EVALUATION OF MALARIA RISK MICRO-STRATIFICATION STRATEGY

UNICEF Myanmar 2010

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TABLE OF CONTENTS

ACRONYMS

3DF	Three Diseases Fund
ACT	Artemisinine-based Combination Therapy
BCC	Behavior Change Communication
BHS	Basic Health Staff
DOH	Department of Health
EDAT	Early Diagnosis and Appropriate Treatment
EPI	Expanded Program on Immunization
HA	Health Assistant
INGO	International Non-governmental Organization
IOM	International Organization for Migration
IPC	Interpersonal Communicator
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
JICA	Japanese International Cooperation Agency
LHV	Lady Health Visitor
LLIN	Long Lasting Insecticide Net
MBR	Malaria Morbidity Rate
MTR	Malaria Mortality Rate
MW	Midwife
NGO	Non-governmental Organization
NIDs	National Immunization Days
NMCP	National Malaria Control Program
PME	Program, Monitoring & Evaluation
PSI	Population Services International
RDT	Rapid Diagnostic Test
RHC	Rural Health Centre
RO	Regional Officer
S/D	State / Division
THN	Township Health Nurse
TL	Team Leader
TMO	Township Medical Officer
UNICEF	United Nations Children's Fund
VBDC	Vector Borne Diseases Control
WCHD	Women and Child Health Development
WHO	World Health Organization

EXECUTIVE SUMMARY

A malaria risk micro-stratification was undertaken in order to identify high-risk malaria villages and communities so that malaria control interventions can be highly targeted. The United Nations Children's Fund (UNICEF) has supported micro-stratification in 80 townships for three years and it is time for re-stratification. This evaluation documents the results thus far from adopting a malaria micro-stratification strategy in UNICEF supported townships.

The main objective was to evaluate the malaria risk micro-stratification strategy in terms of the process and its impact on the effectiveness of malaria control interventions. Both qualitative and quantitative methods were employed.

The specific objectives were to: 1) Examine the epidemiological impact, i.e. malaria morbidity and mortality, of the 80 UNICEF supported townships after implementation of the micro-stratification strategy; 2) Assess the understanding of the concept and purpose of the micro-stratification strategy among various staff categories; and 3) Explore the changes among staff in level of awareness, confidence and willingness related to malaria control activities at township and health centre level.

Out of 80 townships UNICEF supported for micro-stratification and related activities, only 25 townships, which were not overlapping with other partners' malaria programs, had completed distribution of long lasting insecticide nets (LLINs) in 2007. For all 25 UNICEF supported townships combined, the malaria morbidity rate (MBR) was higher in 2008 than it was in the preceding four years. Nevertheless, the 2008 MBR remains slightly below the 1999-2006 average. The malaria mortality rate (MTR) continues to decrease as has been the case since 2005 and remains well below the 1999-2006 average.

It was found that 60% (n=15) of UNICEF townships experienced a reduction in MBR in 2008 compared to the average rates of the pre-intervention period 1999-2006, whereas a reduction in MTR was observed in 96% (n=24) of townships. Reduction of both MBR and MTR was observed in 60% (n=15) of the townships while only 4% (n=1) of townships saw an increase in both MBR and MTR.

In UNICEF townships, the MBR has been reduced by 5% in 2008 compared to the average of 1999-2006, while MTR was reduced by 68%. The MBR reduction in UNICEF townships represents the lowest reduction observed among the intervention groups. The magnitude of MTR reduction is similar to findings in other intervention groups. Population migration and seasonal migrant workers remain the most likely explanation to the limited reduction in MBR with many townships actually seeing an increased caseload in recent years. Increased awareness and proper treatment seeking behavior have contributed to a significant reduction of MTR after introducing the micro-stratification strategy.

Most health staff had a clear understanding of the micro-stratification strategy and activities involved in its implementation. However, some less experienced basic health staff (BHS) did encounter difficulties in the stratification process and were not clear about some of the key terms and definitions which are important for determining the correct stratum for each village. Most staff mentioned that the introduction of the strategy did not adversely affect their ability to carry out other tasks. The participatory process fostered empowerment and a sense of ownership in the community and also led to motivation of implementing health staff.

It is recommended that micro-stratification of malaria endemic areas should take place every three years, but guidelines should be modified in order to make them easier to understand by implementing health staff.

INTRODUCTION

Background

The malaria burden among endemic countries in the world is neither evenly distributed nor equally prevalent. This is also the case in Myanmar, not only because of the highly scattered malaria endemic foci across the country but also due to the socio-economic factors arising from population migration in malaria endemic areas. New development projects such as road construction, dam construction, deforestation, reforestation, new settlements etc. draw the attention of the work force to these sites which are often situated in malaria endemic areas. Even in areas where malaria cases among indigenous people are rare, high numbers of malaria cases present among non immune migrant workers.

Even within high-risk townships, a number of villages in specific rural health centre (RHC) catchment areas may show low prevalence of malaria. Also, the vulnerability of groups, people or families to malaria significantly varies. In some townships, a large number of malaria cases occur only in forested foot hills or forest fringe villages while malaria transmission may be minimal in peri-urban villages. The conventional blanket approach often leaves vulnerable and marginalized people uncovered by effective malaria interventions.

Malaria risk micro-stratification is a strategic risk mapping tool used to identify the most vulnerable communities and families within townships so that malaria control interventions can be highly focused. The strategy was adopted from the pioneering work of Japan International Cooperation Agency (JICA) in Bago Division, which was highlighted as a good practice by an external review of the National Malaria Control Program (NMCP) in 2005. With technical support from JICA, World Health Organization (WHO) and NMCP, United Nations Children's Fund (UNICEF) adjusted the strategy in order to implement it within the 80 UNICEF-supported project townships from 2006 and onwards. A conceptual diagram for the process of malaria risk micro-stratification is illustrated in **Figure 1**.

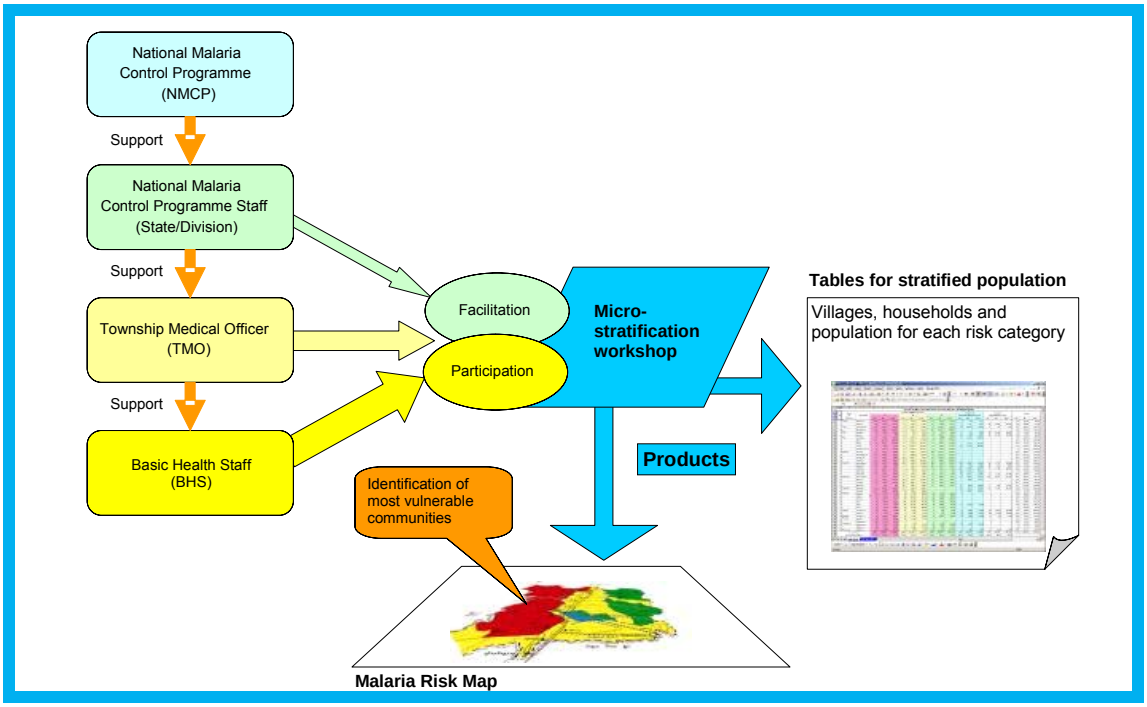


Figure 1 Conceptual diagram for the process of malaria risk micro-stratification

Each village is classified as malarious (stratum 1), potentially malarious (stratum 2) or non-malarious (stratum 3). The malarious villages are further stratified into high risk (1a), moderate risk (1b) and low risk (1c). The main parameters for stratification are presence or absence of indigenous cases, presence or absence of main vectors of malaria, and ecology.

The risk map is an important planning tool for each township as well as state/division and central levels. Based on the risk map, a micro-plan is prepared at township level which includes: a supply/logistics plan of diagnostic, treatment and preventative equipment; a training plan for basic health staff and village health workers prioritizing the high risk areas; a targeted program communication plan. Provision of LLINs and insecticide impregnation activities are strategically planned based on the risk map. Especially for hard-to-reach areas, the possibility of combining malaria prevention activities with existing out-reach services is important (e.g. Expanded Program on Immunization (EPI) outreach activities, Women and Child Health Development (WCHD) ante-natal care, deworming campaigns, etc).

Monitoring and supervision by township health staff and central and local Vector Borne Diseases Control (VBDC) staff is also guided by the risk map. Outbreak preparedness is also promoted by the risk map, which highlights epidemic-prone areas (such as areas with periodical outbreaks, construction sites, migrant population, etc). Township Medical Officers (TMOs) and State/Division VBDC team leaders will be more aware of the risk of outbreaks and will be able to follow the morbidity and mortality report of certain health posts more closely as a result.

Process of implementation

In designing the strategy, the following key aspects were incorporated. First, the process should be participatory and encourage local ownership. Local health staff should be the primary actors, the primary source of the information and the primary users of the result. Second, to realize the first point, the process had to be as simple and feasible as possible to assure proper implementation while motivating and empowering local health staff. Third, the process should encourage local health staff to pay close attention to the most marginalized communities.

After the piloting work and finalization of guidelines, NMCP and UNICEF completed the malaria risk micro-stratification in 40 targeted townships (phase-one) in 2006 and in the additional 40 townships (phase-two) in 2007. Overall, approximately 16,000 villages in 80 townships, with a combined population of 10 million, were classified into five malaria risk categories and depicted on a malaria risk map by the local health staff. Out of the population of 10 million, approximately 2.6 million people (26%) from 440,000 households fell into the highest risk category (1a). Consequently, these people have been specifically targeted with preventative and curative interventions.

The first large-scale intervention conducted was distribution of LLINs (one per household). Initially it was planned to distribute LLINs to all 40 phase-one townships in 2007. However, due to funding shortages leading to delays of planned procurement, it was only possible to distribute LLINs in 28 townships during 2007. A total of 144,000 LLINs were distributed on two occasions (May and September) aiming at 100 percent coverage of families in the highest risk category.

