

Chapter 2.

Policies, strategies and targets for malaria control

This chapter summarizes the policies, strategies and targets for malaria control recommended by WHO. It includes three sections: 1) diagnosis and treatment of malaria; 2) malaria prevention by mosquito control; and 3) goals, indicators and targets.

2.1 Diagnosis and treatment of malaria, including preventive treatment

The two main objectives of an antimalarial treatment policy are:

1. to reduce morbidity and mortality by *i)* ensuring rapid, complete cure of the infection and thus preventing the progression of uncomplicated malaria to severe, potentially fatal disease, *ii)* malaria-related anaemia and, during pregnancy, *iii)* the negative impact of malaria on the fetus; and
2. to curtail the transmission of malaria by reducing the parasite reservoir of infection and infectivity.

Current WHO recommendations for diagnosis and treatment are shown in **Box 2.1**. Since publication of the *World Malaria Report 2008*, WHO has made several modifications to its malaria policy recommendations (1):

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

ii) A fifth ACT, dihydroartemisinin-piperazine, has been added to the treatment options.

iii) A single dose of primaquine is recommended in addition to ACT as an anti-gametocyte medicine in treatment of *P. falciparum* malaria, particularly as a component of a pre-elimination or an elimination programme, provided the risks for haemolysis in glucose-6-phosphate dehydrogenase (G6PD)-deficient patients have been considered.

Furthermore, in light of evidence of resistance to artemisinins, WHO urges more strongly the continued routine monitoring of therapeutic efficacy of antimalarial medicines and halting the use all monotherapies for the treatment of uncomplicated malaria (2).

BOX 2.1

WHO recommendations for diagnosis and treatment of malaria

- Prompt parasitologic confirmation by microscopy or alternatively by rapid diagnostic tests (RDTs) is recommended in all patients suspected of malaria before treatment is started. Treatment solely on the basis of clinical suspicion should only be considered when a parasitological diagnosis is not accessible.
- Uncomplicated *Plasmodium falciparum* malaria should be treated with an artemisinin-based combination therapy (ACT); vivax malaria should be treated with chloroquine 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 primaquine for 14 days in the treatment of *P. vivax* malaria, for the prevention of relapses, subject to considering the risk of haemolysis in patients with G6PD-deficiency.
- Five ACTs are currently recommended for use: artemether-lumefantrine, artesunate-amodiaquine, artesunate-mefloquine, artesunate-sulfadoxine pyrimethamine, and dihydroartemisinin-piperazine. The choice of the ACT should be based on the efficacy of the combination in the country or area of intended use.
- Artemisinin derivatives should not be used as monotherapies for the treatment of uncomplicated malaria as this will promote resistance to this critically important class of antimalarials.
- A single dose of primaquine to be added as an anti-gametocyte medicine to ACT treatment of *P. falciparum* malaria, particularly as a component of pre-elimination or elimination programme, is recommended provided the risk of haemolysis in G6PD-deficient patients is considered.
- Severe malaria should be treated with a parenteral artemisinin derivative or quinine to be 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 suppository and be transferred to a health facility capable of providing definitive treatment with parenteral antimalarial medicines.
- In settings with limited health facility access, diagnosis and treatment should be provided at community level through a programme of community case management (home-based management) of malaria.

2.2 Malaria prevention through mosquito control

2.2.1 Aims

Malaria vector control is intended to protect individuals against infective mosquito bites and, at the community level, to reduce the intensity of local malaria transmission. The two most powerful and most broadly applied interventions are insecticide-treated nets (ITN) and indoor residual spraying (IRS). In some specific settings and circumstances (if the breeding sites are few, fixed, and easy to identify) these core interventions may be complemented by other methods such as larval control or environmental management. WHO recommendations for vector control are the following:

