SDG indicator metadata

(Harmonized metadata template - format version 1.1)

0. Indicator information (SDG_INDICATOR_INFO)

0.a. Goal (SDG_GOAL)

Goal 3: Ensure healthy lives and promote well-being for all at all ages

0.b. Target (SDG_TARGET)

Target 3.3: By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases

0.c. Indicator (SDG_INDICATOR)

Indicator 3.3.3: Malaria incidence per 1,000 population

0.d. Series (SDG_SERIES_DESCR)

SH_STA_MALR - Malaria incidence per 1,000 population at risk [3.3.3]

0.e. Metadata update (META_LAST_UPDATE)

2025-03-28

0.f. Related indicators (SDG_RELATED_INDICATORS)

0.g. International organisations(s) responsible for global monitoring (SDG_CUSTODIAN_AGENCIES)

Global Malaria Programme at World Health Organization (WHO)

1. Data reporter (CONTACT)

1.a. Organisation (CONTACT_ORGANISATION)

Global Malaria Programme at World Health Organization (WHO)

2. Definition, concepts, and classifications (IND_DEF_CON_CLASS)

2.a. Definition and concepts (STAT_CONC_DEF)

Definition:
Incidence of malaria is defined as the number of new cases of malaria per 1,000 people at risk each year.

Concepts:
A case of malaria is defined as the occurrence of malaria infection in a person in whom the presence of malaria parasites in the blood has been confirmed by a diagnostic test. The population considered is the population at risk of the disease.

2.b. Unit of measure (UNIT_MEASURE)

Cases per 1000 population at risk.

2.c. Classifications (CLASS_SYSTEM)

N.A.

3. Data source type and data collection method (SRC_TYPE_COLL_METHOD)

3.a. Data sources (SOURCE_TYPE)

Cases reported by the NMCP are obtained from each country surveillance system. This includes among others information on the number of suspected cases, number of tested cases, number of positive cases by method of detection and by species as well as number of health facilities that report those cases. This information is summarized in a DHIS2 application developed for this purpose. Data for representative household surveys are publicly available and included National Demographic Household Surveys (DHS) or Malaria Indicator Survey (MIS).

3.b. Data collection method (COLL_METHOD)

The official counterpart for each country is the National Malaria Control Program at the Ministry of Health.

3.c. Data collection calendar (FREQ_COLL)

Data is collected every year.

3.d. Data release calendar (REL_CAL_POLICY)

Data is released yearly.

3.e. Data providers (DATA_SOURCE)

The National Malaria Control Program is the responsible to collect the information at each country.

3.f. Data compilers (COMPILING_ORG)

Strategic Information for Response Unit of the Global Malaria Control Programme is the responsible to compile and process all the relevant information. National estimates for some countries are estimated in collaboration with the Malaria Atlas Project (MAP) which has been designated a WHO collaborating centre in geospatial disease modelling.

3.g. Institutional mandate (INST_MANDATE)

The Global technical strategy and targets for malaria 2016–2030 was adopted by The 68 World Health Assembly (https://apps.who.int/iris/bitstream/handle/10665/253469/A68_R1_REC1-en.pdf?sequence=1&isAllowed=y). The Assembly requested WHO to monitor the progress toward the GTS milestones and targets. The World Malaria Report is the process by which the GTS is monitored by country, WHO region and globally.

4. Other methodological considerations (OTHER_METHOD)

4.a. Rationale (RATIONALE)

To measure trends in malaria morbidity and to identify locations where the risk of disease is highest. With this information, programmes can respond to unusual trends, such as epidemics, and direct resources to the populations most in need. These data also serve to inform global resource allocation for malaria such as when defining eligibility criteria for Global Fund finance.

4.b. Comment and limitations (REC_USE_LIM)

The estimated incidence can differ from the incidence reported by a Ministry of Health which can be affected by:

- The completeness of reporting: the number of reported cases can be lower than the estimated cases if the percentage of health facilities reporting in a month is less than 100%
- The extent of malaria diagnostic testing (the number of slides examined or RDTs performed)
- The use of private health facilities which are usually not included in reporting systems.
- The indicator is estimated only where malaria transmission occurs.

