Chapter 2.

Goals, policies and strategies for malaria control and elimination

This chapter summarizes internationally agreed goals for malaria control and the policies and strategies recommended by WHO to achieve them. It has four sections: 1) goals and targets; 2) policies and strategies; 3) malaria elimination; and 4) indicators to track progress.

2.1 Goals and targets for malaria control and elimination

The vision of the RBM Partnership is “a world free from the burden of malaria” (1). From 2007, the United Nations (through the MDGs), the World Health Assembly and the RBM Partnership had consistent goals for intervention coverage and impact for 2010 and 2015 (2–4). These goals have evolved in recent years, largely due to substantial progress in malaria control, with goals and targets becoming increasingly ambitious (Table 2.1).

In April 2008 the United Nations Secretary-General put forward a vision of halting malaria deaths by ensuring universal coverage of malaria interventions by the end of 2010 (5). The aim was for indoor residual spraying (IRS) and long-lasting insecticide-treated mosquito nets (LLINs) to be made available to all people at risk of malaria, especially women and children in Africa, and for all public health facilities to be able to provide effective malaria diagnosis and treatment.

In September 2008 the RBM Partnership added three additional targets as part of the Global Malaria Action Plan (6). The first is to reduce the total number of malaria deaths worldwide to near-zero preventable deaths by 2015. This target is more ambitious than the previous target of a 75% reduction in the number of malaria deaths by 2015, although there is no global consensus on how to measure preventable deaths. The second is that malaria should be eliminated in 8–10 countries by 2015 and afterwards in all countries that were in the pre-elimination phase in 2008. The third goal is: “in the long term, eradicate malaria worldwide by reducing the global incidence to zero through progressive elimination in countries”.

Malaria control forms part of MDG 6 and is central to achieving MDG 4, a two-thirds reduction in the mortality rate among children under 5 years of age. Without substantial progress in controlling malaria, which accounted for 8% of deaths < 5 globally in 2008 and 27% of deaths < 5 in Africa (7), MDG 4 will not be achieved.

| TABLE 2.1 |
| GOALS AND TARGETS FOR MALARIA CONTROL AND THE MDGs |
| United Nations, the World Health Assembly and the RBM Partnership targets to 2007 | RBM Partnership goals and targets from 2008 |
| Coverage of ≥ 80% by 2010 with four key interventions: | Achieve universal coverage for all populations at risk of malaria using locally appropriate interventions for prevention and case management by 2010. |
| • ITNs, | |
| • IRS for targeted households, | |
| • IPTp, | |
| • appropriate treatment with antimalarial medicines for patients with malaria. | |
| Reduce the number of malaria cases and deaths by ≥ 50% between 2000 and 2010 and by ≥ 75% between 2000 and 2015. | By 2010, halve the 2000 malaria burden and by 2015, reduce the number of cases by three-quarters and the number of preventable deaths to near zero. |
| Eliminate malaria in 8 to 10 countries by 2015 and afterwards in all countries that are currently in the pre-elimination phase. In the long-term, eradicate malaria worldwide by reducing the global incidence to zero through progressive elimination in countries. |
| MDG 4 target: By 2015 reduce by two-thirds the mortality rate among children under five. |
| MDG 6 target: By 2015 have halted and begun to reverse the incidence of malaria and other major diseases. |
2.2 Malaria control policies and strategies

The strategic approaches to malaria control fall into two major areas – prevention and case management. Taken together, these strategies work against both the transmission of the parasite from mosquito vector to humans (and from humans to mosquitoes) and the development of illness and severe disease in humans.

2.2.1 Malaria prevention through malaria vector control

The objectives of malaria vector control are two-fold:

- to protect people against infective malaria mosquito bites by reducing vector longevity, vector density and human-vector contact; and
- to reduce the intensity of local malaria transmission at community level, and hence the incidence and prevalence of infection and disease.

