

Methods for preparing the country profiles

This annex describes the methods used for preparing country profiles; they also apply to other sections of the report.

1. Epidemiological profile

Population

The total population of each country or area is taken from the World population prospects, 2009 revision (1). Disaggregated data on children < 5 years of age and on rural populations are also given, as these are the most affected groups in the malaria-endemic countries.

Population by malaria endemicity

The country or area population is subdivided into three levels of malaria endemicity, as reported by the NMCP:

1. Areas of high transmission, where the reported incidence of malaria due to all species was 1 or more per 1000 population per year in 2009.
2. Areas of low transmission, where the reported malaria case incidence from all species was < 1 per 1000 population per year in 2009 but greater than 0. Transmission in these areas is generally highly seasonal, with or without epidemic peaks.
3. Malaria-free areas, where there is no continuing, local, mosquito-borne malaria transmission, and all reported malaria cases are imported (2). An area is designated malaria-free when no cases have occurred for several years. Areas may become malaria-free due to environmental factors or as a result of effective control efforts. In practice, malaria-free areas can be accurately designated by national programmes only after taking into account the local.

Population at risk

The population at risk is the total population living in areas where malaria is endemic (low and high transmissions), excluding the population living in malaria-free areas. The population at risk is often used as the denominator in calculating operational coverage of malaria interventions, and hence in assessing current and future needs, taking into account the population already covered. For countries or areas in the pre-elimination and elimination stages, population at risk is defined by the countries based on the resident populations in foci where active malaria transmission occurs.

Maps of malaria, country profiles

Epidemiological maps for each country or areas are based on the number of cases per 1000 population in 2009. For countries or areas in the African Region, and for Sudan in the Eastern Mediterranean Region and Papua New Guinea in the Western Pacific Region, the total of the probable and confirmed cases was used as numerator because relatively small proportions of cases are confirmed. In other countries confirmed malaria cases were used as numerator. Six levels of endemicity are shown:

- > 100 cases per 1000 population per year;
- > 50 cases per 1000 population per year and < 100 cases;
- > 10 cases per 1000 population per year but < 50 cases
- > 1 cases per 1000 population per year but < 10 cases
- > 0 case per 1000 population per year but < 1 cases;
- 0 recorded cases.

The first four categories correspond to the high-transmission category defined above. It should be noted that case incidence rates for 2009 do not necessarily reflect the endemicity of areas in previous years. If subnational data on population or malaria cases were lacking, an administrative unit was labelled “no data” on the map. In some cases, the subnational data provided by a malaria control programme did not correspond to a mapping area known to WHO. This may be the result of modifications to administrative boundaries or the use of names not verifiable by WHO.

Vector and parasite species

The species of mosquito responsible for malaria transmission in a country and the species of Plasmodium involved are listed according to information provided by WHO regional offices.

Trends in malaria morbidity and mortality

A table in the epidemiological profile gives the reported number of cases tested by microscopy or RDT, the number positive and the number with a *P. falciparum* infection (including mixed *P. falciparum* and *P. vivax*).

The first graph shows four indicators:

- *Number of confirmed cases in all ages per 1000 population per year:* This indicator helps to assess changes in the incidence of malaria over the years, provided that there has been consistency in case reporting over time.

- **Annual blood examination rate (ABER):** the number of parasitological tests done (by microscopy and/or RDTs) divided by the total population at risk. This indicator reflects the proportion of the population that receives diagnostic testing. The number of confirmed cases detected by a programme is influenced by the extent of diagnostic testing (ABER). Ideally ABER should be constant or increasing.
- **Malaria test positivity rate:** the number of parasitologically positive cases per 100 cases examined by RDT or microscopy. This measures the prevalence of malaria parasites among people who seek care and are examined in health facilities.
- **Percentage of cases with *P. falciparum* infection:** the number of *P. falciparum* cases per 100 microscopically confirmed malaria cases. This measures the extent to which *P. falciparum* is prevalent in malaria patients. A decreasing trend over years may indicate progress in reducing or eliminating malaria due to *P. falciparum* (the most dangerous malaria species) as a major public health burden.

Malaria cases

NMCPs may report suspected, probable, and confirmed malaria cases. The relationship between these three types of case is shown in Figure 1.

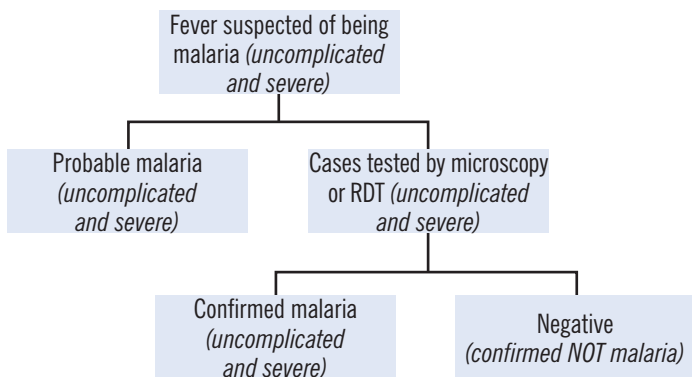


Figure 1 Relationship between suspected, probable and confirmed malaria

2. Intervention policies and targets

This section of the profile shows the policies and strategies adopted by each country for malaria prevention, diagnosis and treatment. Policies may vary according to the epidemiological setting, socioeconomic factors and the capacity of the national malaria programme or country health system. Adoption of policies does not necessarily imply immediate implementation, nor does it indicate full, continuous implementation nationwide. Policies and strategies are divided into those recommended by WHO and those recommended by others at country level.

