To Myanmar’s great credit, as this external evaluation documents, the country has achieved the malaria-specific target of the Millennium Development Goals (MDG 6 target C), which called for halting and beginning to reverse the incidence of malaria by 2015.

Malaria morbidity and mortality rates were, respectively, 53% and 91% lower in 2015 than in 2012, significantly surpassing the reductions aimed for in MDG target 6c.

This report presents the external evaluation of the National Malaria Control Programme of Myanmar, conducted from 6 to 19 March 2016. The methodology of the evaluation, its findings and recommendations are presented here, along with a detailed analysis of the malaria programme and its evolution.

This material will be of lasting use, both for strategic planning and for improving programme implementation, as Myanmar focuses its efforts on the goal of eliminating malaria by 2030.
EXTERNAL EVALUATION OF THE NATIONAL MALARIA CONTROL PROGRAMME MYANMAR
6–19 March 2016
External evaluation of the National Malaria Control Programme Myanmar: 6–19 March 2016

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Disclaimer

Opinions and views expressed in this report are only those of the review team members.
Acronyms

3DF Three Diseases Fund
3MDGF Three Millennium Development Goals Fund
ABER Annual blood examination rate
ACD Active case detection (either proactive or reactive)
ACPR Adequate clinical and parasitological response
ACT Artemisinin-based combination therapy
ACTMalaria Asian Collaborative Training Network for Malaria
ADB Asian Development Bank
AL Artemether-Lumefantrine (Coartem®)
AM Artesunate-mefloquine
AMTR Artemisinin monotherapy replacement project (led by PSI)
API Annual (malaria) parasite incidence (per 1000 pop)
API Pf Annual P. falciparum incidence (per 1000 pop)
API Pv Annual P. vivax incidence (per 1000 pop)
APLMA Asia Pacific Leaders Malaria Alliance (secretariat in Singapore)
APMEN Asia Pacific Malaria Elimination Network (secretariat in Brisbane)
ARC American Refugee Committee
ARCE Strategy for the containment of artemisinin tolerant malaria parasites in
ASEAN South-East Asia (project from 2009 to 2011)
ASEAN Association of Southeast Asian Nations
BCC Behaviour Change Communication
BHS Basic health staff
Cesvi Cooperation e sviluppo (Italian NGO)
CAP-Malaria Control and Prevention of Malaria
CCS Country Cooperation Strategy
CHAI Clinton Health Access Initiative
CHV Community health volunteer
CMS Community malaria survey
CPI Community Partners International
CSM Clinically suspected malaria
DFDA Department of Food and Drug Administration
DHAP/P Dihydroartemisinin-piperaquine
DMR Department of Medical Research
DoH Department of Health
DoMS Department of Medical Services
DOT Directly observed treatment
DRC-TEG  WHO drug resistance and containment technical expert group
EOC     Emergency operating centre
EQA     External quality assurance
ERAR    Emergency Response to Artemisinin Resistance in the Greater Mekong
FAO     Food and Agriculture Organization of the United Nations (Rome)
FFA     Field Financial Assistant
G6PD    Glucose-6-phosphate dehydrogenase
GDP     Gross domestic product
GFATM   Global Fund to Fight AIDS, Tuberculosis and Malaria (Geneva)
GIS     Geographic Information Systems
GMS     Greater Mekong Subregion
GP      General practitioners
GPARC   Global Plan for Artemisinin Resistance Containment
GTS     WHO Global Technical Strategy for Malaria 2016–2030
HCF     Health care facility
HIS     Health Information System
HPA     Health Poverty Action
HR      Human resources
iCCM    Integrated Community Case Management
ICU     Intensive care unit
IDP     Internally displaced populations
IEC     Information, Education and Communication
IRS     Indoor residual spraying
IOM     International Organization for Migration
INGO    International non-governmental organization
ITN     Insecticide-treated mosquito net
IVM     Integrated vector management
JE      Japanese encephalitis
JICA    Japan International Cooperation Agency
JSI     John Snow, Inc. (USA)
K13     Kelch13
LFA     Local Funding Agent
LLIHN   Long-lasting insecticidal hammock net
LLIN    Long-lasting insecticidal net
LMIS    Logistic management information system
MAM     Medical Action Myanmar
MARC    Myanmar artemisinin resistance containment (project)
MCC     Myanmar Council of Churches
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>MCCM</td>
<td>Myanmar Country Coordination Mechanism</td>
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<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
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<td>MHAA</td>
<td>Myanmar Health Assistant Association</td>
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<td>MHSCC</td>
<td>Myanmar Health Sector Coordinating Committee</td>
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<td>MIMU</td>
<td>Myanmar information management unit</td>
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<td>MIS</td>
<td>Malaria Information System</td>
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<td>MMA</td>
<td>Myanmar Medical Association</td>
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<td>MMP</td>
<td>Mobile and migrant population</td>
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<td>MOHS</td>
<td>Ministry of Health and Sports (Myanmar)</td>
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<td>MORU</td>
<td>Mahidol Oxford Tropical Medicine Research Unit</td>
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<td>MPAC</td>
<td>Malaria Policy Advisory Committee (WHO)</td>
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<td>MPR</td>
<td>Malaria programme review</td>
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<td>MRCS</td>
<td>Myanmar Red Cross Society</td>
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<td>MSF</td>
<td>Medecins Sans Frontieres</td>
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<td>NCD</td>
<td>Non communicable disease</td>
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<td>NFM</td>
<td>New Funding Model (GFATM)</td>
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<td>NGO</td>
<td>Non-governmental organization</td>
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<td>NHC</td>
<td>National Health Committee</td>
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<td>NHL</td>
<td>National Health Laboratory</td>
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<td>NMCP</td>
<td>National Malaria Control Programme</td>
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<td>NSP</td>
<td>National Strategic Plan</td>
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<tr>
<td>oAMT</td>
<td>Oral Artemisin monotherapies</td>
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<td>OR</td>
<td>Operational research</td>
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<tr>
<td>PCD</td>
<td>Passive case detection</td>
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<tr>
<td>PCR</td>
<td>Polymerase chain reaction</td>
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<tr>
<td>PHO</td>
<td>Public health officer</td>
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<td>PMI</td>
<td>President’s Malaria Initiative</td>
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<td>PPP</td>
<td>Public-private partnership</td>
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<td>PR</td>
<td>Principal Recipient</td>
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<td>PSI</td>
<td>Population Services International</td>
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<td>Pv</td>
<td><em>Plasmodium vivax</em></td>
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<td>Q</td>
<td>Quinine</td>
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<td>QA</td>
<td>Quality assurance</td>
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<td>QC</td>
<td>Quality control</td>
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<td>QDSTM</td>
<td>Quality diagnosis and standard treatment of malaria</td>
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<td>RAI</td>
<td>Regional Artemisinin Initiative</td>
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<tr>
<td>RDT</td>
<td>Rapid diagnostic test</td>
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<td>RHC</td>
<td>Rural health centre</td>
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<td>RMT</td>
<td>Residual malaria transmission</td>
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RSC  Regional Steering Committee (for RAI)
SCM  Severe and complicated malaria
SEARO  South East Asian Regional Office
SMRU  Sokhlo Medical Research Unit
SOP  Standard operating procedures
SPR  Slide positivity rate
SR  Sub Recipient
SSA  Special Service Agreement
TES  Therapeutic Efficacy Study
THE  Total health expenditure
TMO  Township medical officer
TPHO  Township Public Health Officer
TPR  Test positivity rate
TSG  Technical and Strategy Group
TWG  Technical Working Group
UNAIDS  Joint United Nations Programme on HIV/AIDS
UNICEF  United Nations Children’s Emergency Fund
UNOPS  United Nations Office for Project Services
URC  University Research Co., LLC
USAID  United States Agency for International Development
USP  United States Pharmacopeia
VBDC  Vector-Borne Disease Control
VC  Vector control
VHV  Village health volunteer
WHO  World Health Organization
WHOPES  WHO Pesticide Evaluation Scheme
WPRO  Western Pacific Regional Office
Executive summary

Myanmar has surpassed the Millennium Development Goal #6 by cutting malaria morbidity and mortality rates by more than 50% in 2004 compared with 1990 (The morbidity and mortality rates were 24.35/1,000 population and 12.62/100,000 population respectively in 1990 and 11.10/1,000 population and 3.65/100,000 population respectively in 2004).1 Those results can be reasonably attributed2 from 2010 onwards to the following critical interventions: (a) the large scale-up and use of free-of-charge rapid diagnostic tests (RDTs)3 in communities and peripheral health-care facilities (substantially increasing the detection rate); (b) the countrywide availability of free-of-charge and highly efficacious first-line artemisinin-based combination therapies (ACTs) and; (c) the large distribution of long-lasting insecticidal nets (LLINs)4 on top of the existing important use of traditional nets. The above control interventions have been implemented by numerous dedicated and trained peripheral health-care staff and malaria volunteers posted in strategic locations providing people at risk with malaria information and advice pertaining to behaviour changes (IEC/BCC). Those interventions have been so efficient that confirmed malaria cases are no longer detected (or at very low rate) in an increasing number of villages/townships, especially in eastern and northern states, including in border townships, where recorded \( P. falciparum \) infections are drastically falling.

With increasing political stability, the country is in a more favourable position to intensify control operations, especially in western states bordering India and Bangladesh where \( P. falciparum \) infections are still highly prevalent, and to set up more aggressive elimination interventions in eastern (bordering Thailand) and northern states (bordering China) where \( P. vivax \) (Pv) infections are becoming highly prevalent but where a percentage (estimated at less than 10% except in Mon State) of the remaining \( P. falciparum \) infections are not properly responding to the recommended first-line medicines (ACTs).

Village-based malaria mapping and action

With the progressive set-up (starting at the state level and further down in townships, which are part of the Regional Artemisinin Initiative (RAI) project) of an electronic malaria database

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1 Of note is that most malaria data before 2007 were not confirmed by any lab methods. 2012 is considered a more valuable year for baseline reference with large use of combo RDTs.
2 The country is also experiencing rapid and high deforestation rate impacting on An. dirus and An. minimus survival.
3 \( P. falciparum \) mono RDT from 2010 and combo tests from 2012 onwards.
4 GFATM (through R9NFM and RAI) is the major donor providing more than 90% of the budget requested by the programme. PMI is also a large contributor.
filled in by malaria data assistants from reports collected from volunteers and public health-care facilities, the programme and some township officers under the RAI project are in a better position to document and map confirmed malaria incidence by species, village population and year. Classifying or stratifying villages, according to annual parasite incidence (API), is recommended by the programme and is expected to contribute to measure progress over years by township and by village towards elimination. This is one of the first important critical elements (currently ongoing in selected RAI townships) of an elimination programme, which is to progressively improve the “malaria village intelligence” under township managerial leadership. The “village” at the initial elimination stage could be considered a “foci” by the programme. Interventions are planned and budgeted according to the village API status.

**Targeting mobile and migrant populations**

One major persistent issue that the programme has to face in a more intensified way is malaria control and malaria prevention in mobile and migrant and remote populations. Adults in general and hard-to-reach people are the population at risk, especially those living/working or travelling in at-risk malaria endemic locations/situations, such as forests, forest fringe areas, plantations or industrial compounds. Migrant workers from different malaria-endemic areas gather for economic reasons in these industries. From observations, there is not enough effort made yet to “package”, design or pilot more specific, more suitable and more innovative measures, including IEC/BCC to make sure that those groups are “easily” accessing malaria services, suitable preventive measures and relevant malaria information.

**Partnership engagement, programme stewardship and managerial capacity at central, state and township levels**

All partners (except the large majority of private providers, health-care services from the ministry of defence services and private companies) are directly engaged with the National Malaria Control Programme to deliver recommended services and thus are contributing to feed and consolidate malaria information at each administrative level. If data management has improved in all states (as a contribution from the Global Fund-New Funding Model (GF-NFM) and in 76 selected townships (contribution from the GF-RAI)), the overall planning and monitoring of malaria interventions, including data management, is still far from perfect in the majority of townships in Myanmar. Most township health teams are not in a position,
due to inadequate human resources or staffing, skills and equipment, to perform numerous tasks in relation to overall public health management (all diseases), administration, planning, reporting and day-to-day management of funds in the current highly centralized system. In such a context, it is not surprising to note that township health teams might be bypassed by field partners and peripheral health staff pertaining to activity reports and epidemiological information.

The Vector-Borne Disease Control (VBDC) Programme at central and state levels is managing the malaria programme and in charge of strategy and policy guidance (central level). It is also in charge of monitoring and consolidating reports from all townships activities. The central level team is expected to provide feedback to township teams, but this is happening with delay. The programme has rightly promoted and scaled up full coverage of LLINs\(^8\) starting in high-endemic townships and has substantially increased countrywide access to and use of free-of-charge malaria RDTs and highly efficacious ACTs. Extra funds (3MDG and GF-RAI) have been used to implement (and monitor) specific and somewhere more complex interventions\(^9\) to address multidrug resistance in townships where less susceptible \(P. falciparum\) strains to ACTs have been documented (mainly in states bordering Thailand).

**Strengthening malaria intelligence and timely response to epidemics**

Quality of epidemiological data is one of the critical elements of the elimination programme in Myanmar. Based on the assessment of current epidemiological data, there are still crucial concerns to be addressed by the programme in order to make data more accurate and reliable for decision-makers and planning officers from township to central levels. The capacity (number and skills) of state and township public health teams to analyse data generated by public health facilities and volunteers as well as data obtained from annual (community and HCF) survey is insufficient. Providing timely feedback (from central and state levels) to peripheral services is also inadequate.

An excellent surveillance (and response) system is a cornerstone to achieving and consolidating national, state/region and township elimination malaria targets as per the National Strategic Plan (NSP). As compared with previous years, confirmed malaria data generated from volunteers and peripheral health centres are far better collected, reported, computerized and analysed. A single malaria database has been constructed and currently managed by the VBDC Programme with the strong technical support of World Health Organization (WHO) and partners, such as

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8 11 million LLINs have been distributed over the last 5 years.
9 Myanmar Artemisinin Resistance Containment (MARC) project.
the Malaria Consortium. All malaria data generated from almost all sources except the private sector,\textsuperscript{10} defence services and informal providers are collected via standardized “carbonless” forms and then computerized at the state level (all states) with the help of 66 WHO-supported field data assistants, 24 WHO-supported field project coordinators, supervised by three WHO-supported central level staff and backed up by a few central office staff. More than 100 WHO-supported short-term contracts are managed by WHO. Data for suspected patients tested negative are also computerized, which makes little sense. The completeness performance of the current reporting system is estimated at 83% in 2015 (73% in 2014), which is quite a good achievement over the last 5-year period. The township health team is not yet fully engaged in data management since some partners are reporting directly to the state level, bypassing township teams. Also noticed is the lack of understanding and engagement of generally very dedicated peripheral health workers (midwives) in local data management – basic epidemiology analysis for action – and village stratification.\textsuperscript{11} Monitoring and evaluation (M&E) surveys (in a sample of communities and health-care facilities) are also conducted every year countrywide. The results are very interesting, which catch complementary information in addition to routine data. However, conclusions from the many tables in survey reports are not strategically presented and so not actually contributing to update interventions or reorient strategies as per survey results. In general, there is inadequacy of epidemiology and statistical background at all levels, including central and state decision levels.

There is an epidemic detection and response guideline (malaria and other epidemic-prone diseases) but it was not clear how the guideline is implemented, in particular when responding to vector-borne disease epidemics in a context of acute shortage of human resources (HR), equipment and pesticides.

**Reaching universal ITNs/LLINs coverage target**

Scaling up LLINs has proven to be effective in reducing the malaria burden and shrinking the number of high, moderate and low-endemic townships. Vector control operations mainly rely on LLINs. The next distribution of LLINs needs to take into consideration the updated stratification/mapping of villages (high, medium, low and zero local transmission). On top of periodic mass LLINs distribution, LLINs have to be continuously delivered to address the attrition rate of LLINs in communities; this does not seem to be the case. Over time, more villages will be stratified as “low endemic” or “without local transmission”; and so entering into

\textsuperscript{10} Few private sector data are however included (from MMA, PSI and IOM); this accounts ~1500 GPs estimated at 5% of total GPs (~30 000).

\textsuperscript{11} The first principle in data management is that those generating data are the first ones to use them.
low-risk foci status requires alternative options to identify and eliminate the last parasites and prevent the re-introduction of the disease.

In fact, a large number of traditional nets are used in low-endemic remote villages. They are marketed through local shops almost everywhere in different sizes, materials, quality and cost independently of malaria endemicity to protect people against any nuisance and for privacy. This is an excellent opportunity to sustain the continuous use of conventional nets through impregnation with long-lasting insecticidal formulation. For various reasons (such as the reimpregnation rate remaining very low, high cost and lack of long-lasting insecticide formulations, etc.), the programme has stopped promoting impregnation and reimpregnation of existing bed nets from 2013. The malaria programme review (MPR) team is of the opinion that the programme has to revisit this option of impregnating existing nets as a sustainable personal protection measures while LLINs might continue to be encouraged in remaining high transmission villages. Impregnation kits could be marketed under certain conditions with adequate supervision and encouraged or guided by suitable IEC/BCC materials.

**Indoor residual spraying (IRS) operations**

IRS remains an efficient tool when properly planned and executed following stringent standard operating procedures (SOPs). This does not seem to be the case in Myanmar where 50% of VBDC vacant posts are not filled or existing staff are insufficiently trained and supervised; most equipment is obsolete and pesticides are not properly managed (choice and storage). As per NSP, IRS operations are selective and used to combat epidemics to prevent malaria in new settlements/among internally displaced persons (IDPs) and to prevent the spread of suspected *P. falciparum* resistant strains under RAI following identification and mapping of patients with Day 3 (D3) parasitaemia. IRS operations undertaken by the programme are very rare countrywide and probably more frequent in the 76 RAI-supported townships. There is no systematic report from IRS operations carried out, past or present.

**Entomological surveillance, outdoor transmission and personal protection**

Entomological surveillance and species identification of mosquitoes and analysis of their behaviours (outdoor transmission) guide vector control options and tool(s) to be used according to local situations, i.e. LLINs, IRS, the combination of both under certain conditions, larviciding, environmental measures, etc. When this information is coupled with outdoor biting transmission and outdoor resting/exophilic habits of vectors, it allows innovative preventive/
individual tools such as impregnated blankets or clothes, or other means, such as light traps, to be piloted and perhaps ultimately scaled up based on proper evidence. This is not the case in Myanmar yet or it is still fragmented. For example, there is an ongoing study using impregnated clothes in rubber plantations in Mon State. Preliminary results are showing good acceptance and effectiveness of such an approach to protect rubber tappers.

**IEC/BCC to improve malaria information and contribute to behavioural changes**

IEC/BCC activities have been continuously carried out by both the VBDC and partners through village health volunteers (VHVs) and midwives as interpersonal communication and IEC materials (posters and leaflets), which are of limited quantity and quality in the field. International nongovernmental organizations (INGOs) have, however, been more active in (innovative) IEC/BCC interventions than VBDC. The budget earmarked by the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) in 2013–2014 as per programme request to support IEC/BCC interventions is rather limited (less than 5% of the total GF budget). Save the Children spent about 2.5% of their budget for IEC/BCC materials. Monitoring and evaluation of IEC/BCC interventions are obtained through annual surveys but, as mentioned above, survey results are not strategically summarized and are not contributing much to orient or reorient doable measures to influence local practices and national policies.

Rather limited as well are IEC/BCC tools and materials to be used by non-health influential people, such as teachers in schools, village authorities, monks in pagodas, company owners, etc.

**Advocacy to decision-makers, donors and local authorities**

Advocacy is an important component of the programme to maintain local authorities and decision-makers aware and supportive of strategies to be scaled up to control the disease but also to reach elimination targets and prevent the re-introduction of the disease. Myanmar as a member of the Association of Southeast Asian Nations (ASEAN) has to report to ASEAN Heads of State who are all committed to advocate for and to reach an ASEAN free region of malaria by 2030. The Government of Myanmar is starting to play a more active leading role with the

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13 As per community surveys, community members get first information (on health and malaria) mostly from public health-care facility staff.
set-up of a National Malaria Elimination Committee (NMEC). The NMEC has the Vice-President as patron, the Minister for Health and Sports as chairperson, two deputy ministers for health as vice-chairs, the Director-General of the Department of Public Health (DOPH) as Secretary and the deputy Director-General (Disease Control) as joint Secretary. Members include the Deputy Ministers of 16 ministries and government authority offices and chairpersons of national NGOs. Altogether, there are 35 members in the committee. The committee has a working group and an executive working group; however, they have not yet met.

**Improving access to quality diagnosis and treatment**

Strategies (translated in guideline and training manuals) to support early diagnosis and effective malaria treatment (including transmission blocking treatment of *P. falciparum* and radical treatment of *Pv*) are in place. Implementation is made through VBDC-supported health-care facilities and NGOs down to peripheral health centres and communities. There are also many (unsupervised and untrained) private health-care providers; the majority is not reporting to VBDC. Pertaining to case management of uncomplicated cases outside hospitals, essential malaria commodities, such as RDTs and ACTs, are available at all health-care levels down to communities through volunteers (in selected villages) or in some local shops managed by Population Services International (PSI) but it was not clear how positive cases were reported from the private shops. Peripheral health-care staff and volunteers are generally following case management guidelines updated by VBDC. They rely mainly on combo RDTs for detection of malaria followed by either ACT and primaquine (PQ) single dose to manage *P. falciparum* infections or chloroquine for 3 days, followed by PQ weekly for 8 weeks (case managed by volunteers) or daily for 14 days (case managed by health-care staff). That strategy has drastically contributed to increase the detection rate at the grass root level and to some extent to reduce local *P. falciparum* transmission (together with ITNs) along with an increasing number of infected people treated with ACT. There is apparently no critical issue of using PQ without glucose-6-phosphate dehydrogenase (G6PD) deficiency testing, but pharmacovigilance mechanisms are not in place. All malaria cases are recorded in “carbonless reporting forms” used by all partners and monthly sent to the upper managerial level, which is the township team and further up to the state/regional level where data are computerized (see also section on technical collaboration).

**Improving the capacity of referral hospitals to manage severe and complicated malaria (SCM)**

While looking at records (somewhere not well maintained) from referral hospitals (township and state), the number of severe and complicated malaria cases have been declining over the
last 5 years. This is acknowledged by most of the clinicians met during the review. Clinicians and nurses are generally aware of severe and complicated case management guidelines. Quinine IV as well as artemether IM or IV are used (sometimes both quinine and artemether) to manage SCM. Artesunate vials are in some places overstocked. The majority of referral hospitals do not have an Intensive Care Unit (ICU) with proper equipment/monitoring machines for renal, cardiac, respiratory systems assistance with 24-hour skilled staff and laboratory support.

Diagnosis by microscopy has not received adequate attention and emphasis. Microscopes and microscopists are generally available but quality assurance (QA) and quality control (QC) systems are not in place or, if in place, they are not following WHO standards. RDTs are available and generally used outside working hours of microscopists. Communication between hospital and VBDC staff operating close by is generally limited (e.g. exchange of malaria data, QA/QC procedures and capacity-building).

Strengthening supply chain management

No major issues pertaining to the availability of supplies were noted. The supply chain management observed in the public sector was weak in terms of stores and record-keeping. In some places, malaria commodities were stored on the floor, and bin cards were not used. Storage temperature was generally not recorded and not controlled. At the central VBDC warehouse, bin cards were used but the records on the bin cards and stock books for the same items did not match. The partners visited had a better system in place.

Banning artemisinin monotherapies

In spite of the national ban on oral artemisinin monotherapy, such products were found in two private pharmacies in Loikaw. From informal discussion with partners, artemesunate monotherapies are still marketed in many private shops. An assessment is ongoing to measure the magnitude of the problem.

Promoting and maintaining quality medicines

Post-marketing surveillance and testing of antimalarials are being done by the United Nations Office for Project Services (UNOPS) for medicines procured under the GFATM grant. The Department of the Food and Drug Administration (DFDA) collects samples of antimalarial medicines procured under the GF-RAI grant but the number of samples tested is low. All samples of antimalarials have passed quality testing.
Research

Research activities, which are conducted in different institutes, including the Defence Service Medical Research Centre, are in principle coordinated by the Department of Medical Research (DMR) located in Yangon and the DMR Pyin Oo Lwin branch in Mandalay. An impressive number of studies have been implemented, including on malaria in various domains in collaboration with recognized international research institutions. Pertaining to malaria, the main research topic focus on therapeutic efficacy studies (TES) for monitoring drug resistance, resistance marker screening, identification of new resistance markers, exploration of new tools in the context of malaria elimination, G6PD mapping, IEC/BCC surveys, clinical studies on severe malaria, entomological studies looking at sibling species prevalence and vector bionomics among others. It is not clear to which extent results from those studies have influenced or are strategically influencing the national malaria control/elimination strategy/policy except for results from TES, which are contributing to national drug policy decision and monitoring of Day 3 positivity rate for all ACTs used in Myanmar. The Malaria Technical and Strategy Group (TSG) is tasked to develop a research agenda responsive to the needs of the programme, but it appears that there is no clear mechanisms in place for researchers and VBDC under different departments to agree upon a straightforward research agenda expected to respond to short- and long-term programmatic unanswered questions and needs.

