Report on the

# Intercountry workshop on malaria surveillance, monitoring and evaluation

Sharm El Sheikh, Egypt
11–13 May 2010

**World Health Organization**

Regional Office for the Eastern Mediterranean

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CONTENTS

## 1. INTRODUCTION

An intercountry workshop on malaria surveillance, monitoring and evaluation was held in Sharm El Sheikh, Egypt, from 11 to 13 May 2010. The workshop was organized by the World Health Organization (WHO) Regional Office for the Eastern Mediterranean. The objectives of the workshop were to:

- review the progress and challenges in the implementation of malaria surveillance, monitoring and evaluation systems
- update countries with new developments on malaria surveillance and monitoring and evaluation
- present new WHO malaria surveillance guidelines
- review and finalize the new Regional malaria surveillance form and database
- develop an inventory of digitized maps down to district level for all malaria-endemic countries
- coordinate submission of the data for world malaria report 2010.

Dr Hoda Atta, Regional Adviser, Malaria, delivered the opening remarks. She noted that this meeting was the second regional workshop supported by the WHO Regional Office for the Eastern Mediterranean to strengthen the surveillance, monitoring and evaluation system for malaria. The first was held in Luxor 2004. In recent years, a number of malaria goals and objectives had been adopted globally. Surveillance, monitoring and evaluation were critical activities for measuring how well programmes were operating over time and whether goals were being achieved.

The countries of the Region were in different stages of malaria control and elimination, said Dr Atta, and therefore had different approaches for malaria surveillance and monitoring and evaluation systems. In the context of a malaria control scale-up programme, the malaria monitoring and evaluation system focused on monitoring programme performance, evaluating coverage of interventions, and evaluating the impact of disease burden reduction, specifically morbidity and mortality. However, as programmes became increasingly successful in reducing transmission and moved towards elimination, the malaria-associated morbidity and mortality burden would be dramatically reduced, making measurement of burden less sensitive and more difficult. Therefore, burden measures that only detected clinical illness would not provide good estimates of ongoing transmission. As countries approach elimination, malaria programme impact evaluation and surveillance methods would need to focus on detecting infection (with or without symptoms) and transmission dynamics as the primary indicators of interest. She reminded participants that their countries were committed to reporting their progress towards achieving the global objectives of the Roll Back Malaria initiative (50% reduction of malaria morbidity by 2010 and 75% by 2015 and zero mortality by 2015) and the malaria-related target of the Millennium Development Goals (Goal 6 Target 8—to have halted, by 2015, and begun to reverse the incidence of malaria).

She referred to the World Malaria Reports published in 2005, 2008 and 2009 by WHO which documented the strengths as well as the challenges for malaria surveillance and monitoring and evaluation at the global, regional and national levels. The processes of data collection and their transfer from peripheral health facilities to subnational, national, regional and global levels were long and complex, with many lessons learnt. She asked participants to work together to develop a

plan to reach the objectives of the workshop with goal of strengthening malaria surveillance and monitoring and evaluation.

The chair was shared on a rotating basis. The programme and list of participants are included as Annexes 1 and 2, respectively.

## 2. GLOBAL ENVIRONMENT OF MALARIA MONITORING AND EVALUATION: UPDATES ON MALARIA SURVEILLANCE AND MONITORING AND EVALUATION
*Dr Richard Cibulskis, WHO headquarters*

As the 10th anniversary of the Millennium Development Goals arrives there is increased interest in reporting on the progress of malaria control programmes. The May 2009 Roll Back Malaria Board approved in principle the convening of a "high-level event" in September 2011, linked to the UN General Assembly, to report on progress towards targets. In practice a series of reports is being produced by Roll Back Malaria commencing with *Malaria funding and resource utilization: the first decade of Roll Back Malaria* (UNICEF, WHO and PATH, 2010), *World Malaria Day 2010: Africa Update* (UNICEF and PATH, 2010). These will be followed by reports on *Lives saved, malaria outside Africa* and *Malaria elimination*.

The Malaria Elimination Reference Group (MERG) has been instrumental in developing the malaria component of the *Lives saved tool* (LiST). The tool projects changes in under-5 mortality rates due to changes in the coverage of health interventions, such as change in under-5 deaths from malaria due to increase in insecticide-treated nets use. The tool is not malaria-specific but is intended to help health planning in general. MERG is also developing guidance for measuring the impact of malaria programmes. It has previously developed guidance on indicators that can be derived from household surveys.