- WHO-recommended policies and strategies include (see also Chapter 2):
 - provision of LLINs free of charge or highly subsidized to persons in all age groups at risk for malaria (3);
 - use of IRS, including with DDT (4);

- use of IPTp in highly endemic countries with comparatively low levels of resistance to sulfadoxine-pyrimethamine (5);
 - parasitological confirmation for cases in all age groups (6);
 - provision of ACT, free of charge or highly subsidized in the public sector, for malaria cases infected with *P. falciparum* (6).
 - pre-referral treatment with parenteral quinine or artemisinin derivatives or artesunate suppositories (6); and
 - banning of oral artemisinin-based monotherapies (6).
- Other policies or strategies are those adopted by countries after taking local epidemiological and other circumstances into account. "Yes" implies that the policy or strategy is adopted regardless of the scale of implementation; "No" implies that the policy is not adopted; and "Not applicable" implies that the policy is not relevant to the country situation. The year of adoption of a policy is that in which it was approved by a national malaria control programme. It does not take into account any change that may have occurred after the reports were received.

c) Antimalarial treatment policies are shown. Results of recent therapeutic efficacy tests are also shown where available. Data were extracted from the WHO global database on antimalarial drug efficacy and originate from three main sources: published data, unpublished data, and regular monitoring data from surveillance studies conducted according to the WHO standard protocol. The percentage of treatment failures is equal to the total number of early treatment failures plus late clinical failures plus late parasitological failures, divided by the total number of patients who completed the study follow-up. The number of studies included in the analysis and the years during which the studies were conducted are shown for each antimalarial medicine. The median, minimum and maximum describe the range of treatment failures observed in the studies for each antimalarial medicine. Note that in the 2003 protocol, low-to-moderate transmission areas and intense transmission areas (mainly sub-Saharan Africa) had different definitions for late parasitological failure. Also, in areas of low-to-moderate transmission there was an absence of systematic PCR correction of the results.

3. Implementing malaria control

Coverage with ITNs, from survey data

The percentage of households that own at least one mosquito net, the percentage of persons who slept under a net and the percentage of children under 5 years of age who slept under a net are taken from nationally representative household surveys, such as multiple indicator cluster surveys (MICS), demographic and health surveys (DHS), and malaria indicator surveys (MIS). Other available national surveys were also included. The results of subnational surveys undertaken to support local project implementation are difficult to interpret nationwide and hence are not presented in the profiles, although they can be useful for assessing progress locally. It should be noted that most these surveys are conducted during the dry season for logistical reasons, and the estimates may not reflect the use of nets during peak malaria transmission (when the rate of ITN use may be higher).

For high burden countries in the WHO African Region a model was used to estimate the percentage of households owning at least one ITN for years in which household surveys were not undertaken. The model takes into account data from three sources: household surveys, the number of ITNs delivered by manufacturers to a country, and the number of ITNs distributed by NMCPs (Section 4.1) (7).

Coverage with ITNs and IRS, from programme data

Because many countries do not have recent national survey data, the numbers of mosquito nets distributed and houses sprayed were obtained from the NMCP and used to estimate operational coverage with ITNs and IRS.

Coverage with ITNs: Operational or “administrative” coverage with ITNs was calculated as the number of ITNs distributed, divided by the population at risk (the sum of populations living in low- and high-transmission areas) divided by 2 (a ratio of one ITN for every two persons, following WHO recommendations) and multiplied by 100 (2). As, on average, LLINs are considered to have a useful lifespan of 3 years, the cumulative total of mosquito nets distributed over the past 3 years is taken as the numerator for any particular year. Other ITNs are considered to have an average lifespan of 1 year; some nets will be effective for longer if re-treated with insecticide. Therefore, the numerator for LLINs and ITNs is the sum of the cumulative LLINs distributed in the latest 3 years and the number of ITNs during the latest year. Re-treatment is not taken into account in this report and is in any case becoming less frequent following the introduction of long-lasting nets. Such operational estimates contain no information about the geographical distribution of ITNs or their distribution within households. ITNs may be clustered in certain subpopulations, thus depriving others at risk, and the number of ITNs delivered to a household may exceed or fall short of the recommended ratio of one net per two people.