Cross-border engagement towards agreed-upon regional targets

Cross-border activities need to be considered since elimination targets cannot be reached at national level if neighbouring countries are not engaged as well. This is also crucial to contain and eliminate *P. falciparum* strains in mobile and migrant populations not responding to first-line ACTs. Many cross-border meetings or workshops are organized by various partners/INGOs, especially between Myanmar and Thailand and between China (Yunnan province) and Myanmar, but to a less extent between Myanmar and India/Bangladesh. Such meetings are generally not action-oriented and memoranda of understanding not much helpful, e.g. for data sharing, which is still limited. Of positive note is the website managed by Shoklo Malaria Research Unit (SMRU), which is mapping SMRU-supported interventions and results in selected Myanmar-Thai border townships accessible by all partners.

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14 This is not clear if research activities carried out by the Defence Service Medical Research Centre are actually coordinated by DMR or independently planned.
Addressing programatic challenges towards malaria elimination and prevention of its re-introduction

Programme management in the context of malaria elimination:

Need for more integration without losing malaria expertise: The central challenge of programme management in the context of malaria elimination is to sustain political will to continue to invest in a disease that is no longer part of the top five causes of mortality and morbidity and to administratively/technically being able to convert what was hitherto rather a vertical programme into more horizontally driven approaches, which are part of the primary health-care system. It will no longer be cost-effective or efficient to maintain a separate cadre for the malaria workforce alone. Integration is also required in health informatics, logistics and financing where information, commodity or financial flows related to malaria become an integral part of the much larger general health services. Yet in each of these areas, there is also a need to retain critical “vertical” elements in the form of specialized skills and equipment that a malaria elimination and prevention of re-introduction programme is requesting under the VBD umbrella.

Need for skilled human resource adjusted to clear positions and tasks: Township public health teams include VBDC staff. The malaria-specific human resources as part of VBDC are entomologists, malaria assistants, inspectors, supervisors and permanent spray men. There is an increasing mismatch between the functions that are required by the programme and skills that are actually in place. Roles, functions and position of entomologists are unclear in the current VBDC cadre. There is also a lack of epidemiologists or public health experts with epidemiological skills, e.g. for overall quality data management and feedback, lack of pharmacists to strengthen supply chain management, including store management, and lack of data entry operators and data analysts. These new positions are justified and effective if they are created to address all vector-borne diseases and ultimately all diseases of public health importance rather than only for malaria.

Good on-the-job training and supportive supervision are required to ensure that service providers of the general health services adhere to case treatment protocols, including management of non-malaria fever; that microscopists in referral hospitals keep the necessary skills, VHVs are well supported; that communities and household members are active in vector control, including the promotion and use of (preferably impregnated) bed-nets; that warehouses, storage conditions and management of logistics of vital commodities are optimally driven, and so on. Existing supervisors are not properly trained/do not have the requested skills yet to ensure that all of this is up to standard. An HR policy/plan that ensures a steady supply of these skilled multitask staff to play these roles is therefore a priority. On the other hand, single-task posts, such as permanent spray men and full-time insect collectors, are not undertaking the tasks that they are supposed to do.
**Village health volunteers at frontline:** Emergent human resources who have played an important role are village health volunteers. They have been effective in ensuring access to powerful new technologies, e.g. to test suspect patients and treat them when positive, especially in remote villages. Criteria used to deploy volunteers make sense but are not always applied. They are sometimes operating in villages close to rural health centres or absent in remote villages. The design of VHVs’ role, functions, skills and support varies across implementing partners who have the freedom of using them for various purposes, especially when and where malaria cases are declining. Efforts to counter this by re-skilling them on integrated community case management have been announced but are not yet rolled out on scale.

**Contribution from partner organizations:** International and national NGOs have made valuable contributions in malaria control. They have expanded community case management and local health education centred around VHVs or through innovative IEC/BCC practices/protection measures, such as impregnated clothes or SMS technology, to improve surveillance and rapid response even in remote locations. However, the programme is not taking enough stock of best practices documented in the field to be for some of them included in policies and further scaled up.

**Financing:** The main source of financing is the government budget, which mainly goes into salaries and some equipment complemented by extra funds from international agencies, such as the GFATM, to significantly scale up expensive commodities, especially ACTs, RDTs and LLINs through VBDC and NGOs. The government budget has however never been adequate to cover the minimum HR required by the control programme. Poor absorption of donors’ funds by VBDC is also noticed, which is less the case when funds are managed by NGOs but with high administrative/transaction cost. Financial flows to townships and states are based on the “zero cash flow approach”. Direct payments for activities, which need to be always fully completed before being reimbursed, are being delivered via “field financial assistants”. This leads to several forms of transactional inefficiencies and delays. That approach does not contribute to the development of the financial management capacity at state/region and township levels, which is required to move as per NSP towards a greater decentralization of managerial tasks at township and state/region levels.

**Malaria control in self-administered areas:** A small but significant number of townships, which are designated as self-administered, have set up health systems outside the administration of the health department. Selected partner agencies are performing outreach activities into those particular areas. Control and elimination of malaria in these townships will require greater dialogue and responsiveness of all actors to address community needs and contribute to township and state targets.
**Good governance matters:** Good governance will require greater leadership capacity at national, state and township levels. The township medical officer and the state public health director have both key leadership roles to play and require to be supported and capacitated. Good governance also requires better clear horizontal and vertical lines of accountability against a clear annual budgeted plan of action. Mechanisms in place are weak and partially linked to limited progress towards greater decentralization. Proposed governance committees and coordination committees need to meet regularly, be more outcome-oriented and ensure citizen representation. Effective governance at the national level requires much greater technical capacity. Partner agencies, especially WHO, provide many technical inputs but most of them have also their own priorities and visions. A dedicated public health institution at this level would help to orient public health research activities with evidence-based findings possibly inserted into strategies and policies. Continuous advocacy effort backed up by scientific reports and documents to ensure optimal investment in public health (more than actual investment) in general and in malaria elimination in particular is lacking.
1. **Background**

1.1 **Location and context**

Myanmar, previously known as Burma, is the largest country in mainland South-East Asia with a total land area of 676,578 square kilometres. It stretches 2200 kilometres from north to south and 925 kilometres from east to west at its widest point. It is bounded on the north and north-east by the People’s Republic of China, on the east and south-east by the Lao People’s Democratic Republic and the Kingdom of Thailand, on the west and south by the Bay of Bengal and Andaman Sea, and on the west by the People’s Republic of Bangladesh and the Republic of India. (Figure 1) Myanmar’s capital city is Nay Pyi Taw and its largest commercial city is Yangon.

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

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

Source: National Strategic Plan 2016-2020
The country is divided administratively into Nay Pyi Taw Territory and 14 states and regions, and comprises 74 districts, 330 townships, 398 towns, 32 subtownships, 3065 wards, 13 619 village tracts and 64 134 villages. The first level administrative area is in the central parts of the country, and states in the periphery. The townships and villages are the core planning and implementation units.

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

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

1.2 Demographic indicators

As of 1 January 2016, the population of Myanmar was estimated to be 54 106 691 people. This is an increase of 0.82% (439 534 people) compared with a population of 53 667 157 the year before. In 2015, the natural increase was positive, as the number of births exceeded the number of deaths by 536 135. Figure 2 illustrates the population by age group and gender (male blue and female red) in Myanmar in 2014, demonstrating the overall predominance of a population <40 years old. Due to external migration, the population declined by 96 601. The sex ratio of the total population was 0.972 (972 males per 1000 females), which is lower than the global sex ratio.
1.3 Health system organization

Recent decades of underinvestment left Myanmar’s public health system critically weak and under-resourced. Significant improvements have been made during the last 5 years. The Government’s Total Health Expenditure (THE) is increasing year by year and rose steadily from 86 billion kyats (US$ 70 million) in 2011–2012 to 753 billion kyats (US$ 610 million) in 2015–2016 (fiscal years) – almost a nine-fold increase over 4 years. Government health services provide human resources, infrastructure and facilities, key medicines (including artemisinin combination therapy - ACT) and some simple routine investigations (including rapid diagnostics tests) free-of-charge down to the community level.

Despite recent improvements, most outpatient care is still obtained from private sector providers. Although Out-of-Pocket Expenditure (OPE) for health care fell from 80% in 2011 to 68% in 2013, it was still the seventh highest in the world resulting in high levels of catastrophic
financial payments and subsequent impoverishment. Health outcomes are improving, but remain poor. In 2015, the under-5 mortality rate was 50 per 1000, and life expectancy at birth was 66.

The public health-care system in Myanmar is highly structured, following the state-district-township government hierarchy and based on the principles of primary health care, with medical officers overseeing all health-related activities in their designated areas. There is also an active national network of auxiliary midwives and community health workers operating in collaboration with village health committees, providing prevention and outpatient care. Resources for health-care services at the local level are limited. However, some areas are supported by international and national nongovernmental organizations, to provide effective community-based malaria diagnosis and treatment services through trained community volunteer network. Strategies are in place to make grossly inadequate resources stretch as far as possible. However, the need to review the extent to which the population at high risk, especially ethnic minorities and the hardest to reach, have access to the health-care delivery system is important for further improvements in health outcomes. Under the funding of the Global Fund – Regional Artemisinin Initiative (GF-RAI) grant, the Three Millennium Development Goal Fund (3MDG and United States Agency for International Development President’s Malaria Initiative (USAID/PMI) in the past 3 years, international nongovernmental organizations (INGOs), such as Community Partners International (CPI), Medical Action Myanmar (MAM), University Research Co. LLC (URC) and the American Rescue Committee (ARC) are working directly with non-state actors/ethnic health organizations to provide malaria diagnosis and treatment to the population residing in the conflict-affected areas and nongovernment control area. These partners play a critical role in the reduction of malaria morbidity and mortality in remote settings and need to strengthen their health-care system for the long-term sustainability and accessing universal health coverage.

Recent aid-based interventions have primarily been vertical programmes running independently of the public health system rather than integrated case management system at the field level. There are no specific national strategies addressing integrated health-care management for basic health staff and community volunteers although there is a wish list of integration of service provision at the programmatic level. Similarly, there is no clear instruction, standardized cross-programme recording and reporting among maternal, new-born and child health (MNCH), tuberculosis and malaria programmes. However, funding for aid interventions has increased significantly in the last few years; new funding partners have engaged with the country and key implementing partners are taking an increasingly holistic approach to health-care support.
The Township Public Health Department is headed by the Township Public Health Officer (TPHO) who functions at the Assistant Director level. Under the TPHO, there are two medical officers (one for Disease Control/Public Health and one for medical care) and one administrative officer. Generally, each TPHO is responsible for four to five Rural Health Centres (RHCs) and station hospital (each managed by a health assistant with a woman health visitor and at least one midwife) and four to five sub-RHCs (each managed by a midwife with a public health supervisor – level II). Microscopy services are available at township hospitals and some NGO-run clinics. Microscopists are multi-skilled rather than malaria-specific.

Township hospitals (at least 25 bedded to 50 bedded) are the basic unit for medical and surgical care to the rural and urban community. All township hospitals in the country are managed by a township medical officer (TMO). Under each township hospital, there are one or two station hospitals (16 bedded) managed by a medical officer. All basic health staff, medical officers and TMOs received relevant training on malaria case management, recording and reporting and supply chain management in the past 5 years. Under the malaria elimination efforts, all field staff need to be trained for surveillance, malaria-positive case investigation, outbreak investigation and real time reporting.
2. Malaria programme review

2.1 Rational

The last malaria programme review in Myanmar was conducted in 2012. Since then, as a result of scaled up interventions supported by the GFATM and further additional funds provided to contain/eliminate \textit{P. falciparum} resistant strains to ACTs focusing on the eastern states, numbers of confirmed malaria cases and malaria-attributed deaths in some townships are drastically decreasing to reach very low levels.

The national malaria control programme (NMCP) in Myanmar is at the juncture of shifting, at least, in an increasing number of townships from control operations to elimination and prevention of malaria re-introduction interventions. This is the right time to conduct a comprehensive external programme evaluation to assess epidemiological situation, outcomes and impact of existing programme implementations, identify gaps, challenges, threats, opportunities, lessons learnt and formulate recommendations that would support the programme as well as to assure the investors to move from intensified control operations only to elimination interventions.

2.2 Objective of the malaria programme review

2.2.1 General objectives

The findings and recommendations of the external programme review would help in setting the direction over the next 5 years and to accelerate progress towards malaria elimination in the country. It would serve as a reference for implementing partners when developing/updating their respective plans of action on malaria prevention and control and for development partners’ consideration making investments in the country. It would also be very useful for NMCP and its implementing partners to prepare the upcoming Global Fund New Funding Model (NFM) Concept Note for the period 2017–2020.

The general objectives of the review were therefore as follows:

- To conduct a comprehensive in-depth analysis of the malaria situation and the national malaria control programme in Myanmar.
To make recommendations to accelerate progress towards malaria elimination through further improving current and proposed core interventions to achieve malaria elimination by 2030 in Myanmar.

2.2.2 Specific objectives

• To analyse the epidemiological situation/trends of malaria in Myanmar during the past 8 years (2007–2014), including assessment of data accuracy by source of data and diagnosis method.

• To review the national malaria control/elimination strategy, including the strategy to identify and eliminate resistant strains of *P. falciparum* to ACTs and technical policies and implementation strategies in relation to the epidemiological, social, political and economic contexts of malaria in the country.

• To review the organizational structure and functions, the management and technical capacities, and the financial resources of the national malaria control programme at national and subnational levels.

• To assess the achievements in various programmatic areas of the national malaria control programme, identify gaps, challenges, threats, opportunities, and lessons learnt, with special emphasis through the implementation of Round 9 and NFM from 2011–2015 and RAI from 2014–2015 and other related projects during 2011–2015.

• To assess the roles of private sectors in malaria control as part of the national strategy of public-private partnerships as well as civil society engagement for malaria control.

• To assess the contributions of other technical and implementing partners, such as the Japanese International Cooperation Agency (JICA), WHO, INGOs, NGOs, the private sector and communities at risk in the national response to control malaria.

• To propose specific recommendations/action points to improve the national malaria control programme and to identify strategic contributing elements to accelerate progress towards elimination.

2.2.3 Methodology

The methodology used in this review is shown in Table 1.
### Table 1. Summary of review methodology

<table>
<thead>
<tr>
<th>Thematic areas to be reviewed</th>
<th>Methods of assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Programme management: policies, guidelines, human resource, supervision, partnerships and coordination, malaria financing</strong></td>
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<tr>
<td>(1) National health policies, national health plan and health budget relevant to the Malaria Control Programme</td>
<td>(a) Desk review of relevant documents</td>
</tr>
<tr>
<td>(2) National malaria control programme (NMCP) organizational structure, functions and human resources – including number and TORs if available – at national and subnational levels</td>
<td>(b) Review and discussions on the presentations to be done during the review period</td>
</tr>
<tr>
<td>(3) Malaria programme policies and guidelines and SOPs if available</td>
<td>(c) Key informant interviews at central, district levels (NMCP manager to identify key informants)</td>
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<tr>
<td>(4) Malaria control/elimination programme national strategic plan</td>
<td>(d) Focus Group Discussion (FGD) with different categories of NMCP staff at central level</td>
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<tr>
<td>(5) Malaria control programme operational plan (national and subnational levels)</td>
<td>(e) Field visit</td>
</tr>
<tr>
<td>(6) Financial resources for the malaria control programme – internal (government) and external (Global Fund, WHO, UNICEF, JICA and other partners)</td>
<td>(f) Review of published and unpublished papers/reports</td>
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<tr>
<td>(7) Partnerships, including Country Coordination Mechanism, TSG</td>
<td></td>
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<tr>
<td><strong>2. Epidemiology, epidemic preparedness and response, surveillance, monitoring and evaluation (including stratification)</strong></td>
<td></td>
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<tr>
<td>(1) Malaria parasite species; drug resistance</td>
<td>(a) Desk review of relevant documents</td>
</tr>
<tr>
<td>(2) Population at risks; age and sex distribution of cases</td>
<td>(b) Key informant interviews at central, district levels (NMCP manager to identify key informants)</td>
</tr>
<tr>
<td>(3) Geographic distribution; malaria ecotypes</td>
<td>(c) FGD with different categories of NMCP staff at central level</td>
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<tr>
<td>(4) Stratification and mapping of risk areas and activities per stratum</td>
<td>(d) Field observations during visits and review of records</td>
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<tr>
<td>(5) Health information system and malaria surveillance system</td>
<td>(e) Review of published and unpublished papers/reports</td>
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<tr>
<td>(6) Data flow</td>
<td>(f) Review of TES findings</td>
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<tr>
<td>(7) Use of electronic data capture systems</td>
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<td>(8) Data quality assurance system</td>
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<td>(9) Linkages with other epidemic prone disease surveillance systems</td>
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<tr>
<td>(10) Programme monitoring and evaluation (national and subnational levels), including surveys</td>
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<td>(11) Operational research</td>
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<tr>
<td>(12) IEC/BCC activities</td>
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<td>(13) Private sector contribution</td>
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### 3. Entomology and vector control

<table>
<thead>
<tr>
<th>Thematic areas to be reviewed</th>
<th>Methods of assessment</th>
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</thead>
<tbody>
<tr>
<td>(1) Malaria vectors – species, bionomics</td>
<td>(a) Desk review of relevant documents</td>
</tr>
<tr>
<td>(2) Vector control policies, strategies and their implementation</td>
<td>(b) Review and discussions on the presentations to be done during the review period</td>
</tr>
<tr>
<td>(3) Pesticide management</td>
<td>(c) Key informant interviews and FGDs at central, district levels (MCP manager to</td>
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<tr>
<td>(4) Human resources and training and career development</td>
<td>identify informants)</td>
</tr>
<tr>
<td>(5) Insecticide resistance monitoring and action</td>
<td>(d) Informal interviews of community leaders and beneficiaries of malaria vector</td>
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<tr>
<td>(6) Bioassay test</td>
<td>control</td>
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<tr>
<td>(7) Research on malaria vectors and vector control</td>
<td>(e) Field observations and household visits</td>
</tr>
<tr>
<td>(8) Coverage of vector control interventions (LLINS/ITNS, IRS, others) by stratum by year</td>
<td>(f) Review HR situation and performance indicator</td>
</tr>
<tr>
<td>(9) Epidemic preparedness and response mechanisms</td>
<td>(g) Informal interview with FDA</td>
</tr>
<tr>
<td>(10) Operational research</td>
<td>(h) Review of laboratory records and patients’ records</td>
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<tr>
<td>(11) IEC/BCC activities</td>
<td>(i) Observations in hospitals, laboratory and health centres at community level</td>
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<tr>
<td>(12) Private sector contribution</td>
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</table>

### 4. Diagnosis and treatment (*P. falciparum*, *P. vivax* and mixed and non-malaria fever)

<table>
<thead>
<tr>
<th>Thematic areas to be reviewed</th>
<th>Methods of assessment</th>
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</thead>
<tbody>
<tr>
<td>(1) Malaria diagnosis and treatment policy and its implementation</td>
<td>(a) Desk review of relevant documents</td>
</tr>
<tr>
<td>(2) Service delivery, coverage and access (by township, year and partner agency) and quality; both public and private sector</td>
<td>(b) Review and discussions on the presentations to be done during the review period</td>
</tr>
<tr>
<td>(3) Quality assurance and quality control of malaria microscopy and RDTs and antimalarials</td>
<td>(c) Key informant interviews and FGDs at central level, district health office, hospitals, health centres and laboratories (include administrators, doctors, nurses, laboratory technicians and others who deliver diagnosis and treatment services)</td>
</tr>
<tr>
<td>(4) Referral system</td>
<td>(d) Informal interviews of community leaders, private sectors and beneficiaries of malaria diagnosis and treatment services</td>
</tr>
<tr>
<td>(5) Patient satisfaction from surveys</td>
<td>(e) Informal interview with FDA</td>
</tr>
<tr>
<td>(6) Human resources and training in relation to malaria diagnosis and treatment</td>
<td>(f) Review of laboratory records and patients’ records</td>
</tr>
<tr>
<td>(7) Drug resistance monitoring and strategies to control/eliminate <em>P. falciparum</em> resistant strains to ACTs</td>
<td>(g) Observations in hospitals, laboratory and health centres at community level</td>
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<tr>
<td>(8) Pharmacovigilance system</td>
<td></td>
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<tr>
<td>(9) Operational research</td>
<td></td>
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<tr>
<td>(10) IEC/BCC activities, HR and community involvement in malaria prevention and control</td>
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<tr>
<td>(11) Private sector contribution</td>
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<p>|                                                                                           | (h) Review of TES results                                                             |</p>
<table>
<thead>
<tr>
<th>Thematic areas to be reviewed</th>
<th>Methods of assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5. Procurement and supply chain management</strong></td>
<td></td>
</tr>
<tr>
<td>(1) Policies, systems, processes, forecasting, inventory, stock management, reporting and feedback, quality assurance and human resources relevant to PSM</td>
<td>(a) Desk review of relevant documents</td>
</tr>
<tr>
<td>(2) PSM plan and budget</td>
<td>(b) Review and discussions on the presentations to be done during the review period</td>
</tr>
<tr>
<td>(3) Storage and transport facilities</td>
<td>(c) Key informant interviews and FGDs at central level (particularly FDA and central medical store), district health office, hospitals, health centres</td>
</tr>
<tr>
<td>(4) Capacity-building (malaria and other diseases)</td>
<td>(d) Observations at central medical store and storage facilities at hospitals, health centres, community levels and review of records</td>
</tr>
<tr>
<td><strong>6. Advocacy, partnership (public-private and public-public) and technical collaboration</strong></td>
<td></td>
</tr>
<tr>
<td>(1) Partnership guidelines/strategies and implementation</td>
<td>(a) Desk review of relevant documents</td>
</tr>
<tr>
<td>(2) Advocacy to national and subnational leaderships and partner agencies</td>
<td>(b) Review and discussions on the presentations to be done during the review period</td>
</tr>
<tr>
<td>(3) Behavioural research and related studies on malaria</td>
<td>(c) Key informant interviews and FGDs at central level, district health office, hospital and health centres</td>
</tr>
<tr>
<td>(4) Political commitments</td>
<td>(d) Informal interviews of community leaders and beneficiaries of malaria diagnosis and treatment services</td>
</tr>
<tr>
<td>(5) Private-public partnership</td>
<td>(e) Observations in hospitals, health centres and community and household levels</td>
</tr>
</tbody>
</table>
3. Malaria situation, trends and challenges

3.1 Epidemiology

3.1.1 Malaria parasites

All four species of human plasmodia are present in the country and cases of *P. knowlesi*, a zoonosis, have also been documented primarily in areas along the Myanmar/Thailand border. Figure 3 shows the proportion of *P. falciparum* and *P. vivax* by state.

![Figure 3. Proportion of *P. falciparum* and *P. vivax* by state](source: VBDC 2015)

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3.1.2 Malaria vectors

Of 37 species of Anopheline mosquitoes in Myanmar, 10 species are considered malaria vectors. *Anopheles (An.)* *minimus* and *An. dirus* are primary vectors and other species namely *An. annularis*, *An. sundiacus* (epiroticus), *An. culicifacies*, *An. maculatus*, *An. philippinensis*, *An. aconitus*, *An. hyrcanus* and *An. jeyporiensis* are secondary vectors. Recently, sporozoites were detected in *An. kochi* in Kayin and Tanintharyi region and in *An. annularis* in Dawei township of Tanintharyi region ((URC- CAP)-Malaria). Their role in malaria transmission is limited at this stage. Secondary vectors could be of some importance during certain seasons and in some locations possibly triggering epidemics due to environment modifications and importation of malaria parasites in particular areas. Distribution of primary vectors is given in Figure 4 below.

Vector ecological characteristics explain the geographical distribution of malaria in the country as shown in Figure 5. The forest areas, which are closely related to hilly terrain, forest and forest fringe, are the most conducive to malaria transmission. Deforestation is usually associated with movement of people staying overnight in the forest; therefore, those people are highly exposed to mosquito bites. Malaria transmission is, at most, sporadic in the cultivated plain areas and is usually absent in township areas. Extension or multiplication of plantations and concomitant migration of labourers may lead to the re-emergence of malaria in some areas. Malaria transmission occurs in coastal areas as well around fish and shrimp farming.
Figure 4. Distribution of *Anopheles minimus* and *Anopheles dirus* in Myanmar

Source: JICA 2015
3.1.3 Geographical distribution of malaria

The epidemiology of malaria in Myanmar is highly complex. The epidemiology of the disease varies greatly from location to location and from one population group, individual or situation to another. In many cases, the different situations and contexts require different malaria control strategies, adapted to suit specific risk groups and vector behaviours, and adjusted to take into consideration local infrastructure and health service coverage. Furthermore, the situation in any given area is prone to change rapidly as a result of factors, such as developing drug resistance, changing ecologies, marked deforestation and large-scale population movements associated with seasonal labour, large-scale development projects, etc.