In 2008 and 2009, LLINs were distributed to all 40 phase-two townships as well as the remaining 12 phase-one townships.

Distribution was done effectively by the malaria control staff and local health staff with strong community participation. The distribution teams visited the high-risk villages on an individual

basis and one LLIN was provided to each household. Because many of the villages are highly remote and hard to reach, every effort was made for an integrated service delivery. Thus, in many areas, LLIN distribution was combined with Polio National Immunization Days (NIDs) and/or CRASH programs as well as special outreach sessions for EPI to maximize coverage.

In addition to LLIN provision, a series of interventions were following up in a similarly highly targeted manner, including bed net impregnation, early diagnosis and prompt treatment through village health volunteers and Behavior Change Communication (BCC) activities. UNICEF established a partnership with Population Service International (PSI) for a Malaria BCC project. Across all high-risk areas, 28 interpersonal communicators with 19 different language abilities visited highly endemic villages every day. Each month, around 1,600 communication sessions were conducted with more than 30,000 participants attending. Through these activities, the participants' knowledge on malaria prevention and treatment was improved.

Although the micro-stratification strategy primarily aimed at improving the effectiveness of program interventions (i.e. result-oriented), a human rights-based approach was chosen for the entire process (**Figure 2**). By visualizing the most marginalized villages during the risk mapping exercise, local health staff increased the awareness of their responsibility towards the families whose rights were not fully realized. The *duty bearer–rights holder* relations also became prominent among NMCP staff by assisting local health staff with technical and supply support. The increased recognition of capacity gaps at all levels in supporting vulnerable families has created legitimate demands on local health staff and malaria control staff.

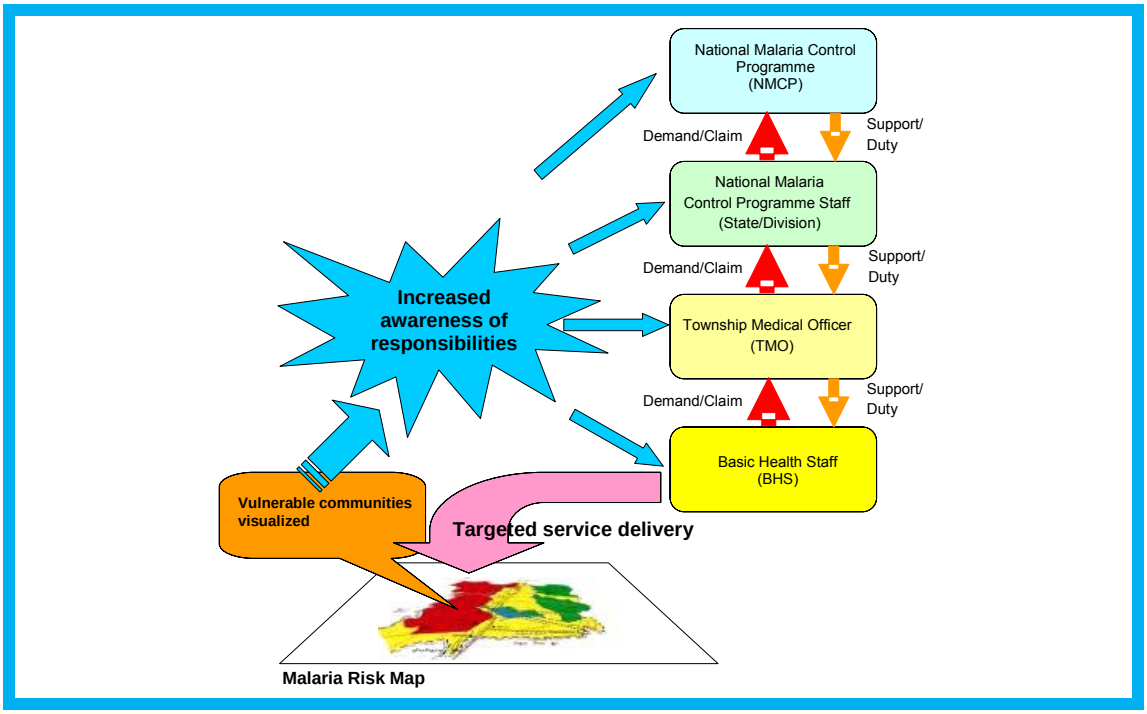


Figure 2 Malaria risk mapping to promote Human Rights-Based Approach

As the micro-stratification strategy has been applied for three years, it is time for re-stratification. Before carrying out re-stratification, there is a need to evaluate the micro-stratification process and impact of activities implemented. In this regard, strengths,

weaknesses, effectiveness, efficiency, usefulness and impact of the strategy need to be assessed.

OBJECTIVES

General objective

- To evaluate the malaria risk micro-stratification strategy in terms of its process and impact.

Specific objectives

- To examine the epidemiological impact of targeted LLIN distribution in UNICEF supported townships, i.e. malaria morbidity and mortality;
- To assess the understanding of the concept and purpose of micro-stratification among NMCP staff, TMOs and BHS;
- To explore changes in awareness, confidence and willingness of NMCP staff, TMOs and BHS towards malaria control activities at township and health centre levels;
- To make recommendations and suggest further actions based on the evaluation findings.

METHODS

Quantitative analysis

The quantitative component will examine primarily the impact of LLIN distribution on malaria morbidity and mortality. Since the introduction of the micro-stratification strategy, distribution of LLIN has been focused on vulnerable communities where the risk of malaria transmission is highest. In theory, this highly targeted approach should bring about a visible impact on malaria morbidity and mortality. This component of the study will quantify the impact of the interventions, using epidemiological data available in health centers and hospitals. The analysis will focus on epidemiological changes taking place after introduction of the micro-stratification strategy.

Design

Intervention groups were selected assuming a “wedged” introduction of the interventions. Townships were categorized into five intervention groups in order to assess the effect of various interventions including UNICEF micro-stratification. Yearly data sets from health facilities provided by central VBDC were used to detect epidemiological changes.

Intervention groups

In 2007, 28 UNICEF supported townships were provided with LLINs (phase-one). Of these, three townships are overlapping with WHO/Three Diseases Fund (3DF) supported townships. Therefore, in the intervention group “UNICEF supported townships” only 25

townships have been included. In the remaining three townships it is not possible to attribute any observed changes to the intervention carried out by UNICEF as any observed epidemiological change might also result from the intervention done by WHO/3DF.

Out of 28 UNICEF townships overlapping with WHO/3DF townships, only eight townships received LLINs from UNICEF in 2007 which is why two groups are formed; overlapping townships *with* and *without* UNICEF distributed LLINs in 2007.

The two other intervention groups included in the analysis are "WHO/3DF supported townships" and "Non-UNICEF / WHO-3DF supported townships."

For intervention groups 2 and 3, townships were selected based on a random selection of proxy townships. Intervention groups, activities and number of townships are shown in **Table 1** below.

Table 1 Intervention groups, activities and number of townships

#	Intervention groups	Intervention activities	# of townships supported in total	# of townships included in analysis
1	UNICEF supported townships	• LLIN distribution (1 per household) • ITN impregnation • Provision of various anti-malaria drugs including for severe malaria (including RDT/ACT) • Support for capacity building of BHS and volunteers • BCC on malaria prevention and treatment seeking behavior through partnership with PSI	80	25
2[1]	WHO/3DF supported townships[1]	• LLIN distribution (1-2 per household depending on the implementing NGO) • Provision of various anti-malaria drugs, but not for severe malaria • Training to volunteers on malaria case management	100	10
3[2]	Non-UNICEF / WHO/3DF townships[2]	• No LLIN distribution • Support for ITN impregnation in some townships • Availability of anti-malaria drugs, but much lower than in groups 1-3	172	13
4	UNICEF townships overlapping with WHO/3DF townships (**no** UNICEF micro-stratification implemented)	• LLIN distribution • Provision of various anti-malaria drugs and capacity building/training (as per group 1-2) • Training to volunteers on malaria case management	28[3]	16
5	UNICEF townships overlapping with WHO/3DF townships (UNICEF micro-stratification implemented)	• UNICEF LLIN distribution (1 per household) or 1-2 per household depending on the implementing NGO • ITN impregnation • Provision of various anti-malaria drugs including for severe malaria • Support for capacity building of BHS and volunteers • BCC on malaria prevention and treatment seeking behavior through partnership with PSI	28[3]	8

[1] Technical management by WHO, [2] Supported by DOH, [3] In total 28 UNICEF townships are overlapping with WHO/3DF townships (i.e. the 28 townships in group 4 and 5 are the same), ITN = Insecticide Treated Net, RDT = Rapid Diagnostic Test, ACT = Artemisinine-based Combination Therapy, NGO = Non-governmental Organization

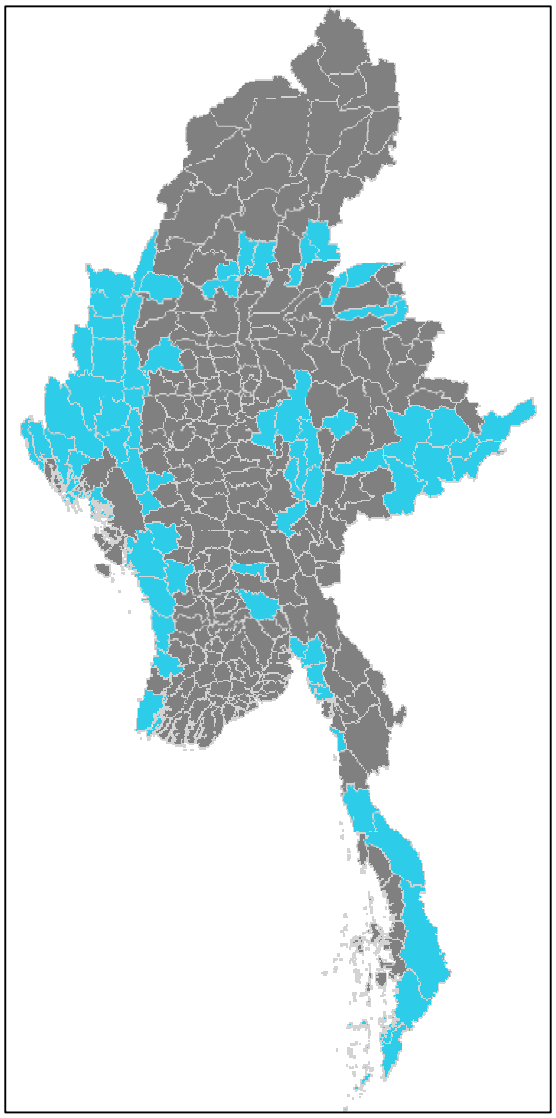


Figure 3 UNICEF supported townships (in blue)

Data collection and analysis

Malaria morbidity and mortality reports from health centers and hospitals were the primary sources of data for the study. Normally, the reports are prepared by local BHS and submitted from health facilities to the township level. The data is aggregated at the township level and submitted to the VBDC project staff at State/Division level. It is further forwarded to the central VBDC where annual datasets are compiled and distributed to organizations like UNICEF and WHO. Analysis yearly data from health facilities will make it possible to detect any epidemiological change that might have taken place within the township.