Coverage with IRS: Operational coverage with IRS is calculated as the number of people living in a household where IRS has been applied during the preceding 12 months, divided by the population at risk (the sum of populations living in low- and high-transmission areas) multiplied by 100. Respondents were asked to convert, where necessary, records of the number of built structures sprayed to number of households, where the average household consists of more than one structure. The number of people protected by IRS, as reported by NMCPs, was taken as the numerator. Programme data are the most important source of information for estimating coverage, as household surveys do not generally include questions on IRS. In addition, IRS is often focalized, carried out on a limited geographical scale, for which nationally representative household surveys may not provide an adequate sample size for coverage to be measured accurately. The percentage of people protected by IRS is a measure of the extent to which IRS is implemented and the extent to which the population at risk benefits from IRS nationwide. The data show neither the quality of spraying nor the geographical distribution of IRS coverage in a country.

For countries outside Africa, assuming that IRS and ITNs are deployed in mutually exclusive geographical areas focusing on populations at high risk, maximum attainable potential coverage of preventive interventions was calculated as the sum of the populations covered by IRS and by ITN divided by the total population at high risk.

Source of treatment for febrile children and antimalarial received, from survey data

Nationally representative household surveys such as MICS, DHS and MIS were used to estimate the percentage of febrile children receiving care (i) in public health facilities; (ii) in private facilities (including pharmacies and shops); and (iii) at home, including those that receive no medication. The type of antimalarial received by febrile children in these categories is also shown.

The results should be interpreted with the following provisos:

- Not all cases of fever are due to malaria, particularly in low-transmission areas, so 100% of febrile children cannot be expected to receive an antimalarial medicine, particularly if they are treated in a health facility and the laboratory diagnosis excludes malaria.
- Most MICS and DHS are conducted during the dry season, and the data may not reflect the year-round incidence of malarial disease or the provision of antimalarial treatment during the period of peak incidence.
- As it may be difficult to exclude some non-endemic areas from the analysis, the rates of antimalarial treatment relative to the estimated need may appear unduly low.
- Respondents to household surveys may not recall accurately the type of medicine given to children.
- Access to ACT may appear unduly low in countries where chloroquine is used to treat *P. vivax*, especially where *P. vivax* causes a high proportion of malaria cases.
- As ACT was introduced comparatively recently and no additional indicator on diagnosis is available, most surveys report only on the use of any (unspecified) antimalarial medicine.
- In the absence of diagnosis, care-givers and patients may consider other diseases as the cause of the fever and hence provide other medicines, such as paracetamol or antibiotics.

Access to effective treatment, from programme data

The graph on access to effective treatment from programme data shows three indicators:

- Percentage of suspected cases tested: the number of suspected cases examined by microscopy or by RDT divided by the total number of suspected malaria cases x 100. This indicator reflects the extent to which a programme can provide diagnostic services to patients attending health facilities.
- Percentage of malaria cases receiving any antimalarial in the public sector: the number of antimalarial treatment courses delivered divided by the number of reported malaria cases attending public sector health facilities x 100, with correction for reporting completeness. This indicator can provide information on whether the malaria control programme delivers sufficient antimalarials to treat all patients who seek treatment in the public sector.
- Percentage of falciparum malaria cases receiving ACT in the public sector: number of ACT courses delivered divided by the number of reported falciparum malaria cases in the public sector x 100, with correction for reporting completeness. This indicator can provide information on whether the malaria control programme delivers sufficient ACTs to treat the number of falciparum cases seeking treatment in the public sector.

The number requiring treatment in a year depends not only on the incidence of malaria but also on the rate of case confirmation. In countries in which all cases are confirmed, the number requiring treatment will be the number of confirmed cases. In countries where not all cases are confirmed, it will be the number of probable cases plus the number of confirmed cases.

4. Financing malaria control

Government and external financing

NMCP budgets and expenditures may be used to assess the extent to which the programmes can maintain or scale up access to malaria prevention, diagnosis and treatment. The data shown are those reported by the programme. The first graph shows financial contributions by source or name of agency by year. The government contribution is usually the declared government expenditure for the year. When government expenditure was not reported by the programme, the government budget was used. External contributions are contributions allocated to the programme by external agencies, which may or may not be disbursed. Additional information about contributions from specific donor agencies, as reported by these agencies, is given in Annex 3.

Breakdown of expenditure by intervention

The pie chart shows the proportion of all malaria funding from all sources, spent on different activities in 2009: ITNs, insecticides and spraying materials, IRS, diagnosis, antimalarial medicines, monitoring and evaluation; and human resources and technical assistance. All countries were requested to convert their local currencies into 2009 US\$. The amounts have not been adjusted for purchasing power parity. When annual plans are completed as anticipated, the amounts shown should be about the same as the total amount received by the programme. Some divergence may occur, however, due to unexpectedly slow or fast disbursement of donor contributions or implementation or to changes in plans, prices and other factors. There may also be differences in the completeness of data, and the expenditures on activities listed may not include all items of expenditure. Government expenditures usually only include expenditures specific to malaria control and do not take into account costs related to maintaining health systems, human resources, etc. Despite the various uncertainties associated with these data, the graphs highlight major changes in programme funding and expenditure.

5. Sources of information

The sources of data are shown at the bottom of each graph. The WHO Global Malaria Programme has created a database containing the information used in compiling this Report. The data, together with profiles for all 106 malaria-endemic countries and territories, are available from www.who.int/topics/malaria/en/.

References

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