The overarching policy and strategy for vector control is “universal coverage with effective vector control”. The two most powerful and most broadly applied interventions are LLINs and IRS. These interventions work by reducing the lifespan of female mosquitoes (so that they do not survive long enough to transmit the parasite) and by reducing human-vector contact. In some specific settings and circumstances, these core interventions may be complemented by other methods, such as larval source control including environmental management. However, larval control is appropriate and advisable only in a minority of settings, where mosquito breeding sites are few, fixed and easy to identify, and to map and treat; in other circumstances, it is very difficult to find a sufficiently high proportion of the breeding sites within the flight range of the vector (8).

Malaria vector control, with LLIN, IRS or other interventions, is only effective if high coverage is achieved and sustained. This requires a sustained programme of vector control delivery operations that are performed correctly and on time. This in turn requires specialized personnel at national, provincial and district levels. As well as practical experience in the delivery of vector control interventions, these teams must also have the capacity to monitor and investigate vector-related and operational factors that may compromise intervention effectiveness, for which specialized entomological knowledge and skills are essential.

WHO recommendations for vector control are the following:

1. Because high coverage rates are needed to realize the full potential of insecticide-treated nets (ITNs) and IRS, WHO recommends that all people at risk in areas targeted for malaria prevention should be covered with LLINs, i.e. “universal coverage” (9,10). It is currently proposed that one LLIN should be distributed for every two persons. This approach may require refinement for implementation at household level: for example, one option is to distribute to each household one LLIN for every two members of the household, rounding up in households with an odd number of members.

2. LLINs should be either provided free of charge or highly subsidized. Cost should not be a barrier to making them available to all people at risk of malaria, especially those at greatest risk such as young children and pregnant women (9).

3. Universal coverage with LLINs is best achieved and maintained by a combination of delivery systems: mass distribution campaigns can achieve rapid initial coverage, but need to be supplemented by routine delivery to pregnant women through antenatal services and to infants at immunization clinics (9).

4. In order to be protected, households must not only own LLINs but also use them. Behaviour change interventions including information, education, communication (IEC) campaigns and post-distribution “hang-up campaigns” are strongly recommended (9).

5. Only LLINs recommended by the WHO Pesticide Evaluation Scheme (WHOPES) should be procured by national malaria control programmes and partners for malaria control. These nets are designed to maintain their biological efficacy against vector mosquitoes for at least three years in the field under recommended conditions of use, obviating the need for regular insecticide treatment (11,12).

6. IRS consists of the application of residual insecticides to the inner surfaces of dwellings, where many vector species of anopheline mosquito tend to rest after taking a blood meal (10). It is effective in rapidly controlling malaria transmission, hence in reducing the local burden of malaria morbidity and mortality, provided that most houses and animal shelters (e.g. > 80%) in targeted communities are treated (8). IRS is applicable in many epidemiological settings, provided the operational and resource feasibility are considered in policy and programming decisions. IRS requires specialized spray equipment and techniques, and both the machinery and the methods must be scrupulously maintained.

7. Currently 12 insecticides belonging to 4 chemical classes are recommended by WHOPES for IRS. An insecticide for IRS is selected in a given area on the basis of data on resistance, the residual efficacy of the insecticide, costs, safety and the type of surface to be sprayed. Special attention must be given to preserving susceptibility to pyrethroids, because they are the only class of insecticides currently used on LLINs.

8. Using the same insecticide for multiple successive IRS cycles is not recommended; instead, it is preferable to use a system of rotation with a different insecticide class being used each year (13). In areas where IRS is the main vector control intervention, this rotation system may include a pyrethroid. In areas with high LLIN coverage, pyrethroids should not be used for IRS.

9. DDT has a comparatively long residual efficacy (≥ 6 months) as an insecticide for IRS. DDT use in agriculture is banned under the Stockholm Convention, but countries can use DDT for IRS for as long as necessary and in the quantities needed, provided that the guidelines and recommendations of WHO are met and until locally appropriate, cost-effective alternatives are available for a sustainable transition from DDT (14).