Pre- and post intervention analysis was conducted for each UNICEF supported township *(historical comparison of single townships)* and data was aggregated for all intervention townships to assess the overall impact *(historical comparison of multiple intervention townships)*. The same historical analysis of multiple intervention townships was carried out for non-UNICEF supported townships in order to compare the overall disease trend between townships with different interventions *(comparison between different intervention groups)*.

Qualitative analysis

The qualitative component will focus on the process. The micro-stratification strategy was adopted by UNICEF not only for improving the effectiveness of the interventions but also for increasing the awareness of responsibilities among Department of Health (DOH) staff involved in malaria control activities at all levels. This component of the study will explore the understanding, perception, empowering and motivating aspects of the micro-stratification strategy among the NMCP staff, TMOs and local BHS. People involved in implementing the micro-stratification strategy were included in the qualitative analysis.

Design

Qualitative data were collected by key informant in-depth interviews. **Annex 2** lists people interviewed and places visited.

Sample size and sampling procedure

Initially it was planned to include 20 key informants in the study. However, the number of key informants increased to 30. The sampling methodology was purposive sampling.

Selection of study subjects

All key informants were health staff at either township or State/Division level from one of the three groups listed below. They all worked in townships where micro-stratification had been undertaken.

1. *Vector Borne Diseases Control project staff*
   According to the proposal, at least one regional officer (RO) and four team leaders (TLs) had to be selected. However, five ROs and three TLs were included because of convenience and availability.

2. *Township Medical Officers*
   Although the targeted number of TMOs for the interview was five, only two were eligible as the remaining three were transferred to other places. Instead, one Health Assistant (HA) and two Township Health Nurses (THNs) were interviewed.

3. *Basic Health Staff*
   Four Health Assistants and 12 Midwives were interviewed.

Data collection and analysis

In-depth interview questionnaire guidelines were developed for all VBDC project staff, TMOs and BHS in consultation with the Program, Monitoring & Evaluation (PME) section of UNICEF Myanmar. The core questionnaire guidelines for in-depth interviews are presented in **Annex 1**.

Due to the nature of the study, formal anthropological analysis was not performed. The report summarizes the findings from in-depth interviews on the understanding, perception, empowering and motivating effects of the micro-stratification strategy at different levels (VBDC project staff, TMOs and BHS). It also includes interpretation of results as well as discussion of strengths and weaknesses in program implementation, leading to recommendations for future program direction.

FINDINGS AND RESULTS

Quantitative Evaluation

Data for the years 1999-2006 have been merged to serve as a baseline, i.e. *pre-intervention years*. The year 2007 will stand alone as an *implementation year* as LLINs were distributed in May and September 2007. Thus, it is not appropriate to include data from 2007 in either the pre-intervention period (1999-2006) or the *year of impact* where the malaria micro-stratification is to be evaluated (2008). For this reason, morbidity- and mortality data from 2008 will be compared to the average of the data from the period of 1999-2006. The 2008 data is not compared to a single year in the pre-intervention period, e.g. 2006, since some fluctuations in data over the years in some townships are observed and the average malaria morbidity rate (MBR) and malaria mortality rate (MTR) is perceived to give a more reliable estimate of the pre-intervention situation.

The following four outcome groups will direct the quantitative analysis on *historical comparison of single townships* and *historical comparison of multiple intervention townships:*

A. Townships with lower values of MBR and MTR in 2008 compared to the 1999-2006 period
B. Townships with increasing MBR and decreasing MTR in 2008 compared to the 1999-2006 period
C. Townships with decreasing MBR and increasing MTR in 2008 compared to the 1999-2006 period
D. Townships with increasing MBR and MTR in 2008 compared to the 1999-2006 period

For *comparison between different intervention groups,* the percent reduction of MBR and MTR from the 1999-2006 average to 2008 will be calculated.

Impact of micro-stratification in 25 UNICEF supported townships

Evident from **Figure 4** is that 60% (n=15) of townships experienced a reduction in MBR, whereas a reduction in MTR was observed in 96% (n=24) of townships. Overall, an absolute positive effect (reduction of both MBR and MTR) of interventions (includes LLIN provision, bed net impregnation, early diagnosis and prompt treatment and BCC activities) was observed in 60% (n=15) of the 25 townships. Only 4% (n=1) of townships saw an increase in both MBR and MTR, while no townships witnessed simultaneous MBR reduction and MTR increase.

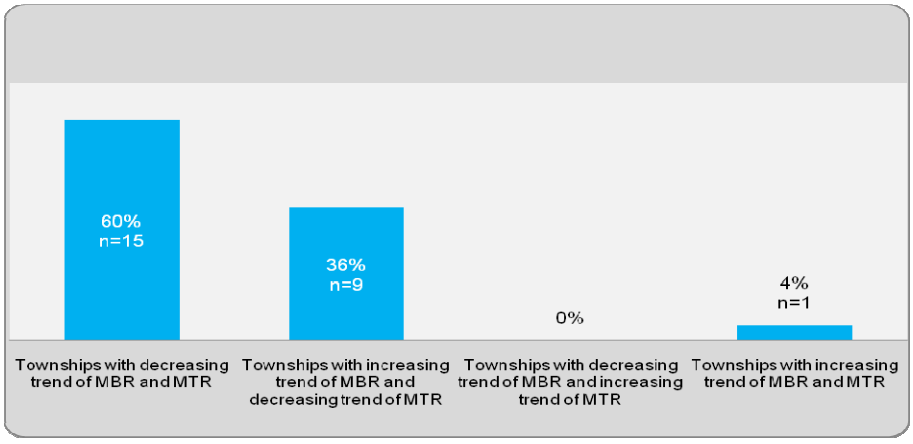


Figure 4 Number of townships and trends in malaria MBR and MTR

Overall impact of micro-stratification on MBR and MTR

The following graphs compares yearly (including the *implementation year* – 2007, and the *year of impact* – 2008) MBR and MTR values to the average values of the *pre-intervention years* 1999-2006.

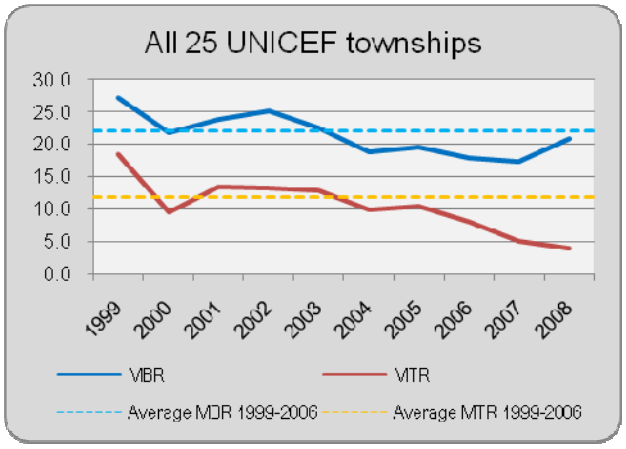


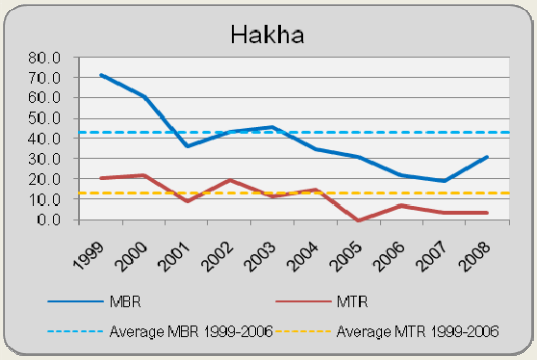
Figure 5 MBR and MTR trend graphs for 25 UNICEF townships

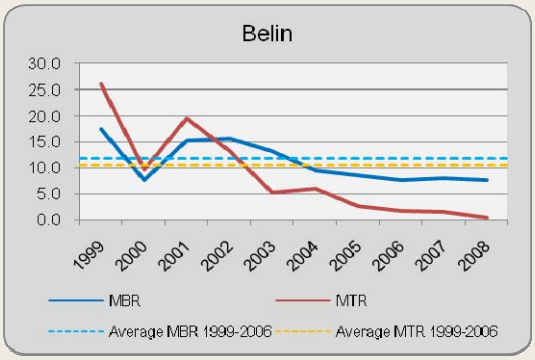
Evident from **Figure 5** is that for all 25 UNICEF supported townships the malaria MBR is higher in 2008 than it was in the preceding four years. Nevertheless, the 2008 MBR remains slightly below the 1999-2006 average. The malaria MTR continues to decrease as has been the case since 2005 and remains well below the 1999-2006 average.

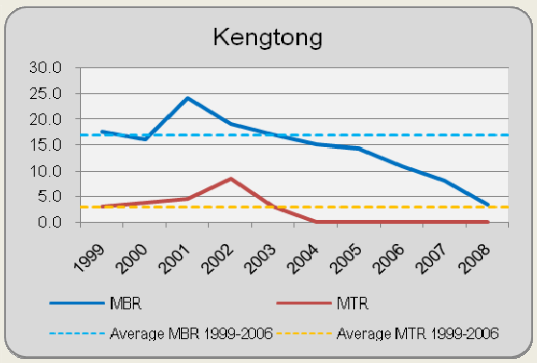
Townships with lower values of MBR and MTR in 2008 compared to the 1999-2006 period

Figure 6 illustrates the townships that have lower values of MBR and MTR in 2008 compared to the 1999-2006 period (group A) as observed from the trend graphs.

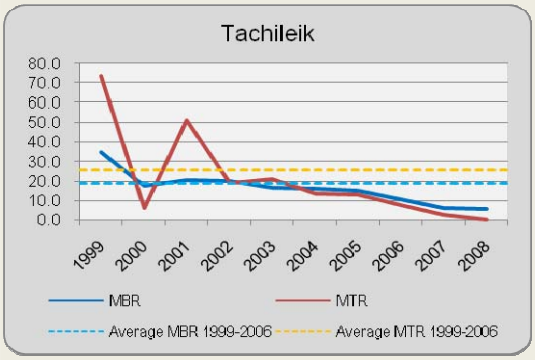
Figure 6 MBR and MTR trend graphs for townships with reduction in both MBR and MTR in 2008 compared to the 1999-2006 period

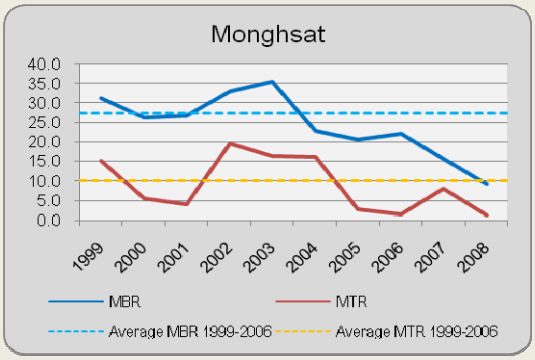




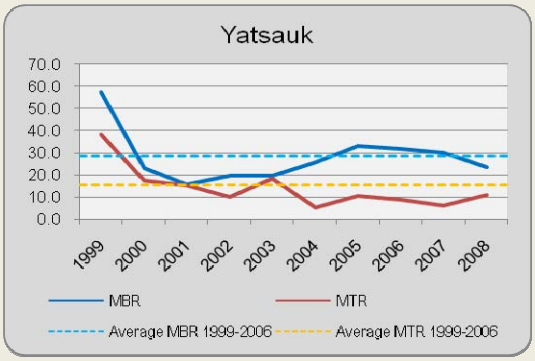


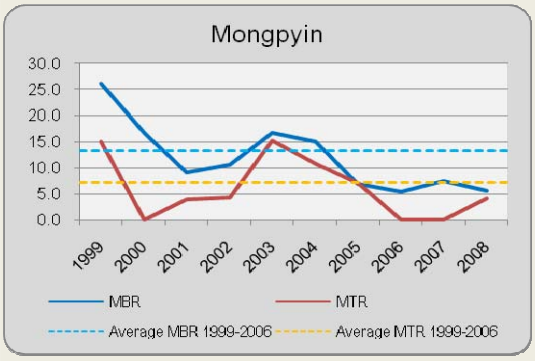
Kengtong, being the capital of Eastern Shan State is provided with specialist service to give medical care to the community. Therefore, whenever complicated malaria cases were referred from a sub-RHC or RHC in the malaria risk areas or self referred to the state hospital, they were managed effectively, thus keeping malaria deaths at the zero.