The behaviour of malaria vectors in Myanmar varies depending on climatic and other environmental factors. Both indoor and outdoor biting takes place, but primary vectors are characterized, at least seasonally, by their early outdoor biting habit. This is a key feature of the epidemiology of malaria throughout the Greater Mekong Subregion (GMS), which limits to some extent the effectiveness of key interventions for vector control and personal protection. Nevertheless, despite a portion of the vector biting occurring early and outdoors, LLINs continue to play a critical role in reducing malaria transmission.17

Population at risk

Table 2 below divides the population at risk into two main groups: 1) static population and 2) mobile and migrant population.

Most malaria cases occur among people residing or temporarily located in villages, houses or shelters nearby (1–3 km) or in forest settings. Persons generally living in such conditions are poor minority ethnic groups living from subsistence farming supplemented by forest activities, such as cutting bamboo or rattan or charcoal production, gold panning and other occupations related to forest activities.\textsuperscript{18,19}

Mobile and migrant populations are other major risk groups for malaria. For economic reasons, they have to go for farming, logging or mining in forest areas, and to work for road or dam construction and for agricultural work, such as rice cultivation, rubber plantation and palm oil plantations. Internally displaced populations (IDPs) caused by dam construction, agricultural works and political conflicts (new settlement camps) are also more exposed to the disease. These population movements may or may not be organized by the government. NGOs are actively involved in LLINs distribution (and to some extent IRS) targeting IDPs in nongovernment townships.

\begin{table}
\centering
\begin{tabular}{|l|l|}
\hline
\textbf{Static populations} & \textbf{Mobile and migrant populations} \\
\hline
- Established villages (ethnic minority groups [EMGs] and ethnic majority) & - Traditional slash-and-burn and paddy field farming communities visiting their forest farms (commonly EMGs) \\
- New settlements & - Seasonal agricultural labourers \\
- Camps associated with large-scale construction projects (dams, bridges, mines, etc.) & - Military patrols, border guard forces and armed groups \\
- Settlements associated with plantations (rubber, oil palm, food) & - Forest workers in the formal sector (police, border guards, forest/wildlife protection services) \\
- Prisons & - Forest workers in the informal sector (hunters, small-scale gem/gold miners, people gathering forest products [precious timber, construction timber, rattan/bamboo]) \\

\hline
\end{tabular}
\caption{Population groups at risk of malaria in endemic areas of Myanmar}
\end{table}

Source: National Malaria Strategic Plan 2016-2020

\textsuperscript{18} National Malaria Control Program, Department of Public Health, Myanmar (2013); "Malaria in Mobile and Migrant Populations in Myanmar".

Stratification and risk maps

Stratification is currently based on available ecological, social and epidemiological determinants. The micro-stratification exercise was completed for 231 townships in 2015 (Figure 6). Criteria for micro-stratification were revised in 2015 by using village-wide malaria API data in line with the changing strategic direction from control to elimination. The “village” was considered the most peripheral administrative population and geographical unit and serves as a representative “foci” where malaria endemicity is measured by using API in addition to the risk factors cited above. Risk factors are still being used to measure receptivity (presence/absence of vectors) and vulnerability (movement of population).

Areas are being stratified as described in Table 3 below. Approximately 10% (5.3 million) of the total population resides in non-malarious areas, 54% lives in malaria-risk areas and out of this, more than 40% of that population is living in high (API >5/1000) and moderate (API 1 to 5/1000) risk areas. More than 35% of the population is living in potential risk-transmission areas. Stratification of malaria by village and further down by subvillage is a good step forward to ensure effective allocation and utilization of resources by township to achieve malaria pre-elimination and elimination targets.

21 Department of Public Health, Ministry of Health and Sports, Myanmar (2016); “Myanmar National Strategic Plan for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination, 2016-2020”.
Figure 6. Stratification by townships – 2015

Source: VBDC 2015
Table 3. Population breakdown by strata and State/Region based on 2015 micro-stratification (carried out in 52 townships and based on API extrapolated for remaining 288)

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Risk</th>
<th>Criteria</th>
<th>2015 stratification</th>
<th>2016 population (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malaria free</td>
<td>API = 0; no transmission</td>
<td>10%</td>
<td>5.3</td>
</tr>
<tr>
<td>2</td>
<td>Potential transmission</td>
<td>API = 0; possibility of vector presence, receptivity and vulnerability</td>
<td>36%</td>
<td>18.7</td>
</tr>
<tr>
<td>3a</td>
<td>High transmission</td>
<td>API &gt;5</td>
<td>24%</td>
<td>12.3</td>
</tr>
<tr>
<td>3b</td>
<td>Moderate transmission</td>
<td>API 1-5</td>
<td>19%</td>
<td>9.7</td>
</tr>
<tr>
<td>3c</td>
<td>Low transmission</td>
<td>API &lt;1</td>
<td>11%</td>
<td>5.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>100%</strong></td>
<td><strong>51.9</strong></td>
</tr>
</tbody>
</table>

Source: VBDC and WHO, 2015

Malaria burden and trends

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

In 2015, Myanmar had an estimated population of 50.8 million with about 44.3 million people living in malaria endemic townships (87% of the population). A total of 182,616 malaria cases were reported in 2015. At present, falciparum malaria accounts for about 63% of cases. Over the last 4 years, Annual \( P. falciparum \) Index (AFI) has been declining each year (5.46 per 1000 population at risk in 2012, 3.57 in 2013, 2.75 in 2014 and 2.11 in 2015). Only 37 malaria-related deaths were reported among hospital inpatients in 2015.
Figure 7 demonstrates the remarkable progress made in reducing malaria-related mortality in Myanmar over the last decade. The number of malaria deaths has declined steadily year by year from 1707 in 2005 to only 37 in 2015 (a 98% reduction over 10 years). The number of malaria inpatients also decreased from 62,813 in 2005 to 7346 in 2015. The malaria case fatality rate fell from 2.87% in 2005 to 0.02% in 2015, reflecting major improvements in access to early diagnosis and appropriate treatment.

The reduction in malaria caseload is less clear due to a combination of factors, including gradual expansion of health-care coverage in recent years (most notably as a result of the roll-out of community-based malaria case management services) and the introduction of RDTs for point of care diagnosis throughout the health system. As a result of these advances, almost all cases are now parasitologically confirmed. Data from 2012 onwards are relatively robust and demonstrate a steady and impressive reduction in caseload year by year. The incidence of reported malaria has dropped by 49% since 2012 (from 8.09 in 2012 to 4.16 in 2015 per 1000 population in 2015) despite improved case detection resulting from the recent roll-out of RDTs.

Malaria is becoming an increasingly focal disease. In 2015, a total of 138 townships had APIs of less than 1 per 1000 at-risk population compared to 45 townships in 2006. In 2015, five states/regions (Rakhine, Sagaing, Ayeyarwady, Kachin and Chin) out of Nay Pyi Taw territories and
14 states/regions together accounted for 63% of confirmed *P. falciparum* cases. Rakhine and Sagaing accounted for 20% and 16% respectively.

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

**Figure 8. Recent trends in reported *P falciparum* and *P. vivax* caseload in Myanmar, 2012–2015**

![Graph showing recent trends in reported *P falciparum* and *P. vivax* caseload in Myanmar, 2012–2015](image)

Source: National Malaria Strategic Plan 2016-2020

Figure 8 demonstrates the steady decline in both *falciparum* and *vivax* malaria between 2012 and 2015. This figure also depicts seasonality of transmission of both *P. falciparum* and *P. vivax* – peaking in July and dropping to a minimum in March and April. This similarity between *P. falciparum* and *P. vivax* is unusual, as in many countries, reported *vivax* caseload exhibits a second lower peak as a result of relapses. The absence of this second peak is probably partly due to the widespread use of primaquine for the treatment of *vivax* malaria in Myanmar resulting in radical cure.
Figure 9 demonstrates the heterogeneous nature of malaria transmission in Myanmar. In some forest-based communities, intense transmission results in increasing immunity with age plus immunity among neonates as a result of maternal antibodies (as demonstrated most clearly by bars relating to females), while in other areas, occupational malaria associated with forest-goers results in increased incidence among non-immune adult males. Malaria incidence appears to be slightly higher among boys than among girls (age groups between 1 and 14), which may be the result of boys’ tendency to spend more time playing outdoors in the evening.

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

Despite this progress, the disease remains a key health problem in forest and forest fringe communities, particularly in remote border areas. Although the likelihood of large-scale malaria epidemics has diminished considerably since the 1990s, the potential for smaller-scale epidemics remains real, and a number of sporadic outbreaks have occurred in recent years (e.g. 2326 cases in eight villages in seven townships in 2011 and 415 cases in six villages in four townships in 2011).
4. Malaria control programme

4.1 Structure

The national malaria control programme is implemented by the VBDC Programme, which is part of the Department of Health under the Ministry of Health and Sports with a staff of 10 assistant directors/malaria regional officers (malarologists), 19 medical officers/malaria team leaders, 7 staff officers (entomology), 1 staff officer (administration), 1 staff officer (field), 1 staff officer (laboratory), 8 assistant entomologists, 45 malaria assistants and 292 malaria supervisors, 96 malaria inspectors, 1 medical technologist, 23 laboratory technicians, 11 entomologist technicians, 177 spray men (permanent), 3 store clerks and many other office staff in 14 states, regions and at the central level. The organizational structure is shown in Figures 10 and 11.

Figure 10. Organizational structure of central VBDC

Source: NMCP, DoPH 2015
4.1.1 Overall objective

The overarching goal of malaria control in Myanmar (2010–2016) is to reduce malaria morbidity and mortality by at least 60% by 2016 (baseline: 2007 data), and contribute towards socioeconomic development and the Millennium Development Goals (MDGs).

The 2010–2016 National Malaria Control Strategy essentially focuses on scaling up countrywide evidence-based malaria control interventions to reduce the disease burden. Interventions have been selected based on global and regional strategies and policies recommended by international technical agencies, such as WHO, and are mainly funded by the GF alongside with other partners, such as the United States President's Malaria Initiative (PMI).
4.1.2 Achievements

Against main objectives of the NSP

The 2010–2016 NSP has the following objectives/targets:

Objective 1 - By 2016, at least 90% of people living in all malaria-risk villages in 284 malaria endemic townships and 100% of population living in artemisinin resistance containment areas are protected against malaria by using insecticide-treated nets/long-lasting insecticidal nets complemented with another appropriate vector control methods, where applicable.

Available results from surveys conducted in 2014 indicate that >95% of the households have at least one net at the rate of 0.6 net per person and around 21% sleep under insecticide-treated nets ITN (LLIN or conventional treated nets). Such results have to be disaggregated by townships where intensive containment operations are taking place. More than 50% of forest-goers are utilizing bed-nets while in the forest.

- 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.

Available public health sector and NGO data in 2014 indicated that the Programme is above target; that is, more than 80% of suspected malaria patients are tested and treated. The detection rate has increased over time as per the annual blood slide examination rate (ABER), (ABER>10%) while in parallel the positivity rate has drastically declined countrywide.

- Objective 2 - By 2016, in 284 malaria endemic townships (270 priority townships), the communities at-risk actively participate in planning and implementing malaria prevention and control interventions.

There are no clear data to measure the achievements under this objective. MPR team members are of the opinion that communities and peripheral health staff, while performing their tasks with dedication, are not sufficiently engaged in data collection, planning, supervision and decision-making. Nearly all the planning and decision-making is made at the higher level because of insufficient managerial capacity, poor skills and equipment at the township level.

- Objective 3 - By 2016, the Township Health Department in 284 malaria endemic townships (270 priority townships) are capable of planning, implementing, monitoring and evaluating malaria prevention and control programme with management and technical support from higher levels.
This is linked to the previous objective, and the reasons are the same. Although capacity of VBDC at state/regional level has increased, this is not the case in the majority of townships.

- **Objective 4** - To contain artemisinin resistance and eventually eliminate *P. falciparum* malaria in artemisinin resistance-affected areas (and at the same time prevent early, detect and contain epidemics by taking care of mobile and migrant populations).

There is clear indication that *P. falciparum* infections have been drastically declining over the last 5 years in all eastern states bordering Thailand and townships bordering the Yunnan Province of China. Malaria cases are also declining but at a slower rate in most western states bordering Bangladesh and India.

- **Objective 5** - Strengthen the partnership by means of intra- and intersectoral cooperation and collaboration with the public sector, private sector, local and international NGOs, United Nations (UN) agencies and neighbouring countries, and promote basic and applied field research.

There is no clear indicator to measure achievements of this above objective. However, the MPR team is of the opinion that serious efforts are ongoing to engage all partners on the implementation of similar strategies/policies and towards collecting/consolidating malaria field intelligence by using standardized forms. WHO with VBDC is playing a major role in coordination and strengthening data management and surveillance mechanisms in general, including from the grass root levels. A majority of I/NGOs are reporting to WHO-VBDC, but some are using their own databases resulting in the fragmentation of key data. That includes WHO-VBDC, UNOPS, SC, 3MDG and PMI.

**Against standard indicators**

When compared against some key outcome indicators as of 2015, some of which have been mentioned in the section above, national targets have been exceeded for four out of the five indicators (Table 4).

For the most recent GF reporting period (1 January to 30 June 2015), the Programme performed well, scoring an A1 rating, with an average performance of 103%. All indicators were achieved or over-achieved. Indeed, since 2014, Myanmar’s GF performance ratings for malaria have consistently achieved scores of A2 or above.

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22 NMCP/WHO is implementing a database with village MIMU ID, e.g. to classify villages per API.
Impact: As described in detail above, the burden of malaria in Myanmar has decreased markedly in the last decade: incidence has dropped by 65% (despite improved case detection resulting from the recent roll-out of RDTs) and related mortality has dropped by 97% in 2015 compared to 2007. Furthermore, the ‘malaria map’ has been shrinking steadily. While this progress cannot be attributed solely to programmatic impact relating to increased investment in malaria control operations, this increased investment has certainly been a key factor.

Table 4. Progress against some standard indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline Value</th>
<th>Baseline Year</th>
<th>Target Value</th>
<th>Target Year</th>
<th>2015 Result</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria Morbidity Rate</td>
<td>9/1000</td>
<td>2007</td>
<td>4.5/1000</td>
<td>2015</td>
<td>3.36/1000</td>
<td>Over-achieved</td>
</tr>
<tr>
<td>Malaria Mortality Rate</td>
<td>2.18/100 000</td>
<td>2007</td>
<td>1.09</td>
<td>2015</td>
<td>0.08/100 000</td>
<td>Over-achieved</td>
</tr>
<tr>
<td>Slide Positivity Rate</td>
<td>42.4%</td>
<td>2009</td>
<td>30%</td>
<td>2015</td>
<td>7.69%</td>
<td>Over-achieved</td>
</tr>
<tr>
<td>Percentage of households with at least one ITN/LLIN</td>
<td>5.65%</td>
<td>2008</td>
<td>98%</td>
<td>2015</td>
<td>54%</td>
<td>Under-achieved</td>
</tr>
<tr>
<td>Percentage of confirmed malaria cases treated in accordance with the national malaria treatment guidelines within 24 hours of onset of symptoms (fever)</td>
<td>25%</td>
<td>2008</td>
<td>60%</td>
<td>2015</td>
<td>86%</td>
<td>Over-achieved</td>
</tr>
</tbody>
</table>

Priority interventions by stratum

The VBDC uses a combination of standard intervention depending on the strata. Table 5 below matches interventions with the strata used in the 2010–2016 National Strategic Plan. Stratification is based on townships.

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23 In a context of lack of information on number and geographical distribution of confirmed malaria cases, a VBD-UNICEF-WHO exercise has been made in 80 townships using social, environmental and epidemiological determinants to classify/stratify townships and villages.
**Table 5. Priority activities by stratum (National Malaria Elimination Plan 2016-2030)**

<table>
<thead>
<tr>
<th>Stratification</th>
<th>Key Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insecticide treatment of existing mosquito nets &amp; promotion of their use</td>
</tr>
<tr>
<td></td>
<td>Provision &amp; promotion of the use of LLINs</td>
</tr>
<tr>
<td></td>
<td>Indoor residual spraying</td>
</tr>
<tr>
<td></td>
<td>Early diagnosis &amp; appropriate treatment</td>
</tr>
<tr>
<td></td>
<td>Behaviour change communication</td>
</tr>
<tr>
<td>Stratum 1: Malarious</td>
<td></td>
</tr>
<tr>
<td>villages</td>
<td></td>
</tr>
<tr>
<td>Stratum 1a: High risk</td>
<td>Stratum 1a: High risk villages</td>
</tr>
<tr>
<td>villages</td>
<td>Yes, First Priority</td>
</tr>
<tr>
<td></td>
<td>Yes, First Priority</td>
</tr>
<tr>
<td></td>
<td>In selected area, First Priority</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Stratum 1b: Moderate</td>
<td>Stratum 1b: Moderate risk villages</td>
</tr>
<tr>
<td>risk villages</td>
<td>Yes, Second Priority</td>
</tr>
<tr>
<td></td>
<td>Yes, Second Priority</td>
</tr>
<tr>
<td></td>
<td>In selected areas, Second Priority</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Stratum 1c: Low risk</td>
<td>Stratum 1c: Low risk villages</td>
</tr>
<tr>
<td>villages</td>
<td>Yes, Third Priority</td>
</tr>
<tr>
<td></td>
<td>To encourage to buy their own LLINs</td>
</tr>
<tr>
<td></td>
<td>In case of outbreak</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Stratum 2: Potentially</td>
<td>Stratum 2: Potentially malarious Villages</td>
</tr>
<tr>
<td>malarious Villages</td>
<td>Yes, For those who will temporarily stay in malarious villages</td>
</tr>
<tr>
<td></td>
<td>To encourage those who would stay temporarily in endemic areas to buy</td>
</tr>
<tr>
<td></td>
<td>In case of outbreak</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Stratum 3: Non-</td>
<td>Stratum 3: Non-malarious Villages</td>
</tr>
<tr>
<td>malarious Villages</td>
<td>Yes, For those who will temporarily stay in malarious villages</td>
</tr>
<tr>
<td></td>
<td>To encourage those who would stay temporarily in endemic areas to buy</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>
5. Case management

Early diagnosis and prompt effective treatment is the main intervention to reduce the duration of illness and severity of malarial disease and to prevent malaria mortality.

5.1 Current strategy – case management

5.1.1 Diagnosis

Diagnosis is carried out by a combination of microscopy and rapid diagnostic tests. The NSP promotes the use of malaria diagnosis by microscopy in referral hospitals, but most of them actually rely on combo RDTs to diagnose malaria. The use of microscopy has almost completely disappeared even in VBDC centres. It is estimated that 60% of microscopes in the country are fully functional but in some states, such as Rakhine, there are only 6/22 (less than 30%) functional microscopes in VBDC centres and hospitals. In Kachin state, all microscopes seen in the general hospital are functional. Health Poverty Action (HPA) is working in nongovernmental areas of Kachin and North Shan State that are mainly using microscopes and trained microscopists to detect and treat malaria (and other diseases requesting microscopy), including in border (malaria) screening posts. There is some effort made to retain the skills of trained microscopists with occasional refresher courses. High-level microscopists are mainly used during therapeutic efficacy studies and other research studies conducted by the Department of Medical Research (DMR). Stocks of microscopy reagents, slides and RDTs are maintained properly with no stock-outs.

5.1.2 Treatment

The National Drug Policy in Myanmar was revised in 2002 with ACTs as the first-line drugs. It was updated in 2008 to include RDTs for confirmatory malaria diagnosis. Artemisinin-Lumifantrine (AL) as alternative ACT to Artemisinin-Mefloquine (A+M); and again in 2011, which included single dose primaquine to all laboratory confirmed malaria cases, and VHVs rendering diagnosis and treatment (PQ weekly for 8 weeks). In December 2014, the drug policy was further updated as follows.

- Three fixed dose combinations ACTs (AL, DHA-PIP and A+M) continued to be recommended for *P. falciparum* cases.
• Artemisinin monotherapy was completely removed from second-line drug for *P. falciparum* treatment failure cases, and replaced by an alternate ACT or a 7-day course of quinine in combination with doxycycline or clindamycin or tetracycline.

• A single dose of primaquine at the dosage of 0.75 mg/kg is prescribed to all blood confirmed falciparum cases and mixed infections with *P. falciparum* on Day 0 without prior G6PD deficiency test.

• Directly observed therapy (DOT) is introduced for all *P. falciparum* cases in artemisinin resistance-affected areas.

• All *P. vivax* cases are treated with chloroquine and 14 days of primaquine in all instances, except treatment of *P. vivax* by volunteers that is applied weekly for 8 weeks.

• Observation of Day 3 parasitaemia is introduced and encouraged, especially in artemisinin resistance-suspected areas.

• ACTs are recommended for pregnant women with severe falciparum malaria in the first trimester.

• Standby treatment is recommended among migrants in remote areas where diagnostic facilities are not available. RDT is strongly recommended. The drug of choice is one of the recommended ACTs.

### 5.1.3 Findings – case management

Government-managed health-care facilities, sub-centres, rural health centres, station and township hospitals and state hospitals account for about 60% of all recorded cases, around 20–30% are seen by the private sector, and another 10–30% from the trained and equipped VHVs. International NGOs are present in some states targeting selected townships and villages with their own health staff together with trained VHVs or outreach operations (mobile clinics). Community-based VHVs have significantly contributed to increase the detection rate of uncomplicated cases at the grass root level as well as awareness of preventive measures by the population.

The referral and township hospital facilities that were visited show inadequate number of trained medical, nursing and laboratory staff. At the township level, only one medical doctor is in charge of both public health and curative interventions. The referral general hospitals, considered as a tertiary level hospital for the state, has limited specialized HR, equipment and nursing care, and no intensive care unit to properly manage seriously ill patients (except in Northern Shan State).
Nationwide, it is reported that approximately 30% of suspected malaria patients receive treatment from the private sector, with various kinds of antimalarial medicines, including artemisinin derivatives available in private clinics, medicine stores and vendors. According to some reports, substandard and/or fake artemisinin products of different origins are still available in the private market but the current magnitude of the problem is unknown. Oral artemisinin tablets have been found in private pharmacies and shops in Kayah State in spite of the national ban. The irrational and overuse of injections, even for those who can tolerate oral medications, is quite common in both the public and private sector, and even for clinically suspected malaria cases.

The Programme provides and distributes quality antimalarial medicines, RDTs, laboratory accessories and other supplies to township level through the state/region malaria control teams, with regular provisions down to village volunteers. Trainings on case management have been sporadically done, especially targeting medical doctors both in the public and private sector. There is lack of adherence to (and absence of) treatment guidelines in some referral and township hospitals. For village volunteers under the VBDC and INGOs, initial malaria training is for 5 days and refresher training for 3 days. The volunteers visited by the MPR team had been trained in 2010 and re-trained in 2015.

The quality assurance/quality control (QA/QC) of both microscopy and RDTs is of concern and needs to be standardized and made functional at all levels. It is very variable in state and township facilities visited. The QA/QC for malaria microscopy under VBDC Kachin and Rakhine recently started in 2016, with maintained QA forms in the VBDC laboratory. The laboratory technician also started supervision, and monitoring visits recently to the microscopy centres and supervisory visit check-lists were available on-site. However, less than half of the centres submitted slides for cross-checking. Hospital laboratories under the Department of Medical Services (DoMS) do not submit slides for cross-checking. Hospital laboratories have their own external quality assurance system (EQAS) regularly conducted through the National Health Laboratory (NHL), with two unknown slides sent to these laboratories for quarterly proficiency testing. These laboratories also send two slides to NHL basically to cross-verify slide quality and readings. Results are relayed back, but no monitoring visits by NHL are conducted to provide microscopists with remedial measures.

The quality assurance system initiated jointly by the NHL and VBDC, supported by WHO and JICA in 2005, remains largely nonfunctional, with no HR and QA Manuals/SOPs in place, nor a sustainability plan. This is now being revived with technical support from the Asian Collaborative Training Network for Malaria (ACTMalaria), and additional financial support from The Japan International Cooperation Agency (JICA) and GF RAI. A national reference laboratory for malaria diagnosis is planned with physical infrastructure and polymerase chain reaction
(PCR) machine provided by a new grant from JICA 2016–2020 (in progress) with one VBDC staff already trained in Japan. The quantitative PCR (qPCR) machine provided by the RAI will be installed there. An HR and long-term capacity strengthening and sustainability plan has not been developed. Terms of reference and functions of this VBDC national reference lab will have to be defined, in collaboration with government facilities, such as NHL and DMR, which are currently performing QA activities for microscopy and RDT, respectively.