WHO's Global Malaria Programme is developing guidelines on malaria surveillance and indicators that can be derived from routine information systems. Other guidance on indicators exists, such as the Global Fund's monitoring and evaluation toolkit, which has about 17 surveillance indicators. Global Malaria Programme guidelines focus on a minimum number of indicators and data elements in order to fit into the health management information systems of a range countries and which can be consistently measured across countries and over time.

## 3. REGIONAL VISION FOR MALARIA SURVEILLANCE AND MONITORING AND EVALUATION FOR CONTROL AND ELIMINATION SETTINGS
*Dr Hoda Atta, WHO Regional Office for the Eastern Mediterranean*

Monitoring and evaluation are critical activities for measuring how well programmes are operating over time by monitoring inputs, processes, outputs and outcomes and if programmes are achieving their goals, traditionally defined by reductions in morbidity and mortality (evaluation of impact).

The difference between programme monitoring and surveillance is as follows.

| Surveillance | Programme monitoring |
| --- | --- |
| Monitors, for example, *disease burden*<br>• malaria incidence or prevalence<br>• malaria-specific mortality<br>Trends in disease burden reflect the health impact of collective efforts of all contributors to the programme including socioeconomic determinants | Monitors *inputs* and *outputs* of the programme; outputs such as: number of health workers trained, number of insecticide-treated bednets distributed |
| | Measure programme achievements at population level by monitoring *coverage* (outcomes). such as percentage of population at risk having access to artemisinin-based combination therapy |
| | Monitor *behavioural outcomes*, such as percentage of people sleeping under insecticide-treated bednets |

The general surveillance methods used for incidence of diseases and deaths include: Routine reporting systems; sentinel reporting systems; surveys and special studies; case and outbreak investigations. The main aims of malaria surveillance in malaria control are:

- monitoring trends of morbidity, severity and mortality due to malaria
  - incidence of mortality and morbidity from routine health facility data (health information system, malaria-specific surveillance, integrated disease surveillance system, private sector, community outreach)
  - prevalence of disease /infection (surveys)
- early detection of malaria epidemics (sentinel)
- monitor drug efficacy, insecticide resistance (sentinel)
- other special studies to monitor: quality of the medicines in the market and adherence of health workers to the national medicine policy.

**Surveillance in malaria elimination/eradication**

The definition of surveillance with respect to malaria eradication is the "part of the programme aimed at the discovery, investigation and elimination of continuing transmission, the prevention and cure of infections, and the final validation of claimed eradication. The individual functions of surveillance are: case detection, parasitological examination, antimalarial drug treatment, epidemiological investigation, entomological investigation, elimination of foci by residual spraying, case follow-up and community follow-up" (*Terminology of malaria and malaria eradication: report of a drafting committee*. Geneva, WHO, 1963).

In control programmes, surveillance focuses on illness and mortality reduction while in elimination programmes surveillance methods focus also on detecting infections (with or without symptoms) and on transmission dynamics. Surveillance in malaria elimination is related to the context of malaria elimination and aims at the following:

- monitoring transmission, and its dynamics in addition to disease burden ( since elimination aims to interrupt local transmission)
- detecting infections (API), regardless of whether symptoms of fever or illness are present

- rapid detection of the cases and their foci; since cases become few and local in distribution, local information systems are needed. As well as passive surveillance, the system will also move to active surveillance and prompt detection of infection
- case based surveillance : complete and timely reporting of each individual case or infection together with epidemiological investigation report.

In elimination , the surveillance system should collect the following specific data and rates pertinent to elimination.

- The number of epidemiologically investigated cases by classification: local or autochthonous cases (sum of indigenous, introduced and relapsing), imported cases, induced cases.
- The number of foci by classification, seven categories. Reclassification is made promptly if the situation changes (e.g. if cases appeared in a cleared-up focus, it should be reclassified as a new potential focus). Status is reviewed at the end of the transmission season. In areas where both species are still transmitted, monitoring should be done separately for each of them; e.g. a focus may be cleared-up for *Plasmodium falciparum* and at the same time, residually active for *P. vivax*.

Specific rates for malaria elimination are computed**:** annual blood examination rate (ABER), annual parasite incidence (API), annual falciparum incidence (AFI), slide positivity rate (SPR) and slide falciparum rate (SFR).

**Surveillance in post elimination**

Surveillance aims to prevent introduced and indigenous cases secondary to imported cases. Data required are: number of imported malaria cases and deaths, by species and by country of origin. Surveillance should be strengthened in priority risk areas (highly vulnerable foci with recent transmission, highly endemic in the past with high receptivity, border areas, near international ports of entry) and priority risk groups (travellers to endemic areas, refugees, students from endemic areas, airline personnel, military, UN peace groups, sports players, intravenous drug users).