10. The spread of insecticide resistance, especially pyrethroid resistance in Africa, is a major threat, and a substantial intensification of resistance monitoring is needed. Malaria vector bionomics and vector distribution maps need to be updated periodically through vector sentinel sites in different eco-epidemiological strata to ensure that the appropriate mix of malaria vector control interventions is being used (8).
11. In most settings where IRS has been or is being deployed, ITNs or LLINs are already in use. Neither LLINs nor IRS alone will be sufficient to achieve and maintain interruption of transmission in holoendemic areas of Africa or in hyperendemic areas in other regions (9). Some observational evidence indicates that the combination of IRS and LLINs is more effective than either intervention alone, especially if the combination helps to increase overall coverage with vector control (15). However, using the combination should not be seen as a way of overcoming coverage gaps due to poor operational practice; before providing people with both IRS and LLINs, the priority should be to ensure that everyone at risk is effectively covered by one or the other. When using the combination of IRS and ITNs, a non-pyrethroid insecticide should be used for IRS.

2.2.2 Diagnosis and treatment of malaria

The main objectives of an antimalarial treatment policy are:

- to reduce morbidity and mortality by ensuring rapid, complete cure of the infection and thus preventing the progression of uncomplicated malaria to severe potentially fatal disease, and preventing chronic infection that leads to malaria-related anaemia;
- to reduce the frequency and duration of malaria infection during pregnancy and its negative impact on the fetus; and
- to curtail the transmission of malaria by reducing the human parasite reservoir of infection and infectivity.

The 2nd edition of the WHO Guidelines for the treatment of malaria was published in March 2010 (16). The current WHO recommendations for diagnosis and treatment are as follows:

1. Prompt parasitological confirmation by microscopy or alternatively by rapid diagnostic tests (RDTs) is recommended in all patients with suspected malaria before treatment is started. Treatment solely on the basis of clinical suspicion should only be considered when a parasitological diagnosis is not accessible.

2. Uncomplicated *P. falciparum* malaria should be treated with an artemisinin-based combination therapy (ACT). A single dose of primaquine is recommended in addition to an ACT for treatment of *P. falciparum* malaria as an anti-gametocyte medicine (particularly as a component of a pre-elimination or an elimination programme) provided the risks of haemolysis in patients with glucose-6-phosphate dehydrogenase (G6PD) deficiency have been considered.

3. *P. vivax* malaria should be treated with chloroquine in areas where it is effective, or an appropriate ACT in areas where *P. vivax* resistance to chloroquine has been documented. Both chloroquine and ACTs should be combined with a 14-day course of primaquine for the treatment of *P. vivax* malaria in order to prevent relapses, subject to consideration of the risk of haemolysis in patients with G6PD deficiency.

4. The five ACTs currently recommended for use are artemether plus lumefantrine, artesunate plus amodiaquine, artesunate plus mefloquine, artesunate plus sulfadoxine-pyrimethamine (SP), and dihydroartemisinin plus piperaquine. The choice of the ACT should be based on the efficacy of the combination in the country or area of intended use.

5. Artemisinin and its derivatives should not be used as oral monotherapies for the treatment of uncomplicated malaria as this will promote resistance to this critically important class of antimalarials.

6. Severe malaria should be treated with a parenteral artemisinin derivative or quinine, and followed by a complete course of an effective ACT as soon as the patient can take oral medications. When intravenous or intramuscular treatment is not feasible, e.g. in peripheral health posts, patients should receive pre-referral treatment with an artemisinin-based suppository and be transferred to a health facility capable of providing definitive treatment with parenteral antimalarial medicines.

7. In settings with limited health facility access, diagnosis and treatment should be provided at community level through a programme of community case management (formerly known as home-based management) of malaria.

2.2.3 Diagnosis and treatment of malaria

Intermittent preventive treatment is the administration of a full course of an effective antimalarial treatment at specified time points to a defined population at risk of malaria, regardless of whether they are parasitaemic, with the objective of reducing the malaria burden in the specific target population.

1. Intermittent preventive treatment in pregnancy (IPTp): all pregnant women at risk of *P. falciparum* infection in countries in sub-Saharan Africa with stable malaria transmission, should receive at least two doses of sulfadoxine-pyrimethamine, given at the first and second scheduled antenatal care visits (at least one month apart) after "quickening" (the first noted movement of the fetus). The doses of SP should be taken under direct observation during the antenatal visits.