For quality assurance of RDTs, the NMCP in collaboration with DMR and WHO, set up a QA system from 2009 to 2013. Only WHO prequalified RDTs are procured. Since transport and storage of RDTs affects the sensitivity of RDTs, state and INGO storage facilities are not always temperature controlled. DMR tested RDTs by lot upon purchase and 3- to 6-month post-field exposure, but results were not known to state level programme staff. INGOs also raised issues on dried-out buffer stock solutions.

A malaria microscopy QA manual was developed in 2014, but remains to be approved and printed, and made available at states/townships, with training on malaria microscopy and RDT QA SOPs at all levels. This needs to be updated again with reference to the 2015 WHO Manual in Malaria Microscopy (second edition).

### 5.1.4 Action points – case management

**Diagnosis**

- Establish an EQA system for malaria microscopy (including the hospital laboratories under DoMS) and RDTs and have capacity-building plan with standardized training curriculum.
- Produce a harmonized training module with a standardized curriculum for malaria microscopy and QA/QC for all training institutions (NHL, DMR, VBDC, INGOs, etc.).
- Assure quality microscopy in referral and township hospitals for validation of RDT diagnosis, density, species and parasitological response, with a careful selection and refresher training for microscopists for these validation functions.
- Establish a malaria reference laboratory (i.e. Gyogong VBDC lab in Yangon) for the following:
  - QA/QC of malaria microscopy and RDT;
  - supervision and monitoring;
- implementation of use of a standardized training curriculum and SOPs for microscopy and RDT;
- resolving discordant results through molecular tests;
- prevention, maintenance and repair of microscopes.

- Ensure a long-term HR capacity strengthening and sustainability plan for this reference lab.

**Treatment**

- Improve the quality of malaria treatment; there is a need for a standardized training curriculum on updated treatment guidelines, including BCC.
- Build capacity-building using an integrated training package/standard curriculum for diagnosis and treatment targeting both the public and private sectors at (a) outpatient clinics, (b) hospitals at different levels and (c) community, based on 2015 national treatment guidelines.
- Conduct training and refresher courses for case management annually for doctors and all health providers.
- Improve management capacity at referral hospitals for severe malaria, including provision of adequate HR, supportive lab, documentation and facilities for dialysis, assisted respiration and ICU/critical care.
- Improve integrated management at RHCs by providing adequate HR and laboratory recording, especially of non-malaria fevers.
- Produce guidelines, SOPs, diagnosis and treatment algorithms (posters) to be made available at all levels, including the private sector.

**Community-based case management**

- Strengthen and scale up malaria case management with regular supportive supervision to progressively include diseases other than malaria.
- Expand malaria services for mobile and migrant populations, especially in remote and inaccessible areas, including areas under the control of private companies.
- In elimination areas/townships, organize “integrated” (and no longer “vertical”) training sessions: Strengthen and scale up Integrated Community Case Management (ICCM) (for malaria, TB and HIV) where volunteers have to be posted and target peripheral health staff (midwives) elsewhere.\(^{24}\)

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\(^{24}\) Ideally, IMCI/IMAI or similar programmes should be part of the basic training curriculum of nurses/midwives/peripheral health staff.
6. Artemisinin resistance

6.1 Current status – artemisinin resistance

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

Artemisinin resistance probably emerged at the border between Myanmar and Thailand in 2001, but was not clearly recognized until 2008. Since 2009, data from Myanmar has consistently shown delayed parasite clearance times among a significant proportion of patients treated with each of three first-line ACTs (AL, A+M and DHA-PIP). All three nevertheless remain effective, giving high cure rates except in the case of ASMQ in the Myanmar-Thailand border region. Measurement of Day 3 positivity rate (as a proxy indicator of *P. falciparum* resistance to artesunate) over the last 5 years in therapeutic efficacy study (TES) sites located in eastern locations shows a slight increased proportion of *P. falciparum* patients still parasitological positive on Day 3 (from 10 to 25%).

Kelch13 (K13) mutants have been identified in Myanmar, including recently in the west of the country. Analysis suggests that these mutants arose independently rather than spread from Cambodia.

Table 6. summarizes the current situation for three of the most commonly used combinations. Bold font indicates resistance (>10% D3 treatment failure).

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25 Data from SMRU border clinics that treat patients from the Myanmar side of the border.
### Table 6. ACPR and Day 3 follow-up by ACT in eastern - northern states/townships from 2009 to 2015

<table>
<thead>
<tr>
<th>Myanmar (Eastern border)</th>
<th>n</th>
<th>42-day PCR-ACPR</th>
<th>Day 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dihydroartemisinin Piperaquine (DHA-PIP)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009 Kawthaung, Thanintharyi</td>
<td>79</td>
<td>97%</td>
<td>19%</td>
</tr>
<tr>
<td>2010 Mon</td>
<td>75</td>
<td>99%</td>
<td>23%</td>
</tr>
<tr>
<td>Kachin</td>
<td>57</td>
<td>98%</td>
<td>3.5%</td>
</tr>
<tr>
<td>East Shan</td>
<td>51</td>
<td>100%</td>
<td>2%</td>
</tr>
<tr>
<td>2011 Kawthaung, Thanintharyi</td>
<td>57</td>
<td>95%</td>
<td>23%</td>
</tr>
<tr>
<td>2012 Myawaddy, Kayin</td>
<td>73</td>
<td>95%</td>
<td>8%</td>
</tr>
<tr>
<td>2014 Myawaddy, Kayin</td>
<td>28</td>
<td>100%</td>
<td>11%</td>
</tr>
<tr>
<td>Lashio, Shan</td>
<td>4</td>
<td>100(3/3)</td>
<td>25%</td>
</tr>
<tr>
<td>Bokepyin, Thanintharyi</td>
<td>5</td>
<td>(2/2) 100%</td>
<td>0</td>
</tr>
<tr>
<td>2015 Myitkyina, Kachin</td>
<td>56</td>
<td>100%</td>
<td>5</td>
</tr>
<tr>
<td>Muse, N Shan</td>
<td>60</td>
<td>100%</td>
<td>5</td>
</tr>
<tr>
<td><strong>Artemisin Lumifantrine (Fansidar®)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009 Kawthaung, Thanintharyi</td>
<td>80</td>
<td>93.8%</td>
<td>6.3%</td>
</tr>
<tr>
<td>2010-2011 Kawthaung, Thanintharyi</td>
<td>84</td>
<td>94%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Kayin</td>
<td>66</td>
<td>97%</td>
<td>5%</td>
</tr>
<tr>
<td>Kachin</td>
<td>59</td>
<td>100%</td>
<td>2%</td>
</tr>
<tr>
<td>Eastern Shan</td>
<td>50</td>
<td>100%</td>
<td>2%</td>
</tr>
<tr>
<td>2012 North Shan</td>
<td>55</td>
<td>100%</td>
<td>7.3%</td>
</tr>
<tr>
<td>Kachin</td>
<td>52</td>
<td>98%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Kayah</td>
<td>51</td>
<td>96%</td>
<td>14%</td>
</tr>
<tr>
<td>Kayin</td>
<td>59</td>
<td>97%</td>
<td>14%</td>
</tr>
<tr>
<td>Mon</td>
<td>5</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Kawthaung, Thanintharyi</td>
<td>58</td>
<td>100%</td>
<td>12%</td>
</tr>
<tr>
<td>2014-15 Mawthaung, Thanintharyi</td>
<td>28</td>
<td>93%</td>
<td>0%</td>
</tr>
<tr>
<td>2015 Myitkyina, Kachin</td>
<td>56</td>
<td>52 (96.3%)</td>
<td>5</td>
</tr>
<tr>
<td>Muse, N Shan</td>
<td>60</td>
<td>56(96.5%)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Artemisinin + Mefloquine</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012 North Shan</td>
<td>45</td>
<td>100%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Kachin</td>
<td>16</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Kayah</td>
<td>16</td>
<td>98%</td>
<td>25%</td>
</tr>
<tr>
<td>Kawthaung, Thanintharyi</td>
<td>48</td>
<td>98%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Source: ERAR-WHO
The Myanmar artemisinin resistance containment (MARC) framework was developed by NMCP and partners, and endorsed by the Ministry of Health in April 2011 for implementation from 2011 to 2015. The MARC framework followed the Global Plan for Artemisinin Resistance Containment (GPARC). Multiple implementing partners (IPs) were supposed to be working in the project areas, 21 townships of Tier 1 area and 31 townships of Tier 2 areas.

The goals of containment were as follows:

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

Objectives 1, 2 and 4 of the MARC are (1) to improve access to and use of early diagnosis and quality treatment according to the national treatment guidelines, including mobile populations, (2) to decrease drug pressure for selection of artemisinin-resistant malaria parasites by stopping the use of artemisinin mono-therapies and substandard/fake drugs, and (4) to increase migrant/mobile populations’ access to and use of malaria diagnosis, treatment and vector control measures, including personal protection. These objectives are still valid for elimination.

The MARC was supplemented and updated under the RAI that was initiated in 2015 covering all six of the GMS countries, with the overall goal to protect the effectiveness of artemisinin as an effective treatment for P. falciparum malaria, by eliminating artemisinin-resistant P. falciparum parasites in the places where they are already known to exist and thereby prevent their spread while at the same time to detect and contain any new foci of transmission that may emerge.

### 6.2 Findings – artemisinin resistance

Artemisinin resistance was first suspected in 2009 in the eastern part of the country bordering Thailand (see Table 6). Although cure rates of ACTs were high (95–100%) TES carried out from 2009 to 2015 showed delayed parasites clearance (D3 positive rates >10%) mainly in the eastern state/regions. K13 mutations, the gene for artemisinin resistance, have also been observed in the eastern states. Clinical correlation in the presence K13 mutations is strongly recommended by WHO, hence the importance of the 28- or 42-day TES.
The situation on the western border of the country is not as bad as in the eastern border. TES in Rakhine consistently showed 100% adequate clinical and parasitological response (ACPR) with no Day 3 positives recorded by using either AL or DHA-PIP since 2010. K13 assays done by DMR showed all wild type parasites (no mutation). Recent preliminary results from Chin State seem to show the same satisfactory cure rates.

In Kachin State, the RAI project is currently supporting activities in seven townships. Screening points strategically located on migrants’ routes and DOT plus monitoring D3 positive is expected to slow down the spread of *P. falciparum* resistance to ACT. Two screening posts in Kachin tested >400 migrants in 2015 and had a positivity rate of 1%, with 80% Pv (such as in Yunnan). Among D3 investigated patients, only one (soldier) has been found positive at D3 and negative at Day 28.

For treatment failures, the 2015 treatment guidelines recommend treating the patient with another ACT or Quinine + Tetracycline or Doxycycline for 7 days (Q7T7 or Q7D7). An alternative co-formulated ACT still known to be effective in the region is a good option. If, however, there is already delayed clearance to the artemisinin component of the ACT, this can further compromise the partner drug (now working as monotherapy to kill all parasites). It would be important not to further compromise the other ACTs by not using other ACTs again to treat the same patient. A completely different therapeutic (chemical) compound, such as Q7T7 or Q7D7, may be a better option, since the goal in a treatment failure (whether it is a recrudescence or reinfection) is the complete clinical and parasitological cure for the patient. This would also warrant hospitalization or supervised treatment with Q7T7 or Q7D7 to ensure full compliance and complete cure for such cases, thereby eliminating the potentially resistant falciparum infection.

### 6.3 Action points – artemisinin resistance

- Continue (and expand) therapeutic efficacy studies, with involvement of state VBDC; dissemination of updated results at the local level.
- Pilot study in suspected artemisinin-resistant areas; consider a Day 28 follow-up of all *P. falciparum* patients by RDT and blood film. If *P. falciparum* positive at Day 28, provide with supervised treatment of Q7T7/D7 (for potentially resistant cases).
7. Vector control

Current prevention and vector control strategies are summarized in Table 7. Scaling up LLINs and ITNs to reach universal coverage is considered as the main vector control strategy across all transmission areas in Myanmar.\textsuperscript{26} IRS is applied mainly for outbreaks and to prevent transmission in resettlement areas. In RAI-supported townships, IRS is also executed in households situated around D3 \textit{P. falciparum} positive cases to prevent the spread of suspected \textit{P. falciparum}-resistant parasites. Integrated vector management (IVM) is a part of the strategy as well but it has not been implemented. The use of repellents and biological and environmental control measures are not widely used. Some trials are ongoing, such as to study the impact of insecticide-treated materials/cloths targeting rubber trappers and a repellent study in Kaya State.

7.1 Long-lasting insecticide-treated nets and insecticide-treated nets

7.1.1 Current strategy – LLIN and ITN

A national policy was developed in 2003 and revised in 2009 to scale up the use of insecticide-treated nets (ITNs) and long-lasting insecticidal nets (LLINs) for malaria prevention and control in Myanmar. The objective was to protect at least 80\% of the population living in moderate- and high-risk areas with ITNs/LLINs by the year 2015.\textsuperscript{27}

In 2011, due to the emergence of artemisinin-resistant falciparum malaria in the southern part of Myanmar, it was recommended to interrupt transmission of \textit{P. falciparum} by universal (100\%) coverage and usage of insecticide-treated bed nets (either LLINs or ITNs) in all targeted areas (Tier 1 areas). The effectiveness of LLINs or ITNs depends on the magnitude of malaria transmission, vector biting and resting behaviour, human behaviour and other factors. LLINs were planned to be provided to mobile and migrant populations as well. VBDC planned to apply indoor residual spraying (IRS) combined with ITN/LLIN in highly endemic villages in Tier 1 areas starting from 2011. With very limited resources and staff available, there was no entomological

\textsuperscript{26} National Malaria Control Programme, Department of Public Health, Myanmar (2012): National Strategic Plan for Malaria Prevention and Control 2010-2016.

\textsuperscript{27} National Malaria Control Programme, Department of Public Health, Myanmar (2015): ITN/LLIN policy in Myanmar, revised version 2015.
study conducted to evaluate the impact of ITN and LLIN. In addition, IRS operations have not been applied widely even in “Tier 1” areas.

Procurement of LLINs for VBDC was made by UNOPS (principal recipient for GFATM projects). UNOPS has taken the responsibility for procurement of all malaria commodities (diagnostics, drugs, LLIN, etc.) for all subrecipients. In 2014, VBDC distributed 367,788 LLINs. The data of other partners are not included. Based on the data of country distribution and VBDC’s distribution of LLIN (see Table 7), VBDC had delivered 35.9%, 39.4%, 14.1% and 14.2% of national procurement, respectively. On the other hand, other partners’ contribution on LLINs distribution was 64.1%, 61.6%, 85.9% and 85.8%, respectively. It shows the almost equal responsibility of all implementing partners who have efficiently and effectively distributed LLINs with minimum overlapping.28

<table>
<thead>
<tr>
<th>Measures</th>
<th>Area Stratification</th>
<th>Potential API=0 – present of vector (Receptive / vulnerable)</th>
<th>Free API=0 No transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of LLINs</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Treatment/retreatment of bed nets (ITNs)</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Routine/Regular IRS</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Supplement/special IRS</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>IRS in selected area (s) or focal spray – outbreaks/resettlement/ IDP/organized camps</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Repellents</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Space spray (Outbreaks, urban, compact community and present of vectors)</td>
<td>-</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>Biological control</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
</tr>
<tr>
<td>Environmental control</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
</tr>
<tr>
<td>Insecticide treated materials/ cloths (risk group population - trial underway)</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
</tr>
</tbody>
</table>

Source: VBDC

### 7.1.2 Findings – LLINs/ITNs

Based on observation and discussion in the field, there is limited collaboration and coordination between VBDC and partners at state and local levels for planning and reporting LLINs distribution. Moreover, discussion with villagers, during field visits, revealed that people often sleep overnight without bed nets while performing farm and forest activities during cultivation season. Further, there were limited or no IEC/BCC materials in relation to malaria prevention in the forest or similar at-risk situations. Furthermore, it was observed that in addition to the LLINs received from the Programme, people are purchasing local bed nets, which are available/marketed at different cost, sizes, colour, texture and composition in almost all local stores and shops.

#### Table 8. Number of ITNs and LLINs distributed/planned in Myanmar, 2014–2017

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017*</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNOPS-NFM</td>
<td>626 747</td>
<td>1 100 489</td>
<td>1 901 490</td>
<td>1 502 666</td>
</tr>
<tr>
<td>UNOPS-RAI</td>
<td>382 062</td>
<td>331 662</td>
<td>229 415</td>
<td>881 146</td>
</tr>
<tr>
<td>Save the Children</td>
<td>132 828</td>
<td>331 662</td>
<td>229 415</td>
<td>881 146</td>
</tr>
<tr>
<td>PMI/USAID</td>
<td>200 000</td>
<td>793 500</td>
<td>300 000</td>
<td>456 000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1 341 637</strong></td>
<td><strong>3 370 767</strong></td>
<td><strong>3 012 615</strong></td>
<td><strong>4 839 812</strong></td>
</tr>
</tbody>
</table>

* Planned  
Source: VBDC.

There is some evidence but without proper documentation that the long-lasting insecticide-treated net programme has some advantages over a massive ITNs programme mainly due to retreatment cost (expensive tablets + intensive re-treatment field operations). This is why the massive distribution of LLINs has been preferred over the massive reimpregnation of existing nets under GF R9 NFM. PSI discontinued social marketing of deltamethrin tablet (KO-Tab) for retreatment of bed nets in 2014. However, since millions of nets already exist and people in Myanmar are willing to buy nets from the market, the option of regular mass (re) treatment of existing nets with a long-acting insecticide could be a valuable and sustainable individual protection and vector control measure by the Programme again. The outputs related to insecticide treatment of existing mosquito nets as well as numbers of LLINs distributed are shown in Table 8 above. However, the target coverage of the endemic population in the country is still low (5.65% and 19.99% of households have at least one ITN/LLIN in 2008 and 2011, respectively). The impregnated net coverage in subsequent years has significantly increased to reach 54% in 2015.²⁹

A community survey conducted in 2011 that covered 9731 households in 40 villages in nine states/regions revealed that 93.2% of households owned any kind of bed net (treated and retreated). Of those who owned bed nets, 24.5% owned one net, 34.5% owned two nets, 23.6% owned three nets and 17.4% owned four or more nets. It was also found that 20% of households had at least one LLIN/ITN. An average of 17.6% of the population had slept under the ITN/LLIN the previous night.30

Another bed net survey, conducted in 2012 in six states and seven regions covering 12,334 households in 445 villages of 51 townships, revealed that 97.3% had any kind of bed nets. In all states and regions, at least 94% of the population slept under bed nets. This finding is similar to the finding in 2011. The proportion of sleeping under the mosquito net among over 5 years children was at least 92%, which is higher than the proportion in 2011. The coverage of the ownership of at least one LLIN/ITN, was 73.5% of households and 63.8% slept under LLIN/ITN last night.31

Although bed net ownership is high, there are concerns about whether existing nets are being used properly and in a consistent manner to achieve effective malaria prevention. The national policy and implementation strategy to scale up ITNs/LLINs for malaria control (2003) has been updated taking into account changes in the national, regional and global policies. This review also includes the need to focus now on full coverage of populations in high and moderate malaria risk areas with ITNs/LLINs. The policy of distribution of LLIN is one LLIN for two persons and it is applied to all populations at risk, not differentiated among areas (i.e. regardless of level of malaria risk). For operational purposes, it was suggested that budgeting for procurement of LLINs has to be made at the ratio of 1 LLIN for 1.8 persons.32

Many partners are responsible for the distribution of LLINs in targeted townships but there is generally weak collaborative and/or comprehensive plans to distribute LLINs. The plans do not include all NGOs at state/region and township levels. Furthermore, reports of LLINs distribution are obtained mainly from VBDC and not from all partners, especially in Kachin State, which is not contributing to properly documenting the number of at-risk people protected by LLINs. There were considerable difficulties to estimate migration pattern and occupation of non-organized groups of migrants who could have been protected with ITNs/LLINs. According to the Deputy Director of Kachin State, there are approximately 400,000 to 500,000 migrants from other states/regions that come to work seasonally in Kachin. These groups of people do not normally receive LLINs when they come to work in high- and moderate-risk areas with the exception that in RAI-supported townships, LLINs were distributed to seasonal migrants by VBDC and some INGOs.

30 CMS 2011.
31 CMS 2012.
As per observations/discussions during the field visits, mosquito nets are not carried by villagers that go to work in or close by forests. Some of them bring LLINs received from the Programme; therefore, some of the family members do not sleep under LLINs. “Malaria prevention packages” targeting mobile and migrant populations (MMPs) and security forces are not developed by the Programme.

7.1.3 Action points – LLIN and ITN

- Distribution of LLINs is as a priority to cover 100% of the population living in stratum 3 areas in Strata 3a and 3b (and Stratum 3c) to achieve universal coverage.

- Universal coverage requires that the distribution is based on actual needs rather than based on an automatic allocation of one LLIN/ITN for every 1.8 persons. In order to maintain the high levels of coverage and usage and address attrition rate, a system has to be set up to continuously make available additional or replacement nets. For planning for distribution, other factors have to be taken into account per household, such as regular forest activities, household members sleeping together, size of rooms, etc.

- Collaborative mechanisms with plantation and large companies have to be established to set up micro-planning meetings among concerned partners at each township to avoid overlaps. Additional LLINs (on top of existing ones) have also to be provided to mobile populations and at-risk group populations as part of the “forest package” to be finalized.

- Active monitoring of the actual LLIN coverage and use has to be strengthened to allow VBDC/township teams to address low coverage levels in at-risk villages or in mobile population groups/clusters.

- To re-establish insecticide treatment and re-treatment policy and strategy of local conventional bed nets. This will contribute to good community practices as part of IVM. This will be as well a more sustainable measure than LLINs for prevention and control of malaria towards elimination and prevention of malaria re-introduction. Free distribution may be considered in high and moderate risk areas through mass campaigns and social marketing of insecticide tablets at a reasonable price in low or potential risk transmission areas.

- Since there is only one company currently producing long-lasting insecticide tablets, VBDC with partners has to explore alternative ways of producing/marketing similar products in the region.

- To develop or update criteria, guidelines and SOP for the treatment and re-treatment of locally purchased bed nets. An implementation plan (including mass treatment campaigns) and an accurate reporting system has to be developed among concerned partners involving volunteers, RHC midwives and local authorities.
7.2 Indoor residual spraying (IRS)

7.2.1 Current strategy - IRS

IRS operations are conducted to control outbreaks, in development projects situated in endemic areas and new (re)settlements. IRS is recommended to be applied in combination with ITN/LLIN in artemisinin resistance-affected areas/villages in order to drastically and quickly reduce *P. falciparum* transmission. There are no clear-cut instructions to select villages or size of areas where IRS has to be used over LLINs/ITNs. So far, IRS has been applied in only a few drug-resistant areas under the RAI project. Table 9 showed that a small amount of dichlorodiphenyltrichloroethane (DDT) was used in 2003 but DDT has been banned in the country since 2014. Malathion has been used some years and lastly in 2013. Alpha-cypermethrin has been used between 2009 and 2014. To delay the development of insecticide resistance, VBDC recommends the use of non-pyrethroid pesticides for IRS.


<table>
<thead>
<tr>
<th>Yr</th>
<th>SR</th>
<th>Tsp</th>
<th>Village</th>
<th>Camp</th>
<th>House &amp; structure</th>
<th>Population overed</th>
<th>Use DDT75%Kg</th>
<th>Use Malathion50%EC(L)</th>
<th>Use Fendona5%Kg</th>
</tr>
</thead>
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Source: VBDC, 2014.

7.2.2 Findings – IRS

Reports on IRS operations are almost non-existent. It seems that IRS has been applied in only a few townships in RAI-supported townships.
Until now and despite programmatic recommendations, insecticides used for IRS remain synthetic pyrethroids, which are similar to those used in impregnated nets. No clear criteria are used to select insecticides to be used for IRS. Myanmar has no clear policy and guidelines on the use of insecticides for public health. Registration of pesticide for public health use will have to be approved by an insecticide/pesticide board under the Ministry of Agriculture, where there is one representative (senior entomologist) who is staff of the Ministry of Health. Registration of pesticide products, such as repellents, aerosol, mosquito coils and related insecticide applicators and machines, have to be approved by the Pesticide Board.

Quality of spraying operations is essential to ensure effective and safe use of chemicals in communities. The team had no opportunity to visit villages where IRS had been used. Planning for and monitoring of spraying operations is not clear (where, when, what and how). Records of spraying operations are lacking and if submitted, they are not properly analysed for use in further planning and for improvement of operations.

Roles and responsibilities of spray men at township level are not clear or do not match what they are actually doing. They are supposed to be responsible for conducting spraying operations including space spraying. Most have not attended any refresher training courses during the past several years. Newly recruited spray men did not attend any orientation training sessions on vector control policies and operations.