Several challenges face the surveillance systems in endemic high-burden countries of the Region including: limited coverage, missing some areas due to insecurity; social and political factors; dependent on patient-seeking behaviour and use of public facilities, reporting may be incomplete in terms of location and time; indicators and quality of data are poor; other sources are missing (private, community); various systems are often uncoordinated, with double counting (health information systems, malaria surveillance, early warning and response network (EWARN), community health workers) .

Countries should exert more efforts to strengthen surveillance. Investment in health is increasingly dependent upon evidence of positive changes in disease burden following health interventions. Funding agencies use surveillance information to select priorities among disease control activities and, select priority countries for funding.

4.    **ENTOMOLOGICAL SURVEILLANCE AND VECTOR CONTROL MONITORING AND EVALUATION**
      *Dr Abraham Mnzava, WHO Regional Office for the Eastern Mediterranean*

In general the world has witnessed progress in the reduction of deaths and suffering from malaria in small to medium-size countries through diagnosis, treatment and prevention of cases. For prevention, the use of long lasting nets (LNs) and indoor residual spraying (IRS) has contributed significantly to the reported reduction. These efforts, however, are threatened by the development and spread of vector resistance to insecticides—especially to pyrethroids—the only class of insecticides that can be used for both LNs and IRS.

In the Eastern Mediterranean Region, vector resistance to pyrethroids is a major problem in Sudan and possibly in Afghanistan and Somalia. In the case of Sudan the sustainability of IRS with a carbamate is a problem. Unlike in the past when fingers were being pointed at the use of pesticides in agriculture, there is evidence that the use of pesticides in public health could also be responsible for the selection of resistance by the vectors. Depending on the mechanism of resistance, there is also evidence that resistance could reduce the impact of vector control interventions.

Where are we with new products and formulations? We are very far away with new products but there is some light at the end of the tunnel with mixtures and formulations of available products. The main concern is on their safety. What about combinations—like with artemisinin-based combination therapy? Theoretically combinations are promising but we need the evidence.

Two areas are therefore critical—entomological surveillance and monitoring and evaluation of coverage of vector control interventions. Routine monitoring of insecticide resistance through sentinel sites once a year or once every two years. In countries implementing malaria control—measurement of entomological inoculation rate (EIR) from biting rates, blood meal index and proportion of sporozoite infected mosquitoes. Larval collections could provide indication of vector densities, especially in countries implementing elimination. Measuring parity could provide a crude measure of survivorship. Assessing universal coverage of interventions, including use in the case of LNs, is a key component of monitoring and evaluation.

In conclusion, countries are making good progress with scaling-up of universal coverage of interventions. These efforts are indeed threatened by vector resistance. The latter will drive entomological surveillance, monitoring and evaluation. Capacity is therefore needed to ensure strengthening the capacity for surveillance, monitoring and evaluation.

5.    **COUNTRY REPORT ON SITUATION OF MALARIA SURVEILLANCE AND MONITORING AND EVALUATION**

**5.1   Afghanistan**
      *Dr Ahmad Walid Sediqi, National Malaria and Leishmaniasis Control Programme*

The National Malaria and Leishmaniasis Control Programme (NMLCP) has taken advantage of the existing monitoring and evaluation systems at the national level. All monitoring and

evaluation activities continue to be coordinated with stakeholders at the national and sub-national levels. The monitoring and evaluation directorate of the Ministry of Public Health will oversee monitoring and evaluation activities in Afghanistan. A national malaria monitoring and evaluation unit has been established to coordinate and supervise the monitoring and evaluation of national malaria activities. The current health management information system provides the necessary data to calculate malaria-specific indicators. NMLCP will conduct intermittent surveys to gather further malaria specific information. Regular reports from sentinel sites, supervisory visits and submission of administrative records from PRs for malaria grants will be other sources for monitoring and evaluation.

Currently malaria indicators in the health management information system are reported incidence, malaria mortality, stock-out of anti-malaria drugs except artemisinin-based combination therapy (ACT) and laboratory-confirmed cases. It has been proposed by the malaria control programme to add the following indicators: number of patients treated with ACT, age and sex-specific incidence rates, severe and complicated cases with parasitological conformation, number of cases among pregnant women and number of cases confirmed by rapid diagnostic test (RDT).