2. Intermittent preventive treatment in infants (IPTi): all infants at risk of *P. falciparum* infection in countries in sub-Saharan Africa with moderate to high malaria transmission, should receive three doses of SP along with the DTP2, DTP3 and measles immunization through the routine immunization programme.

2.2.4 Resistance to antimalarial medicines

Antimalarial drug resistance is a major public health problem which hinders the control of malaria. The measurement of drug resistance in malaria is complex, as four different tools are used: (i) therapeutic drug efficacy studies measure clinical and parasitological efficacy and are the primary source to inform the treatment policy of the national malaria control programme (NMCP); (ii) in vitro studies measure the intrinsic sensitivity of parasites to antimalarial drugs; (iii) molecular marker studies identify genetic mutations and subsequently confirm the presence of mutations in blood parasites;
and (iv) pharmacokinetic studies characterize drug absorption and drug action in the body. While each method provides a contribution towards a more complete understanding of antimalarial drug resistance, therapeutic efficacy studies remain the gold standard for guiding drug policy. NMCPs should monitor the therapeutic efficacy of antimalarial medicines over time in order to ensure early detection of changing patterns of resistance so that national malaria treatment policies for first- and second-line drugs can be revised and appropriate management of clinical cases assured.

To interpret and compare results within and between regions and to follow trends over time, therapeutic efficacy monitoring must be conducted with similar standardized procedures. WHO prepared a protocol for assessing antimalarial drug efficacy in high transmission areas in 1996; it was updated in 2009 on the basis of expert consensus and feedback from the field (19). WHO has also prepared a field manual on in vitro assays for the sensitivity of malaria parasites to antimalarial drugs (20) and a guideline on genotyping malaria parasites to distinguish between reinfection and recrudescence during therapeutic efficacy testing. Parasite genotyping is now becoming increasingly necessary due to the longer follow-up of patients (21). The following recommendations are drawn from the 2009 edition of Methods for surveillance of antimalarial drug efficacy:

1. National malaria control programmes should establish sentinel sites (selected health facilities) for the surveillance of antimalarial drug efficacy. Experience suggests that 4–8 sites per country will achieve a balance between representativeness and practicality. The sentinel sites should represent all the epidemiological strata in the country but it is critical to select a “manageable” number of sites to ensure proper monitoring and supervision.

2. Efficacy of first- and second-line medicines should be tested at least once every 24 months at all sites. For the purposes of comparability, assessments should always be conducted at the same time of year.

3. A follow-up of 28 days is recommended as the minimum duration for medicines with elimination half-lives of less than 7 days (amodiaquine, artemisinin derivatives, atovaquone-proguanil, chloroquine, lumefantrine, quinine, and sulfadoxine-pyrimethamine). For medicines with longer elimination half-lives (mefloquine, piperaquine), longer follow-up periods are necessary.

4. The standard protocol to test the efficacy of medicines against *P. falciparum* may need adjustment for *P. vivax*. Since *P. vivax* infections relapse, many countries require primaquine therapy for radical cure. Administration of primaquine concurrently or soon after administration of chloroquine may conceal resistance to chloroquine alone, resulting in underestimation of the risk of therapeutic failure or resistance to chloroquine. Therefore, in certain cases primaquine therapy should be postponed until after the 28-day follow-up. Nonetheless, if local health policy includes mandatory administration of primaquine with chloroquine, the failure rate should be considered to be that of the combination regimen.

5. Countries should consider changing the first-line treatment for malaria if the total failure rate exceeds 10%; however, efficacy and failure rates should be assessed in the context of their 95% confidence intervals.