4.c. Method of computation (DATA_COMP)

Malaria incidence (1) is expressed as the number of new cases per 1000 population per year with the population of a country derived from projections made by the UN Population Division and the total proportion at risk estimated by a country's National Malaria Control Programme. More specifically, the country estimates what is the total proportion of the population at risk of malaria and then, for each year, the total population at risk is estimated as the UN Population for that year, times the proportion of the population at risk at baseline. The same proportion of the population at risk is used for the entire time series to ensure comparability of estimates through time.

For each country or area, the number of malaria cases was estimated by one of the three methods described below.

Method 1:
Method 1 was used for countries and areas outside the World Health Organization (WHO) African Region, and for low transmission countries and areas in the African Region as follows: Afghanistan, Bangladesh, the Bolivarian Republic of Venezuela, Botswana, Brazil, Cambodia, Colombia, the Dominican Republic (until 2020), Eritrea, Ethiopia, French Guiana (until 2020), the Gambia, Guatemala (until 2020), Guyana, Haiti, Honduras (until 2020), India, Indonesia, the Lao People's Democratic Republic, Madagascar, Mauritania, Myanmar, Namibia, Nepal (until 2020), Nicaragua, Pakistan, Panama (until 2020), Papua New Guinea, Peru, the Philippines, the Plurinational State of Bolivia, Rwanda, Senegal, Solomon Islands, Timor-Leste (until 2016), Vanuatu, Viet Nam (until 2020), Yemen and Zimbabwe. Estimates were made by adjusting the number of reported malaria cases for completeness of reporting, the likelihood that presumed cases were parasite positive, and the extent of health service use. The procedure, which is described in the World malaria report 2008 (1), combines national data annually reported by national malaria programmes (NMPs) (i.e. reported cases, reporting completeness and test positivity rates) with data obtained from nationally representative household surveys on health service use among children aged under 5 years, which was assumed to be representative of the service use in all ages. Briefly:
$T = (a + (c \times e))/d \times (1 + f/g + (1 - g - f)/2/g)$

where:
a is malaria cases confirmed in the public sector
c is presumed cases (not tested but treated as malaria)
d is reporting completeness
e is test positivity rate (malaria positive fraction) = a/b, where b is suspected cases tested
f is the fraction seeking treatment in the private sector
g is the fraction seeking treatment in the public sector
Factor to adjust for those not seeking treatment: $(1 - g - f)$
Cases in the public sector: $(a + (c \times e))/d$

Cases in the private sector: $(a + (c \times e))/d \times f/g$

To estimate the uncertainty around the number of cases, the test positivity rate was assumed to have a normal distribution centred on the test positivity rate value and standard deviation – defined as $0.244 \times e0.5547$ and truncated to be in the range 0, 1. Reporting completeness (d) was assumed to have one of three distributions, depending on the value reported by the NMP. If the value was reported as a range greater than 80%, the distribution was assumed to be triangular, with limits of 0.8 and 1.0, and the peak at 0.95. If the reporting completeness was reported as a value and was more than 80%, a beta distribution was assumed, with a mean value of the reported value (maximum of 95%) and confidence intervals (CIs) of 5% around the mean value. If the value or range was more than 50% but less than or equal to 80%, the distribution was assumed to be rectangular, with limits of 0.5 and 0.8, and the peak at 0.8. Finally, if the value or range was less than or equal to 50%, the distribution was assumed to be triangular, with limits of 0 and 0.5, and the peak at 0.5 (2). The fraction of children brought for care in the public sector and in the private sector was assumed to have a beta distribution, with the mean value being the estimated value in the survey and the standard deviation being calculated from the range of the estimated 95% CIs. The fraction of children not brought for care was assumed to have a rectangular distribution, with the lower limit being 0 and the upper limit calculated as 1 minus the proportion that were brought for care in the public and private sectors. The three distributions (fraction seeking treatment in the public sector, fraction seeking treatment in the private sector only and fraction not seeking treatment) were constrained to add up to 1.