7.2.3 Action points – IRS

- There is a need to develop a national policy and subsequent guidelines pertaining to the use of insecticides from a public health viewpoint (not only agriculture). National experts and entomologists have to be assigned to perform those tasks.
- It is necessary to review roles and functions of the insecticide board of the Ministry of Agriculture and give responsibilities to the FDA under the MOHS to register “public health” insecticides, insecticide products, household pesticide products and related equipment.
- Careful planning and budgeting of IRS operations have to be made annually in collaboration with concerned stakeholders. The monitoring and reporting system needs to be reviewed and properly implemented at different levels. SOPs of IRS and fogging and other vector control tools have to be updated to support VBD interventions.
- Review and assign clear roles, functions, skills and responsibilities of VBD team at each level to support the overall VBD agenda.
7.3 Integrated vector management (IVM)

7.3.1 Current strategy – IVM

IVM is not formally part of the VBDC strategy in Myanmar.

7.3.2 Findings – IVM

Myanmar has developed a vast experience in applying integrated vector control (IVC) measures, using different vector control tools to control malaria and other vector-borne diseases. Vector control is well suited for integrated approaches because some vectors are responsible for multiple diseases, and some interventions are effective against several vectors. It is necessary for the VBDC to consider the IVM approach, which is “a rational decision-making process for the optimal use of resources for vector control”. 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 intersectoral action and are able to establish vector control and health-based targets. The cost effectiveness of vector control measures is central to IVM.

WHO has been advocating the IVM approach since 2006. Meetings with malaria Programme managers have been organized in WHO/SEARO several times. A framework has been developed for Implementing IVM at District Level in the South-East Asia Region and a subsequent IVM training session was conducted in Myanmar. It is unfortunate that this cost-effective and sustainable IVM approach has not taken off yet.

7.3.3 Action points – IVM

- To pilot IVM projects in collaboration with partners and research institutes to empower the community in selected townships by using local/villagers for mosquito collection both larvae and adults for vector distribution and mapping. Information on presence of vector will be used for malaria micro-stratification.
- To collaborate with JICA experts, as operational research, to empower the community to collect ground information on land-use, occupational migration related to forest activities and other mobile risk group populations.

• To mobilize communities through the IVM approach, as operational research, to support distributions of LLINs, treatment and re-treatment of ITNs and other suitable environmental measures.

• Leaders of community and other local stakeholders to be involved to identify most at-risk group populations. They could be responsible/accountable for the distribution of malaria prevention packages with LLINs, long-lasting insecticide-treated hammock nets (LLIHN), repellents and other tools in the community.

7.4 Other vector control measures

7.4.1 Current strategy – other vector control measures

None

7.4.2 Findings – other vector control measures

Other vector control measures, such as larviciding, could supplement above-mentioned interventions. However, there is no solid evidence that biological or chemical larviciding are effective on an operational scale against *An. minimus* or *An. dirus*. Therefore, use of larvivorous fish and environmental management are not applied for malaria control in Myanmar. Use of repellents is currently being studied in Kaya with no result so far. Use of LLIHNs has been effectively used to protect mosquito bite among forest workers in Vietnam and Cambodia but not in Myanmar.34 Trials on insecticide-treated materials/clothes for rubber tappers are being carried out with preliminary positive results in southern states of Myanmar35.

7.4.3 Action points – other vector control measures

• To develop protocol on the use of LLIHNs among mobile and migrant populations. Collaborate with research institutes and interested partners to conduct field trials of LLIHNs.

• To create a task force to look at specific suitable measures being part of a package expected to protect individuals in forest/forest fringe locations and special situations.


8. Surveillance

8.1 Current strategy – surveillance

There is currently no effective case-based surveillance system for malaria. Reporting is part of the overall national surveillance response system that includes all epidemic prone diseases updated in 2015. Rapid surveillance and response teams are based at state and district levels. They are trained in Nay Pyi Taw for one month, and managed by the central epidemiological unit under the disease control section of the MOHS.

There is also no ongoing vector surveillance system in place primarily due to the lack of qualified personnel.

8.2 Findings – surveillance

No malaria epidemic has been detected since 2012. This could be linked to the recommended low sensitive epidemic thresholds. It could also be linked to the inability of VHV’s or peripheral health staff to suspect an epidemic because of unclear epidemic threshold criteria at the community level, as well as a lack of general guidance. With increasing communities becoming almost free of malaria, detection thresholds based on standard deviation(s) from the mean or absolute cases are becoming irrelevant.

8.3 Action points – surveillance

- Make malaria a notifiable disease.
- In townships reaching pre-elimination thresholds, introduce case classification according to WHO surveillance guidelines (adjusted to local conditions).
- Update the epidemic detection and response manual in line with elimination requirements, including proactive and reactive screening with ad hoc equipment, materials and skills according to foci status.
- Revise existing epidemic thresholds according to the local situation and historical data.
- Progressively merge malaria into existing emergency mechanisms and multitask detection and response teams with other epidemic prone diseases. Strengthen VBDC response teams accordingly.
9. Monitoring and evaluation

9.1 Current strategy – M&E

A standardized malaria data collection form is used across all health facility levels and NGOs to capture tested and confirmed malaria cases by species, month and village. Flow of data is presented in Figure 12. VBDC, in collaboration with WHO, is computerizing all forms, including details on patients with no malaria via state-level data assistants.36

There is an M&E guideline in existence with technical guidance on surveys to capture non-routine indicators. A detailed explanatory list of outputs, outcomes and impact indicators are described. The majority of partners have M&E specialists looking at data to be collected and consolidated for analysis and reporting.

**Figure 12. Flow of data**

![Flow of data diagram](image)

Source: SDOPH, Rakhine 2016

9.2 Findings – M&E

The MPR team acknowledges efforts made by the Programme and partners to improve the routine reporting system that captures essential malaria data from peripheral administrative locations and from various sources. Health facility reporting rate countrywide was approximately 78% in 2015.

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36 Volunteers supervised by NGOs are posted in more than 9500 villages and volunteers supervised by NMCP in more than 7000 villages (PMI report, 2014). Criteria from VBDC to select villages to post volunteers are available and quite clear. However, application of such criteria varies partner by partner as well as supervision tools, completeness of reporting and feedback mechanisms.
From information given by the Programme, partners and field staff at all levels confirmed malaria cases are substantially declining countrywide over the last 5 years with data increasingly available by village. This provides support that API by village could be further consolidated allowing for far better stratification for planning/targeting interventions according to API with increasing township leadership.

All forms, including negative tested patients, are computerized at the state level. It was not clear to the MPR team what the Programme is doing with all computerized data of negative patients for malaria.

Hospital data are in principle included in the VBCD-WHO managed database, but it is not clear how malaria recording forms are used by hospital teams in a context of poor data management in the majority of hospitals. Overall data management in hospitals is very poor with QA/QC microscopy and laboratory results not matching registered ward cases. RDTs are generally used outside working hours of laboratory technicians. Another problem is that if a severe patient is admitted but coming from another state, he/she is not “officially” recorded.

Data are still missing from private providers, health-care services in private industries employing migrant workers, and highly mobile security forces. There is a clear need to progressively consolidate malaria intelligence into a single database.

The MPR team acknowledges that an increasing number of partners are contributing to reporting by using and submitting the standardized form to the state team. There are limited data from private providers and security forces. PSI is making efforts to support and encourage private providers through the SUN Quality Health and quality diagnosis and standard treatment of malaria project covering around 1500 general practitioners to regularly report data. There are grey areas where internal conflict is ongoing with limited or no access and hence no reporting.

If forms are generally well completed without much delay, they (carbonless records) are brought to above levels (village to health centre, health centre to township and township to state) by motorcycle or similar means. This is not facilitating completeness and aggregation and data analysis at township level and not allowing quick feedback. State level teams seem not to be in a position to analyse and report on computerized data at their level.

Peripheral health workers as per MPR observations have handwritten maps available with villages, health facilities and population per village in their catchment area. They have quite clear knowledge of malaria cases by village being in touch with volunteers and recorded cases on a daily basis. With some additional training during supervisory visits, they could be in a position to calculate API per village and classify them as per NSP recommendations.
Community and health facility surveys are regularly conducted with technical support from specific NGOs, such as Malaria Consortium under PMI or the University of California at San Francisco. Those surveys have the potential to provide valuable information, but data analysis and results are most of the time superficial and not leading to strategy or policy update or revisions of some practices.

The MPR team observed at all levels the lack of epidemiological background of staff and inability to adequately analyse and present data, and make proper evidence-based conclusions for decision-making and action. Basic epidemiology training courses are needed, targeted first at state and township public health staff.

Stratification of areas by village will depend on availability of API data, test positivity rate (TPR), ecological settings and presence/absence of vectors at the village level. Village-wise information may neither be available nor accurate in each village since it mainly depends on performance of peripheral health-care facilities and volunteers (passive case detection using RDTs) and malaria notification by private providers (see section 8 on surveillance).

Information on vector distribution (receptivity) and movement of population (vulnerability) is not available in most townships and villages. This information may not be included for village micro-stratification in most areas. Since planning and decisions on vector control measures depend largely on micro-stratification at the village level, efforts should be made to ensure maximum reliability of relevant information at the village level, including demography, population, number of houses (and farm huts), availability of local bed nets, number of LLINs, etc.

In Bago, experts supported by JICA have demonstrated a feasible and practical approach by using remote sensing, a geographical information system and ground information to improve ecological knowledge, to access entomological data and to list relevant occupations related to movement of local people. Foci of malaria transmission in villages have also been mapped, which has contributed to a more reliable micro-stratification at the village level.

### 9.3 Action points – M&E

- Review and update the list of essential malaria indicators in the context of malaria elimination and prevention of re-introduction.
- Fine tune the existing carbonless reporting form by deleting some items (age groups), by coding some items (e.g. village) and adding a few relevant ones (age, occupation, travel history outside the village within last month, village population).
• Adjust the reporting form to facilitate further coding, computerized data analysis, planning decision and epidemic detection. For example, the suggestion is to code the village by using a national identification from the Myanmar Information Management Unit (MIMU), add a last month travel history item (yes/no), occupation (especially at screening points) and village population (as per annual update from midwives). Delete age groups to be replaced by “age”.

• Improve the capacity (training sessions and workshops) of township and peripheral health staff to stratify villages by API by using confirmed malaria data that they routinely generate (for planning, budgeting and reporting).

• Encouraging hospital teams to use the standardized forms to be further accurately incorporated into the malaria database.

• Consolidate existing malaria databases into one single database managed by VBDC with technical assistance from WHO. Suggestion is that all partners/donors contribute to accurately report and strengthen the township, state and national malaria database with increasing peripheral data ownership and management.

• Facilitate regular supervisions and collection of data and feedback from state and township level by providing 4-wheel drive vehicles and drivers to state and township teams (especially to reach difficult areas). Ensure that reporting forms are all reaching to and managed by township staff.

• Engage an increasing number of private providers starting with Myanmar Medical Association members to report to VBDC state teams who in return provide them with feedback.

• Discuss with security forces health staff how to communicate and exchange relevant malaria data.

• Improve data analysis generated through surveys for decision-making and strategy and policy revision.

• Agree on a key few malaria items to exchange or report on with neighbouring provinces and districts. Partners operating in border areas to set up websites to report on interventions and data and accessible by interested actors (example SMRU website).

• Increase the capacity of the peripheral staff generating data to perform simple data analysis that would guide local action, including mapping of village by API classifying them by coloured API (red, yellow, green) and allowing them to monitor progress over time against elimination and prevention of re-introduction targets.

• Organize several quarterly and annual meetings at all levels. They are expected to take stock of progress and challenges and orient decisions and actions. The MPR team is of the opinion that such meetings should focus on essential technical and operational
challenges to be identified and addressed at each level. Meeting minutes should capture and summarize those challenges with documented and innovative practical operation procedures put in place.

- The central team (VBDC) and state staff are expected to provide regular feedback to peripheral staff. The MPR team did not see any annual reports from VBDC or state staff with such feedback. Suggestion is made to consolidate meeting minutes with a summary of critical field and technical issues to be further consolidated and addressed at all levels by partners and supportive agencies.37

- More attention has to be paid by VBDC to assess the vectoral capacity, vectors and human behaviours, especially in villages where high transmission (API > 5/1000) persists in spite of high ITN/LLIN coverage and access to RDTs and ACTs.

- Expand the application of remote sensing, GIS and ground information to fine tune village and subvillage stratification, especially where transmission persists.

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37 Criteria to select villages where volunteers have to be posted are quite clear but not necessarily followed by implementing partners. Supervision and reporting forms are not harmonized or IPs not aware of tools recommended by the national programme to consolidate malaria intelligence at the village level by using VHV and rural health center data.
10. Pharmaceuticals

The NMCP of the VBDC programme is responsible for supply management of the national malaria programme. In addition, there is a more than 31 partners (NGOs and INGOs) involved in supplying treatment and care and in various aspects of supply management. The overall supply chain system is therefore fragmented. The GFATM is providing funds and the grant is implemented by two principal recipients (PRs), UNOPS and Save the Children, which both have several subrecipients. The supply situation is satisfactory and stock-outs are rare. A National Health Supply Chain Strategy for Medicines, Medical Supplies, and Equipment 2015–2020 was developed in 2015.

10.1 Current strategy – pharmaceuticals

An Essential Medicines List was issued in 2010. The NMCP is responsible for forecasting antimalarial medicines and other supplies based on epidemiological data and past consumption.

The GFATM principal recipient, UNOPS, carries out procurement.

Combating fake/counterfeit drugs and banning of artemisinin-based monotherapy is an important strategy for preventing the proliferation of artemisinin resistance. Artemisinin monotherapies (oAMT) were banned in Myanmar monotherapies at the end of 2012. Existing stocks of oAMTs distributed earlier should have been withdrawn from the market no later than October 2014, and the import, sale and distribution of such products is no longer allowed. But oAMTs still appear in the market.

There is no specific strategy included in the National Strategic Plan Malaria Prevention and Control, 2010–2016, but elements of logistics management and supply issues are mentioned. Likewise, there is no specific strategy on distribution or pharmacovigilance.

10.2 Findings – pharmaceuticals

10.2.1 Selection and use of medicines

The Malaria Standard Treatment Guidelines that are still in draft form include artesunate and artemether tablet monotherapy that are banned, but not ACTs, which are the primary drugs used for routine treatment.
10.2.2 Forecasting

Forecasting of malaria commodities is difficult as the number of cases is dropping, but these commodities need always to be available in case of outbreaks or surges of cases. The case management reporting system consists of a Malaria Case Register (carbonless form (4 copies)) in which the patient’s name, diagnosis, RDT and medicine usage are recorded. Stock balance of RDTs and antimalarials are also recorded. The form is used by all partners providing diagnosis and treatment; village health volunteers, subcentres, rural health centres. Partners (NGOs and INGOs) are using the same form. The form is sent on a monthly basis to township VBDC where data are compiled and forwarded to the state VBCD. State VBCD compile the data submitted by townships. UNOPS, who is responsible for procurement, receive data from the state level (which UNOPS compiles) but not from the township level (the compiled township cases are not included in the data provided by the states). Thus, UNOPS forecasting is not based on the total number of cases reported. However, UNOPS organizes annually a 3-day forecasting exercise with all partners, including WHO, NMPC, subrecipients (SRs – including NGOs, INGOs) in which all partners present their needs, agree on the assumptions for the forecasting and agree upon the final forecasting figures.

10.2.3 Procurement

UNOPS procures WHO prequalified antimalarials or antimalarials registered in countries with Stringent Regulatory Authorities. RDTs are procured based on WHO recommended selection criteria and national guidelines. The WHO Pesticide Evaluation Scheme (WHOPES) recommended pesticides are being procured. UNOPS’s main expertise is on procurement and there are no issues related to the procurement process. UNOPS is procuring commodities for SRs.

10.2.4 Oral artemisinin monotherapy

A recent report 38 on the Myanmar Artemisinin Monotherapy Replacement (AMTR) Malaria Project describes that the availability of quality assured ACTs provided has decreased. This is explained by the decrease in malaria cases, which again means that the antimalarial market in both the public and private market is shrinking.

In spite of the ban, oAMTs continue to appear on the market (illegal import, remains of stock imported before the ban). Availability of oAMT has actually increased. When the AMTR project

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was launched, 67% of the outlets had oAMT in stock. The figure fell to 10% in 2014 but increased to 27% in 2015.

### 10.2.5 Storage facilities

The VBCD central warehouse is managed by an upper divisional clerk with 15 years of experience. There are six additional sanctioned posts for lower divisional clerks of which only three are filled. When required, workers are hired on a daily basis.

Standard operating procedures have been developed by UNOPS for the Logistics Management Information System (LMIS), which covers aspects of supply chain management. These are available with the staff managing the warehouse.

The VBCD warehouse in Yangon consists of two buildings: one for antimalarials, RDTs and other commodities; and one for pesticides. The first building has been renovated. It has 10 small air conditioners and temperatures at the time of the visit were 25°C and 28°C, which were recorded at two different locations of the warehouse. There were charts for recording of the temperature in the morning and afternoon. However, temperature recordings were not entered since 20 January 2016.

The various items are stored on pallets or on steel shelves in an orderly manner. Each item has a bin card for recording transactions and product details enabling traceability (batch number, expiry date, quantity received, issued to, quantity issued, balance).

In addition, a stock book was maintained recording basically the same information as on the bin cards. However, it was noted that there were discrepancies between balances recorded on bin cards and stock books.

Pesticides are stored in a separate building. No bin cards are being used. It was observed that a drum with malathion was leaking on the floor. No personal protection equipment was seen.

The storage facilities at states and township levels are inadequate in terms of organization and housekeeping. In Kayah State, one room of a new or newly renovated warehouse was filled with unwanted items; motorbikes with fogging machines, discarded goods, empty printer cartridges, etc.

Subrecipients have their own storage facilities and their stock management is better than what was observed in the public sector.
10.2.6 Logistic management information systems (LMIS)

A manual system is in place: the Malaria Case Register (carbonless form for case and commodity reporting). In addition, SOPs with reporting forms are developed by UNOPS.

Currently, the Clinton Health Access Initiative (CHAI) is developing an electronic LMIS based on the software mSupply, which is used by many countries all over the world. It is modified in collaboration with the MOHS to be used by the disease programmes for malaria, tuberculosis, HIV/AIDS and hepatitis. The system is being piloted in several states. It will be scaled up by the end of 2017 to all state-level VBCD warehouses and subdepots, a total of 69 sites.

Training will be provided to all users as well as supervision and monitoring. The system is being installed on laptops with a modem and given to the store staff. The system is web-based. As Internet connectivity is poor in some parts of the country, the system can be used offline and data can be uploaded when Internet connectivity is available. A Malaria Field Officer at the central NMPC office in Nay Pyi Taw has been appointed as the focal person for mSupply. At the warehouses, a data assistant will do the data entries that will have to be checked by a “Data Manager” before the system will accept the entry. How this is going to be implemented is unclear. Even at the central VBCD warehouse, there is no data assistant or data manager. Another issue is data discipline/accuracy of data entry. Currently, one can find different stock levels recorded for the same item on a bin card and stock level.

10.2.7 Distribution

UNOPS is procuring antimalarials, RDTs and other commodities under the GFATM grant. After having been cleared at customs, the goods are brought to the VBDC central warehouse in Yangon where it is being checked according to the appropriate SOP and stored.

There is no distribution system in place but a pull system is being practiced. State and regional VBDC obtain their requirements (RDTs, antimalarials and other commodities) in two ways:

- Staff collect items when attending meetings in Yangon;
- Transport is hired (trucks, private transport companies) for transportation to state VBDC. The malaria commodities being small in volume are transported with other goods of all kinds. Delivery time can be from 2 days to 1 week. This unsupervised distribution is not satisfactory.
For the national programmes for tuberculosis and HIV/AIDS, UNOPS has established Long-Term Agreements with private distributors (transport companies) to ensure timely deliveries under controlled conditions. However, these programmes require much larger volumes of commodities. The volumes to be distributed from VBCD to state levels are much smaller. However, a better way of distribution from the VBDC warehouse to state levels should be explored.

Townships consolidate their needs based on case reporting (carbonless form), which is submitted to state VBDC, who consolidates the needs from all townships. When the malaria commodities arrive at the state VBDC, the township VBDC has to collect the items themselves. Likewise, RHC collect their requirements from the township VBCD. Subcentres collect from RHCs. Village health volunteers collect from the township VBDC.

LLINs are distributed directly from the central level to townships.

### 10.2.8 Pharmacovigilance

DFDA is responsible for pharmacovigilance but lacks the resources in terms of trained staff to conduct such in a proper way. DFDA is not a member of the WHO Programme for International Drug Monitoring. The ADR reporting form has been developed and distributed. Importers are reporting on behalf of companies abroad but few reports are received from health facilities. Only serious events are reported; for instance, reactions on antibiotic injections. The reporters need to be trained on what is an adverse event. Feedback on the report needs to be provided by the DFDA. The resources to run pharmacovigilance is always underestimated. Health providers are normally reluctant to submit reports due to various reasons (too time consuming, no feedback on reports so why report, fear of being blamed for medical mistakes, limited knowledge of what is an adverse event).

### 10.3 Action points – pharmaceuticals

- The list of antimalarials contained in the National Essential Medicines List 2010 needs to be aligned with recommended antimalarials in the Malaria Standard Treatment Guidelines. Artesunate and Artemether oral monotherapy products need to be removed and Artemisinin combination therapy products need to be included.
- Forecasting of antimalarials should be based on number of cases and not so much on past consumption considering the decline in cases. However, additional stock catering
for seasonal variations and possible outbreaks should be available, possibly at central or state levels.

- Notification of the oAMT ban is a national health issue and should be the responsibility of the central DFDA to make such ban nationwide through the website, national newspapers more in addition to notifying states and townships.

- The ban on import, manufacture, export, registration, re-registration, distribution and sale of artemisinin monotherapy needs to be reinforced by the DFDA. Such a ban should be communicated from the central DFDA to all affected: importers, manufacturers, exporters, wholesalers/distributors, pharmacies and drug sellers. The FDA has to strengthen its regulatory action to ensure complete phase-out of oral monotherapy.

- Post-marketing surveillance of antimalarial drugs should be strengthened through filling vacancies at the state DFDA and through provision of additional funds for sampling and screening (to be included in the Concept Note for the next GFATM grant).

- Collaboration with law enforcement agencies (police, customs, Interpol) is essential and needs to be intensified to combat counterfeit drugs and oAMT.

- Stock management at state and township levels has to be improved through the selection of dedicated staff for supply management. These should be provided with training and enabling factors, such as recognition and increased staff responsibility, in order to improve motivation.

- SOPs related to all aspects of supply chain management established by UNOPS should be disseminated at all levels and their implementation should be ensured through capacity-building, supervision and monitoring (NMCP and UNOPS).

- A post for pharmacist at the central VBCD warehouse should be created to ensure implementation of Good Storage and Distribution Practices at all levels through capacity-building, supervision and training.

- Long-term adviser should be recruited initially to strengthen all aspects of supply chain management.

- A system for collection and proper disposal of expired antimalarials should be established.

- Air conditioners and standby generators should be provided to state VBCD stores where such are not yet installed where antimalarials and RDTs are kept.

- Storage, handling and disposal of insecticides needs improvement with emphasis on personal and environmental protection.

- Regular and frequent training of staff involved in supply chain management should be conducted as well as supervision and monitoring visits to ensure correct data entries. The prerequisite for introducing electronic LMIS is a functioning paper-based system.
• Before introducing the electronic LIMS, data entry discipline must be established through training and supervision in the use of the paper-based system.
• State and township VBCD offices should be provided with vehicles for collection of malaria commodities at the higher level. The vehicle need not be dedicated for distribution only but should be used for supervision and monitoring visits, or
• Deliveries through courier companies should be explored.
• Activities and budget for strengthening of pharmacovigilance should be in the Concept Note for the next GFATM grant.
11. Advocacy and IEC/BCC

11.1 Current strategy – advocacy and IEC/BCC

11.1.1 Advocacy

One of the outcomes of the East Asia Summit in Myanmar in 2014 was to issue “the Declaration for Asia-Pacific Malaria Elimination in 2030”. In Malaysia in 2015, the Leaders of Asia-Pacific agreed upon the Asia-Pacific Elimination Roadmap. The Asia Pacific Leader Malaria Alliance (APLMA) is preparing the Leaders’ Dashboard (a malaria elimination tracking tool) for following up the progress of each country every year before the East Asia Summit through respective country Ministries of Foreign Affair.

Advocacy is mentioned as a key activity in the 2010–2016 NSP (#6.5.5) as follows:

Advocacy for support in malaria control is conducted at three levels

- Top level: Ministry of Health
- Intersectoral and cross-border level: Tourism, forestry, economic development, women and children development (mechanisms for cooperation to be established).
- At operational level:
  a. Community ownership of the malaria programme;
  b. Maintaining gains, and improve community ownership, on malaria self-protection;
  c. Increase community roles and ownership in community case management;
  d. Towards equal partnership at state/regional in planning malaria control.