The trend of confirmed malaria cases shows a significant decrease in recent years; this is clearer for falciparum malaria—the number of cases decreased from more than 84 000 in 2002 to 4026 in 2009. With achievement we hope that falciparum malaria will be eliminated very soon from Afghanistan

Insecurity, reporting clinical cases from different level of health facilities due to weak confirmation system, insufficient knowledge of staff about malaria surveillance and monitoring and evaluation, lack of motivation, poor coordination among stakeholders, absence of laboratory facilities in basic health centres, an unregulated private sector and wide practice of self-medication are among the challenges of malaria surveillance in Afghanistan.

For strengthening malaria surveillance and monitoring and evaluation, the malaria control programme in Afghanistan is planning to revise the health management information system in coordination with the health management information system, monitoring and evaluation directorate and other stakeholders, to implement a national malaria database at the provincial level, to revise the malaria monitoring and evaluation plan, to establish entomology surveillance, to finalize and implement data quality assurance guidelines and to increase supportive supervision.

## 5.2 Iraq
*Dr Muthana Ibrahim Abdul-Karim Al-Dulaimi, National Malaria Programme*

Endogenous malaria decreased in Iraq from 42 in 2005 to 0 in 2009, and we hope very soon malaria will be eliminated. The programme has planned a comprehensive assessment of malaria situation with WHO support.

### 5.3    Pakistan
*Dr Muhammad Suleman Memon, Directorate of Malaria Control*

The estimated malaria case load in Pakistan is around 1.6 million cases per year. Yet the reported clinical cases are much higher. As an example, 4.5 million clinical malaria cases were reported by the Ministry of Health in 2009. Additionally, 4 million fever cases were treated with antimalarial drug (chloroquinine) by lady health workers as malaria suspected cases. Most of the districts sharing the major burden are located in border provinces with Afghanistan, Islamic Republic of Iran and India (Sindh). *P. vivax* is the predominant species (74%) however *P. falciparum* is on the rise in previously *P. vivax* dominant areas (Federally Administered Tribal Areas). Punjab with more than 56% of the country's population has been the least endemic provincesince 1990.

Information on clinical malaria, confirmed cases, SPR, ABER, parasite species and API is currently available at all levels. New tools for Global Fund target districts provide information on age, sex, pregnancy, diagnosis (microscopy and RDTs), treatment (ACT) coverage, LN distribution and logistics stock-outs.

Achievements on strengthening malaria surveillance and monitoring and evaluation inclide evaluation of malaria monitoring and evaluation system at the national level through preparation of national monitoring and evaluation guidelines and system documents for Global Fund target districts, development of new tools for 19 Global Fund target districts with planned replication in other parts of the country, involvement of private care delivery (four pilot districts) in malaria surveillance, conduct of malariometric surveys in 19 Global Fund target districts in 2009 , initiation of entomological surveillance at sentinel sites and development of needed tools for reporting on entomological parameters.

The main challenges of malaria surveillance in Pakistan include a fragmented information system and lack of coordination between various systems, relying on a malaria information system that is mainly inherited from the eradication era and mainly based on the old data recording and reporting tools, neglected entomological surveillance, lack of information on age, sex, pregnancy, coverage of interventions, not fully used demographic health survey although considered as major information source and deteriorating security situation in the north-west.

### 5.4    Saudi Arabia
*Dr Mohammad Al Zahrani, Director of Malaria Department*

The number of local malaria cases decreased from 4729 in 2000 to 58 in 2009. In the first 10 weeks of 2010 the number of local cases was only 5, which is a significant reduction in comparison to 2009; the corresponding number then was 36.

Strengthening passive and active case detection activities by public health institutions and mobile teams, strengthening malaria diagnosis, conduction of special screening activities in special laboratories for all the expatriates entering the country, designing special formats to ensure prompt notification of any case of malaria including prompt exchange of information between the relevant regions if it is needed, prompt epidemiological investigation for every single case of malaria using a

special malaria case epidemiological investigation form and training of malaria staff on the new formats are among achievements for strengthening malaria surveillance and monitoring and evaluation in Saudi Arabia.

Among the challenges of malaria elimination programme in the area of malaria surveillance and monitoring and evaluation are high turnover of staff; an expected decline in the sensitivity of malaria case detection and the impossibility of monitoring the efficacy of anti-malarial drugs using WHO standard procedures, with a dramatic decline in the number of malaria cases recorded in most regions; unstable political and security situation in the border areas with Yemen led to the freezing of vector control operations and surveillance, especially the mobile teams, in addition to the entomological surveillance; replacement of expatriates by newly graduated nationals in the malaria stations; and lack of reporting by the private sector.