Over the last decade, most malaria-endemic countries shifted their national treatment policies to ACTs and efficacy studies are now conducted on combination therapies. Of particular concern is whether there is evidence of resistance to artemisinin. Neither the mechanism of artemisinin resistance, nor a molecular marker to screen for it, has yet been identified. The current working definition of artemisinin resistance is: (i) an increase in parasite clearance time, as evidenced by ≥ 10% of cases with parasites detectable on day 3 after treatment with an ACT (suspected resistance); or (ii) treatment failure after treatment with an oral artemisinin-based monotherapy with adequate antimalarial blood concentration, as evidenced by the persistence of parasites for 7 days; or (iii) the presence of parasites at day 3 and recrudescence within 28–42 days (confirmed resistance).  

### 2.3 Malaria elimination

From a country perspective, interruption of local mosquito-borne malaria transmission, i.e. elimination of malaria, is the ultimate goal of malaria control. With rapid scale-up and sustained efforts, malaria transmission can be interrupted in low-transmission settings. However, in areas of moderate to high transmission malaria transmission can be greatly reduced, but interruption of transmission is likely impossible. To interpret and compare results within and between regions and to follow trends over time, therapeutic efficacy monitoring must be conducted with similar standardized procedures. WHO prepared a protocol for assessing antimalarial drug efficacy in high transmission areas in 1996; it was updated in 2009 on the basis of expert consensus and feedback from the field (19). WHO has also prepared a field manual on in vitro assays for the sensitivity of malaria parasites to antimalarial drugs (20) and a guideline on genotyping malaria parasites to distinguish between reinfection and recrudescence during therapeutic efficacy testing. Parasite genotyping is now becoming increasingly necessary due to the longer follow-up of patients (21). The following recommendations are drawn from the 2009 edition of Methods for surveillance of antimalarial drug efficacy:

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### BOX 2.1

#### DEFINITIONS (23,24)

**Malaria control**

Reducing the malaria disease burden to a level at which it is no longer a public health problem.

**Malaria elimination**

The interruption of local mosquito-borne malaria transmission; reduction to zero of the incidence of infection caused by human malaria parasites in a defined geographical area as a result of deliberate efforts; continued measures to prevent re-establishment of transmission are required.

**Certification of malaria elimination**

The official recognition of malaria-free status granted by WHO after it has been proven beyond reasonable doubt that the chain of local human malaria transmission by *Anopheles* mosquitoes has been fully interrupted in an entire country for at least 3 consecutive years.

**Malaria eradication**

Permanent reduction to zero of the worldwide incidence of infection caused by a particular malaria parasite species. Intervention measures are no longer needed once eradication has been achieved.

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3. This definition is prone to confounding factors (known and unknown) such as splenectomy, haemoglobin abnormalities and reduced immunity.
to require new tools. The WHO position on malaria elimination is set out in a recent meeting report (22, 23) and is summarized below:

1. In areas of high, stable transmission, where a marked reduction in malaria transmission has been achieved (as may be indicated by slide positivity rates of less than 5%) a “consolidation period” should be introduced, in which: (i) control achievements are sustained, even in the face of limited disease; (ii) health services adapt to the new clinical and epidemiological situation with a lower case load and reduced levels of immunity; and (iii) surveillance systems are strengthened to allow rapid response to new cases. This transformation phase precedes a decision to re-orient programmes towards elimination.

2. Countries with low, unstable transmission (as may be indicated by less than 1 case per 1000 population per year)4 should be encouraged to proceed to malaria elimination, with falciparum elimination preceding vivax elimination where these species co-exist. Before making this decision, however, they should take account of the overall feasibility, including entomologic situation, programmatic capacity, fiscal commitment, political commitment, and potential threats to success, including the malaria situation in neighbouring countries. Malaria elimination might require regional initiatives and support and will require strong political commitment.

3. Countries with an absence of locally acquired malaria cases for three consecutive years, and the systems in place to prove this, will be eligible to request WHO to initiate procedures to certify that they are malaria-free.

4. Failure to sustain malaria control will result in a resurgence of malaria, as has happened in the past, and must be avoided. Therefore, public and government interest in intensified malaria control and elimination needs to be sustained, even when the malaria burden has been greatly reduced.

