MONITORING AND EVALUATION TOOLKIT

HIV, Tuberculosis, Malaria and Health and Community Systems Strengthening

PART 4: MALARIA
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Acronyms

ACT    artemisinin combination therapy
BCC    behavior change communication
CCM    Country Coordinating Mechanism
DHS/DHS+ Demographic and Health Survey
HIS    health information system
HSS    health systems strengthening
IEC    information, education, communication
IPT    intermittent preventive treatment
IRS    indoor residual spraying
ITN    insecticide treated net
LLIN   long-lasting insecticidal net
M&E    monitoring and evaluation
MERG   Monitoring and Evaluation Reference Group
MICS   Multiple Indicator Cluster Survey
MIS    Malaria Indicator Survey
RBM    Roll Back Malaria Partnership
RDT    rapid diagnostic test
WHO    World Health Organization

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Malaria

1. Introduction

The increasing scale and complexity of malaria funding and programs have intensified the need for data to inform decision-making and to demonstrate progress toward the Millennium Development Goals. To meet these goals, strengthen programs and demonstrate value for money, countries must have strong monitoring and evaluation (M&E) systems to report accurate, timely and reliable data on programmatic performance, progress and impact.

This part of the M&E toolkit presents an overview of global malaria goals and strategies (Section 2), new control policies and tools (Section 3), M&E considerations and requirements for Global Fund-supported malaria programs (Section 4), selected indicators recommended for Global Fund reporting, recommendations for strengthening data collection systems (Section 5), and for program reviews and evaluations in the context of Global Fund grant renewals and periodic Reviews (Section 6).

This guidance aligns with international malaria M&E standards (Sections 7 and 8), taking into account country needs and capacity. The measurement framework is consistent with that presented in the previous edition of the toolkit, but includes updates to service delivery areas related to a supportive environment, community-based services indicators, improved impact/outcome indicators and measurement methods, and guidance on indicator disaggregation. Indicators listed in this toolkit are recommended for reporting to the Global Fund and are a subset of those that can be used for program management.

2. Goals and strategies in the fight against malaria

The international community has committed to fighting malaria through ambitious global targets, funding and new strategic directions. Malaria goals and targets include the Millennium Development Goals, the 2005 World Health Assembly resolutions, and Roll Back Malaria 2008 Global Malaria Action Plan and 2005-2015 Global Strategic Plan. Based on progress over recent years, Roll Back Malaria updated its goals and targets for 2015 in May 2011 (Box 1).

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### Millennium Development Goals

**Goal 4:** Reduce child mortality  
**Target 5:** Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.  
**Indicators:**  
- Under-five mortality rate  
- Infant mortality rate  
**Goal 6:** Combat HIV/AIDS, malaria and other diseases  
**Target 6.C:** To have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.  
**Related indicators:**  
- Prevalence and death rates associated with malaria  
- Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures

### World Health Assembly 2005

- Establish national policies and operational plans to ensure that at least 80 percent of those at risk of, or suffering from, malaria benefit from major preventive and curative interventions by 2010 in accordance with WHO technical recommendations so as to ensure a reduction in malaria cases and deaths of at least 50 percent by 2010 and 75 percent by 2015, from 2000 levels.

### Roll Back Malaria refined/updated targets and milestones beyond 2012

**Objective 1.** Reduce global malaria deaths to near zero by end 2015, from 2000 levels.  
**Objective 2.** Reduce global malaria cases by 75 percent by end 2015, from 2000 levels.  
**Target 1.1** Achieve universal access to case management in the public sector.  
By end 2013, 100 percent of suspected cases receive a malaria diagnostic test and 100 percent of confirmed cases receive treatment with appropriate and effective antimalarial drugs.  
**Target 1.2** Achieve universal access to case management, or appropriate referral, in the private sector.

### 3. Malaria-specific considerations

This section highlights some of the latest developments in malaria control, including those that affect M&E strategies and/or pertain to specific Global Fund reporting requirements. These updates are related to the following areas: (1) vector control; (2) intermittent preventive treatment; (3) diagnosis testing and monitoring.