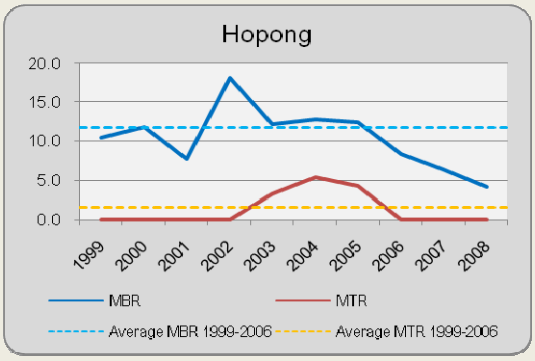


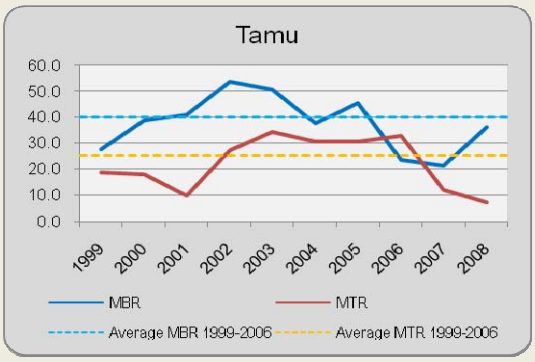


The increase of MTR in **Yatsauk Township** was found to be due to late arrival of complicated malaria cases from teak extraction work sites which are usually situated far from the nearest health facility. Thus, early diagnosis, treatment and referral was ineffective. These complicated malaria cases occurred among non-immune forest workers.

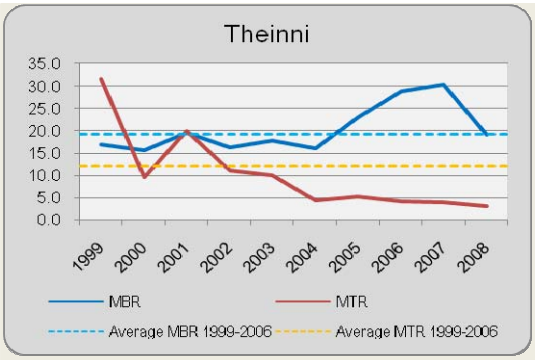


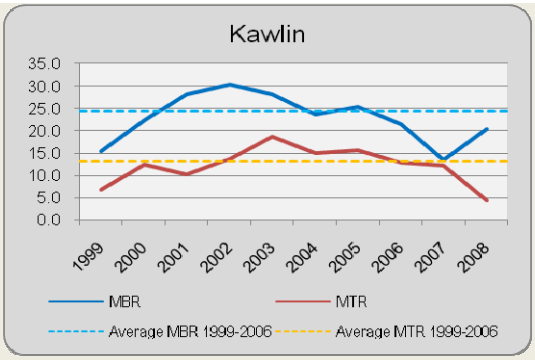




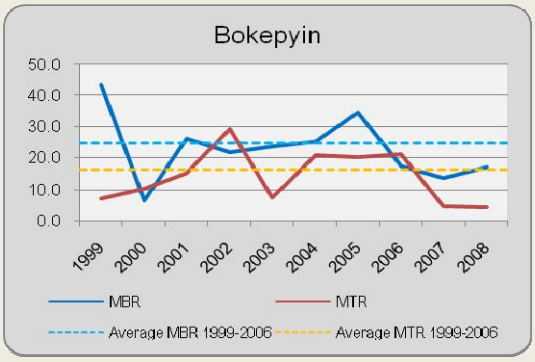


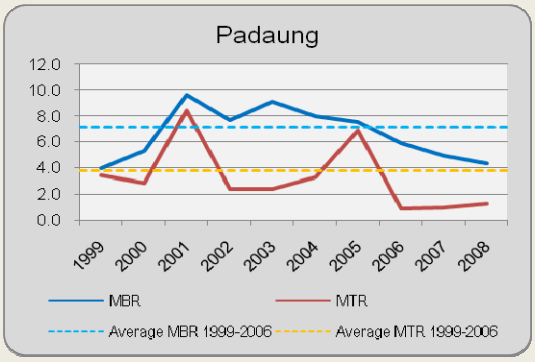
Tamu Township borders India and sees high population migration. The malaria situation in the border areas depends on the magnitude of population movement. LLIN distribution cannot be made available for temporary settlers, thereby increasing the MBR. Early diagnosis and prompt, effective treatment was made available with RDT/ACT in all communities whether migrants or locals. This activity has maintained the low MTR.

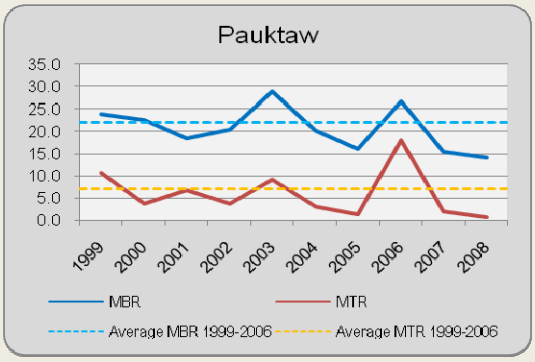


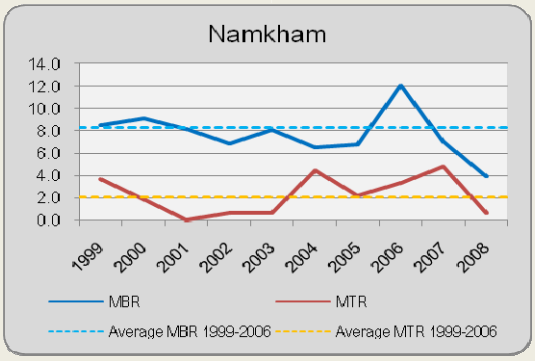


Bokepyin Township is located in a coastal region and has seen a slight increase in MBR despite LLIN distribution to all target households including to palm oil workers. The increase is likely due to an improved reporting system. RDT/ACT has been provided in adequate amounts down to sub-RHC level and to palm oil project sites for early diagnosis and prompt treatment. This support has led to the stable MTR observed in recent years.









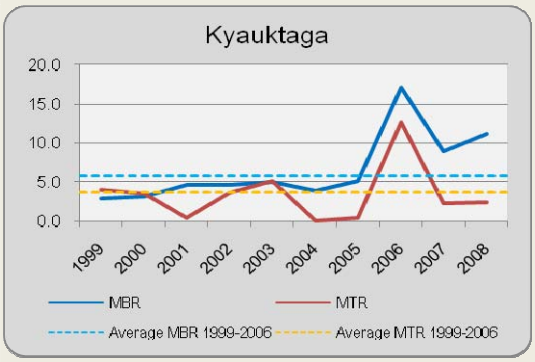
All the above townships have seen reductions in both MBR and MTR in 2008 compared to the average of the 1999-2006 period. Many townships maintain a decreasing trend in MBR and/or MTR, while some townships only started observing reductions in MBR and/or MTR

over the past few years. Only few townships observe a slight increase in MBR and/or MTR in recent years, however values remain under the 1999-2006 average. It is also important to notice that the present 2008 MBR and MTR values in some townships are matched by equally low or lower values at some point during the 1999-2006 period. This fact may indicate unstable malaria conditions, migrating populations/workers (in or out), variations in the ability to respond to suspected malaria cases, variations in case detection ability or variations in the availability of malaria medication and/or LLINs at township level.

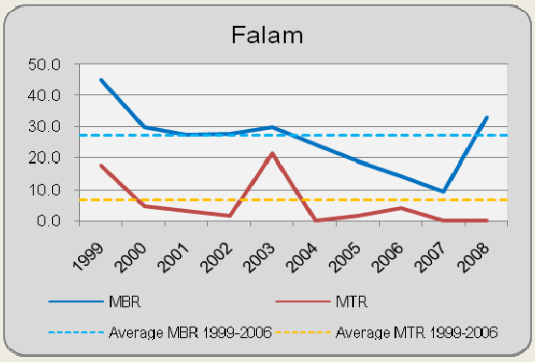
Townships with increasing MBR and decreasing MTR in 2008 compared to the 1999-2006 period

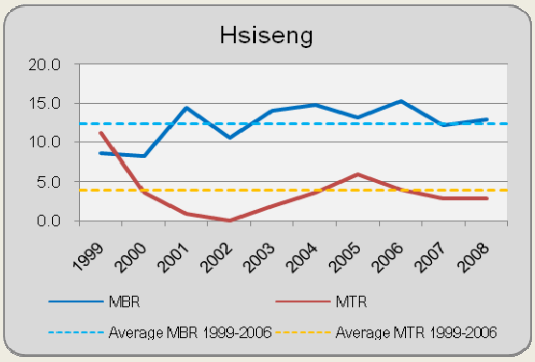
Some townships experienced increasing MBR while MTR was decreasing (group B). This happened in spite of implemented micro-stratification and distribution of LLINs. These townships are shown in **Figure 7**.

Figure 7 MBR and MTR trend graphs for townships with increasing MBR and decreasing MTR in 2008 compared to the 1999-2006 period

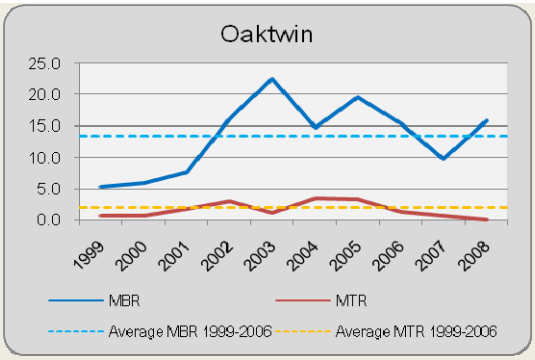


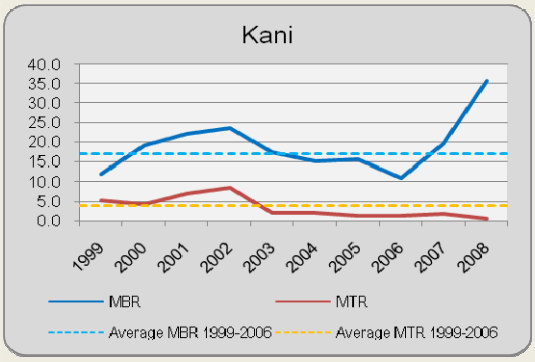
MBR is increasing in **Kyauktaga Township** despite LLIN distribution due to initiation of 25 new projects bringing in non-immune migrant workers after completion of the micro-stratification and micro-planning for LLIN distribution and RDT/ACT provision. There were not enough LLINs for these workers, of whom many aquired malaria. The MTR was kept stable in 2007-08 due to adequate provision of RDT/ACT for diagnosis and prompt treatment.

