
Representative from Ministry of Public Health, Thailand	
Dr Wichai Satimai	Director, Bureau of Vector-Borne Diseases, Department of Disease Control, Ministry of Public Health
Donor agencies	
Dr Thomas P Kanyok	Senior Programme Officer, Global Health, Infectious Diseases The Bill and Melinda Gates Foundation, Seattle, USA
Dr. Julia Kemp	Health Adviser, Department for International Development (DFID) British Embassy, Myanmar
Dr Masatoshi Nakamura	JICA Myanmar Office
World Health Organization	
Dr Pascal Ringwald	Project Director, Antimalarial Drug Resistance, Global Malaria Programme
Dr H.S.B Tennakoon	WHO Representative to Myanmar
Dr Krongthong Thimasarn	Medical Officer, Malaria Unit, WHO Representative Office to Myanmar
Dr Mya Sapai Ngon	National Professional Officer, Malaria Unit, WHO Representative Office
Dr Khin Than Oo	National Consultant, Malaria Unit, WHO Representative Office
Dr Maung Maung Thein	National Consultant, Malaria Unit, WHO Representative Office
Ms Charlotte Rasmussen	Junior Professional Officer, Malaria Unit, WHO Representative Office
Dr San Kyawt Khine	National Consultant, Rakhine State
Dr Kyaw Swar Myint	National Consultant, Sagaing Region

Dr Than Naing Soe	National Consultant, Tanintharyi Division
Dr Saw Lin	National Consultant, Mandalay Region
Dr Si Thu Ye Naung	National Consultant, Mon State
Ms Stellar Myint	Secretary, Malaria Unit, WHO Representative Office
Ms Cho Cho Tin	Secretary, Malaria Unit, WHO Representative Office
Ms Nay Zar Oo	Data Assistant, Malaria Unit, WHO Representative Office
Dr Allan Schapira	Short-term consultant