## 5.5 Somalia
*Dr Jamal Amran, WHO Somalia*

Malaria transmission ranges from unstable and epidemic-prone in Puntland, Somaliland and parts of Central to moderate in Central Somalia to high in the South. It is estimated that approximately 75% of Somalia's people live in areas that support unstable or very low *Plasmodium falciparum* parasite rate (0%–5%) transmission. The number of reported cases has decreased in recent years. However due to a decrease in the reporting rate by WHO sentinel sites it is difficult to properly interpret the reported data.

The most important challenges of the malaria surveillance in Somalia are lack of a standard estimated population figure in the country; security and instability in many parts of the country; absence of central government; inadequate skilled health professionals and high turnover; lack of standard malaria reporting formats; poor coordination networks among the malaria stockholders at all levels; limited resources; and delay of release of funds.

## 5.6 Sudan
*Mr Abd Alla Ahmed Ibrahim Mohamed, monitoring and evaluation focal point*

The overall budget for malaria monitoring and evaluation is USS\$ 804 000. Malaria surveillance and information system is part of the general health information system; however, there is a separate system for malaria case notification using the same data collection forms and personnel.

The main achievements for strengthening malaria monitoring and evaluation in recent years are monitoring and evaluation units at national and state level producing weekly, monthly and quarterly compiled national reports, regular feedback to states on a monthly and weekly basis, quarterly meetings with state coordinators, conduct of malaria household and health facility surveys in 2009 and early 2010.

High staff turnover, limited use of data at local level, low data quality and long time lag between submission of reports and feedback are among challenges of malaria monitoring and evaluation.

### 5.7 Sudan (south)
*Dr Edward Quirino Bepo, National Malaria Programme*
*Mr Robert Gama Hassan, National Malaria Programme*

The number of reported cases in 2009 was 325 634; however due to very weak surveillance system this figure is not reliable. Unity state has the highest number of reported figures. A malaria indicator survey was implemented, and a report will be available in 2010.

Difficulties include a shortage of qualify health personnel to be recruited as county surveillance officers, weak health service delivery and infrastructure, frequent staff turnover at central, state and county levels, logistical difficulties due to poor roads and communication and insecurity.

### 5.8 Yemen
*Dr Moamar Mohammed Badi, monitoring and evaluation focal point*

In 2009, the number of reported confirmed malaria cases was 54 493 with *P. falciparum* making up more than 99%. In the same year slide positivity rate was 6.9%.

Before implementation of the new malaria surveillance system in 2009, activities by three different departments in the Ministry of Public Health and Population resulted in inconsistent data. The main achievements for strengthening malaria monitoring and evaluation in recent years are the development of a malaria monitoring and evaluation national plan (2005), updating of the plan and provision of computers and printers for monitoring and evaluation in 22 governorates from Round 2 Global Fund grants (2006), approval of Round 7 Global Fund grants with the health management information system and the disease surveillance departments as subrecipients (2007), updating the monitoring and evaluation plan to conform with the Global Fund grant (2008), formal establishment of monitoring and evaluation unit within the national malaria control programme, and recruitment of monitoring and evaluation focal point supported by the Global Fund and conduction of malaria indictor survey (2009).

The main challenges are insufficient understanding of the concepts and importance of monitoring and evaluation within the different Ministry of Public Health and Population departments, difficult terrains hampering routine supervision and other field visits, reliance on external funding sources and lack of adequate national resources that are needed to sustain such costly activities, insufficient trained staff and security concerns in some parts of the country.

Among the planned activities for strengthening malaria surveillance in Yemen are updating the national monitoring and evaluation plan to conform with the national malaria strategic plan (2011–2015), strengthening national surveillance and monitoring and evaluation capacities within the national malaria control programme, establishing functional malaria surveillance monitoring and

evaluation units and team at the national and subnational levels including recruitment of a highly qualified expert on monitoring and evaluation for the first two years for coaching the surveillance monitoring and evaluation system, developing an epidemic preparedness and response plan and employment of the weekly watch tool at facilities in epidemic-prone areas, enrolment of the private, supportive supervision from different level of the program, full use of the Global Malaria Database and midterm and final evaluation and programme review.

## 6. WORLD MALARIA REPORT 2008 AND 2009: PROCESS AND LESSONS LEARNED
*Dr Richard Cibulskis, WHO headquarters, and Dr Ghasem Zamani, WHO Regional Office for the Eastern Mediterranean*

The *World malaria report* provides the global community with a comprehensive overview of progress in controlling malaria. Each year it reviews latest policies for vector control and case management, domestic and international financing of malaria programmes, procurement and distribution of commodities, coverage of vector control and case management programmes, trends in disease and the impact of control programmes, and progress towards elimination. It aims to include information for the latest full calendar year, hence the *World malaria report* to be published in 2010 will include information up to 2009.