1. Because high coverage rates are needed to realize the full potential of either ITNs or IRS, WHO GMP recommends “universal coverage” of all people at risk in areas targeted for malaria prevention. In the case of ITNs, this means that all people at risk in areas targeted for malaria prevention should be covered with ITNs (3, 4).
2. ITNs should be either free of charge or highly subsidized. Cost should not be a barrier to making them available to all people at risk, especially young children and pregnant women (3).
3. Universal coverage with long-lasting insecticidal nets (LLINs) can be achieved and maintained by combining distribution through occasional campaigns with continuous distribution to pregnant women and infants at routine antenatal and immunization contacts (3).
4. Only LLINs recommended by the WHO Pesticide Evaluation Scheme (WHOPES) should be procured by national malaria 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 (5, 6).
5. IRS consists of the application of insecticides to the inner surfaces of dwellings, where endophilic anopheline mosquitoes often rest after taking a blood meal (4). IRS is applicable in many epidemiological settings, as long as operational and resource feasibility is considered in policy decisions. Twelve insecticides belonging to four chemical classes are currently recommended by WHO for IRS. An insecticide for IRS in a given area is selected on the basis of data on resistance, the residual efficacy of the insecticide, cost, 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 insecticide currently used on ITNs.
6. Scientific evidence indicates that IRS is effective in controlling malaria transmission and thus reduces the related burden of morbidity and mortality as long as most houses and animal shelters (e.g. > 80%) in targeted communities are treated. IRS is effective only if the operation is performed correctly, which depends on the existence at national, provincial and district levels of adequate infrastructure and programme capacity for implementation, monitoring and evaluation (4).
7. DDT has comparatively long residual efficacy (≥ 6 months) against malaria vectors and plays an important role in the management of vector resistance. Countries can use DDT for IRS for as long as necessary and in the quantities needed, provided that the guide-

lines and recommendations of WHO and the Stockholm Convention are met and until locally appropriate, cost-effective alternatives are available for a sustainable transition from DDT (7).

8. Resistance to insecticides, especially pyrethroids, is an urgent and growing threat to the sustainability of current methods of vector control. Monitoring and managing resistance to the insecticides used in both ITNs and IRS are vital (3, 4).
9. 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 (3). Some observational evidence indicates that the combination of IRS and LLIN is more effective than either intervention alone, especially if the combination helps to increase overall coverage with vector control (8). More formal trials are being planned. In using the combination of IRS and ITNs, it is preferable to use a non-pyrethroid insecticide for IRS.

2.2.2 Resistance to antimalarial drugs

Antimalarial drug resistance is a major public health problem, which hinders the control of malaria. The rapid spread of resistance to these drugs over the past few decades has led to intensification of the monitoring of their efficacy, to ensure proper management of clinical cases and early detection of changing patterns of resistance in order to revise national malaria treatment policies. Surveillance of therapeutic efficacy over time is an essential component of malaria control. The results of tests for therapeutic efficacy (in vivo tests) provide the most important information for determining whether first- and second-line drugs are still effective and also provide evidence for ministries of health to update their national malaria treatment policies.

WHO's role in the global management of drug resistance has been twofold. Its normative and standard-setting role results in a harmonized approach to this global concern. In order to interpret and compare results within and between regions, and to follow trends over time, tests must be conducted with similar standardized procedures, and WHO has standardised the available methods. Since 1996, WHO has updated the protocol for assessing antimalarial drug efficacy on the basis of expert consensus and feedback from the field (9). WHO has also prepared a field manual on *in vitro* assays for the sensitivity of malaria parasites to antimalarial drugs (10) and a guideline on genotyping malaria parasites to distinguish between reinfection and recrudescence during therapeutic efficacy tests. Genotyping is now becoming mandatory with the longer follow-up of patients (11). Apart from its normative role, WHO GMP is also providing technical assistance to countries in both the surveillance of drug resistance and guidance on treatment policies. Routine surveillance systems put in place by countries and coordinated by WHO have shown that the failure rate of currently used ACTs is increasing on both sides of the Thai-Cambodian border, due mainly to local emergence of resistance to artemisinin derivatives. WHO is investigating this problem and implementing strategies to contain and prevent the dissemination of resistance further.

In response to the challenge posed by the emergence of resistance to antimalarial drugs, WHO has established a global database of information and the results of antimalarial drug efficacy tests at country

level. The database is used by governments to review and update their treatment policies. The continuously updated database can also be made available to other stakeholders. The data will be analysed for a report on global monitoring in 2009, focusing on the efficacy of ACTs, which will describe WHO's work in monitoring resistance to antimalarial drugs, setting up the database, standardizing therapeutic efficacy tests, promoting more rational use of the available tests for evaluating resistance and showing how the results of these tests are used for updating national malaria treatment policies.

The indicators in Table 2.1 apply to countries with high, moderate and low transmission that are in the control phase but not to those in the pre-elimination or elimination phases. Indicators have not yet been developed for the phases of pre-elimination, elimination and prevention of reintroduction.