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treatment; (4) malaria surveillance systems; (5) monitoring drug and insecticide resistance and (6) maternal and child health linkages.

3.1 Vector control
Since 2007, the World Health Organization (WHO) has recommended that insecticide-treated nets (ITNs) are made available to all people at risk of malaria, a principle referred to as universal access. This is defined as the availability of one ITN for every two people at risk. However, to achieve this ratio at the household level, an estimation of one ITN for every 1.8 people in the target population is generally used for procurement to account for persons living in households with odd numbers of members. ITNs should be provided free of charge or highly subsidized, using a combination of delivery systems including antenatal and immunization clinics, as well as mass distribution campaigns to households.

Indicators to assess coverage and use of ITNs have been revised to reflect the shift toward universal access. To report on these indicators, data collection through population-based surveys remains the same, but the information is analyzed using different methods.

Indoor residual spraying (IRS), which refers to the application of insecticides to the surfaces of households or other structures, is applicable in many settings, provided the operational and resource feasibilities are considered in policy decisions. Observational evidence suggests that the combination of IRS and ITNs is more effective than either intervention alone, especially in cases where the combination increases overall coverage of vector control activities.

3.2 Intermittent Preventive Treatment
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 for malaria, regardless of whether the recipients are parasitemic, with the objective of reducing the malaria burden in the target population. WHO currently provides normative guidance for intermittent preventive treatment in pregnancy (IPTp) and intermittent preventive treatment in infants (IPTi). Programs implementing these activities must have M&E systems that are able to track the coverage of these interventions, which should be strengthened and continually supported to provide quality information for use in program management.

3.3 Diagnostic Testing and Treatment
In March 2010, the WHO Global Malaria Program issued new case management guidelines for malaria which strongly recommended the prompt parasitological confirmation of all patients with suspected malaria prior to starting treatment. These guidelines are applicable in all regions, irrespective of endemicity level. Parasitological diagnosis can be achieved through either conventional microscopy or WHO-qualified rapid diagnostic tests (RDTs). Uncomplicated *P. falciparum* malaria should be treated with artemisinin-based combination therapy (ACT).

The scale-up in parasitological diagnosis of malaria is lagging behind the scale-up of treatment with ACTs. This is most notable in highly-endemic African countries where presumptive treatment, using either ACTs or monotherapies, persists.

Increasing the coverage of parasitological diagnosis will improve the care of patients with positive tests and those with negative tests for whom another diagnosis must be sought. Improved testing will also avert the use of antimalarial medicines in patients without malaria, thereby reducing unnecessary side effects, wastage, drug interactions and selection pressure for drug resistance. Ultimately, this will improve public trust in the management of acute febrile illness. Expanded parasitological diagnosis will also allow for markedly improved malaria surveillance.

3.4 Malaria Surveillance Systems
In 2012, WHO will release guidelines for malaria surveillance that are stratified by stages of control, differentiating the priorities for programs in control and elimination phases.6,7 In highly endemic areas in the control phase (such as most countries in sub-Saharan Africa), malaria cases are so numerous that analysis is based on aggregate numbers and actions are undertaken at a population level. As transmission in a country is progressively reduced, it becomes increasingly both feasible and necessary to track and respond to individual cases.

Surveillance systems will be markedly strengthened by the movement towards universal coverage of parasitological diagnosis for all suspected cases, regardless of program control phase or endemicity, as recommended in WHO’s 2010 treatment guidelines.

3.5 Monitoring drug and insecticide resistance
Ongoing surveillance of drug and insecticide resistance is essential for preserving the effectiveness of antimalarial treatment regimens (particularly ACTs) and of insecticides used for vector control.