The primary source of information for the report is malaria endemic countries which provide data on policy adoption, programme implementation and disease trends. This is allied to data from partner agencies (particularly on financing and commodity procurement) and household surveys. The different data sources are consolidated within a relational database which is used to produce standard tables and programmatically relevant analyses. Information from the database is made available on the web so that countries and partners can obtain a summary of a country's situation, examine trends, make inter-country comparisons and undertake further in-depth analyses.

This year (2010), the deadline for data collection from endemic countries is the end of June in order to enable data cleaning to be undertaken in July. Data analysis and reporting writing will occur in August and September while final editing and layout will occur in October, in time for the report's release in November. In addition to the basic data collection from all countries in the Eastern Mediterranean Region additional information on malaria programme expenditures will be sought from Afghanistan and Sudan.

## 7. COUNTRY LEVEL BURDEN ESTIMATION METHODOLOGY FOR MALARIA MORBIDITY AND MORTALITY
*Dr Richard Cibulskis, WHO headquarters*

WHO, along with other development partners, recommends that the number of malaria cases and the number of deaths attributed to malaria should be used as core indicators by all malaria-endemic countries. However, the number of cases and deaths reported by countries does not always provide a good guide to the true number of cases occurring in a country because: not all malaria cases and deaths reported are confirmed by slide examination or rapid diagnostic test; hence there may be considerable over-diagnosis of malaria in a country; irregularity in reporting from health facilities and districts to central levels can influence trends in morbidity and mortality such that they

are more likely to reflect variation in reporting rates rather than disease incidence; and routine reporting systems do not consider patients attending private clinics or other nongovernment facilities or morbidity treated at home; hence incidence estimated from routine reports can underestimate the true number of malaria cases and deaths.

Because of these problems the number of cases reported by a ministry of health is adjusted to take into account incompleteness in reporting systems; patients seeking treatment in the private sector, self-medicating or not seeking treatment at all; and potential over-diagnosis through the lack of laboratory confirmation of cases. For some African countries the quality of case reporting is considered insufficient for the above formulas to be applied. In such cases an estimate of the number of cases is derived from the number of people living at high, low or no risk of malaria. Malaria incidence rates for these populations are inferred from longitudinal studies of malaria incidence recorded in the published literature. Incidence rates are adjusted downward for populations living in urban settings and the expected impact of insecticide-treated nets and indoor residual spraying programmes.

The true number of malaria deaths is estimated by one of two methods: by multiplying the estimated number of *P. falciparum* malaria cases in a country by a fixed case fatality rate. This method is used for all countries outside the WHO African Region and for countries in the African Region where estimates of case incidence were derived from routine reporting systems and where malaria comprises less than 5% of all deaths in children under 5 as described in the *Global burden of disease incremental revision for 2004* (GBD 2004). A case fatality rate of 0.45% is applied to the estimated number of *P. falciparum* cases for countries in the African Region and a case fatality rate of 0.3% for *P. falciparum* cases in other regions. For countries in the African Region, where malaria comprises 5% or more of all deaths in children under 5, the number of deaths is derived from an estimate of the number of people living at high, low or no risk of malaria. Malaria deaths rates for these populations are inferred from longitudinal studies of malaria deaths as recorded in the published literature.

The methods applied for calculating incidence and death rates associated with malaria rates are described fully in the *World malaria report 2008*, together with procedures for estimating the uncertainty around estimates.

## 8. CRITICAL REVIEW OF 2010 ANNUAL MALARIA SURVEILLANCE REPORTS BY COUNTRIES
*Dr Ghasem Zamani, WHO Regional Office for the Eastern Mediterranean*

Country teams had a group work to finalize their peer reviews on annual malaria surveillance 2009. Based on the feedback from participants this exercise was very helpful for understanding the contents, procedures and importance of the annual report and it is expected that will improve the quality of reported data for future. The headquarters team will consider repeating this experience in other Regions.

## 9.    METHODOLOGY OF HEALTH FACILITY SURVEY: EXAMPLE OF SUDAN
*Dr Abdisalam M. Noor, KEMRI*

These are surveys which are based on a nationally representative sample of health facilities and are designed to collect information on the readiness of the health facilities and health workers to provide appropriate case management to patients with uncomplicated malaria.