11.1.2 IEC/BCC

One of the objectives mentioned in the National Health Plan 2011–2016 is as follows: “To enable the people to be aware and follow behaviours conducive to health”.

The 2010–2016 NSP Malaria mentions that IEC/BCC is one of the main strategies to educate and raise awareness of target populations for malaria prevention and control.
IEC interventions target high-risk populations and mobile migrant populations. They also pay special attention to boost interventions related to artemisinin resistance containment operations as well as LLIN distribution, improved utilization of nets in different settings, population screening, and compliance with the full treatment regimen (including low dose primaquine in *P. falciparum* infections).

As quoted in NSP, BCC mechanisms and tools have to be strengthened to improve treatment-seeking behaviours and adherence to treatment. Various channels are mentioned, such as interpersonal communication, mass media, schools, mobile teams, etc.

## 11.2 Findings – advocacy and IEC/BCC

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

The ‘Myanmar Health Sector Coordinating Committee’ (M-HSCC), an expansion of the GF specific ‘Myanmar-Country Coordinating Mechanism’, was established in 2013 and takes a leading role in coordination of both governmental and nongovernmental sectors. There is also a TSG for malaria under M-HSCC, which is led by the Department of Disease Control with WHO as technical secretariat. The TSG-Malaria appoints a working group (the Core Group for TSG-Malaria) to deal with specific tasks as necessary.

Myanmar’s economic growth and improving political situation enhance the investment of multinational private companies that can contribute to malaria control, particularly in their workplaces (mining, rubber plantations, construction sites). Local factories that produce commodities used for personal protection of VBD need to produce better quality of products and cooperate to sustain the gains of malaria control. Networking of developing partners and international actors will always play an active role of advocacy for malaria control in Myanmar.

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”. That document has not been updated.
The total trained was about 40,000 VHVs in Myanmar (roughly half under VBDC and half managed by INGOs). The actual number currently in place is 15,000. VHVs are highly dedicated and generally well appreciated by their communities in highly malarious areas. Their roles are essentially to provide health and malaria information, use RDT in suspect patients, provide ACT or CQ in positive patients, and refer RDT negative patients to upper level care. Implementing partners have other options to recruit and train VHVs with different incentive approaches. It includes also different IEC/BCC approaches used by NGOs, which are generally more innovative than VBDC. In general, IEC materials found in the field and BCC mechanisms used are quite limited in quantity and strategically unclear.

Budget expenditures to cover IEC/BCC interventions and materials from the Global Fund are quite limited (less than 2% out of total GF expenditures over the last 5 years) as per Table 10 below. Save the Children indicated that approximately 2.5% of their budget was spent to cover IEC/BCC activities. The CAP-Malaria project (supported by PMI-USAID) reported in 2015 that 915 Village Malaria Workers, 691 Basic Health Staff, and 384 Village Chiefs were trained on Interpersonal Communication (IPC), and after training, they provided IPC (via group health talks or individual health talks) covering 938,648 people including 58,939 migrants. In addition, 261,060 pamphlets and 18,577 posters have been distributed and 59 billboards were set up. Lastly, small media videos were displayed at the village level in some states, and radio and TV messages were delivered on buses for travelling passengers. The impact of these interventions are documented through community and HCF surveys.

<table>
<thead>
<tr>
<th>Table 10 - Budget expenditures on IEC/BCC activities (USD)</th>
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<tbody>
<tr>
<td><strong>Expenditures</strong></td>
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<tr>
<td>IEC/BCC</td>
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<tr>
<td>Total Budget</td>
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<td>Proportion on IEC/BCC</td>
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Normally, all IEC/BCC materials from all stakeholders, including public, private sector and media operators are approved by the Health Education Bureau within the Department of Public Health, but more time is necessary to ensure this.

11.3 Action points – advocacy and IEC/BCC

- Advocacy is crucial to mobilize national politicians and international donors towards control and elimination goals in Myanmar. The government has to take the leading
role and progress made over the last few years must be properly documented and disseminated through appropriate channels.

- The strategy for IEC/BCC should be revised and updated (particularly by using results from numerous surveys, results from research institutes and building on various positive experiences from NGOs). Within the VBDC, some staff should be trained in IEC/BCC, taking stock of innovative communication approaches and modern BCC packages (such as positive deviance).

- Surveys should be used to contribute to targeting the right message to the right population groups. For example, in many areas, the transmission by mosquito is well known and therefore not the priority message; but in some eastern townships, relatively high proportions are unaware and require prioritization of this message. Formative research is thus important to guide BCC activity.

- IEC/BCC materials should be enough in quantity and quality (e.g. to cover ethnic and migrant mobile populations) through appropriate and suitable channels (user-friendly for the target population) in the following domains: origin of malaria, test and treat early, adherence to treatment, sleep under impregnated bed net, individual protection measures when outside villages, etc. Such materials should be also adjusted to be used by influential people in communities, such as school teachers, monks in pagoda or imams in mosques.

- The Programme should document its achievements and challenges to construct appealing advocacy documents and presentations to be used for local and high-level decision-makers and international development agencies.

- The Malaria Elimination Committee should endorse the soon-to-be-revised National Malaria Strategy towards malaria elimination.

- The various committees should monitor elimination achievements against targets and to report yearly to the East Asia Summits and APLMA.

- The Health Education Unit, which is under the Department of Public Health, should develop a clear and straight-forward IEC/BCC strategy adjusted to local needs utilizing modern tools in connection with communication technology channels and personal devices.

- The VBDC and partners should work together with research institutes to modify and produce user-friendly IEC/BCC materials to be used by health and non-health staff, and influential persons (leveraging sound, song, video, movies, pictograms, etc.) to reach the most at-risk and generally uneducated population.

- The private sector (companies, industries, etc.) should be provided with a budget for IEC/BCC materials (and other malaria services) as part of their corporate social responsibility or/and allow them to use services, communication technologies and channels free-of-
charge (similar to Cambodia where a mobile phone company supports free SMS sent by VHV).

- The Programme and partners should ensure that IEC/BCC materials, tools and strategies encompass prompt diagnosis and treatment (and adherence to treatment), individual protection in different situations, IRS where and when needed, active surveillance and epidemic control through “suitable” tools targeting the most at-risk people in Myanmar, such as internal and external migrants, soldiers, forest-goers, IDPs, remote ethnic people, etc.

- The Ministry of Health, as well as donors, should increase the budget allocated to IEC/BCC (currently less than 2%) and advocacy operations.
12. Programme management

12.1 Strategy – programme management

12.1.1 Programme structure

The 2010–2016 National Strategy Plan for Malaria Control puts emphasis on health systems strengthening as one of the core objectives of the Programme with progressive decentralization of managerial responsibilities to the Township Health Department. Objective 4 of the NSP says that, “By 2016, the Township Health Department in 284 malaria endemic townships are capable of planning, implementing, monitoring and evaluating malaria prevention and control Programme with management and technical support from higher levels.”

At township level, the Malaria Control Programme is already 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 subcentres. The VBDC staff in each endemic township comprises a malaria assistant, malaria inspector, malaria supervisor and permanent spray man.

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 has established malaria microscopy services.

Below subcentres, basic health services are provided through outreach by health workers and health volunteers. Some special activities (e.g., research studies, surveys) are implemented by the state/regional VBDC team.

12.1.2 Village health volunteers

The NSP envisages a key role for community volunteers (VHVs) that are recruited to provide diagnosis and treatment services for malaria together with screening, DOT and follow-up.

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39 Excerpt from 2010–2016 NSP: “Evidence-based malaria control are anchored on strong health systems and are contributing to strengthen health systems” further stating that “The Program 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 programs 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.”
where access to health facilities is difficult. VHVs are trained to use RDTs as well as managing medicines and other supplies. The volunteers are also responsible for BCC and ultimately will be trained to diagnose and treat diarrhoea and acute respiratory tract infections as well as malaria. A special curriculum and guideline based on the iCCM has been prepared.

The NSP also envisages a role for VHVs in surveillance and response “In relation to community-based surveillance, the volunteer will be trained to draw monthly graph of the number of RDTs used and the number of positive tests. He/she will be able to detect an outbreak early and the community and will be able to monitor its malaria situation (for example verifying lower positivity rates following interventions).”

International and national partners are playing a vital role in malaria control in Myanmar. Their contribution is acknowledged as important to control malaria and reach elimination. Broadly their roles can be categorized into four domains as follows:

- Reaching vulnerable populations and operating in unstable conflict areas to apply innovative context-wise approaches: CESVI, HPA, Malteser, Community Partners International (CPI), International Organization for Migration (IOM), Save the Children, World Concern, World Vision (WV), Myanmar Health Assistant Association (MHAA).
- Reaching/working with nongovernment providers and piloting new approaches: PSI, Myanmar Medical Association (MMA) and Myanmar Health and Development Consortium (MHDC).
- Conducting operational surveys and research: Malaria Consortium, SMRU, MAM, University of Maryland, Baltimore (UMB).

12.1.3 Funding

The sources of funds for the Malaria Control Programme are first the Government of Myanmar’s tax-based budgetary allocations and second, extra funds from international donor agencies and NGOs. The government budget pays for all the staff and drugs in hospitals and health-care facilities, their infrastructure and maintenance, and the staff salaries and infrastructure of the entire VBCD work force, which is the major part of recurrent expenditures. The international donor agencies provide with extra funds to cover almost all malaria commodities, a modest part of office equipment, much of malaria-specific training sessions, some part of monitoring and supervision activities and the entire VHV component.
Financial flow of international donor funds is in kind – in the form of commodities or through “Field Financial Assistant” as reimbursement or direct payments. Even in government funds, salaries and commodities are upfront expenditures. There is thus a zero cash flow system in operation.

A number of townships are facing administrative situations where the department is facing a political barrier in staffing and organizing services in the township hospitals, rural health centres and subcentres. Almost invariably these areas also face major geographic barriers to health-care provision.

In some of these areas, there is an understanding that an equilibrium is established and the state should act within these limitations; and these are termed self-administered areas. Here the main strategy is to assign a partner NGO to these areas who is willing and capable of ensuring access in such townships.

In other townships, the situation is more unstable and such a designation has not been given. But even here the state for delivery of public health services deal with partners who in turn deal with non-state actors.

There are also numbers of villages or village clusters, which become out of bounds for health staff due to what is termed as “security reasons.” Here a common strategy is to deploy a VHV and then provide services through these persons.

### 12.1.4 Partner organizations

Partner organizations are generally either funded by major international donor agencies or consortium of donors (such as GFATM, PMI or 3MDG) or by using their own funds, such as Médecins Sans Frontières (MSF). In addition, some agencies play the role of fund management agencies for donors as well as act as implementation agencies. Save the Children is for example principal recipient of the GF NFM for several NGOs and UNOPS principal recipient mainly covering interventions managed by the NMCP.

The Ministry of Health and Sports is expected to coordinate all actors. One major effort from a coordination viewpoint is the Coordination Committee whose secretariat is in UNAIDS. This is ensuring that all proposals/projects are screened and aligned with national policies and strategies (through specific disease technical committees) both in geographic area of operation and activities to be undertaken. By 2020, all activities performed by the UNAIDS Secretariat will be taken over by the MOHS in Nay Pyi Taw.
12.1.5 Role of WHO

WHO is responsible for providing leadership on health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support and monitoring and assessing health trends. The presence of WHO in Myanmar is based on the Basic Agreement signed between the Government of the Republic of the Union of Myanmar and WHO for the provision of technical advisory assistance. The WHO Country Office in Myanmar is supported by the Regional Office as well as by headquarters. Technical collaboration and coordination among the countries in the GMS, including Myanmar, is also provided by the Regional Hub for Emergency Response to Artemisinin Resistance (ERAR) based in Phnom Penh, Cambodia.

The work of WHO in Myanmar is based on the Global Programme of Work, the recommendations of WHO Regional Health Committee and the Country Cooperation Strategy (CCS). Prevention and control of malaria is one of the key programmes being executed by WHO.

The WHO malaria unit provides technical and/or financial supports to national malaria control programme in the areas of a) development of policies and strategies, b) national strategic plans, c) capacity development, d) research and e) surveillance, supervision, monitoring and evaluation. WHO has two sources of budget – “regular budget” or “assessed contributions” and “voluntary” contribution on biennium basis. The assessed contribution is being used for training activities, fellowships, research, capacity development as well as procuring drugs and commodities. The voluntary contribution is being used for other purposes. WHO is getting voluntary contributions from GFATM-NFM 2013–2016, the GFATM-RAI (2014–2016) and from support of USAID PMI through SEARO.

From April 2011-June 2014, WHO received grants from Three Diseases Fund (3DF) (later by 3MDG) for intensified malaria control being implemented by the NMCP, Myanmar Council of Churches (MCC) and MMA. WHO provided technical and management support, including international and local procurement, to the three implementing partners. The 3MDG Fund, which is the second phase of 3DF continued to support MARC project in 2013 with total grants of some US$ 17.2 million to all 9 implementing partners (including WHO for NMCP). The fund from 3MDG was discontinued in June 2014, and this terminated the role of WHO as the fund executing agency for the NMCP, which was an exceptional role of WHO Myanmar over the past 7 years (2007–2014).

Phase I of round 9 GFATM grant implementation commenced in January 2011 and would have ended in December 2012 but was subsequently extended to June 2013 as transition to the
actual Phase II grant that is integrated with New Funding Model grant (2013–2016). The WHO role in the implementation of the Phase I 9th round GFATM grant (and similarly in Phase 2 & NFM) is to provide technical and management support to the National Malaria Control Programme.

The WHO malaria unit is providing technical and management support to NMCP both at the central as well as the field level. In addition to country office staff (international and national staff) based in Yangon (scientist, technical officer, National Professional Officer (NPOs), National Technical Officer (NTOs)), WHO has fielded a total of about 100 staff at central (Nay Pyi Taw), state/regional and township levels. They are providing support to NMCP in the following areas:

1. Micro-planning and budgeting at national and state/regional levels
2. Updating the training curriculum, training materials and BCC materials and preparing training plan
3. Conducting training of basic health staff and village health volunteers and document the output and outcomes
4. Training and refresher training of data assistants
5. Improving the quality of malaria microscopy
6. Timely reporting, developing and maintaining database on the Malaria Control Programme, including database on training of BHS and microscopists
7. LLIN distribution and mass treatment of mosquito nets
8. Procurement and supply management
9. Conducting therapeutic efficacy studies
10. Conducting of health facility and community-based surveys on malaria
11. Field visits to provide technical assistance and to monitor progress and assess outcomes
12. Preparation and submission of reports.

The WHO Malaria Unit is working very closely with the NMCP and serves as secretariat of the Malaria Technical and Strategy Group (TSG), which is a technical body that provides technical guidance to the M-HSCC, an expanded version of the Myanmar Country Cooperation Mechanism (M-CCM).

Another important role of WHO is to facilitate coordination of activities of all the partners involved in malaria control/elimination in the country. Below in Table 11 is the list of the partners with their roles and responsibilities.
We already noted that one of the stated objectives of the NSP (objective 4) is with respect to the decentralization and the development of capacity and systems – both at state and township levels – to move in this direction.

### 12.1.6 Good governance

We further note that objective 3 of the NSP calls for a much higher level of community participation: To quote “By 2016, in 284 malaria endemic townships, the communities at risk of malaria actively participate in planning and implementing malaria prevention and control interventions.” Community participation is thus not only a role of being present as beneficiaries; it includes holding the systems accountable for the delivery of services and even being able to set priorities.

We note that both of these objectives are qualified by the necessity of providing the townships and states with the necessary public health and programmatic leadership. Taken together, they form some of the key elements of good governance.

Advocacy leading to political priority for elimination of malaria and providing the necessary funds for this are also critical to the good governance that is required. And since the fate of malaria elimination rests of the fate of the primary health-care system – swimming or sinking with it – there is therefore a need to reiterate “Health for All” as a key governance objective.

### 12.1.7 Entomology unit

The entomology unit is one of the units under the Deputy Director Malaria. The unit is responsible for entomological studies of malaria and other vector-borne diseases, which include vectors of malaria, dengue, lymphatic filariasis, Japanese encephalitis and other vector-borne diseases (Figure 13).
Entomology and vector control capacity in the VBDC programme needs to be strengthened at this critical juncture where Myanmar is committed to malaria elimination by 2030. Based on a report of Macdonald, there are 8 entomologists and 19 assistant entomologists for the whole country. Of the eight entomologists in the programme in 2016, five will retire in the next four years (before 2020). Of 19 sanction posts of assistant entomologists, 8 posts have been appointed (see Table 11). Most of the vacant assistant entomologist posts are located in high malaria burden townships. In addition, the DMR Medical Entomology Unit is understaffed. There are very few skilled staff in states and regions to conduct essential entomological activities.

One Insectarium has been re-established in Yangon with the support of WHO and JICA. Entomological staff have been assigned to work in the insectarium on a rotational basis. There is limited financial support except from the government for sample collection (both adult and larvae). The laboratory is not functioning.

12.2 Findings

12.2.1 Findings – programme management

So far, only few townships mainly under the GF-RAI project are approaching a point where they are able to plan, implement, monitor and report on malaria control interventions. Likewise, state level teams are not in a position to provide clear technical guidance and feedback to lower levels in the health-care system. This means that the system is not capable of providing the level of information on interventions and progress made township by township that is needed for effective programme management.

Malaria is no longer in the top 20 causes of mortality or morbidity in most townships contributing to current lack of alertness and vigilance, but malaria could re-emerge as a serious public health problem if the surveillance and response capacity at the township level is not strengthened and maintained.

It is no longer cost-effective to have many cadres of staff dedicated to tackling a single communicable disease so as the Programme moves towards elimination it will have to integrate progressively into the general health system. Even if the Programme could secure the money to maintain a vertical malaria programme, retaining the skills and interest of a full “vertical Programme” staff will become challenging. The Programme will have to be increasingly dependent on funding from the government.

Integration has implications for programme management across five domains as follows:

- Less and less staff will be malaria-specific, especially epidemiologists, microscopists, supervisors, and village health volunteers.
- The information flows become increasingly a part of the health management information system.
- Allocations to general health services will be more critical (as compared with or in addition to malaria only).
- Logistics of malaria commodities will be part of all health-care commodities in the public health system.
- The township medical officer/township health team and the state disease control and public health leadership alongside with state and township authorities need to understand elimination requirements and conditions, and provide the necessary technical guidance and political support to the elimination programme.
In the short term, certain programmatic elements will have to remain vertical because certain degrees of technical specialization are required. For example, the procurement of RDTs and ACTs and LLINs etc. require specific technical knowledge, procedures and specifications, which cannot be managed by peripheral health-care services. Quality assurance in microscopy and RDTs, studies in vector dynamics, and even the development and review of technical guidelines for diagnosis and treatment, tracking resistance patterns require high level of malaria expertise. Retaining the needed workforce and skills in such domains will remain a challenge.

12.2.2 Findings – human resources for Health

There are 14 state/regional teams with 199 staff but many key posts, especially entomologists, are vacant. The work definition, skills and deployment of 22 malaria assistants and about 80 malaria inspectors requires more clarity. Malaria inspectors are deployed district-wise and now township-wise – but function is similar to supervisors with township level responsibilities. Malaria assistants provide “assistance” to the team leader.

Few townships have the full complement of an inspector, a supervisor and spray man. Typically, a state or region addresses its shortage in human resource by allocating a township with one of the three - and in spite of this there are still many townships with none of them. Spray men are not called upon for much spraying work since spraying has become occasional or in some states not happening at all. The 151 spray men are therefore assigned to a number of alternative jobs that need to be done for which they have neither been trained nor are qualified for. The 270 supervisors have limited skills with lack of clarity on what they are accountable for. There are no clear mechanisms to ensure that such supervisors are checking if doctors or volunteers are for example not adhering to standard guidelines or if data entered are not reliable. There is in general no dedicated staff in charge of data entry and record-keeping.

There are also a number of other key tasks for which there is no one available with the requested skills. Epidemiologists to read, and interpret data and promote action is one such instance. Pharmacists for warehouse/store managers is another issue. Microscopists with required skills for supervision, on-the-job training and quality assurance of township and hospital-based lab technicians is another critical one. Data management also requires specific skill sets.

In brief, the formal job definition, the skills that the workforce possesses, what they actually do and what needs to be done often do not match.

The quality of microscopy remains to be objectively assessed but anecdotal reports indicate that only about 50% of the established services are fully functional. In station hospitals and in some selected RHCs, VBDC has established malaria microscopy services.
12.2.3 Findings – VHVs

Village health volunteers as they are most frequently named are active, effective and essential for the success of the Programme. They have made an essential contribution to programmatic outcomes by increasing the detection rate, access to quality medicines and malaria information backed up by dedicated RHC midwives.

The four criteria used to deploy volunteers are as follows: (1) village with high malaria burden, (2) hard-to-reach village, (3) village with relatively high population density, and (4) village where there is no health-care facility/health staff close by. Those criteria make sense but do not necessary match specific situations or conditions, such as cluster of moving people temporarily living/working in at-risk areas outside traditional village settings. State VBDCs and TMOs can decide where to post volunteers in the township. The problem is that there is a maximum quota of village health volunteers per township, which is not necessarily based on a township situation analysis as per the above criteria. Thus of about 200 villages in a township area, villages with health-care facilities would be less than 30 – and even if we include those nearby, this will be about 90 villages under PHC catchment area. The remaining villages would need a village volunteer and sometimes because of high population movement or high malaria density even where the facility exists, a volunteer position is justified. Depending on the township situation analysis, most villages do not have a VHV. In such villages, as per team observations, malaria detection rate is generally poor as well as has subsequent case reporting. Most areas with labour concentration, especially most at-risk workers, do not benefit from trained VHVs in place.

Quarterly coordination meetings with TMO and implementing partners at the state level are in principle addressing issues such as overlapping (more than one volunteer per village of distribution of excessive number of LLINs), as the result of different partners operating in the same township.

The implementation of the iCCM package has not been observed during field visits but midwives are generally aware of diseases other than malaria (especially respiratory diseases) to think about when fever is documented.

VHVs’ supervision by NGOs and subhealth centres (midwives) is generally satisfactory. Supervision of VHVs by malaria supervisors is rather weak. The main problems seem to be the lack of (trained) supervisory staff, the lack of clear protocol (kind of checklist) to be used

41 Outside one hour per 5-km walking distance (geographical access) from the nearest HCF.
during field visits, multiple functions beyond VHV’s supervision and lack of clarity of malaria supervisor role. On the other hand, subcentre midwives and PHS, if in existence, are seriously undertaking supervisory and reporting visits either under NGO or NMCP management, which is encouraging.

Different VHV training packages, assigned roles, support structures and remuneration/incentives across partners have been noticed creating confusion and reflecting the lack of MOHS/programmatic policy pertaining to VHVs complementary to the health system.

Auxiliary midwives with specific curriculum and tasks are also in place in some locations but with no clear policy direction. This is giving room to whatever partner or vertical programmes, to use them in a flexible manner but also without clear rationale and follow-up. The common characteristics they all share are that they are women selected from the community and residents in the community and working on a voluntary basis. Their work is recognized by some forms of incentives per selected tasks for which they are specifically trained. There are no formal qualifications beyond the prerequisite of literacy.

There is also a significant gap between the design and the actual delivery in remuneration/work compensation to VHVs. While the policy design is to give 50 000 kyats for travel support every three months, the actual delivery scheme seems to be as low as 21 000 kyats.

12.2.4 Findings – partner management

Coordination meetings at the township level are contributing to address potential overlaps in terms of volunteer deployment and LLIN distribution to cite a few. It is unclear to which extent such meetings are action-oriented to improve programme effectiveness since there are no meeting minutes with a section on remedial actions and follow-up. Some partners might focus on their own immediate goals rather than programmatic ones.

There is considerable variation on the proposed packages by partners with respect to village health volunteers’ roles and activities. Problems are now limited but could be a major setback when the Myanmar health system has to take over and support the entire VHV network.

The “artemisinin monotherapy replacement programme” implemented by PSI shows positive results when all distributors are brought on board and properly supervised. However, it seems that new (informal) distributors continuously appear on the scene with medicines, including AS monotherapies of unknown origin. There is concern on stocking through social marketing informal providers with a range of diagnostic tests and medicines and thus creating/
empowering old and new unqualified outlets, which can have undesirable/uncontrolled outcomes at the field level.

Information sharing between partners and NMCP has greatly improved but there are still major gaps at the township level – more so about information from private providers.

12.2.5 Findings – financing

There are considerable issues pertaining to financing mechanisms in place. This is reflected through poor absorption of donor funds by facilities/VBDC at the state level – and this could be as low as 60% or even lower. Absorption of funds by international NGOs is rather good and could be above 80%. However, the latter comes with a cost. In the NGO sector, overheads and administrative costs are high and could approach 50% of all expenses even without counting monitoring and supervision activities.