2.3 Goals, indicators and targets

The vision of the RBM Partnership is "a world free from the burden of malaria" (12). As of 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 (13–15). Coverage is meant to reach $\geq 80\%$ by 2010 with four key interventions: ITNs for people at risk, appropriate antimalarial medicines for patients with probable or confirmed malaria, IRS for targeted households at risk and intermittent preventive treatment in pregnancy (in moderate-to-high transmission settings). The global impact targets are a reduction in the number of malaria cases and deaths per capita by 50% or more between 2000 and 2010, and by 75% or more between 2000 and 2015.

The RBM partnership added three additional targets as part of the Global Malaria Action Plan in September 2008 (16). The first is to reduce the global number of malaria deaths to near-zero preventable deaths by 2015. This target is more aggressive 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 are in the pre-elimination phase today (2008). The third goal is, "in the long term, eradicate malaria worldwide by reducing the global incidence to zero through progressive elimination in countries".

The Inter-agency and Expert Group on MDG Indicators has established specific indicators for malaria (13):

- 6.6 Incidence and death rates associated with malaria.
- 6.7 Proportion of children under 5 years sleeping under insecticide-treated bed nets.
- 6.8 Proportion of children under 5 years with fever who are treated with appropriate antimalarial medicines.

Table 2.1 draws together the work of RBM since 1998, the Abuja Declaration in 2000 (14), the resolution of the Health Assembly in 2005 (15), and various subsequent revisions of the MDGs for malaria and the RBM Global Action Plan for Malaria. It shows practical indicators recommended by WHO for use by national malaria programmes to measure coverage with malaria control interventions and epidemiological impact. Core national operational logistics and reporting indicators are also listed. The only substantial change from last year's indicator list is the addition of a new IRS indicator: percentage of at-risk population targeted by IRS. This indicator has no target but is intended to monitor the contribution of IRS to overall malaria control.

Table 2.1 Malaria indicators, targets and sources of data (17–19)

A. TRENDS IN MALARIA CASES AND DEATHS

IMPACT MEASURE	INDICATOR	NUMERATOR	DENOMINATOR	DATA TYPE/SOURCE	TARGET
Malaria cases					
	1.1 Confirmed malaria cases (microscopy or RDT, per 1000 persons per year) ^a	Confirmed malaria cases per year (< 5 years or total)	Population (< 5 years or total)	Routine surveillance	Reduction in cases per capita: ≥ 50% by 2010, and ≥ 75% by 2015 in comparison with 2000
	1.2 Inpatient malaria cases (per 1000 persons per year) ^b	No. of inpatient malaria cases per year (< 5 years or total)	Population (< 5 years or total)	Routine surveillance	Reduction in cases per capita: ≥ 50% by 2010, and ≥ 75% by 2015 in comparison with 2000
Malaria transmission					
	1.3 Malaria test positivity rate (both microscopy and RDT) ^a	No. of laboratory-confirmed malaria cases	No. of suspected malaria cases with parasite-based laboratory examination	Routine surveillance	No target set, indicates level of control ^c
Malaria deaths					
	1.4 Inpatient malaria deaths (per 1000 persons per year)	No. of inpatient malaria deaths per year (< 5 years or total)	Population (< 5 years or total)	Routine surveillance	Reduction in deaths per capita: 50% by 2010 and ≥ 75% by 2015 in comparison with 2000 ^d
	1.5 Malaria-specific deaths (per 1000 persons per year)	No. of malaria deaths per year (< 5 years or total)	Population (< 5 years or total)	Verbal autopsy (surveys), complete or sample vital registration systems	
	<i>For high-transmission countries</i> 1.6 Deaths of children < 5 years old from all causes (per 1000 children < 5 years old per year)	No. of deaths in children < 5 years old from all causes	Population (< 5 years)	Household surveys, complete or sample vital registration systems	No target set