5. Because malaria control today relies heavily on a limited number of tools, in particular artemisinin derivatives and pyrethroids, which could potentially become less effective because of resistance, the development of new tools for vector control and other preventive measures, diagnosis, treatment and surveillance must be a priority.

2.4 Indicators

The United Nations Inter-agency and Expert Group on MDG Indicators has established the following specific indicators for malaria (2):

6.6 Incidence and death rates associated with malaria

6.7 Proportion of children under 5 years sleeping under insecticide-treated mosquito nets

6.8 Proportion of children under 5 years with fever who are treated with appropriate antimalarial medicines.

As policies and strategies for malaria control have evolved over the last decade the indicators have been adapted to reflect the latest recommendations. For example, indicator 6.7 has been expanded to consider also the proportion of the population of all age groups that sleep under ITNs (24). Similarly, indicator 6.8 does not yet reflect policy recommendations to provide a parasitological test for all fever cases.

Table 2.1 summarizes 30 indicators recommended by WHO for use by national malaria programmes to measure coverage with malaria control interventions (ITNs, IRS, IPTp, diagnosis and treatment) and their epidemiological impact. The selection of indicators draws upon: the Abuja Declaration in 2000 (3), the resolution of the World Health Assembly in 2005 (4), the RBM Global Action Plan (6), the work of the RBM Malaria Monitoring and Evaluation Reference Group (MERG) (25, 26), and previous editions of the World Malaria Report (24, 27). Of the 30 indicators, 20 are derived from routine information systems and would typically be available for monitoring on a monthly basis. Not all indicators are applicable to every epidemiological setting, hence individual programmes would use only a sub-set of the 20 routine indicators. The remaining 10 indicators are derived from household surveys and, while these would not normally be available every year for every country, they provide complementary information for programme assessment.

The major changes from the indicator list in the World Malaria Report 2009 are: (i) addition of indicators for low transmission settings; (ii) addition of an indicator that considers the prevalence of parasitaemia in populations of children under 5 as recommended by MERG; (iii) addition of an indicator that considers whether the number of ITNs recorded in household surveys is sufficient to cover all household members; (iv) addition of an indicator that considers the proportion of households with at least one ITN and/or sprayed by IRS in the last 12 months as endorsed by MERG; (v) addition of an indicator that considers the percentage of fever cases receiving a diagnostic test as endorsed by MERG; (vi) the case management indicator of the proportion of fever cases receiving an appropriate antimalarial medicine is replaced by the proportion of suspected malaria cases receiving appropriate treatment. Appropriate treatment is defined by national policy but will generally follow the break-down below:

Febrile children with a finger/heel stick

| With positive result: received antimalarial | Appropriate |
| With positive result: did not receive antimalarial | Inappropriate |
| With negative result: received antimalarial | Inappropriate |
| With negative result: did not receive antimalarial | Appropriate |

Febrile children not receiving finger/heel stick

| Received antimalarial | Appropriate |
| Did not receive antimalarial | Inappropriate |

The last change is considered necessary because WHO recommends that all persons suspected to have malaria should receive a parasitological test and because an increasing number of member states are expanding the availability of parasitological diagnosis through RDTs; hence it is no longer informative to determine whether all fever cases receive an antimalarial medicine.

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4. These milestones should be adjusted for each country and situation, keeping in mind the resources available for notification, investigation and follow-up of malaria cases.
## TABLE 2.2
### MALARIA INDICATORS, TARGETS AND SOURCES OF DATA

#### A. TRENDS IN MALARIA CASES AND DEATHS

<table>
<thead>
<tr>
<th>IMPACT MEASURE</th>
<th>INDICATOR</th>
<th>NUMERATOR</th>
<th>DENOMINATOR</th>
<th>BREAK-DOWN</th>
<th>DATA SOURCE</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Malaria cases</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Confirmed malaria cases (microscopy or RDT), per 1000 persons per year</td>
<td>Confirmed malaria cases per year x 1000</td>
<td>Population</td>
<td>All ages, &lt; 5, male, female</td>
<td>Routine surveillance system or HMIS</td>
<td>Reduction of cases per 1000: ≥ 50% by 2010, and ≥ 75% by 2015 in comparison with 2000</td>
</tr>
<tr>
<td>1.2</td>
<td>Inpatient malaria cases per 1000 persons per year</td>
<td>No. of inpatient malaria cases per year x 1000</td>
<td>Population</td>
<td>All ages, &lt; 5, male, female</td>
<td>Routine surveillance system or HMIS</td>
<td></td>
</tr>
</tbody>
</table>