The Global Plan for Artemisinin Resistance Containment,8 developed in response to confirmed resistant cases, outlines the necessary actions to contain and prevent resistance to artemisinins. Therapeutic drug efficacy

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6 WHO. Disease surveillance for malaria control (forthcoming)
7 WHO. Disease surveillance for malaria elimination (forthcoming)
studies are considered the standard for determining antimalarial drug efficacy and should be conducted according to standardized procedures recommended by WHO.\textsuperscript{9} 

Insecticide resistance management has to be considered a critical component of any vector control program. The choice of insecticide should be supported by up-to-date information on resistance among local anopheles vectors. WHO is also developing a Global Plan for Insecticide Resistance Management in Malaria Vectors, to be released in early 2012.

3.6 Linkages with maternal and child health programs

In high-transmission areas, infants, young children and pregnant women are the groups that are the most affected by malaria. Accordingly, children under five years of age and pregnant women are priority groups for malaria prevention, diagnosis and treatment.

Recognizing the strong linkages between malaria control and maternal and child health, the Global Fund is committed to strengthening maternal and child health services in the context of supporting malaria programs, as a strategy to maximize overall impact of investments on health systems (see also Part 1 of this M&E toolkit).\textsuperscript{10,11} Activities to strengthen these services can include the integration of malaria services into family planning, antenatal and immunization clinics, thus providing malaria prevention and treatment services alongside general maternal and child care.

4. Monitoring malaria programs

As malaria control expands, many programs in high-endemic settings have increased intervention coverage significantly and are reducing malaria transmission intensity and disease burden.\textsuperscript{12} In this changing environment, flexible and evolving approaches to M&E are more important than ever.

This section presents the overall framework for malaria M&E, and selected programmatic output, outcome and impact indicators for monitoring programmatic performance and progress of Global Fund-supported malaria programs. The indicators are aligned with recommendations of the WHO Global Malaria Program and Roll Back Malaria M&E Reference Group (MERG). Indicator selections are suggested to minimize the reporting burden on programs, focusing on the set of the most common indicators recommended for each specific activity area (including community and health system strengthening in the context of malaria control). For more complete lists of existing malaria indicators, see the guidelines and resources listed in section 7.3.

The indicator selection process was guided by four major principles agreed on in the Paris Declaration on Aid Effectiveness:

- build on existing nationally and globally agreed indicators, such as those of MDGs, WHO and Roll Back Malaria;
- reduce reporting burden on programs, by minimizing the number of indicators to be collected;
- relying on existing data collection systems, such as health information systems, including community-level, health facility and behavioral surveillance surveys, and population-based (household) surveys;
- reconcile M&E needs of countries, disease programs and donors.

For each selected indicator, a more detailed description is provided in Section 8, including the rationale for using the indicator, definitions including the numerator and denominator, details on data collection tools, methods and frequency, and links to resource documents.

4.1 Overall malaria program M&E framework

The overall M&E framework for malaria control programs (Figure 1) follows the standards used for many disease M&E systems, from input & process, via output and outcomes to health impact, linked to a process of assessment and planning.


4.2 Monitoring output and outcome indicators

Tables 1 and 2 provide a list of key programmatic output and outcome indicators that are recommended for routine reporting. The indicators are grouped according to data collection systems, e.g. routine program and health information systems. Examples of data elements required to construct the indicators in Table 1 are listed in Table 4. Detailed descriptions of indicators are provided in Section 8. This is not an exhaustive list of indicators that should be used by a malaria program or included in the M&E plan. Depending on the local context, countries can identify additional output indicators to monitor program implementation or track malaria commodities. Further guidance may be obtained from the resources provided in Section 7.