There are also inefficiencies in resource allocation and transaction barriers that lead to a situation where on the ground there are problems due to lack of funds, or underpayments – and at the top there are resources apparently allocated according to the needs. Such problems were observed with cash flows to support monitoring and supervision, VHV payments, store management, etc. This could possibly exist across more budget heads. Those transaction inefficiencies are bound to increase as the number of budget lines in which allocations are made increase as well. In addition, since the Field Finance Assistant (FFA) agent has to be available for direct disbursements for a large number of township level activities and there are only two FFAs in a state, which has over 20 townships, programme implementation, especially in components, such as training, is slowing down considerably. Township activities have now to take place sequentially instead of in parallel, which is not contributing to increase programmatic performance and leads to continuous reprogramming.

The “zero cash flow financing” approach currently in use misses the need for capacity-building in financial management. As the Programme starts encompassing more and more goals, especially in NCDs, the FFA approach will not work even at its current level of inefficiency. There is no substitute to building capacity in townships for financial management, which is central to overall programme management and the clearly stated third objective of the NSP about decentralization to townships.

The parallel cash flow of donor agencies without requiring participation would diminish state and township ownership on key components, such as the VHV programme. Too often such components fade away when donor funds cease and government is required to take over. Such
essential department role, though it may appear as an additional burden now, is essential to ensure sustainability beyond the project period.

Informal quotas on HR recruitment limit the ability of states to fill in vacancies in HR and subsequently without such HR in place, all expenditure and activities slow down. These forms of informal rationing help the Programme to stay within budget lines but they alter the perception of what is essentially an “adequacy of financing” problem into a “programme management problem”. There is a need to be aware and alerted to this.

12.2.6 Findings – engaging with self-administered areas

No such areas were visited, and there are therefore no first-person observations. However, there were conversations with partners and health-care personnel in these states as well as few private citizens and most important health administrators during these visits, which were informative. There were however no conversations with general administrators or security forces.

One understanding is that many of these areas have a long and unbroken tradition of assertion of autonomy and while they are willing to take assistance in some areas related to health care, they are deeply suspicious and limited in what they might accept.

Some partners are able to establish meaningful dialogue – adequate to ensure safe passage provided that they remain limited to their health functions, and that these are clearly stated.

There are process reports of a number of patients tested and cases that were positive, but not enough clarity on which villages were covered and which were not, and on incidence of complications.

12.2.7 Findings – good governance

Many township officers and state officers are already providing a fair amount of leadership. Despite considerable potential, there is limited capacity to boost the leadership guidance at township and state levels.

There is considerable technical human resource available in development partners but most are limited to immediate project goals and therefore the task of strategic thinking, especially at state and township levels, has a huge gap. Even at the national level – regular evaluations,
operational research, uptake of research findings from multiple sources – requires much better facilitation.

Most committees provide for participation of partners but despite the clarity in objective 3 of the NSP there is limited or no citizen or end-of-service users’ representation in the committees, which needs to be made functional.

12.2.8 Findings – entomology unit

VBDC has suffered severe depletion of its human resources, including entomologists/assistant entomologist in states and regions over the last 20 years. Almost 50% of sanction posts for entomological staff are vacant. These vacant posts are mainly at state and regional levels, especially in high-endemic malaria state/regions. The external review malaria programme in 2012 recommended to accelerate recruitment of missing staff.42

Roles and responsibility of entomologists and assistant entomologists and other VBDC staff are not clear in the context of malaria elimination and control of other vector-borne diseases.

Entomological activities are crucial for the VBDC in the context of malaria elimination and prevention of its re-introduction. In addition to entomology and vector control, entomologists require additional knowledge and inputs on malaria elimination interventions, monitoring and reporting.

12.3 Action points

12.3.1 Action points – programme management

- More attention has to be paid to strengthen the capacity of township teams to ensure that control and elimination and prevention of re-introduction programmatic tasks are understood to be properly planned, funded, carried out, monitored and reported.
- The township team being the “de facto” accountable unit for progress made towards malaria elimination, efforts have to be made to create/set up integrated multitasks

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powerful public health township teams, e.g. to detect and respond to any epidemics, including malaria.

12.3.2 Action points – human resources

- Much additional value can be generated by rationalizing the existing workforce and by closing the gap in numbers and skills starting with public health and VBDC township teams in accordance to “what has to be done/achieved” at each level.

- The MOHS and VBDC must appoint qualified public health specialists with good epidemiology skills in each state with the purpose of collecting, interpreting and using field generated information to take stock of progress and guide action. This expertise is not to be for malaria alone but for all vector-borne and epidemic diseases, e.g. to strengthen surveillance and to study the determinants of all diseases of public health importance, including NCDs.  

- One malaria supervisor in each township with clear terms of reference is essential and feasible even at this stage. Where there are identified gaps, one PHS-1 or health assistant, if available, could be trained to play this role.

- Supervisors and inspectors need to be accountable for 7 essential functions as follows:
  
a. On-the-job training for VHVs, PHS, MW to adhere to (and report on) case management and health education guidelines.

b. Training and retraining and supervision/reporting of spraying operations, including maintenance of equipment and pesticide management. The system will increasingly rely more on supervisors than spray men who can recruit, train and deploy temporary staff for spraying operations, including fogging whenever the need for this arises.

c. Verify information flow (completeness and timeliness).

d. Supervise LLINs distribution according to planning and other vector control activity with village committees/headman/VHVs.

e. As a member of the surveillance and response team, initiate outbreak investigation and response at the township level in consultation with the state team.

43 In the context of malaria for example, over 90% of the incidence could come from less than 10% of villages. A systematic understanding of the epidemiological/entomological determinants that make that particular village more vulnerable than another is not even attempted. This should happen as a routine. This is the sort of specialist support that township management needs.
f. Supervise and provide on-the-job training for microscopists as part of the QA/QC national system so that they retain skills despite low exposure to malaria cases.

g. Supervise/maintain as part of supply chain management proper storage of malaria commodities, especially RDTs and medicines, at township hospitals to identify expired drugs and RDTs and avoid stock-outs and over-stocks.

- There is a need for one entomologist in each of the 14 states to plan VBDC interventions and to report on VBDC interventions and studies.
- One well-trained store-keeper is needed exclusively for state stores and one qualified pharmacist in township hospital to ensure that procurement and good SCM practices are in place.
- To post qualified microscopists primarily in referral hospitals. These “malaria” microscopists are laboratory technicians dealing with other diseases but their malaria-related skills are maintained and monitored through a special programme for external QA. The state level VBDC microscopists should preferably be level 1 microscopists accredited by WHO to perform quality assurance tasks. This is therefore not a routine recruitment, but a careful selection to be made for this position.
- The health assistant, public health supervisor, lady health visitor and midwives require regular inputs and encouragement to make malaria elimination a priority. A system of continuing education and support for this cadre would make a big difference.

Myanmar has a unique institution in the way it recruits, trains and deploys public health supervisors and health assistants, and the functioning of all of primary health care in the community rests upon this.

The township medical officer has a leadership role with a wide range of functions. Leadership training is needed as well.

12.3.3 Action Points – VHV

- There is a need to finalize a long-term national vision, strategy and policy pertaining to the curriculum, selection, location and use of community health volunteers beyond malaria to complement what the peripheral health-care facilities are doing or expected to do in the PHC context. 44
- The long-term vision might concentrate roles and tasks of volunteers on counselling, which needs to be supported by proper user-friendly materials and tools touching,

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44 VHV or auxiliary nurses do not have to be perceived as an alternative to well-qualified and trained staff in properly established RHCs and subcentres.
for example, sanitary education, use of oral rehydration solution (ORS), diarrhoea management, nutrition, HIV/AIDS, maternal health and reproductive health, detection and reporting of unusual events, ITNs coverage monitoring, reimpregnation of traditional nets, etc.

- Within the above framework, the following immediate measures could be considered:
  a. Ensure a VHV in all villages that are located more than half or one hour walking distance of any subcentre or RHC.
  b. Assure travel support of 50,000 kyats every 3 months and in addition consider a regular monetary incentive linked to some basic activities and outcomes, such as household visits for health education, disease surveillance, etc.
  c. Establish agreed-upon protocols and criteria for selection of volunteers backed up by integrated training packages/curriculum.
  d. Design career opportunity path of recognized volunteers to become public health services officer or malaria worker and later posted back in their village or its nearest subcentre or RHC.
  e. Clarify remuneration policy across multiple partners supporting VHVs/CHWs.

### 12.3.4 Action points – partner management

- Need to make monthly/quarterly state and township level joint platform coordination meetings with partner agencies more effective. Maintaining minutes, sharing information and agreeing on action points to reach township and state/region level outcomes would be a major step forward.

- Coordination of health information from partners at the township and state level is a must. The partners use the same standard forms but they could also do it better through the carbonless approach so that state and township have not only a copy but are also in a position to consolidate the malaria intelligence by township and further by village. This is not to be seen as merely a reporting issue – but as an essential contribution to integrated programme planning, implementation, monitoring and disease surveillance and response.

- The measures for engagement of qualified general practitioner must be strengthened by enumerating and mapping all those providing health services, including malaria, and monitoring the percentage of general practitioners who are actually engaged. Involving all general practitioners thus would eventually lead to better adherence to protocols and much better quality and extend of disease surveillance (and response).
Beyond qualified general practitioners there is a need for greater clarity/policy on what is required and caution on where and when to engage with informal and traditional providers. When there are robust and proven strategies of establishing primary care centres with an appropriate human resource strategy for the same (public health and malaria worker strategy) and when there is a successful VHV approach in place, there would be no rationale to promote and legitimize new unqualified providers. However, existing providers with local credibility could be weaned of random monotherapies to using the “test, treat and track” approach with recommended standard treatment guidelines.

**12.3.5 Action points – financing**

- There is an urgent need to build capacity of states and townships to spend and account for expenditure within major budget lines. Building capacity requires training, but it is far more than mere training. It is adequacy of accounting staff, establishment of accounting principles and increasingly of computerized accounting mechanisms, the systems of bank accounts and bank signatories and the culture of managing one’s own account. It takes time and effort, but in any modern and effective system, it is a precondition for sustainable success. It is also aligned to the clear policy statement in this regard.
- Recognizing the time it takes to shift from zero cash flow systems to budgetary allocation to states and townships, a beginning should be made with some percentage of expenses being provided in cash to a bank account, and this could be incrementally increased. Salaries of regular staff and major commodities would probably remain on a zero cash basis, at least in a township level, but incrementally the rest would be as an annual budget on limited heads – about 6 to 10 headlines.
- Partner agencies could be financed at the national level directly. But their budget should also show state and township allocations and these allocations should be shared with the respective states and townships for better coordination, integrated planning, outcome measurements and capacity development – and so paving the way for handing over to the complete government ownership.
- Addressing the inadequacy of financing. A major part of funding would have to come from enhanced public health expenditure by the government. In the current national context where health systems development and primary health-care systems, including township hospitals, remain the major strategy, the large part of health expenditure would go to deploying adequately remunerated and skilled human resources, at least more than 50%. Currently all public health expenditure is at about 11 000 kyats per capita per year or about $10 per capita – which is much lower than neighbouring countries and to what is expected from international norms.
12.3.6 Action points – entomology

- Efforts to be made to fill vacant posts with clear assignment tasks, especially assistant entomologists in high-burden states/regions.
- Review and revise post descriptions of entomologists and other related staff. Organize training sessions in the context of programmatic reorientation towards malaria elimination and control of other vector-borne diseases.
- Develop annual plan for entomological activities to support malaria programme/other vector-borne disease interventions.
- To assign full-time assistant entomologist/entomology technicians to maintain anopheline and other mosquito colonies in Yangon. Adequate operating fund has to be allotted for supplies, equipment, field collection, field materials and for maintaining mosquito colonies.
- To establish a communicable diseases/vector-borne disease task force on capacity-building to develop a long-term strategic plan for human resource in entomology and vector control. This plan has to be reviewed and implemented by the Ministry of Health and the Department of Public Health.

12.3.7 Action points – engaging with self-administered areas

- Persist with whatever works for now.
- In the short term, there is scope for intermediaries or interlocutors to be identified who can establish communication lines between both sides for achieving well-defined priorities delivered through partners, such as testing and treating all with fever or distributing LLINs. In stable self-administered areas, there is a strong case for the dialogue to understand and respond positively to what are their perceived health-care priorities and provide the support for this at terms that they understand along with inputs that help them understand disease and its determinants better.
- In the long term, what is required is a dialogue at the level of leadership and communities around saving lives and caring that promotes participatory planning and autonomy in decision-making in peoples’ councils – in line with objective 3 of the NSP. This in turn has the potential to win trust and promote an end-to-conflict environment to establish more peaceful conditions. Overcoming political barriers to health care is primarily a political task, but health-care staff bringing to communities positive assets have the potential to catalyze that movement.
- Whichever way the dialogue takes, the village health volunteer is key to at least the first step; and we may need a more advanced package – more on the lines of a modified
Public Health Service 2 and the Malaria Worker package to achieve the immediate objectives in these areas.

12.3.8 Action points – good governance

- Invest in developing capacity for leadership in policy development and planning – with help from international technical agencies, such as WHO. This is required at all three levels (township, state and national).
- Set up a GVT-supported but autonomous institutions of excellence for health policy and health systems strengthening. That institution will contribute first to bridge gaps between research and academic institutions and second from a public health policy viewpoint, will contribute to increase the technical and managerial capacity required at the national level.45
- For the Department of Public Health to build leadership capacity – both technically and programmatically – in collaboration with international agencies.
- To increase opportunities for more horizontal accountability – by revitalizing committee structures, providing for more citizen representation and orienting and enabling the committees to be a vehicle of consultative policy-making and accountability in implementation.
- To improve vertical accountability by using and regularly reporting on HMIS-based indicators to properly guide programme management and policy decisions.
- To roll out via conferences and events a strong advocacy effort by the Ministry of Health/programme leaders in synergy with partners to mobilize resources.
- To increase public health expenditure (percentage of gross domestic product (GDP) and per capita). A policy statement on elimination of malaria as part of a “national health policy towards health for all” would be another important good governance measure.

45 A similar approach is used in many countries, such as HiTAP, HHA in Thailand, NHSRC/NIHF/NCD in India or NICE in UK or NIH/CDC in USA. Such an organization could coordinate evaluations, operational research, technology assessment, cost-effectiveness studies and act as a “policy think-tank”.

13. Technical collaboration

13.1 Strategy – technical cooperation

Table 11. Partners engaged in malaria control in Myanmar

<table>
<thead>
<tr>
<th>Organization</th>
<th>Roles and responsibilities</th>
<th>PR/ Funding agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC</td>
<td>Case management and prevention, LLIN distribution, Mobile clinics</td>
<td>GF-RAI</td>
</tr>
<tr>
<td>Burnet Institute</td>
<td>Community-based case management and prevention activities</td>
<td>3MDG</td>
</tr>
<tr>
<td>Cesvi</td>
<td>Case management and prevention by VHV, LLIN distribution, Advocacy and social mobilization</td>
<td>SC-PR</td>
</tr>
<tr>
<td>CHAI</td>
<td>TA</td>
<td></td>
</tr>
<tr>
<td>CPI</td>
<td>Community-based case management and prevention activities</td>
<td>3MDG, RAI (ICC)</td>
</tr>
<tr>
<td>HPA</td>
<td>Case management and prevention in special regions of Shan and Kachin</td>
<td>SC-PR</td>
</tr>
<tr>
<td>IOM</td>
<td>Case management and prevention, LLIN distribution, Mobile clinics, Day 3 Surveillance, Migrant screening points and workplace interventions</td>
<td>SC-PR</td>
</tr>
<tr>
<td>JICA</td>
<td>Case management and prevention, Survey, Capacity-building, Technical support, Entomology</td>
<td>JICA</td>
</tr>
<tr>
<td>JSI</td>
<td>Procurement and logistics support</td>
<td>PMI/USAID</td>
</tr>
<tr>
<td>MORU</td>
<td>Economic-epidemiological modelling to support the containment of artemisinin resistance in the MARC regions</td>
<td>3MDG</td>
</tr>
<tr>
<td>Malaria Consortium</td>
<td>Myanmar Malaria Indicator Survey 2015</td>
<td>3MDG</td>
</tr>
<tr>
<td>Malteser Intl.</td>
<td>Case management and prevention, LLIN distribution and mobile clinics (in Northern Rakhine State)</td>
<td>SC-PR</td>
</tr>
<tr>
<td>WHO</td>
<td>Technical support</td>
<td></td>
</tr>
<tr>
<td>MAM</td>
<td>Community-based case management and prevention activities</td>
<td>3MDG, GF-RAI, RAI (ICC)</td>
</tr>
<tr>
<td>MCC</td>
<td>Case management and prevention, LLIN distribution</td>
<td>GF-NFM</td>
</tr>
<tr>
<td>MHAA</td>
<td>Case management and prevention, LLIN distribution</td>
<td>3MDG</td>
</tr>
<tr>
<td>MMA</td>
<td>Case management and prevention, LLIN distribution, BCC, Mobile clinics</td>
<td>GF-NFM, GF-RAI</td>
</tr>
<tr>
<td>MRCS</td>
<td>Case management and prevention, LLIN distribution</td>
<td>GF-NFM</td>
</tr>
<tr>
<td>Organization</td>
<td>Roles and responsibilities</td>
<td>PR/ Funding agency</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>PSI</td>
<td>Social marketing of RDTs and antimalarial drugs, Prevention and case management through GP and VHVs, LLIN distribution, Mobile clinics</td>
<td>SC-PR, 3MDG</td>
</tr>
<tr>
<td>Save the Children</td>
<td>Case management and prevention, LLIN distribution</td>
<td>SC-PR, GF-RAI</td>
</tr>
<tr>
<td>SMRU</td>
<td>Operational research and others</td>
<td>RAI (ICC)</td>
</tr>
<tr>
<td>USP</td>
<td>Quality monitoring and related TA</td>
<td>PMI/USAID</td>
</tr>
<tr>
<td>URC-CAP Malaria</td>
<td>Case management and prevention, LLIN distribution, Mobile clinics, Microscopist training</td>
<td>PMI/USAID</td>
</tr>
<tr>
<td>World Concern</td>
<td>Community-based case management and prevention activities</td>
<td>3MDG</td>
</tr>
<tr>
<td>World Vision Myanmar</td>
<td>Case management and prevention, DOT activity, BCC</td>
<td>SC-PR</td>
</tr>
</tbody>
</table>

Source: VBDC 2015

13.2 Findings – Technical cooperation

Numerous partners from various backgrounds are operating in Myanmar. They are contributing to scale up and monitor interventions at all levels and geographical areas, including self-administered areas, conflict-affected zones, hard-to-reach locations and border areas. They are piloting innovative approaches, which are not always well documented or consolidated at a higher decisional level, to be inserted in NSP and further scaled up. This also applies to research activities led by MDR, which have to be better connected to the MOHS/VBDC agenda. The GFTAM and PMI are the main funding sources of implementing partners, including WHO and VBDC.

In such a complex environment, increasing coordination and exchange of information matters. UNAIDS is taking leadership to coordinate donors and implementers expected to perform health activities (malaria included) in Myanmar spear-headed by the Minister of Health chairing the board. It is anticipated that the Ministry of Health will take over that responsibility from 2010 onwards. This is a huge challenge for the new government, which has still not enough (public) skilled staff at all health-care levels to perform expected tasks, especially when envisioning a disease-elimination goal, such as malaria elimination in the near future.

Coordination includes also working alongside with the important private sector workforce and security forces to engage them better into mandatory elimination interventions and prevention of re-introduction activities, mainly surveillance.
WHO, as immediate partner to the MOHS, will remain under pressure to contribute to sound strategies and policies but also capacity-building of the national workforce.

### 13.3 Action points – technical cooperation

- WHO to continue (with partners) to strengthen the overall surveillance and response/data management system and increase the capacity of nationals to perform accurate data analysis and reporting.

- INGOs/NGOs from their field experiences to identify documented/evidence-based best practices and options to address remaining programmatic challenges, e.g. targeting MMPs and most vulnerable populations. Defining “intervention packages” suitable for certain situations and people at risk is a must.

- WHO and partners to collaborate with the Programme to finalize essential guidelines and training materials based on global and regional WHO guidelines.

- WHO with VBDC to identify essential TA needed and to provide technical support to NMCP for malaria elimination in Myanmar.
14. Research

14.1 Strategy – general research

The malaria control strategy pertaining to operational and basic malaria research in Myanmar has been guided by the Regional Strategy for Malaria Control in the WHO Region for South-East Asia (WHO/SEARO 2005) and the WHO Global Malaria Strategy to scientifically contribute to the following technical elements:

- Revamping surveillance.
- Strengthening planning and management.
- 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.
- Establishing and sustaining broader partnerships with other disciplines, sectors and organizations.
- Developing specific strategies to tackle *Plasmodium vivax* malaria.
- Increasing coverage and proper use of insecticide-treated nets (ITNs) as a part of integrated vector management (IVM).

The Department of Medical Research has been the main centre for malaria research; research is conducted in collaboration with the national malaria control programme, different levels of public health services, Myanmar Medical Association and 5 medical universities.

Malaria research activities are being carried out in Myanmar both in public and private institutions touching different disciplines, including diagnosis, case management, drug resistance, operational and health systems, entomology, severe and complicated malaria.

14.1.1 Strategy – case management

Section 8.4.6 of the NSP 2016 states evidence-based planning, research and policy development among its strategies. Research will be further strengthened to inform policy development. The Malaria TSG, comprised of national and international experts, is convened by MOHS in collaboration of WHO to recommend/revise policy to address key technical issues on malaria. The TSG will develop a research agenda responsive to the needs of the Programme. Some of the key issues to be addressed are listed below, with 4 topics related to case management:
• 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.
• Drug resistance monitoring (including Pv) institutionalized in sentinel sites.
• Effective strategies for eliminating fake and counterfeit medicines.
• Mosquito behaviour change, insecticide resistance, risk of importation of vectors.
• Studies on alternative vector control that reduces reliance on insecticides.
• Assessment of novel tools, such as suppositories, Pv rapid tests, insecticide-treated hammock-nets.
• Economics of intersectoral action for prevention and control, e.g. in plantations and coastal areas.

14.1.2 Strategy – entomology research

It is important to assess the continued effectiveness of vector control measures; monitoring of vectors susceptibility to insecticides, especially pyrethroids, is important. The Programme recognizes that information as being crucial for decision-making to select insecticides for vector control and individual protection.

Resistance to DDT has been reported in *An. annularis* (Rakhine State) and tolerance to DDT was observed in *An. aconitus*. *An. hyrcanus* was documented resistant to pyrethroids and tolerant to malathion and DDT. *An. sinensis* was reported resistant to pyrethroids. Results from studies of vector resistance to insecticides during the last 5 years are summarized in Table 12. In addition to the VBDC data, resistance monitoring was carried out by the CAP-Malaria Project in Tainintharyi and Kayin states on *An. maculatus*, *An. hyrcanus*, *An. aconitus* and *An. kochi*. No vector resistance was noticed to deltamethrin and permethrin.

14.2 Findings – research

Over the 2001-2011 period, in public academic institutions only, 91 malaria studies have been conducted on the following topics: therapeutic efficacy, biochemistry, immunology and clinical studies, malaria diagnosis (n=40), drug resistance and molecular markers, pharmacokinetics
and traditional medicine (n=19), health economics and social sciences (n=16) and malaria vectors (n=10). 46

Many research projects have started later than planned or even failed to start due to several factors, such as delayed proposal submission and feedback timing, delayed funding and lengthy administrative procedures. Reporting of research findings to all levels of the Control Programme was generally made as well as dissemination of results to the respective related departments, authorities and communities mainly through the annual health research congress, scientific seminars, workshops and public health talks. There are some drawbacks, such as inability to attend such meetings by the key partners because of their busy schedule, limitation in distribution of proceeding, lack of free access to research websites. Many projects actually end up with poor results, insufficient information sharing and so minimum utilization of main findings.

Apart from the routine malarriometric tools, molecular studies – such as Assessment of Artemisinin Resistance Markers, Polymorphisms in the K13 Propeller, and a Multidrug-Resistance Gene in the Eastern and Western Border Areas of Myanmar – are being explored and observed. A new surveillance tool for malaria elimination in Myanmar also has been initiated in 2015.

14.2.1 Findings – case management

Myanmar has excellent academicians and researchers as shown by past publications in the last four decades. Opportunities to disseminate useful results from operational research (OR) are given through the Annual Health Congress done in January every year, which needs active attendance by national and state/regional Programme staff. VBDC can actively collaborate with academic/research institutions and vice versa, as more OR with evidence-based results are needed to drive policy decisions.

For G6PD deficiency, DMR conducted in the last 8 years studies in Kayah, Rakhine and Chin states. Mild G6PD deficiency ranged from 0.44% to 3.97%, and severe deficiency from 0 to 1.98%, determined by cytochemical staining method (semi-quantitative method). More tests are planned in the future by DMR with other ethnic populations across the country.