#### In low transmission / elimination settings

| 1.3 | No. of active foci reported per year | None | None | Routine surveillance system | |
| 1.4 | No. of cases by classification | None | Local (introduced, indigenous, relapsing), imported, induced | Routine surveillance system |

#### Malaria transmission

| 1.5 | Malaria test positivity ratio | No. of laboratory-confirmed malaria cases | No. of suspected malaria cases with parasite-based test | Microscopy RDT, PI, P, PCD, ACD | Routine surveillance system or HMIS | No target set. Indicates level of control |

#### In high transmission areas

| 1.6 | Proportion of children aged 6–59 months with malaria infection | No. of children aged 6–59 months with malaria infection detected by microscopy | No. of children aged 6–59 months tested for malaria parasite by microscopy | Household survey | |

#### Malaria deaths

| 1.7 | Inpatient malaria deaths per 1000 persons per year | No. of inpatient malaria deaths per year (< 5 years or total) x 1000 | Population | All ages, < 5, male, female, pregnant women | Routine surveillance system or HMIS | Reduction in deaths per 1000: ≥ 50% by 2010 and ≥ 75% by 2015 in comparison with 2000 |
| 1.8 | Malaria-specific deaths per 1000 persons per year | No. of malaria deaths per year x 1000 | Population | All ages, < 5, male, female, pregnant women | Verbal autopsy (surveys), complete or sample vital registration systems | ≥ 75% by 2015 in comparison with 2000 |

#### In high transmission areas

| 1.9 | All-cause < 5 mortality rate (μ5y) | No. of deaths in children < 5 years from all causes x 1000 | No. of children born in time period | Household surveys, complete or sample vital registration systems | No specific malaria target set |

#### B. COVERAGE WITH INTERVENTIONS

<table>
<thead>
<tr>
<th>CONTROL STRATEGY</th>
<th>INDICATOR</th>
<th>NUMERATOR</th>
<th>DENOMINATOR</th>
<th>BREAK-DOWN</th>
<th>DATA SOURCE</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vector control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Proportion of population at risk potentially covered by nets distributed</td>
<td>No. of persons with ITN from No. of ITNs distributed</td>
<td>No. of persons at risk of malaria</td>
<td>Routine data commodities distributed</td>
<td>≥ 80%</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Proportion of targeted risk group receiving ITN</td>
<td>No. of ITNs distributed to risk groups</td>
<td>No. of persons in risk groups targeted for receiving ITN</td>
<td>Pregnant women, &lt; 5, migrant workers</td>
<td>Routine data on commodities distributed</td>
<td>≥ 80%</td>
</tr>
<tr>
<td>2.3</td>
<td>Proportion of households with at least one ITN</td>
<td>No. of households surveyed with at least one ITN</td>
<td>Total No. of households surveyed</td>
<td>Household survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>Proportion of individuals with access to an ITN in a household</td>
<td>No. of individuals with access to an ITN in a household</td>
<td>Total No. of individuals who slept in surveyed households the previous night</td>
<td>Household survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>Proportion of individuals who slept under an ITN the previous night</td>
<td>No. of individuals who slept under an ITN the previous night</td>
<td>Total No. of individuals who slept in surveyed households the previous night</td>
<td>All ages, &lt; 5, pregnant women</td>
<td>Household survey</td>
<td>≥ 80%</td>
</tr>
<tr>
<td>2.6</td>
<td>Percentage of population at risk protected by IRS</td>
<td>No. of persons protected by IRS</td>
<td>No. of persons at risk for malaria</td>
<td>Routine data from national malaria control programme</td>
<td>No target set. Indicates contribution of IRS to overall malaria control</td>
<td></td>
</tr>
</tbody>
</table>
**C. MANAGEMENT SYSTEMS**