**Key objectives of the northern states of Sudan health facility surveys**

To determine the national levels and trends in the availability of recommended and non-recommended antimalarials and malaria diagnostics in public health facilities; to determine the national levels and trends in health workers' adherence to outpatient guidelines for malaria diagnosis, treatment, counselling and drug dispensing for patients across all age groups in public health facilities; to establish a national network of facilities that can be used for continuous surveillance of key malaria case-management indicators.

**Sampling procedure and sample size and survey tools**

Surveys are based on a nationally representative sample of public health facilities (government, nongovernment organizations and faith-based facilities). National representativeness is assured by drawing a stratified random sample from the universe of public health facilities and taking into consideration within-country distribution of facilities by state and type of facilities. A simple random sample is drawn from each stratum in proportion to the size of the stratum. This will guarantee that the resulting sample will be an equal probability sample which will not require weighting in the analysis.

Typically three survey questionnaires are used: a health facility assessment questionnaire; a patient's exit interview questionnaire; and a health worker's questionnaire. The health facility assessment questionnaire documents the type and location of health facility; general infrastructure such as access to water and electricity; the availability of weighing scales and thermometers; the number and cadre of health workers; the number trained on the use of artemisinin combination therapies and rapid diagnostic tests in malaria case-management and integrated management of childhood illness; the availability of artemisinin combination therapies, other antimalarials, rapid diagnostic tests and antibiotics; the availability of functioning microscopy; and stock-outs of key malaria case-management materials. The patient's exit interview questionnaire records information on patient's age, weight, temperature, history of fever, referral status, type of visit, prior use of antimalarials, main complaints, whether patient was tested for malaria; type of treatment prescribed and dosage; and the key counselling and drug dispensing tasks performed during the facility visit. The general diagnostic and treatment details are retrieved from the patient's consultation and laboratory notes or cards. The health worker questionnaire records information on the health worker's age; sex; cadre; access to artemisinin combination therapies, rapid diagnostic test and IMCI training; exposure to rapid malaria case-management orientation; and supervisory visits. The health workers' knowledge of the national malaria case-management protocol are also assessed.

**Field work and quality control**

Overall, the survey management team is usually composed of national supervisors; regional supervisors; and survey teams of two to three persons per health facility. At each of the survey facilities data are collected over one survey day. On the survey day, survey teams arrive at each facility before the official opening time and stay until the official closing time or until the time when the night shift would take over duties in facilities open 24 hours. Data are collected using three methods. First, all patients presenting to the outpatient departments during working hours undergo rapid screening when they are ready to leave the facility. The screening includes determination of patient's age, weight, temperature, history of fever, referral status (treated as outpatient or referred for hospitalization), and whether the visit is an initial or follow up. Non-referred patients presenting for an initial visit with history of fever or temperature ≥37.5 °C then proceed with an interview during which information is collected from patient-held cards about routine malaria diagnostics requested, results reported and medications prescribed. During the interviews information is also collected about prior use of antimalarial drugs and the key counselling and drug dispensing tasks performed during this facility visit. Second, each facility is assessed to determine the availability of different cadres of health workers; artemisinin combination therapies, diagnostics, thermometers, weighing scales, charts and guidelines. Third, health workers who attend to recruited patients on the survey day are interviewed at the end of the working day to collect information on their demographics, pre-service training, access to guidelines and retrospective exposure to in-service training and supervision. During the interviews information is also collected on health workers knowledge of malaria case management. If more than one health worker usually attends to patients at a facility on the survey day, all will be interviewed.

**Data entry and analysis**

Trained data entry personnel are used to enter information from the survey questionnaires using customized data entry screens developed in software such Microsoft Access 2007 or MySQL. Double data entry should be used in order to verify data.

**Ethical considerations and ethical review**

Because these surveys involve the review of patients' records and inconveniences to patients visiting health facilities and direct interview of health workers ethical approval that includes acquisition of consent from and anonymity of respondents should be sought from relevant national review bodies.

**10.    GLOBAL AND EMR MALARIA MAP AT DISTRICT LEVEL**
*Mr Ryan Williams, WHO headquarters, and Eng. Amir Aman, WHO Regional Office for the Eastern Mediterranean*

A map is an exceptional visual tool, particularly for malaria as a geographical disease. Malaria is a focal disease and even in a high transmission setting malaria distribution is not homogenous. Because of this and because the first operational level is district, the first administration level is too big and normally has many different epidemiological settings to provide enough details for focal

malaria. Particularly with decrease in the level of transmission, malaria is becoming more and more focalized. For this reason it was requested for all countries to prepare and send to WHO the most recent digitized maps at least for the secondary administrative level.