14.2.2 Findings – entomology

Available information on vector resistance is based on old records and from a few studies in previous years. No report of resistance was found pertaining to primary vectors (i.e. An. minimus and An. dirus) to all 3 groups of insecticides (organochlorine, organophosphate and pyrethroids). Pyrethroids are including deltamethrin, permethrin and ethofenprox. Vector resistance to insecticides does not seem to be a major problem in Myanmar. However, alongside with the universal coverage of LLINs and large use of agricultural pesticides, there may be considerable insecticide pressure that needs to be regularly monitored at least on primary vectors. This is not done.

Table 12. Susceptibility of primary malaria vectors and other Anopheline species to different insecticides in Myanmar, 2011–2015

<table>
<thead>
<tr>
<th>Species</th>
<th>Insecticide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Organophosphate (malathion)</td>
</tr>
<tr>
<td>An. minimus</td>
<td>-</td>
</tr>
<tr>
<td>An. dirus</td>
<td>S</td>
</tr>
<tr>
<td>An. maculatus</td>
<td>S</td>
</tr>
<tr>
<td>An. philippinensis</td>
<td>-</td>
</tr>
<tr>
<td>An. aconitus</td>
<td>S</td>
</tr>
<tr>
<td>An. sundaicus</td>
<td>-</td>
</tr>
<tr>
<td>An. annularis</td>
<td>S</td>
</tr>
<tr>
<td>An. sinensis</td>
<td>S</td>
</tr>
<tr>
<td>An. hyrcanus</td>
<td>T</td>
</tr>
</tbody>
</table>

Note: S= susceptible, T= tolerant; R= resistant Source: VBDC, 2014.

14.3 Action points – research

- For DMR alongside with interested national and international institutions but also implementing partners and in close collaboration with VBDC to develop a 5-year strategic and achievable research agenda encompassing all malaria (elimination) components to respond to unanswered technical or operational questions (gaps) linked to malaria elimination and prevention of its re-introduction.
- VBDC and DMR to submit that agreed-upon research agenda to interested national/international institutions and potential donors.
• To create an enabling "research" environment by encouraging IPs, NGOs and research/academic institutions to submit research proposals in line with the research agenda and further assisting researchers to develop sound protocol "ethically acceptable".

• To strengthen information sharing (dissemination and utilization) of valid and credible research findings to the academic personnel, control personnel as well as communities. An open access "research" website managed by DMR could allow interested institutions/researchers to access topics of interest, submission procedures, ethical regulations, donors' interest and potential funding sources, informal results and publications, Q/A forum, etc.

• To clarify the qPCR methods to be used and rationale for the Programme to use PCR in the context of MDR and malaria elimination.

• To select suitable sites countrywide to collect sample of mosquito vectors to be tested against currently used insecticides.

• To review and revise entomological monitoring protocols to collect enough information to monitor vector resistance to public health insecticides. Results to be shared with concerned authorities, including stakeholders.

• Mapping of vectors susceptible/resistance to insecticides to be annually updated.

• To better stratify malaria at township level, as part of the country planning process, attempt should be made as operational research to link vector sibling species and associated ecological/topographical settlings in selected townships.

• Improve collaboration and coordination with universities, other training institutions, non-health departments, medical/health professional societies, INGOs and private sectors to select and conduct operational research of relevance for the Programme (case management options targeting MMPs should be a priority research activity in the research agenda).

• G6PD deficiency mapping and G6PD tests to be performed where feasible pilot studies on primaquine use, adherence and monitoring of SAE – pharmacovigilance – (PQ daily x 14 days vs weekly x 8 weeks).

• Evaluation of BCC/IEC activities and tools to ensure that these address cultural and language sensitivities of the target populations, and to obtain level of satisfaction for further refinement.
15. Main action points

Epidemiology and stratification

- Scaled-up interventions, especially at grass root level, are drastically impacting on the malaria situation in Myanmar. Those results need to be properly documented with all partners involved and disseminated nationally and regionally (e.g. as part of advocacy documents).
- Malaria interventions by (village) API need programmatic readjustment as compared to the previous NSP to match pre-elimination, elimination and prevention of re-introduction requirements.
- Village stratification evolves on a yearly basis with malaria data analysis by village to be ideally managed by township health teams. The list of villages by API has to be annually updated with proper MIM47 ID.
- Contribution to more solid village-oriented epidemiological intelligence has to be strengthened by involving all private providers (from private doctors to shop keepers) and data from defense health services.
- The carbonless form needs further adjustments to reflect: (a) village population (which is annually updated by midwives), (b) travel history during the last month (Y/N), (c) occupation and (d) age (not age groups). All entries to be coded.
- The capacity (number and skills) of state and township public health teams to analyse data generated by public health facilities and volunteers as well as data obtained from annual (community and HCF) surveys has to be strengthened. Timely and to-the-point strategic feedback (from central and state levels) has to be provided (in a timely basis) to township team and peripheral health staff.

Case management at the periphery (communities and health-care facilities). Access to health care

- Maintain and strengthen regular supervision of and reporting from volunteers and peripheral health workers.
- Maintain/strengthen the capacity of peripheral health staff to “test, treat track and report” malaria patients.

47 Myanmar Information Management Unit.
• Promote and support VHVs through capacity-building (at midwife curriculum level and further through refreshing courses in the field) on integrated case management of childhood/adult illnesses to address non-malaria fevers.
• Pharmacovigilance mechanisms to be put in place in public referral hospitals and public health-care facilities to cross-checked potential serious adverse events due to primaquine use.
• Map G6PD deficiency in selected locations/tribal areas.
• Improve access to malaria services and information to migrant workers engaged in private companies, industries, etc. This could be done by making available or strengthening health-care services in industrial compounds or by strengthening existing health-care services close by industrial, mining or farming compounds in collaboration with private owners.

Case management in referral hospitals (State and Townships)

• In the context of malaria elimination and prevention of its re-introduction, skills of clinicians and nurses in malaria case management in public and private hospitals have to be maintained up to standard. Regular training sessions and/or web-based communication mechanisms supported by the programme/MOHS or continuing medical education have to be set up and maintained with adequate feedback.
• Communication between hospital and VBD staff has to be strengthened at least in the following domains: exchange of malaria data, QA/QC of malaria diagnosis and reporting and capacity-building towards malaria elimination.
• EQA system has to be set up for malaria microscopy (including in hospital laboratories under the Department of Medical Services) and combo RDTs.
• Develop harmonized training modules for malaria microscopy and QA/QC procedures to be used across all training institutions and partners (NHL, DMR, VBDC, INGOs, etc.).
• Establish a malaria reference laboratory (i.e. Gyogong VBDC lab in Yangon) to:
  – Support QA/QC of malaria microscopy and RDT
  – Support supervision and monitoring
  – Support the development of a standardized training curriculum and SOPs for microscopy and RDT
  – Address discordant results through molecular tests

48 Regular testing of the quality and performance of RDTs (largely used in Myanmar by all partners) is crucial. Majority of malaria data rely on combo RDT results even in hospitals. SOPs for quality testing and follow up somewhere too complex to be properly implemented have to be revisited.
- Maintain and repair microscopes
- Organize regular (re) training sessions targeting lab staff possibly through internet as well (e.g. camera built microscopes)

- Ensure a long-term HR capacity strengthening and sustainability plan for this reference lab.

**P. falciparum resistance monitoring, follow up and treatment**

- Continue therapeutic efficacy studies with better involvement of state VBDC; disseminate updated results at local level.
- **Pilot study:** in suspected AS resistant areas, consider a Day 28 follow-up of all *P. falciparum* patients by RDT and blood film (starting in Mon State). If *P. falciparum* positive at Day 28, provide with Q7T7/D7 to patients – to be admitted – carrying potential resistant parasites.

**Vector control and individual protection**

- The entomological unit in VBDC needs to be strengthened to perform strategic tasks, such as: providing technical advice to township teams, mapping of essential vector control and transmission attributes (insecticide resistance, vector behaviour, parous or infection rates), contributing to determine receptivity (especially in villages where malaria persists in spite of intensive control operations), carrying out entomological surveys in all eco zones and fine tuning of SOPs to eliminate active foci and prevent re-introduction of transmission.
- To strengthen VC (and IRS/fogging/larviciding operations, etc.) as part of strategic VBD – and malaria control – interventions. The VBD central team needs to revisit roles, tasks and functions (and equipment/materials) of VBDC staff at all levels to ensure that specific and quality VC interventions (such as vector mapping, vector resistance to pesticides, epidemic response or D3 focal spraying) are properly and timely carried out and carefully reported.
- Develop annual plan for entomological activities to orient/support malaria and other VBD programme interventions.
- To establish national policy and guidelines for the use of pesticides in the context of public health (and not only agriculture).
- In the context of the large coverage by and large use of traditional nets locally marketed, consider again the impregnation and reimpregnation of existing traditional nets, especially in endemic villages (API>1/1000). Guideline and SOPs if already in existence to be fine-tuned accordingly.
• To continue to promote the use of LLINs targeting high endemic villages (API >5/1000) but also targeting individual or family (cluster) forest workers by providing extra LLINs on top of existing ones to be used in such specific at-risk situations.

• To collaborate with interested partners (for ex JICA) to consolidate vector intelligence.

**Surveillance and Response, M&E**

• Surveillance mechanisms are on track to further capture and regularly update village-based malaria information. Those mechanisms need to be strengthened at township level (managerial public health unit) but also at central level expected to take full surveillance and response leadership (with the full set up of one single malaria database from all sources) from 2020 onwards.

• Suspect patients tested negative do not have to be line listed except if there is a valuable reason to do this. The database should only include the number of total suspected patients who are tested with further line listing details of relevance from each positive patient.

• Malaria has to be progressively merged into existing emergency mechanisms and multitasks detection and response teams with other epidemic prone diseases. Strengthening VBDC response teams accordingly.

• Existing malaria epidemic thresholds have to be revisited according to evolving API per village.

• M&E surveys results have to be better analysed to measure progress against targets and to fine tune VBD strategies and policies accordingly.

• Malaria indicators to be finalized in the context of malaria control and elimination and prevention of re-introduction objectives and targets (as per WHO guidelines).

• Malaria to be a notifiable disease.

**PROCUREMENT, SUPPLY CHAIN MANAGEMENT, QUALITY MEDICINES, PHARMACOVIGILANCE**

• The ban on import, manufacture, export, registration, re-registration, distribution and sale of artemisinin monotherapy needs to be reinforced by the DFDA. Such ban has to be clearly communicated from the central DFDA to importers, manufacturers, exporters, wholesalers/distributors, pharmacies and drug sellers. The FDA has to strengthen its regulatory action to ensure complete phase-out of monotherapy.

• Stock management at state and township levels has to be improved through selection of dedicated staff for supply management. These should be provided with training and enabling factors, such as recognition and increased staff responsibility, in order to
improve motivation. SOPs related to all aspects of supply chain management established by UNOPS have to be disseminated at all levels. Supervision and monitoring have to be conducted on regular basis to ensure that essential data are recorded according to SOPs.

- Regular and frequent training of staff involved in supply chain management has to be conducted as well as supervision and monitoring visits to ensure correct data entries.
- Post-marketing surveillance of antimalarial drugs has to be strengthened through filling vacancies at state DFDA and through provision of additional funds for sampling and screening (to be included in the Concept Note for the next GFATM grant).
- The list of antimalarials contained in the National Essential Medicines List 2010 has to be aligned with antimalarials in the Malaria Treatment Guidelines. Artesunate and Artemether monotherapy products must be removed and Artemisinin combination therapy products need to be included.
- Forecasting of antimalarials has to be based on number of cases and not so much on past consumption considering the rapid decline in cases. However, additional stock catering for seasonal variations and possible outbreaks has to be available, possibly at central or state level. Township VBBCDs need to provide UNOPS with compiled data based on the Malaria Case Register (carbonless form) for improved forecasting.
- A system for collection and proper disposal of expired antimalarials has to be established.
- State and township VBBCD offices have to be provided with vehicle/trucks for collection of malaria commodities at the higher level. The vehicle needs not be primarily dedicated for distribution but could be used as well for supervision and monitoring activities. Alternatively, deliveries through courier companies have to be explored.
- Activities and budget for strengthening of pharmacovigilance have to be in the Concept Note for the next GFATM grant.

**Advocacy**

- The programme has to document its achievements and challenges to construct appealing advocacy documents and presentations to be used for local and high-level decision-makers and international development agencies.
- Endorsing the forthcoming revised National Malaria Strategy towards malaria elimination is the next task of the working committee to be further endorsed by the Malaria Elimination Committee. One of the functions of those committees is to monitor elimination achievements against targets and to yearly report to East Asia Summits and APLMA.
IEC-BCC

- The Health Education Unit, which is under the Department of Public Health, has to develop a clear and straightforward IEC/BCC strategy adjusted to local needs and to use modern tools in connection with communication technology channels and personal devices. NMCP and Partners should work together with Research Institutes to modify and produce user-friendly IEC/BCC materials to be used by health and non-health staff/influential persons (include sound/song/VDO/movie, pictograms, etc.) to reach the most at risk and generally uneducated population.

- The private sector (companies/industries, etc.) might provide with some budget for IEC/BCC materials (and other malaria services) as part of their corporate social responsibility or/and allow to use their services/communication technologies and channels free of charge (such as in Cambodia where a mobile phone company is supporting free SMS sent by VHVs).

- Knowledge Management from Implementers have to be better documented and disseminated and for some of them being possibly incorporated into strategies and policies.

- IEC/BCC materials, tools and strategies have to encompass prompt diagnosis and treatment (and adherence to treatment), individual protection in different situations, IRS where and when needed, active surveillance and epidemic control through “suitable” tools targeting the most at-risk people in Myanmar, such as internal and external migrants, soldiers, forest-goers, IDPs, remote ethnic people, etc.

- The budget allocated to IEC/BCC (currently less than 2%) and advocacy operations has to be increased accordingly.

Human Resources for Public Health

- The programme must appoint qualified public health specialists with good epidemiological skills in each State to carefully analyse/interpret and use collected information, e.g. to revisit strategies and guide health and malaria action.

- An on-the-job support and continuing education strategy has to ensure that HAs, LHVVs, PHS and MWs in rural health centres and pharmacists and laboratory technicians in hospitals are not only retaining their skills but also are accessing new tools and capacities to implement and monitor VBD programmatic activities.

- The malaria inspector and supervisor and other VBD staff have to be multitasks oriented to be able to perform “on-the-job” training supervisions and accurate reporting. This might include organizing indoor/outdoor spraying operations, verifying information flow, ensuring appropriate case management, planning LLINs distribution and impregnation of nets and participating in outbreak investigations and response.
A long-term vision statement and policy and strategy has to be set up pertaining to roles, functions and tasks of community health volunteers expected to complement (and not substitutes) the existing health-care workforce. The national policy has also to lay down the basic principles on which selection, activities, training curriculum, incentives and performance assessment are based.

Finance

• There is an urgent need to build the managerial capacity of central, states and township health team pertaining to budget development, allocation or resources, disbursement, expenditures and overall financial reporting.

• Partner agencies could be financed at the national level directly but their budget has also to show state and township allocations, which are shared with the respective state and township teams. This will pave the way for handing over all managerial tasks to central and state staff increasing ownership and accountability.

• The national policy has to specify minimum levels of public health expenditure in relationship to GDP and total budgets and within such a framework to ensure that malaria elimination interventions and HR are adequately budgeted.

Governance

• Bottom-up planning (rather than up-to-bottom) to be progressively set-up starting in RAI-supported townships advancing to \( P. falciparum \) elimination.

• Build leadership capacity at township, state and national level. In the context of empowering and integrating planning at the township level, leadership capacity at this level needs urgent attention.

• Build a dialog with communities and local representatives in self-administered areas. Such a dialogue helps them to understand their vulnerability to malaria and also assures them of access to health services responsive to their needs.

• Continue to engage with partners, providing them the space required to reach to vulnerable populations, to innovate new approaches and using them to build capacity in public health systems for long-term sustainability.

• Establish a government-supported but autonomous institution of excellence for health policy and health systems strengthening. That “public health” institution could be seen as a bridge between research and academic institutions on the one hand and policy and implementation agencies on the other hand to provide the technical capacity that is required at the national level.
• Build horizontal accountability, by revitalizing committee structures, providing for more citizen representation and orienting/enabling the committees to be a vehicle of consultative policy-making and accountability in implementation.

• Improve vertical accountability by establishing indicator-based HMIS, which has process, output and outcome indicators and using this to review progress internally and in the coordination committees with partner agencies and to inform decision-making.

• Develop a policy statement on elimination of malaria as part of the national health policy towards health for all, and a commitment to reach a level of public health expenditure needed to implement such a policy is another important good governance measure.

Research

• DMR alongside with interested national and international institutions but also implementing partners and in close collaboration with VBDC to develop a 5-year strategic and doable research agenda encompassing all malaria (elimination) components to respond to unanswered technical or operational questions (gaps) linked to malaria elimination and prevention of its re-introduction.

• VBDC and DMR to submit agreed-upon research agenda to interested national/international institutions and potential donors.

• To create an enabling “research” environment by encouraging international partners, NGOs and research/academic institutions to submit research proposals in line with the research agenda and further assisting researchers to develop sound protocol that is “ethically acceptable”.

• To strengthen information sharing (dissemination and utilization) of valid and credible research findings to the academic personnel, control personnel as well as communities. An open access “research” website managed by DMR could allow interested institutions/researchers to access topics of interest, submission procedures, ethical regulations, donors’ interest and potential funding sources, informal results and publications, Q/A forum, etc.

• Clarify the qPCR methods to be used and rationale for the programme to use PCR in the context of multidrug resistance and malaria elimination.

• Innovative measures, tools or approaches to be piloted to address outdoor transmission or to improve personal protection targeting workers in at-risk locations (forest, forest-fringe, etc.). Positive experiences with INGOs or local people to be consolidated and scaled up.
Operational research protocol to be developed and implemented to evaluate the impact of vector control measures, especially LLINs.

Carry out a pilot study to explore the possibility of engaging villagers for mosquito collection (adult and larval surveys) to know vector distribution and mapping in selected states/regions and townships.

Carry out a pilot study to apply remote sensing and GIS technologies for micro-stratification of endemic areas in selected townships.

Cross-border interventions

Joint budgeted action plans to be agreed upon between border townships, including exchange of a few but essential malaria data.

Township interventions and data should be available and known at least by both parties as well as migratory routes and results from the numerous screening points on border. Website(s) to be maintained with all suitable information available (activities and results) by partners operating in border provinces (SMRU website as an example).

Best practices of relevance if any from border activities carried out so far have to be documented and discussed for potential scaling up.

Technical collaboration

WHO to continue (with partners) to strengthen the overall surveillance and response/data management system and increase the capacity of nationals to perform accurate and regular data analysis and reporting.

INGOs/NGOs from their field experiences to identify documented/evidence-based best practices and options to address remaining programmatic challenges, e.g. targeting MMPs and most vulnerable populations. Defining "intervention packages" suitable for certain situations and people at risk is a must.

WHO and partners to collaborate with the programme to finalize essential guidelines and training materials based on global and regional WHO guidelines.

WHO with VBDC to identify essential TA needed and provide technical support to NMCP for malaria elimination in Myanmar.
Annex 1. List of reviewers

External Reviewers

1. Dr Charles Delacollette, Team Leader, Independent Public Health Consultant, Belgium
   Former Coordinator WHO-Mekong Malaria Programme
2. Professor Abul Faiz, Case Management, Professor of Medicine
   Retired from Sir Salimullah Medical College, Mitford, Dhaka, Bangladesh
3. Dr Chusak Prasittisuk, Vector Control Specialist, Thailand
   Former Coordinator, Communicable Diseases, WHO/SEARO
4. Professor Sundararaman Thiagarajan, Health systems, HR and Financing Specialist, India
   Professor and Dean, School of Health Systems Studies, Tata Institute of Social Sciences (TISS)
5. Mr Truls Ericksen, PSM Specialist, Independent Consultant, Norway
   Former Regional Adviser in Pharmaceuticals, WHO/WPRO, Philippines
6. Dr Wichai Satimai, IEC/BCC Specialist, Thailand
   Former Director of Bureau of Vector Borne Disease

National Reviewer

1. Dr Thar Tun Kyaw, National Reviewer, Myanmar
2. Dr Ye Htut, National Reviewer, Myanmar

WHO Secretariat

1. Dr Badri Thapa, Scientist (Malaria Control), WHO Country Office for Myanmar, Myanmar
2. Dr Mushfiqur Rahman, Technical Officer, WHO Country Office for Myanmar, Myanmar
3. Dr Eva Maria Christophel, Regional Malaria Adviser, WHO/SEARO
4. Dr Dorina Bustos, Therapeutic Efficacy Study Manager, WHO Emergency Response to Artimisinin Resistance, WHO, Thailand
5. Dr Myo Myint Naing, National Professional Officer, WHO Country Office for Myanmar, Myanmar
6. Dr Tet Toe Tun, National Professional Officer, WCO WHO Country Office for Myanmar, Myanmar
7. Dr Win Htike, National Professional Officer, WHO Country Office for Myanmar, Myanmar
### Annex 2. Reviewers per thematic area

<table>
<thead>
<tr>
<th>Thematic Areas Reviewed</th>
<th>Reviewers</th>
<th>Technical Secretariat</th>
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<tbody>
<tr>
<td>1. Programme management: policies, guidelines, human resource, supervision, partnerships and coordination, malaria financing</td>
<td>Professor Sundararaman Thiagarajan</td>
<td>Dr Eva Maria Christophel</td>
</tr>
<tr>
<td>2. Epidemiology, epidemic preparedness and response, surveillance, monitoring and evaluation (including stratification)</td>
<td>Dr Charles Delacollette</td>
<td>Dr Badri Thapa</td>
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<tr>
<td>3. Entomology and vector control</td>
<td>Dr Chusak Prasittisuk</td>
<td>Dr Mushfiqur Rahman</td>
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<td>4. Diagnosis and treatment (<em>P. falciparum</em>, <em>P. vivax</em> and mixed and non-malaria fever)</td>
<td>Professor Abul Faiz</td>
<td>Dr Dorina Bustos</td>
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<tr>
<td>5. Procurement and supply chain management</td>
<td>Mr Truls Ericksen</td>
<td>Dr Myo Myint Naing</td>
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<tr>
<td>6. Advocacy, partnership (public-private and public-public) and technical collaboration</td>
<td>Dr Wichai Satimai</td>
<td>Dr Tet Toe Tun Dr Win Htike</td>
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Annex 3. Health facility and organizations visited

<table>
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<tr>
<th>Team</th>
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<th>State</th>
<th>Places and organizations visited</th>
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<tbody>
<tr>
<td>Team A</td>
<td>Dr Charles Delacollete</td>
<td>Kachin</td>
<td>Public Health Department, Kachin State VBDC Office, Myitkyina General Hospital, Private clinic – Myanmar Medical Association, Aung Myin Thar Station Hospital, Tang Hpre Screening Point, Malaria Ips – Medical Action Myanmar, Malaria Ips – Health Poverty Action</td>
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<tr>
<td>Team B</td>
<td>Mr Truls Erikson</td>
<td>Kayah</td>
<td>State Public Health Office, Loikaw, State VBDC Office Loikaw, Kayah State Hospital, Loikaw, Hpruso Township Hospital and Township VBDC, Kyal Poe Gyi RHC, Hpruso Township, Malaria Ips – Medical Action Myanmar, Malaria Ips – Health Poverty Action</td>
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<tr>
<td>Team C</td>
<td>Dr M Abul Faiz</td>
<td>Rakhine</td>
<td>State Public Health Office, State VBDC Office, Sittwe General Hospital, Kyun Daung RHC, Ponnagyun Township, Township Hospital, Kyauktaw Township, Myanmar Health Assistant Association, Kyauktaw</td>
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<tr>
<td>Team D</td>
<td>Dr Sundararaman</td>
<td>Northern Shan</td>
<td>Associated State Health Office (Lashio), Lashio VBDC Office, Lashio General Hospital, Mongyai Township Hospital, Township Medical Officer’s Office, Lote Khut Village, Lote Khut Village S/C, Hoya Village</td>
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<td>Team A-D</td>
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To Myanmar’s great credit, as this external evaluation documents, the country has achieved the malaria-specific target of the Millennium Development Goals (MDG 6 target C), which called for halting and beginning to reverse the incidence of malaria by 2015. Malaria morbidity and mortality rates were, respectively, 53% and 91% lower in 2015 than in 2012, significantly surpassing the reductions aimed for in MDG target 6c.

This report presents the external evaluation of the National Malaria Control Programme of Myanmar, conducted from 6th to 19th March 2016. The methodology of the evaluation, its findings and recommendations are presented here, along with a detailed analysis of the malaria programme and its evolution.

This material will be of lasting use, both for strategic planning and for improving programme implementation, as Myanmar focuses its efforts on the goal of eliminating malaria by 2030.