Sector-specific care seeking fractions were linearly interpolated between the years that had a survey and were extrapolated for the years before the first or after the last survey. The parameters used to propagate uncertainty around these fractions were also imputed in a similar way or, if there was no value for any year in the country or area, were imputed as a mixture of the distributions of the region for that year. CIs were obtained from 10 000 draws of the convoluted distributions. The data were analysed using R statistical software, using the convdistr R package to propagate uncertainty and manage distributions (2).

For India, the values were obtained at subnational level using the same methodology. An additional adjustment was applied in several states in India between 2020 and 2022, to control for the reductions in reported testing rates associated with disruptions in health services related to the COVID-19 pandemic. The states with reductions in testing rates below those expected (defined as a change in testing rates of more than 10% observed between 2018 and 2019) in 2020 were Bihar, Chandigarh, Chhattisgarh, Dadra and Nagar Haveli, Delhi, Goa, Jharkhand, Karnataka, Puducherry, Punjab, Uttar Pradesh, Uttarakhand and West Bengal. In 2021, the states with reductions in testing rates were Assam, Chandigarh, Chhattisgarh, Daman and Diu, Delhi, Goa, Himachal Pradesh, Karnataka, Kerala, Manipur, Puducherry, Punjab, Uttar Pradesh, Uttarakhand and West Bengal. In 2022, cases were corrected for the states of Assam, Bihar, Chandigarh, Chhattisgarh, Delhi, Gujarat, Himachal Pradesh, Manipur, Puducherry, Punjab, Sikkim and West Bengal. In these states, the excess number of indigenous cases expected in the absence of diagnostic disruptions was calculated by estimating the number of additional tests that would have been conducted if testing rates were similar to those observed in 2019, then applying the test positivity ratio observed in 2019 (or in 2020 for Delhi and Jharkhand, or in 2021 and 2022 for Delhi and Puducherry) to this number. The malaria burden in countries outside the WHO African Region was affected by the COVID-19 pandemic in different ways. In several countries, the movement disruptions led to transmission reductions; in other cases, testing rates remained unchanged. This made it challenging to apply a single source of data for correction to all countries, considering also that it was difficult to relate the reported data to the essential health services (EHS) response. No adjustment for private sector treatment seeking was made for the following countries and areas because they report cases from the private and public sector together: Bangladesh, the Bolivarian Republic of Venezuela, Botswana, Brazil, Colombia, the Dominican Republic, French Guiana, Guatemala, Guyana, Haiti, Honduras, Indonesia (since 2017), Myanmar (since 2013), Nepal (since 2019), Nicaragua, Panama, Peru, the Plurinational State of Bolivia and Rwanda. For Senegal and Yemen, reported cases from last year were used, adjusting for the changes in population at risk values, and then these data were used to estimate the number of cases.

Method 2:
Method 2 was used for high transmission countries in the WHO African Region and for countries in the Eastern Mediterranean Region in which the quality of surveillance data did not permit a robust estimate from the number of reported cases. These countries were Angola, Benin, Burkina Faso, Burundi, Cameroon, the Central African Republic, Chad, the Congo, Côte d'Ivoire, the Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Malawi, Mali, Mozambique, the Niger, Nigeria, Sierra Leone, Somalia, South Sudan, the Sudan, Togo, Uganda, the United Republic of Tanzania and Zambia. In this method, estimates of the number of malaria cases were derived from information on parasite prevalence obtained from household surveys.

First, data on parasite prevalence from almost 60 000 survey records were assembled within a spatiotemporal Bayesian geostatistical model, together with environmental and sociodemographic covariates, and data distribution on interventions such as insecticide-treated mosquito nets (ITNs), antimalarial drugs and indoor residual spraying (IRS) (3) that are updated yearly to review the model. The geospatial model enabled predictions of Plasmodium falciparum prevalence in children aged 2–10 years, at a resolution of 5 × 5 k 2 m, throughout all malaria endemic WHO African Region countries for each year from 2000 to 2020. Second, an ensemble model was developed to predict malaria incidence as a function of parasite prevalence (4). The model was then applied to the estimated parasite prevalence, to obtain estimates of the malaria case incidence at 5 × 5 km2 resolution for each year from 2000 to 2021.1 Data for each 5 × 5 km2 area were then aggregated within country and regional boundaries, to obtain both national and regional estimates of malaria cases (5).