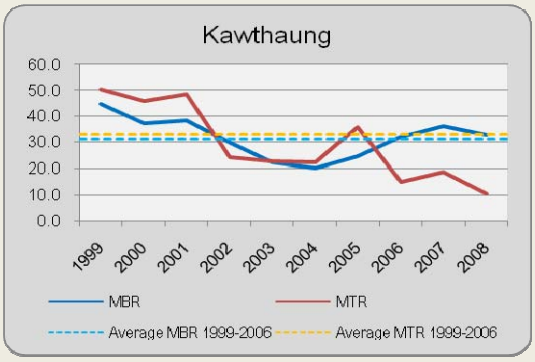


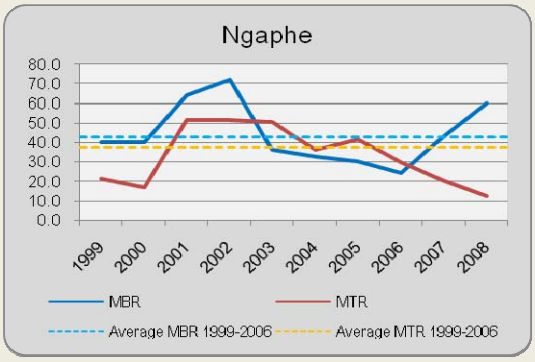


The 2008 MBR of **Oaktwin Township** is back at the 2006 level due to population migration. Community utilization of health facilities has increased more than previous years. This is due to the free and effective treatment provided with RDT/ACT, hence increasing the caseload. People who usually chose self-treatment or treatment by quacks have changed their treatment seeking behavior. Adequate supply of RDT/ACT has stabilized the MTR.



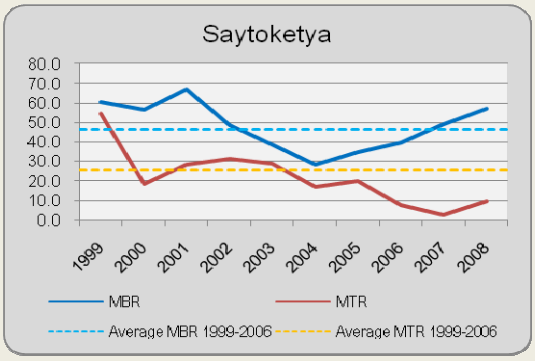


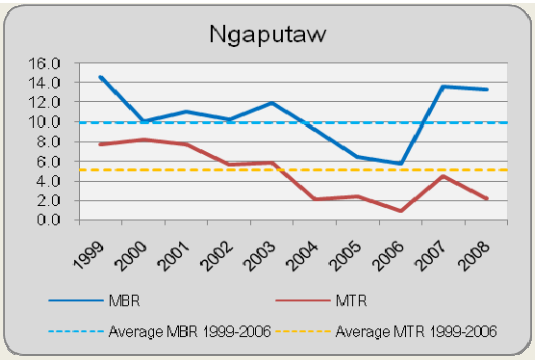




Ngaphe Township is highly endemic for malaria. The MBR and MTR are 2-3 times higher than in other townships. People earn their living by forest-related work. LLINs were distributed to all targeted households, but there was a utilization problem as the man had to go to the project site in the forest without a LLIN which was left at home with the family. Also, LLINs cannot cover the temporary migrant workers. A malaria outbreak occurred at the project site, increasing the MBR in 2008. MTR kept decreasing.

Despite good coverage with LLINs, diagnostic and treatment facilities in **Saytoketaya Township**, the MBR keeps increasing due to migrant workers who are not provided LLINs. A project contracter refused to provide bednets for his workers which left them unprotected. When workers contracted malaria, the project contractor did not take any resposibility for the medical care and the workers had to depend on quacks for relief of their symptoms.



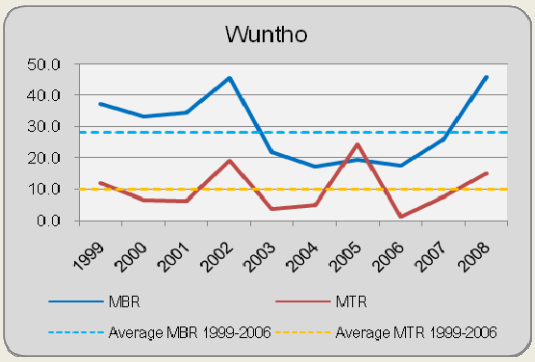


From the graphs above it is clear that some townships have 2008 MBR values only marginally above the 1999-2006 average while other townships have significantly higher MBR values in 2008. For many townships, the MBR has been on the rise in recent years, for some only during the past one year after implementation of the micro-stratification strategy. For MTR, there is a general decreasing trend in recent years, though a slight increase is seen in a few townships. However, the 2008 MTR is still below the 1999-2006 pre-intervention average MTR.

Townships with increasing MBR and MTR in 2008 compared to the 1999-2006 period

Only one of the 25 UNICEF supported townships noticed higher MBR and MTR values after implementation of the micro-stratification compared to the 1999-2006 average (group D). Both MBR and MTR have been increasing since 2006 and especially the MBR is well above the average rate observed in the period 1999-2006. The trend graphs are shown in **Figure 8**.

Figure 8 MBR and MTR trend graph for township with increasing MBR and MTR in 2008 compared to the 1999-2006 period



Comparison of malaria situation

After the malaria risk micro-stratification and related activities were implemented, the impact of these efforts was compared to impacts in townships belonging to the other intervention groups (2–5, cf. Table 1).

The selected variables to compare were:

- Malaria MBR per 1,000
- Malaria MTR per 100,000
- Percent reduction of malaria MBR (2008 compared to average 1999-2006 period)
- Percent reduction of malaria MTR (2008 compared to average 1999-2006 period)

Figure 9 shows the 2008 MBR and MTR for each of the intervention groups. In the group of overlapping UNICEF/WHO-3DF townships where UNICEF micro-stratification is not yet implemented the greatest MBR is observed at 47%. WHO-3DF townships shows a MBR about half of that magnitude, followed by UNICEF townships. Among the WHO-3DF townships, the greatest MTR is found at 9.8%, almost twice the magnitude of other groups which are all ≤ 5%.

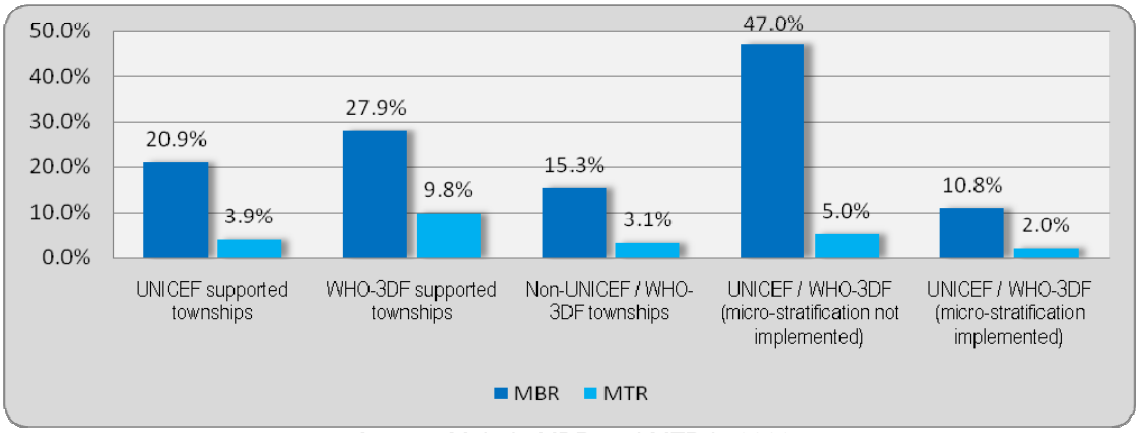


Figure 9 Malaria MBR and MTR in 2008

Average MBR and MTR was calculated using the data from 1999-2006 for each group. The eight-year averages of MBR and MTR were compared with the average MBR and MTR of 2008 for each group and the percent reduction was calculated. The respective MBR and MTR reductions in percent among the five implementation groups are shown in **Figure 10**.

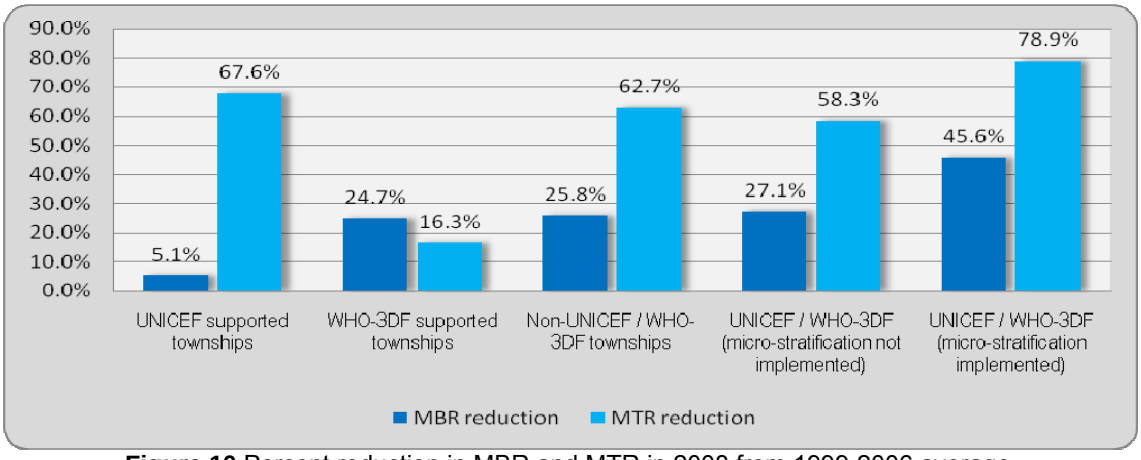


Figure 10 Percent reduction in MBR and MTR in 2008 from 1999-2006 average

It is observed from Figure 7 that the group of overlapping UNICEF/WHO-3DF townships where UNICEF micro-stratification is already implemented shows the greatest reduction in both MBR (45.6%) and MTR (78.9%). The other groups, except WHO-3DF townships, show a great reduction in MTR while UNICEF townships sees a much lower reduction of MBR compared to all other groups (5.1%) despite a high MTR reduction (67.6%).