B. COVERAGE WITH INTERVENTIONS

CONTROL STRATEGY	INDICATOR	NUMERATOR	DENOMINATOR	DATA TYPE/SOURCE	TARGET
Prompt access to effective treatment					
	2.1 Appropriate antimalarial treatment of children < 5 years within 24 hours of onset of fever ^{e–g} (MDG indicator 6.8)	No. of children < 5 years receiving appropriate antimalarial treatment (according to national policy) within 24 hours of onset of fever	No. of children < 5 years with fever in the past 2 weeks in surveyed households ^e	Household surveys	≥ 80%
Mosquito control with ITNs					
	2.2 ITN use by all persons or children < 5 years or pregnant women (MDG indicator 6.7) ^h	No. of persons (all ages) or children < 5 years or pregnant women who reported sleeping under an ITN during previous night	No. of persons (all ages) or children < 5 years old or pregnant women in surveyed households	Household surveys	≥ 80%
	2.3. “Administrative” ITN coverage ⁱ	No. of persons with ITN from numbers of ITN distributed ⁱ	No. of persons at risk for malaria	Routine NMCP data	≥ 80%
Mosquito control by IRS					
	2.4. Percentage of population at risk that is targeted for indoor-residual spraying (IRS)	No. of persons that are targeted for IRS	No. of persons at risk for malaria	Routine NMCP data	No target set. Indicates contribution of IRS to overall malaria control
	2.5. Households sprayed with insecticide among those targeted	No. of households sprayed at least once in one year according to national guidelines	No. of households targeted according to national guidelines	Routine NMCP data	100%
Prevention of malaria in pregnancy					
	<i>For high-transmission countries</i> 2.6. Pregnant women who received two doses of intermittent preventive therapy	No. of pregnant women who received two doses of intermittent preventive therapy	No. of pregnant women who made at least one ANC visit in one year	Routine antenatal clinic data	≥ 80%

C. OPERATIONAL INDICATORS USED AT HEALTH FACILITY, DISTRICT AND NATIONAL LEVELS, MEASURED USING ROUTINE HEALTH INFORMATION SYSTEMS

MONITORING	INDICATOR	NUMERATOR	DENOMINATOR	DATA TYPE/SOURCE	TARGET
Diagnosis					
	3.1. Percentage of outpatient suspected malaria cases that undergo laboratory diagnosis ^j	No. of outpatient suspected malaria cases that undergo laboratory diagnosis (by age group)	No. of outpatient suspected malaria cases that should be examined (by age group)	Routine surveillance data	≥ 90%
Appropriate treatment at health facilities					
	3.2. Percentage of outpatient cases that received appropriate antimalarial treatment according to national policy	No. of malaria cases receiving appropriate antimalarial treatment at health facility	No. of outpatient malaria cases expected to be treated at health-facility level with appropriate antimalarial medicine	Routine logistic data	100%
Routine distribution of mosquito nets					
	3.3. ITN distribution to vulnerable sub-groups	No. of ITNs distributed to vulnerable groups ^k	No. of persons in vulnerable groups targeted for receiving ITNs	Routine logistic data	≥ 80%
Antimalarial drug supplies					
	3.4. Health facilities without stock-outs of first-line antimalarial medicines, mosquito nets and diagnostics, by month	No. of health facilities without stock-outs of any first-line antimalarial medicines, ITNs and RDTs, by month ^l	No. of health facilities	Routine logistic data	100%
Reports for programme management					
	3.5. Completeness of monthly health facility reports on logistics or surveillance ^m	No. of health facility reports received each month, on logistics or surveillance	No. of health facility reports expected each month	Routine surveillance and logistic data	> 90%

From references 17–19

RDT: rapid diagnostic test; MDG: Millennium Development Goal; ITN: insecticide-treated net; IRS: indoor residual spraying

- 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 RBM target was introduced in the 2008 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. As malaria incidence is reduced, a smaller percentage of fevers will be due to malaria. With improved diagnosis, treatment can be targeted at confirmed cases. This indicator is currently under review.
- f. In areas where *P. vivax* is dominant and in areas of low transmission, this indicator may be less useful.
- g. The intention is to treat all persons with an appropriate antimalarial medicine; however, children are at greatest risk, especially in areas of high transmission.
- h. Indicator should be calculated separately for all persons, children and pregnant women.
- i. “Administrative” or operational ITN coverage is measured from the number of LLINs or ITNs distributed by ministries of health and partners. LLINs are the preferred type of ITN; they are assumed to protect for 3 years and conventional ITN for 1 year. One LLIN is assumed to protect two persons. This indicator mainly measures distribution and not hanging or use.
- j. Laboratory diagnosis includes microscopy and RDT; this is also an indicator of the quality of surveillance.
- k. e.g. pregnant women attending antenatal clinics, children attending in the context of the expanded programme on immunization.
- l. This indicator has three subindicators: one each for antimalarial medicines, ITNs and RDTs.
- m. This indicator can have one to three subindicators, depending on the data collection forms and reporting channels. For example, the inpatient data channel may be separate from the outpatient data channel, or logistics and disease surveillance data channels may be separate.

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