Between 2020 and 2022, additional cases estimated using this method were added to account for the disruptions in malaria prevention, diagnostic and treatment services as a result of the COVID-19 pandemic and other events that occurred during this period. Disruption information was reported per country and was obtained from the national pulse surveys on continuity of EHS during the COVID-19 pandemic conducted by WHO (first round in May–July 2020, second in January–March 2021 and third in November–December 2021) (6-8), and extended into 2022. The medium, minimum and maximum (with a limit of 50%) values of the ranges provided by countries to define disruptions were used to quantify the percentage of malaria service disruptions. This information was integrated into the estimates by applying an approach previously used for assessing the impacts of interventions on malaria burden through the creation of counterfactual burden estimates for scenarios with varying levels of intervention coverage. It was assumed that COVID-19-related disruptions to health care manifested themselves as reduced treatment seeking for malaria and thus reduced effective treatment with an antimalarial drug. The counterfactual estimates were then aligned, per country, with the estimates from the pulse surveys to produce a set of COVID-19-adjusted estimates for 2020, 2021 and 2022. For countries for which the estimates with the updated spatiotemporal model were considerably different from previous estimates without addition of new data or evidence that explained the drastic changes estimated by the model (Burkina Faso, Gabon, Guinea, Mali, the Niger, Nigeria, Somalia, the Sudan and Uganda), the case series published in the World malaria report 2023 (10) were used until 2022, adjusting for the changes in population-at-risk values. The values for 2023 were estimated by applying the change rate between the cases estimated using the spatiotemporal model of incidence between 2022 and 2023 and adjusting for population changes between these 2 years.

Method 3:
For most of the elimination countries and countries at the stage of prevention of reintroduction, the number of indigenous and introduced cases registered by NMPs are reported without further adjustments (6). The countries in this category were Algeria, Argentina, Armenia, Azerbaijan, Belize, Bhutan, Cabo Verde, China, the Comoros, Costa Rica, the Democratic People's Republic of Korea, Djibouti, the Dominican Republic (since 2021), Ecuador, Egypt, El Salvador, Eswatini, French Guiana (since 2021), Georgia, Guatemala (since 2021), Honduras (since 2021), Iraq, the Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Malaysia, Mexico, Morocco, Nepal (since 2021), Oman, Panama (since 2021), Paraguay, the Republic of Korea, Sao Tome and Principe, Saudi Arabia, South Africa, Sri Lanka, Suriname, the Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste (since 2017), Türkiye, Turkmenistan, the United Arab Emirates, Uzbekistan and Viet Nam (since 2021).

Country-specific adjustments
For some years, information for certain countries was not available or could not be used because it was of poor quality. For countries in this situation, the number of cases was imputed from other years when the quality of the data was better (adjusting for population growth), as follows: for Afghanistan, values for 2000–2001 were imputed from 2002–2003; and for Bangladesh, values for 2001–2005 were imputed from 2006–2008. For Ethiopia, values for 2000–2019 were taken from a mixed distribution between values from Method 1 and Method 2 (50% from each method). For the Gambia, values for 2000–2010 were imputed from 2011–2013; for Haiti, values for 2000–2005, 2009 and 2010 were imputed from 2006–2008; for Indonesia, values for 2000–2003 and 2007–2009 were imputed from 2004–2006; and for Mauritania, values for 2000–2010 were imputed from a mixture of Method 1 and Method 2, starting with 100% values from Method 2 for 2001–2002, with that percentage decreasing to 10% of Method 1 in 2010. For Myanmar, values for 2000–2005 were imputed from 2007–2009; and for Namibia, values for 2000 were imputed from 2001–2003 and values for 2012 were imputed from 2011 and 2013. For Pakistan, values for 2000 were imputed from 2001–2003; and for Papua New Guinea, values for 2012 were imputed from 2009–2011. For Rwanda, values for 2000–2006 were imputed from a mixture of Method 1 and Method 2, starting with 100% values from Method 2 in 2000, with that percentage decreasing to 10% in 2006. For Senegal, values for 2000–2006 were imputed from a mixture of Method 1 and Method 2, with 90% of Method 2 in 2000, decreasing to 10% of Method 2 in 2006. For Thailand, values for 2000 were imputed from 2001–2003; for Timor-Leste, values for 2000–2001 were imputed from 2002–2004; and for Zimbabwe, values for 2000–2006 were imputed from 2007–2009.