Qualitative Evaluation

In-depth interviews were carried out using a core questionnaire developed with the support from UNICEF PME section in Yangon. The main themes of the in-depth questionnaire were:

- Understanding and importance of micro-stratification
- Training on micro-stratification
- Implementation of micro-stratification
- Effects of micro-stratification
- Strengths and weaknesses of micro-stratification
- Recommendations

Understanding of micro-stratification

All key informants understood the micro-stratification strategy. Those who had the greatest interest in the strategy understood more. Proper understanding is needed mostly among midwifes as they are the main implementers in the sub-RHC. Health Assistants are the main actors in the RHC and they have the responsibility of implementing as well as supervising the work of midwives (MWs), i.e. their understanding is crucial. It was found that learning capacity of the individual and basic educational qualification helps a lot to understand the strategy. If the THN has a primarily clinical nursing background, difficulties in understanding public health work such as micro-stratification may present. As the micro-stratification is a new component for all BHS, it is not surprising that it may initially be difficult to understand.

VBDC staff such as ROs and TLs understood the strategy very well as this is their original area of work. However, they mentioned that staff members such as malaria assistants, malaria inspectors and malaria supervisors need to gain more interest in the strategy.

Importance of micro-stratification

People from each staff category agreed that micro-stratification is essential and important. Some of the important aspects mentioned by staff were:

Midwifes	Ability to focus on the risk areas in providing treatment and health education
Township medical officers, Health assistants, Township health nurses	Effective management of resources allocated to their area and effective supervision of staff and their work on malaria control activities
Vector Borne Diseases Control staff	In regard to planning and program aspects they perceived that micro-stratification is important for: • Planning malaria control • Resource management such as LLIN, RDT/ACT • Inter-sectoral coordination with other stakeholders for malaria control activities • Training of all staff categories, especially for BHS and VBDC staff

Opinion about micro-stratification

Regarding key informants' opinion, BHS only responded that micro-stratification guided them to work effectively. Due to the stratification all midwives experienced that treatment of malaria was very successful and that they learned a lot about malaria prevention and control.

During the interview, HAs1 who represent the TMO and other TMOs had various opinions. They realized that by making use of micro-stratification, they gradually begin to adopt a more village level focus instead of a sub-RHC level focus and they began to notice the changes in the immediate environment. One TMO was really concerned about the high number of migrant workers pouring into the area as it made malaria control challenging. He mentioned that this problem arose only after the micro-stratification was implemented. Before the micro-stratification, the places where migrant workers aggregated had no villages or houses. These temporary settlements suddenly appeared and they had to face the problem. His opinion was that this kind of unexpected event should be incorporated into the micro-stratification guidelines.

In relation to this situation, the RO of Bago Division mentioned that the present micro-stratification only focuses village-wise and that areas where no villages previously existed have been left out. Thus, when unexpected sudden appearances of camps or temporary shelters occur in previously bare lands, micro-stratification does not cover these areas.

He further expressed his opinion: *"My responsibility is to look after 14 townships, but micro-stratification has covered only two townships. This patchy coverage of only two townships has made me face some problems from the administrative point of view."*

Regarding awareness of the strategy, most MWs interviewed were only aware of the stratum they are working with. For example, one MW said: "*My villages are all in 1c and I know the activities to be carried out but for the other area which is not my responsibility, I don't know."* 80% of interviewed MWs knew which groups of vulnerable people or marginalized families that needed to be given priority or attention.

Training on micro-stratification

The training before the actual implementation on the micro-stratification is one of the most important components of the whole micro-stratification process. Implementation of micro-stratification depends mainly on training. The trainers were VBDC project staff, specifically Malaria ROs and TLs of all States and Divisions. The participants were TMOs and all BHS, mainly HAs1, HAs, Lady Health Visitors (LHVs) and MWs. The training guidelines were translated into Myanmar and the training was also conducted in Myanmar. The essential points and operational definitions were defined and the data collection forms and formats were also translated into Myanmar. It was observed that trainers explained the guidelines and the data forms/formats point by point, slowly and clearly so that participants could understand. Responses from the above mentioned key informants are presented below:

HAs: All HAs agreed that the training was simple and easy to understand but in the application to the actual work, some BHS had encountered difficulties. Some could not identify an indigenous case. At the beginning of the training, some did not understand topics well but as the training continued they gradually caught up with the topics discussed.

THNs, LHVs, MWs: They faced the problem of identification of indigenous cases. Most of them agreed that the training was simple and easy to understand but in application of the guideline they faced difficulties in deciding which stratum to choose. This indicates that a

clearer understanding of the micro-stratification methodology is needed for some staff. Before the training, they did not know their area, but after the training they could locate the villages with malaria problems in their catchment area.

TMOs: During the field visit to the five townships for the in-depth interviews, the interviewer met only with three TMOs because the other two had already transferred to other places. Among the three TMOs, one transferred after the micro-stratification process and thus he was only able to participate in the implementation activities. According to the TMOs' experience on micro-stratification training, it had been conducted systematically by VBDC staff and going into every detail of the guidelines. TMOs said: *"BHS attended the training without failure to show up and took great interest in the training."* As micro-stratification is a new subject, TMOs noticed that BHS had some difficulties in following the course in the beginning. As TMOs, they felt managerial and leadership obligations as well as responsibility for the success of the training. One of the TMOs was very efficient and self motivated and was able to guide his BHS during the training. TMOs also noticed that the guidelines – although easy to understand – created some difficulties among BHS in deciding the correct strata.

VBDC staff: VBDC staff was important for the micro-stratification training. Their trainer role implies that they carry a lot of responsibility for the success of the micro-stratification. Their experiences, views and comments were expressed frankly during the in-depth interviews. According to the interviews with VBDC staff, the training on micro-stratification was carried out in two phases:

1. Explanation of the objectives of micro-stratification followed by discussion on the micro-stratification strategy in detail. Data collection forms and formats were explained and BHS were asked to carry out data collection within a specified period.

2. After completion of data collection, all BHS staff met at township level for stratification by sub-RHC. Hereafter, data was compiled by RHC area. After stratification by RHC, data was again compiled to get the complete picture of the township. VBDC staff took part as facilitators and resource persons during the micro-stratification exercise.

All VBDC staff noticed that BHS from the majority of townships actively participated in the discussion with great enthusiasm and interest. As it was a new subject for them, they were very keen to know the strategy thoroughly. Four out of five ROs noticed that BHS were not clear about the criteria for stratum II compared to stratum I and III. Two TMOs also mentioned that the distance criteria used in strata 1a, 1b and 1c created confusion among some BHS. The criteria "Distance from the forest", "Distance to the nearest health center" and "Distance from breeding sources of primary vectors" caused some confusion. One RO said: *"These distances confused the BHS to get to the right decision of the stratum. These distances whether to delete or maintain should be seriously considered in next stratification."*

Another issue was the problem of understanding operational definitions, i.e. 90% of VBDC staff mentioned that BHS did not clearly understand the terms "local transmission," "indigenous cases of malaria," "Imported malaria cases" and "forest." These operational definitions are explained in the guidelines.

Another term brought up for discussion by VBDC staff was "hard-to-reach" areas. They discussed that "hard-to-reach" does not imply that the village is malarious. "Hard-to-reach" may simply be due to difficult communication or for security reasons etc. They also discussed the process of classifying these areas into appropriate strata. If the classification process is merely based on estimations or guessing, there is a chance that "hard-to-reach"

areas classified as 1a (i.e. high risk), for example, might in fact not be high risk areas which would lead to a waste of resources.

VBDC staff – especially ROs – mentioned that guidelines should be modified and suggested to include some scientific methodology in the re-stratification guidelines. Furthermore, they suggested that re-stratification should take place every three years.

Implementation of micro-stratification

The implementation of micro-stratification in each township followed after the training and field operational data collection was completed. In the implementation phase, the TMO or HA1/THN (where there was no TMO) was the manager. The main implementers were the HA, LHV and all MWs of the respective RHCs. In this phase, VBDC ROs/TLs assisted as resource persons and facilitators.

Roles

All HAs knew their roles clearly in implementation of the micro-stratification strategy. As they are leaders of each RHC, they felt a sense of responsibility for the success of micro-stratification in their area. Moreover, they also felt that they had to play a central role in coordinating and cooperating with local administrative authorities. For midwives, 50% did not realize their roles. One midwife said: *"I don't know how to express my role in micro-stratification."* Only after explaining their roles they realized their roles and responsibility.

Activities performed

All HAs and 50% of MWs knew what activities they had to perform. They knew what data to collect according to the data collection format. Everyone remembered LLIN distribution, bed net impregnation activities and health education for malaria prevention. They also remembered the importance of diagnosis and prompt treatment using RDT/ACT. They never failed to remember the risk mapping activity.

Actual implementation

In the course of implementation the following are the events noticed by different staff categories:

BHS (HAs, MWs):

- Demographic data such as village, household, and population data was difficult to get from village authorities.
- Village maps were not available. Only the sub-RHC map were available but without demarcation lines, making the risk mapping difficult.
- Area stratification based on distance from forest, health center and breeding places of primary vectors was sometimes difficult to carry out.
- As local transmission or indigenous cases were hard to know for every village, it was difficult to determine the stratum to which these areas belonged to.
- The micro-stratification guidelines, although simple, are not always easy to apply. However, it is easier for BHS who have been working in the area for many years and who know the situation of the area very well.
- One HA mentioned that as he is the successor of the previous HA, he has to accept the stratification made before, whether it is in line with the guideline or not. He found that some villages were allocated to the wrong stratum, making resource allocation (LLIN) difficult.
- BHS were confident about the area they had stratified to the best of their knowledge.

VBDC staff:

- It was noticed by VBDC staff that BHS who had been working in the same area for many years could easily apply the guidelines and collect the data needed for micro-stratification.
- Through experience from Chin State it was mentioned that some villages could not be reached, leaving the stratification of that area incomplete or not stratified. These villages may be put in stratum 1a by guessing which in could make resource allocation difficult.
- Bias in the stratification process of stratum 1a has been observed. There are at least two reasons for this: 1) MWs may be inclined to put villages into stratum 1a in order to get more resources or 2) Personal bias in estimating distance from "forest," "health centre" or "vector breeding sources" so that they can include their areas into the desired stratum.
- Due to difficulties among some BHS in understanding the stratification process, some villages were misclassified to the wrong stratum, e.g. 1a villages misclassified as 1b, 1b villages as 1a, or 1b villages as 1c etc.
- It was noticed that BHS had problems stratifying villages into stratum 2.

Satisfaction of work performed

After BHS had mapped out their stratified area, they were very satisfied with the final micro-stratification. BHS took great pride of their performance. However, some difficulties were encountered. As mentioned above, it was sometimes difficult to get actual demographic data, mainly household, village and population data. Another limitation was the difficulties in getting village area maps with clear demarcation.

Support

Regarding support (financial, logistic and technical), people from all townships reported that this was timely, adequate and sufficient. For the logistic support, two townships mentioned that they had to supplement on their own. For the LLINs, transport charges from township to villages were not adequate and created a burden for the villages. An example from Magway Division was that in one township, the allotted transport charge was 200,000 kyats. In reality they had to spend 1.2 million kyats for the LLINs to reach the respective villages. This problem was solved by receiving help from village authorities and well-off villagers. If this scenario took place in all other townships, it would be a great burden.