It was agreed that for *The World malaria report 2010* at least two countries in the Region would have maps at district level and by the end of 2010 all endemic countries will be able to provide malaria maps at district level.

## 11. RECOMMENDATIONS

For strengthening malaria surveillance and monitoring and evaluation and better quality of *The World malaria report* this year and in future the participants in the workshop recommended the following.

1. Countries should finalize and send their malaria annual reports and surveillance data including shape files to the Regional Office before 15 June.
2. Malaria control and elimination programmes should coordinate with the health management information system to integrate malaria related data in the health information system and intensify supportive supervision to improve the quality of data.
3. Countries should allocate enough resources for malaria surveillance and monitoring and evaluation and WHO to tap new donors for monitoring and evaluation support.
4. Countries should follow up with responsible units or organizations at national level to obtain appropriate digitized maps at least at the level of secondary administrative levels including other information layers related to malaria.
5. WHO should support counties to develop their digitized maps at least up to secondary administrative either by conducting training-of-trainers training on GIS and mapping or through technical assistance in the country.
6. WHO should prepare a framework for data reporting which countries should follow at all levels.
7. WHO should establish an information portal for malaria to be used for information sharing for all countries including online reporting tools.
8. WHO should design and conduct regularly a regional course on malaria surveillance and monitoring and evaluation in 2011.
9. WHO should finalize malaria surveillance and monitoring and evaluation guidelines and s help countries to adopt and to develop their standard operating procedures for malaria surveillance and monitoring and evaluation.
10. WHO should facilitate priority-setting for operational research in the field of malaria control and elimination and support countries to raise resources to support operational research.

**Annex 1**

**PROGRAMME**

**Tuesday, 11 May 2010**

| | | |
|---|---|---|
| 08:00–08:30 | Registration | |
| 08:30–09:00 | Opening session | *Dr H. Atta* |
| | Opening remarks from WHO Regional Office for the Eastern Mediterranean | |
| | Introduction of participants | |
| 09:00–09:30 | Global environment of malaria monitoring and evaluation: updates on malaria surveillance and monitoring and evaluation | *Dr R. Cibulskis* |
| 09:30–10:00 | Regional vision for malaria surveillance and monitoring and evaluation for control and elimination settings | *Dr H. Atta* |
| 10:30–11:00 | Entomological surveillance and vector control monitoring and evaluation | *Dr A. Mnzava* |
| 11:00–12:30 | Country report on situation of malaria surveillance and monitoring and evaluation (countries with control programme) | *Country representatives* |
| 13:30–14:00 | Discussion | |
| 14:00–15:00 | Country report on situation of malaria surveillance and monitoring and evaluation (countries with elimination programme) and discussion | *Country representatives* |
| 15:00–15:30 | *World malaria report* 2008 and 2009: process and lessons learned | *Dr R. Cibulskis* *Mr R. Williams* *Dr G. Zamani* |
| 16:00–16:30 | *World malaria report 2010*: tools and process | *Dr R. Cibulskis* |
| 16:30–17:00 | Demonstration of EMRO malaria database | *Mr A. Aman* |
| 17:00–17:30 | Discussion and introduction to the group work for the following day | *Dr G. Zamani* |

**Wednesday, 12 May 2010**

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|---|---|---|
| 08:30–09:30 | Group work on tools and process of *World malaria report* | |
| 09:30–10:00 | Plenary | |
| 10:30–11:00 | Country level burden estimation methodology for malaria morbidity and mortality | *Dr R. Cibulskis* |
| 11:00–12:30 | Practical session on estimation for malaria morbidity and mortality | |
| 13:30–14:30 | Plenary: country level burden estimates | |
| 14:30–15:00 | Discussion | |

| 15:00–17:30 | Critical review of 2010 annual malaria surveillance reports by countries<br>Introduction to the review process<br>Practical work: review of 2010 annual malaria surveillance reports by countries | *Dr G. Zamani* |

**Thursday, 13 May 2010**

| 08:30–09:30 | Report on critical review of 2010 by countries | |
| 09:30–10:00 | Discussion | |
| 10:30–11:00 | Methodology of health facility survey: example of Sudan | *Dr A. Noor* |
| 11:00–11:30 | Global and regional malaria map at district level | *Dr R. Cibulskis*<br>*Mr R. Williams*<br>*Dr G. Zamani*<br>*Mr A. Aman* |
| 11:30–12:30 | Work with countries to standardize available regional maps at district level | |
| 13:30–15:00 | Group work for preparation of recommendations and plan of action | |
| 15:30–16:30 | Conclusions and recommendations | |
| 16:30 | Closing session | |

**Annex 2**

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