4.d. Validation (DATA_VALIDATION)

Burden estimates presented in the World Malaria Report are sent to the countries via regional offices for consultation and approval.

4.e. Adjustments (ADJUSTMENT)

Not Applicable

4.f. Treatment of missing values (i) at country level and (ii) at regional level (IMPUTATION)

(i) **At country level**
For missing values of the parameters (test positivity rate and reporting completeness) a distribution based on a mixture of the distribution of the available values is used, if any value exists for the country or from the region otherwise. Values for health seeking behaviour parameters are imputed by linear interpolation of the values when the surveys were made or extrapolation of the first or last survey. When no reported data is available the number of cases is interpolated taking into account the population growth.

(ii) **At regional and global levels**
Not Applicable

4.g. Regional aggregations (REG_AGG)

Number of cases are aggregated by region, and uncertainty obtained from the aggregation of each country's distribution. Population at risk is aggregated without any further adjustment. Estimation at global level is obtained from aggregation of the regional values.

4.h. Methods and guidance available to countries for the compilation of the data at the national level (DOC_METHOD)

Information is provided by each country's NMCP using a DHIS 2 application created specifically for this purpose.

4.i. Quality management (QUALITY_MGMNT)

Burden estimates are first reviewed internally by GMP and WHO regional and country offices. These are then shared to country for validation. Final approval is received from the WHO division of Data, Analytics.

4.j Quality assurance (QUALITY_ASSURE)

We perform internal validation for outliers and completeness and raise queries to countries through the regional offices for clarification. When necessary, we rely on data quality assessment information from external sources such as partners working in malaria monitoring and evaluation.

4.k Quality assessment (QUALITY_ASSMNT)

We perform internal validation for outliers and completeness and raise queries to countries through the regional offices for clarification. When necessary, we rely on data quality assessment information from external sources such as partners working in malaria monitoring and evaluation.

5. Data availability and disaggregation (COVERAGE)

Data availability:
109 countries

Time series:
Annually since 2000

Disaggregation:
The indicator is estimated at country level.

6. Comparability / deviation from international standards (COMPARABILITY)

Sources of discrepancies:
The estimated incidence can differ from the incidence reported by a Ministry of Health which can be affected by:

- The completeness of reporting: the number of reported cases can be lower than the estimated cases if the percentage of health facilities reporting in a month is less than 100%
- The extent of malaria diagnostic testing (the number of slides examined or RDTs performed)
- The use of private health facilities which are usually not included in reporting systems.

7. References and Documentation (OTHER_DOC)

URL:
https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2024

References:

1. World malaria report 2008. Geneva: World Health Organization; 2008 (https://apps.who.int/iris/handle/10665/43939).

2. The R Project for statistical computing [website]. Vienna: R Foundation for Statistical Computing; 2023 (https://www.R-project.org/).

3. Weiss DJ, Mappin B, Dalrymple U, Bhatt S, Cameron E, Hay SI et al. Re-examining environmental correlates of Plasmodium falciparum malaria endemicity: a data-intensive variable selection approach. Malar J. 2015;14:68 (https://doi.org/10.1186/s12936-015-0574-x).

4. Cameron E, Battle KE, Bhatt S, Weiss DJ, Bisanzio D, Mappin B et al. Defining the relationship between infection prevalence and clinical incidence of Plasmodium falciparum malaria. Nat Commun. 2015;6:8170 (https://doi.org/10.1038/ncomms9170).

5. Malaria Atlas Project [website]. 2023 (https://malariaatlas.org).

6. Pulse survey on continuity of essential health services during the COVID-19 pandemic: interim report, 27 August 2020. Geneva: World Health Organization; 2020 (https://iris.who.int/handle/10665/334048).

7. Second round of the national pulse survey on continuity of essential health services during the COVID-19 pandemic: January−March 2021. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/340937).

8. Third round of the global pulse survey on continuity of essential health services during the COVID-19 pandemic: November–December 2021. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/351527).