LLIN distribution

The situation of LLIN distribution and responses from beneficiaries were indirectly obtained from the BHS and VBDC staff who were involved in LLIN distribution.

After the micro-stratification, the first main activity to follow was the distribution of LLINs to villages stratified as 1a. BHS and VBDC staff noted that LLINs were supplied in adequate amounts to nearly all townships. However, two townships experienced a shortage of LLINs which was due to a discrepancy in household data. At the time of LLIN distribution, which took place two years after completion of the micro-stratification, the number of households had increased. BHS explained that the reason for this could be that there were unexpected new settlers who had migrated into the area. This resulted in inadequate distribution and coverage of LLINs.

According to BHS and VBDC staff, beneficiaries were satisfied with getting the LLINs free of charge – some even asked for more nets. Through interviews about the usage of LLINs it was learned that not all people knew how to use it, but the utilization increased after receiving information about how to use it and the benefits of using it. The beneficiaries also

discovered additional benefits of using LLINs, for example that they help keeping out bed bugs and domestic insects. Moreover, beneficiaries knew more about malaria and its prevention after receiving health information.

Eligible families that did not receive LLINs due to insufficient amounts of LLINs asked why they were not included. BHS then had to explain that families with children aged less than five years and pregnant women were given priority, but that when more supplies arrived, those that were left out would receive LLINs.

Households that were in stratum 1b – situated adjacent to 1a but not eligible to receive LLINs – were not happy about the fact that they were not included on the distribution list. They thought it was discrimination.

Diagnosis and treatment

Support for malaria diagnosis and treatment was provided to all 80 townships irrespective of the stratum. RDT/ACT was distributed according to the risk area. After the micro-stratification, health education and awareness raising activities took place at the same time as LLIN distribution. The situation on utilization of diagnostic facilities and responses from patients were indirectly obtained from BHS who were providing the medical care in the community. According to BHS, in the past, whenever they provided health education to the community, no other activities were arranged. Now, diagnosis and treatment was provided free of charge together with LLIN distribution soon after the community was provided with health information. Patients who usually approached quacks were now choosing to go to the health center for treatment of malaria.

Working with other organizations

UNICEF had signed a contract with the international non-governmental organization (INGO), Populations Services International (PSI), under the component of behaviour change communication (BCC). Any INGO carrying out activities in relation to malaria control was interviewed by key informants, mainly TMOs and BHS.

According to TMOs, INGOs (mainly PSI) approached them before they began implementing the BCC program in the project townships. They tried to focus their activities according to micro-stratification results, giving priority to 1a villages.

Information on the activities performed by PSI was indirectly collected during the in-depth interviews with BHS. The main implemented activities were 1) Health education information for raising awareness on malaria followed by a video about malaria transmission and prevention (where video facilities were available), and 2) Demonstration of bed net impregnation and promotion of insecticide tablets with subsidized rate. These activities were performed by the local interpersonal communicators (IPCs) from PSI accompanied by village health staff from the area if present. Mostly IPCs carried out their work on their own.

From interviews with BHS it was noted that awareness raising sessions with video were successful. The video sessions were most appreciated in villages located further away from the high way bus line compared to villages located nearer to the high way bus line as people in these villages are used to video shows. Bed net impregnation gained a lot of interest which was due to the awareness raising activities through health education talks, followed by practical activities.

VBDC project staff mentioned that LLIN distribution activities were also implemented by the International Organization for Migration (IOM) and JICA. IOM gave priority to the migrant

population whether they were residing in stratum 1a or not. JICA gave priority to workers working at development project sites situated in malarious areas.

Effects of the strategy

BHS work load

The micro-stratification strategy was mainly implemented by MWs. From the in-depth interviews it was evident that 70% of MWs did not think that the micro-stratification strategy had overburdened them. Midwives also realized that they could carry out malaria prevention and treatment activities systematically and efficiently, hereby gaining trust and acceptance within the community.

Initially, 25% of MWs thought that the micro-stratification would overload them with work. However, only 14% felt that they were overloaded with new project activities. They explained that *"The duties of midwives are already complex and many feel overloaded with work, which is why no more tasks should be given."* Among BHS who did not feel overburdened, it was mentioned that "*Micro-stratification work can be part of an integrated approach to deliver primary health care."* Other BHS mentioned that *"Micro-stratification training has increased our knowledge on malaria prevention, control and treatment and our general practice has become better than before."*

Ownership of the Strategy

VBDC staff, TMOs and HAs felt empowered by the strategy. At first, BHS (THNs, LHVs, MWs) thought that micro-stratification was just a temporary project. However, being part of a continued process from data collection to finalization of risk maps, they gained great interest and felt that their objectives were successfully accomplished. They realized that the risk maps they had produced would be used by themselves during day-to-day work in community health care. Learning by doing and practical experience had created ownership of the micro-stratification strategy. A MW said *"I became midwife out of my own interest. I always performed my assigned duties with great sincerity, dedication and with the best of my knowledge and capacity. I regard all the health related work as my own and there is no way for me to work just superficially and let people suffer. If I don't want to work anymore, I will quit."*

Change in malaria case load

The malaria situation was explored before and after the introduction of micro-stratification strategy by the in-depth interviews with key informants of the townships and with VBDC project staff. Information received during interviews was mainly through experiences on clinical grounds and findings during respondents' field visits.

The TMO from Kyauktagar Township described his experiences throughout his three years service: *"I noticed that the malaria caseload in my hospital was increasing instead of going down in spite of initiation of micro-stratification. I think that the sleeping behavior within the community has not changed* [not using LLINs] *and the situation may be compounded with other factors like population migration. I noticed that although morbidity is increasing, the number of severe complicated cases and deaths due to malaria have declined significantly."*

Two MWs and one THN from other townships also mentioned that the number of malaria cases had not changed much, indeed it had been increasing. The reason for this was

thought to be the fact that people who usually did not go to the health center had changed their attitudes and practices and now started to visit health centers.

VBDC staff (ROs and TLs) also noticed a reduction of malaria morbidity and mortality in their respective states and divisions. ROs from Rakhine State and Magway Division mentioned that they had noticed a visible impact of ITNs and RDT/ ACT on the number of malaria deaths.

ROs from Bago division had the same view as the TMO from Kyautagar Township. The malaria caseload was increasing due to the effects of arriving migrant workers. The acting TL – the head quarter malaria assistant of Kayin State – noticed that there was not much change in the caseload in Kayin State.

These are the preliminary comments of BHS from five townships and VBDC staff. To be more complete, experiences from townships of other States/Divisions should be explored in future evaluation.

Strengths and weaknesses

Some of the strengths and weaknesses regarding micro-stratification and related activities as perceived by the key informants are collectively summarized below.

Strengths

- TMOs, HAs1 and HAs mentioned that because of micro-stratification they can advocate to local administrative bodies about their plan of work in the control of malaria.
- Micro-stratification results help to plan for malaria control activities at every level of health care.
- Resources like LLINs, RDT/ACT, insecticide tablets and health education materials can be allocated effectively based on the micro-stratification.
- Micro-stratification improves early diagnosis and prompt treatment. This strengthens confidence and trust within the community.
- Because of early detection of malaria cases, severe and complicated cases or impending severe cases can be referred in time to a higher level of care.
- The community becomes aware of the benefits of LLIN usage through health education activities taking place before the distribution of LLINs and impregnation of bed nets. Furthermore, the community becomes more involved in public health activities.
- Other implementing partners such as PSI, IOM and JICA can make use of the micro-stratification results in carrying out malaria related activities in their respective organizations.
- Micro-stratification guidelines contribute and work well in the course of actual implementation.

Weaknesses

- TMOs and VBDC staff pointed out that the micro-stratification guidelines and some of the operational definitions were not clear for all BHS (e.g. terms such as “local transmission,” “indigenous cases,” “imported cases,” “forest,” and “breeding places of vectors”).
- Activities following micro-stratification took some time to implement (e.g. LLIN distribution followed only after long time).
- LLINs were not sufficient in some townships.

- RDT/ACT distributed in the first batch was near to the expiry date.
- Scientific methods were lacking in micro-stratification.
- One of the VBDC project ROs pointed out that the application of micro-stratification guidelines was different between various States and Divisions. (e.g. 1a villages in one State/Division were not the same as in another State/Division.

DISCUSSION

Different activities impact malaria morbidity and mortality in different ways. The malaria micro-stratification strategy, hence also this report, focuses on two kinds of activities: 1) Activities contributing to the reduction of malaria morbidity (*preventive* activities) and 2) Activities contributing to the reduction to the malaria mortality (*curative* activities).

Activities that contribute to the reduction of malaria **morbidity** are:

- LLIN distribution to high-risk groups
- Impregnation of existing mosquito nets with insecticides (i.e. ITNs)
- Vector control such as indoor residual spraying (IRS) with insecticides
- BCC through media, health education information, awareness-raising sessions, inter-personal communication, focus group discussions etc.

Activities that contribute to the reduction of malaria **mortality** are:

- Provision of Early Diagnosis and Appropriate Treatment (EDAT), promptly and effectively
- BCC, especially focusing on correct treatment seeking behavior of the community

Malaria morbidity

The MBR is partly influenced by BCC activities and the degree to which health facilities are utilized. These factors might have played a significant role in the observed increase of MBR. This issue was also discussed during in-depth interviews with TMOs and BHS. They mentioned that the observed increase in caseload was due to the fact that the community has become more aware of malaria prevention and proper treatment seeking behavior through BCC. Consequently, people in the community, who usually approached quacks, now choose to go to the health centre for diagnosis and treatment, thereby increasing total caseload.

Importantly, the observed increase in MBR is not due to ineffective LLINs. In fact LLINs have a vector control component incorporated in it which acts like vector control, hence preventing malaria transmission through mosquito bites. This vector control effect is not achieved by using ordinary bed nets which only prevents man-vector contact. Vector control is the most effective preventive measure for malaria and through provision of LLINs the capacity of mosquito vectors is greatly reduced, just as in the case of indoor residual spraying.

Malaria mortality

The MTR decreased in 24 out of 25 (96.0%) UNICEF supported townships (phase-one) in 2008 compared to the 1999-2006 average. This is a result of the improved diagnostic and treatment facilities provided down to the sub-RHC level and even to the village level through volunteers. In interviews with BHS it was mentioned that they rarely came across severe

cases needing referral, even after seeing a greater caseload. TMOs also noticed that fewer severe cases were admitted to hospitals and the few severe cases they came across were generally in a much better state than previously and could be successfully treated. The reduced MTR is also an indirect result of health education by health staff and the BCC component through PSI which promoted early and proper treatment seeking behavior.

Factors affecting observed results

New development projects such as road construction, dam construction, deforestation, reforestation, new settlements etc. draw the attention of the work force to these sites which are often situated in malaria endemic areas. Even in areas where malaria cases among indigenous people are rare, high numbers of malaria cases present among non immune migrant workers, which will lead to an increase in MTR and MBR, even in areas where LLINs have been distributed.