### Supplies

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>INDICATOR</th>
<th>NUMERATOR</th>
<th>DENOMINATOR</th>
<th>BREAK-DOWN</th>
<th>DATA SOURCE</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.1 Proportion of health facilities without stock-outs of key commodities by month</td>
<td>No. of health facilities without stock-outs of key commodities by month</td>
<td>No. of health facilities</td>
<td>ACTs, RDTs, ITNs</td>
<td>Routine reporting system or HMIS</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Reporting

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>INDICATOR</th>
<th>NUMERATOR</th>
<th>DENOMINATOR</th>
<th>BREAK-DOWN</th>
<th>DATA SOURCE</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.2 Annual blood examination rate</td>
<td>No. of all suspected malaria cases</td>
<td>Population</td>
<td>ACD, PCD</td>
<td>Routine surveillance system or HMIS</td>
<td>≥ 80%</td>
</tr>
<tr>
<td></td>
<td>3.3 Completeness of monthly health facility reports</td>
<td>No. of health facilities reports received each month</td>
<td>No. of health facilities reports expected each month</td>
<td>Commodity distribution, stock-outs, outpatient cases, inpatient cases</td>
<td>Routine surveillance system or HMIS</td>
<td>≥ 90%</td>
</tr>
</tbody>
</table>

### In low transmission / elimination settings

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>INDICATOR</th>
<th>NUMERATOR</th>
<th>DENOMINATOR</th>
<th>BREAK-DOWN</th>
<th>DATA SOURCE</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.4 Proportion of private facilities reporting to national malaria surveillance system</td>
<td>No. of private facilities in areas at risk for malaria reporting to national malaria surveillance system</td>
<td>No. of private facilities in areas at risk for malaria</td>
<td>Routine surveillance system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From references 23–27. Indicators derived from household surveys are in italics.

RDT, rapid diagnostic test; MDG, Millennium Development Goal; ITN, insecticide-treated net; IRS, indoor residual spraying; ACD, active case detection; PCD, passive case detection

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**Footnotes:**

a. Use only if > 90% of suspected cases have examination for parasites (microscopy or RDT).

b. Marker for severe malaria.

c. Malaria test positivity rate < 5% during the malaria season marks the readiness for transition from control stage to pre-elimination stage.

d. A new RMB target was introduced in the 2018 Global Malaria Action Plan: “near zero preventable malaria deaths” by 2015. This target is more ambitious than the target of 75% reduction in malaria deaths by 2015.

There is no global consensus on how to measure preventable malaria deaths.

e. This indicator is estimated from the number of LLINs or ITNs distributed by ministries of health and partners. LLINs are assumed to protect for 3 years and conventional ITNs or retreatments not for 1 year. A single net is assumed to protect two persons. Hence the number of people potentially covered is the 2 * (number of LLINs delivered in last three years + number of conventional ITNs and retreatments delivered in last year). This indicator measures distribution and not hanging or use.

f. This indicator is estimated from the number of ITNs available in each household. Each net is assumed to protect two persons. Thus a household with 5 residents will require 3 ITNs.

g. Parasitological tests include microscopy and RDT.

h. Ideally all suspected cases will be given a diagnostic test and only treated with an antimalarial if they test positive for *P. falciparum* or *P. vivax* cases not tested should be given an antimalarial according to national policy.

i. Comments h apply to indicator 2.12 also. The intention is to treat all persons with an appropriate antimalarial medicine; however, children are at greatest risk, especially in areas of high transmission and many household surveys do not ask about antimalarial treatment over age 5 years. In areas of low transmission, it is recognized this indicator may be less useful.

j. This indicator can vary depending on data collection forms and reporting channels. For example, the inpatient data channel may be separate from the outpatient data channel, or the commodities and disease surveillance data channels may be combined.

k. Facilities should report even if they have zero cases.
References