With a range of factors potentially influencing the changes observed in MBR and MTR (e.g. presence of migrant workers), it is difficult to calculate a reliable attributable fraction for observed changes. Hence, the effects of interventions implemented under the micro-stratification and micro-planning exercise are merely a contribution to the observed changes. This contribution, however, might be substantial. MBR and MTR may have been overestimated as migrant workers are not counted in the population (village and township level) but are counted as malaria cases/deaths upon contact with staff at health facilities. This might have influenced the observed mortality and morbidity rates in some UNICEF townships, thereby contributing to an overestimation of the overall MTR and MBR in all UNICEF supported townships.

As mentioned, in some townships the observed MBR and MTR for 2008 are matched by equally low or lower values at some point during the 1999-2006 period. This may indicate unstable malaria conditions, migrating populations/workers (in or out), variations in the ability to respond to suspected malaria cases, variations in case detection ability or variations in the availability of malaria medication and/or LLINs at township level. A combination of these factors is likely to have influenced the trend of MBR and MTR over the past decade.

Different findings among implementation groups

A change in MBR and/or MTR is anticipated in 2008 in UNICEF supported townships as a strategic shift was made when introducing the micro-stratification strategy, thereby increasing preventive and curative activities among the people most at risk of contracting malaria. For non-UNICEF townships, however, a significant change is not necessarily expected in 2008 compared to previous years – if any indeed – as no major strategic shift has taken place. Nevertheless, township focus and availability of supplies might change over the years causing fluctuations in both MBR and MTR to occur in all townships affected by malaria in the country.

All intervention groups have seen significant reductions in both MBR and MTR in 2008 compared to the period of 1999-2006. When looking at the degree of reduction it is important to keep in mind the township focus of various stakeholders (i.e. intervention groups). Remember that non-UNICEF/WHO-3DF townships are usually townships with lower malaria MTR and MBR in the first place. Therefore, it might be easier to achieve a high percent reduction in these areas, even with just little intervention. Indeed, in 2008, non-UNICEF/WHO-3DF townships had the second lowest MBR and MTR values which represent a significant reduction since 1999-2006.

In contrast, overlapping UNICEF/WHO-3DF townships where UNICEF micro-stratification was not yet implemented had the highest MBR in 2008. In 2008, WHO-3DF townships had

the highest MTR, nearly twice as high as any other intervention group. This might reflect the fact that both UNICEF and WHO-3DF townships are chosen through a needs-based approach, i.e. where communities are most at risk.

From in-depth interviews it came out that BHS experience some difficulties with important terms and definitions relating to the stratification process of villages. This obviously has to do with the fact that guidelines were not always clear and easy to understand for the BHS, but also because the strategy itself is new to BHS and will take some time to get familiar with. In this regard it was also observed that that BHS were not always clear about the role they should play in the process. Nevertheless, the strategy did bring about a sense of empowerment and ownership of activities. This is likely to be further strengthened after acquiring more experience and receiving more training.

There is no doubt that distribution of LLINs play a key role in addressing both MBR and MTR in high-risk communities. To achieve a high impact of LLIN distribution, there are several points to consider:

- Coverage of LLIN distribution
- Timely distribution to cover the transmission season
- Number of LLINs to meet the planned target
- Adequacy of provided LLINs
- Correct utilization of LLINs
- LLIN coverage for migrating populations
- Contributing events like environmental change and change in ecology
- Utilization of health facility by the community
- BCC coverage

CONCLUSION

This evaluation has documented the results thus far from adopting a malaria micro-stratification strategy in UNICEF supported townships. Among the key findings is that 60% (n=15) of UNICEF townships experienced a reduction in MBR in 2008 compared to the average rates of the pre-intervention period 1999-2006, whereas a reduction in MTR was observed in 96% (n=24) of townships. Reduction of both MBR and MTR was observed in 60% (n=15) of the townships while only 4% (n=1) of townships saw an increase in both MBR and MTR.

For all 25 UNICEF supported townships combined the malaria MBR is higher in 2008 than it was in the preceding four years. Nevertheless, the 2008 MBR remains slightly below the 1999-2006 average. The malaria MTR continues to decrease as has been the case since 2005 and remains well below the 1999-2006 average.

In UNICEF townships, the MBR has been reduced by 5% in 2008 compared to the average of 1999-2006, while MTR was reduced by 68%. The MBR reduction in UNICEF townships represents the lowest reduction observed among the intervention groups. The magnitude of MTR reduction is similar to findings in other intervention groups. Population migration and seasonal migrant workers remain the most likely explanation to the limited reduction in MBR with many townships actually seeing an increased caseload in recent years. Increased awareness and proper treatment seeking behavior have contributed to a significant reduction of MTR after introducing the micro-stratification strategy.

Most health staff had a clear understanding of the micro-stratification strategy and related activities involved in its implementation. However, some less experienced BHS did encounter difficulties in the stratification process and were not clear about some of the key terms and definitions which are important for determining the correct stratum for each village. Most staff mentioned that the introduction of the strategy did not adversely affect their ability to carry out other responsibilities. The participatory process fostered empowerment and a sense of ownership in the community and also led to motivation of implementing health staff.

RECOMMENDATIONS

Ways and means of improvement of the micro-stratification strategy as suggested by key informants as well as other recommendations generated from in-depth interviews are presented below:

- Micro-stratification guidelines should be modified and simplified. For this, a micro-stratification modification workshop should be arranged in collaboration with VBDC, WHO, JICA and other stakeholders working on malaria prevention and control. At this workshop, retired malariologists, VBDC ROs and senior TLs should also be invited as they have already acquired experience from the present micro-stratification exercise.

- VBDC ROs and TLs recommended that scientific methods should be included in the guidelines but should be feasible for the BHS (e.g. spleen rate).

- BHS suggested that operational definitions should be made clearer for the terms “local transmission,” “indigenous case,” “imported case,” “forest,” and “vector breeding sites.”

- Entomological information should be provided to know the vectors and their breeding sources up to the village level if possible. This information is to be provided by the state and division VBDC teams.

- Hard-to-reach villages assigned to stratum 1a should be reviewed again as not all hard-to-reach villages are malarious by nature.

- TMOs, ROs and TLs pointed out that problems of migrant populations should be considered separately in the micro-stratification guidelines. The criteria used for malarious villages like “distance from forest,” “distance from health centre,” “distance from breeding source” should be substituted with other criteria.

- Re-stratification should take place every three years.

- One of the ROs pointed out that micro-stratification is village level based and if there is an unexpected emergence of development projects in a previous bare land area, nobody are taking responsibility for stratification of this area. With this example he pointed out that stratification of such areas should be considered in the guidelines.

- Refresher training on micro-stratification is requested by BHS. As learning capacity may vary, BHS requested longer duration of the training.

The following are the activity-related recommendations:

- After micro-stratification, support for related activities like LLIN distribution should follow as soon as possible.
- The LLIN distribution policy of one net per household should be reconsidered, i.e. to consider two LLINs per household.
- Transport charges of LLINs from township to villages are not adequate. For this, VBDC ROs suggested to consult them for the local transport charges.
- All townships suggested supplying RDT/ACT with good expiry date.
- More volunteers should be recruited to cover the 1a stratum villages which are hard-to-reach.
- LLINs should be supported in two forms – single and double nets.

Recommendations related to evaluation:

- Qualitative evaluation was done in only five townships of two states and two divisions. The findings of the in-depth interviews in the five townships cannot be generalized to the whole country. This evaluation is only small scale and findings and results are preliminary ones. Therefore, the evaluation should be extended to include at least one township per remaining 10 states and divisions in order to get a more complete view.
- The evaluation mainly focused on the health provider aspect. For future evaluations, in-depth interviews should include local administrative bodies, beneficiaries and stakeholders.

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ANNEXES

Annex 1:

Core Questionnaire Guidelines for In-depth Interviews

For VBDC project staff (RO & TL), TMO and BHS

1. Understanding
    a. Briefly tell me about the micro-stratification strategy as you understand it.
    b. Do you think this strategy is important for malaria control? Yes/No? Please give reasons, e.g. How? What aspect?
    c. What is your opinion about the strategy? (Awareness and attitude, level of attention to the most marginalized families)
2. Training
    a. Tell me about the training/workshop conducted before the actual implementation of micro-stratification.
    b. How did the training go? (Contribution to the actual work)
    c. How was the feedback/response from the participants?
3. Implementation
    a. What activities were done?
    b. What is your role?
    c. What do you think of your role in regard to the implementation?
    d. Is it satisfactory or not? Give reasons? Any barriers? Please explain.
    e. What support was provided/received (Financial, technical, logistical etc. - sufficient or not?)
    f. How was the actual implementation on the ground?
    g. What kind of response/feedback did you receive from BHS? (Excluded in BHS questionnaires) .
    h. What kind of feedback did you (BHS) receive from direct beneficiaries?
    i. Was the number of LLINs provided sufficient? (Satisfaction from beneficiaries)
    j. Diagnosis and treatment – acceptance of beneficiaries regarding RDT/ACT, responses from beneficiaries.
    k. What difficulties/challenges did you encounter? How did you overcome these? (Solutions)
    l. What are your experiences working with other stakeholders, e.g. PSI?
    m. What activities were done?
    n. What is their application of micro-stratification results?
4. Effects of the Strategy
    a. How do you perceive the effects of the strategy?
        i. Direct
            1. Any change in the malaria caseload in the communities after the implementation of the strategy?
            2. Any effect on workload of BHS?
        ii. Indirect
            1. Ownership of the strategy – perception of BHS, attitude of BHS towards participation in the micro-stratification work.
5. Strength and Weaknesses
    a. Do you think the strategy needs to be improved? Yes/No? Give reasons.
    b. Suggestions for improvement
6. Recommendations

Annex 2:

List of persons interviewed

1.	VBDC - Regional Officer	Central VBDC
2.	VBDC - Regional Officer	Bago Division
3.	VBDC - Regional Officer	Magway Division
4.	VBDC - Regional Officer	Mon State
5.	VBDC - Regional Officer	Rakhine State
6.	VBDC - Team Leader	Mon State
7.	VBDC - Medical Officer	Central VBDC
8.	VBDC - Malaria Assistant	Kayin State
9.	Township Medical Officer	Padaung Township
10.	Township Medical Officer	Paung Township
11.	Township Medical Officer	Kyauktaga Township
12.	Health Assistant (1)	Tha Hton Township
13.	Township Health Nurse	Padaung Township
14.	Township Health Nurse	Hlaing Bwe Township
15.	Health Assistant	Padaung Township
16.	Health Assistant	Tha Hton Township
17.	Health Assistant	Paung Township
18.	Health Assistant	Kyauktaga Township
19.	Lady Health Visitor	Paung Township
20.	Three Midwives	Paung Township
21.	Two Midwives	Padaung Township
22.	Two Midwives	Tha Hton Township
23.	Two Midwives	Hlainb Bwe Township
24.	Two Midwives	Kyauktaga Township

List of places visited

1. Bago Township
2. Hlaing Bwe Township
3. Kyauktaga Township
4. Maw La Myaing Township
5. Padaung Township
6. Pa-an Township
7. Paung Township
8. Tha Hton Township