More detailed information on indicators for monitoring health and community system strengthening (including on M&E systems strengthening) are listed in Part 5 of the toolkit. These indicators are important given the increase in Global Fund malaria grants and proposals that focus on community-based services. These indicators should be included in the performance framework as relevant to the malaria program.
### TABLE 1.
Recommended output and outcome indicators from program routine systems for consideration by national malaria control programs

<table>
<thead>
<tr>
<th>Service delivery area</th>
<th>Output and outcome indicators</th>
<th>Data collection frequency</th>
<th>Measurement tools</th>
<th>Relevance for crosscutting areas</th>
<th>Equity dimension (recommended disaggregation)</th>
<th>Maternal, Neonatal and Child Health</th>
<th>Quality of services</th>
<th>Community-based services</th>
<th>Global Fund Top Ten Indicator</th>
<th>Global Fund Periodic Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vector control</td>
<td>Prevention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of insecticide-treated nets distributed to target populations</td>
<td>Monthly</td>
<td>National malaria program, medical store stock records, HIS</td>
<td>Geographical location</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of targeted risk group receiving an insecticide-treated net</td>
<td>Monthly</td>
<td>HIS, national malaria program</td>
<td>Pregnant women attending antenatal clinics, children attending immunization clinics, migrant workers, geographical location</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of the population-at-risk potentially covered by nets distributed</td>
<td>Monthly</td>
<td>National malaria program, medical store stock records, HIS</td>
<td>Geographical location</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of households in targeted areas that received IRS in the last 12 months</td>
<td>Monthly</td>
<td>IRS program</td>
<td>Geographical location</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Percentage of the population-at-risk protected by indoor residual spraying</td>
<td>Monthly</td>
<td>HIS, IRS program</td>
<td>Geographical location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Insecticide efficacy monitoring</td>
<td>Number of studies of insecticide efficacy completed according to WHO protocol</td>
<td>At least every 2 years</td>
<td>National malaria program or research institute</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevention in pregnancy</td>
<td>Percentage of pregnant women attending antenatal clinics who received at least two doses of intermittent preventive treatment for malaria</td>
<td>Monthly</td>
<td>HIS</td>
<td>Geographical location</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

13 In the column "Global Fund Top Ten Indicator", the indicators that are recommended as part of the set of Top Ten indicators (i.e., the core programmatic indicators) are identified (see Part 1 of the Toolkit).

14 In the column "Global Fund Periodic Review," the indicators that are recommended for monitoring of progress at Periodic Review (see Part 1 of the Toolkit) are listed.

15 “Point of care” refers to the point of delivery of services, for example health facility, community, or private health facility.
<table>
<thead>
<tr>
<th>Service delivery area</th>
<th>Output and outcome indicators</th>
<th>Data collection frequency</th>
<th>Measurement tools</th>
<th>Relevance for crosscutting areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case management</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Percentage of all suspected malaria cases that received a parasitological test.</td>
<td>Monthly</td>
<td>HIS, routine surveillance system</td>
<td>Age (&lt;5, &gt;5 years), geographical location, point of care</td>
</tr>
<tr>
<td></td>
<td>Annual blood examination rate</td>
<td>Monthly</td>
<td>HIS</td>
<td>Case detection type (active or passive), geographical location, point of care</td>
</tr>
<tr>
<td></td>
<td><strong>In low transmission areas:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proportion of reported cases that are fully investigated</td>
<td>Monthly</td>
<td>HIS</td>
<td>Geographical location</td>
</tr>
<tr>
<td>Treatment</td>
<td>Percentage of confirmed outpatient malaria cases that received first line antimalarial treatment according to national policy</td>
<td>Monthly</td>
<td>HIS</td>
<td>Parasite species, age (&lt;5, &gt;5 years), geographical location, point of care</td>
</tr>
<tr>
<td>Drug efficacy monitoring</td>
<td>Number of studies of drug efficacy completed according to WHO protocol</td>
<td>At least every two years</td>
<td>National malaria program or research institute</td>
<td></td>
</tr>
<tr>
<td><strong>Health systems strengthening</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSS: Procurement and supply chain management</td>
<td>Percentage of health facilities reporting no stock-out of key commodities during the reporting period</td>
<td>Monthly</td>
<td>HIS</td>
<td>Geographical location, type of facility</td>
</tr>
<tr>
<td>HSS: Routine data collection, analysis and use</td>
<td>Percentage of health facilities submitting timely and complete reports according to national guidelines</td>
<td>Monthly</td>
<td>HIS</td>
<td>Geographical location</td>
</tr>
<tr>
<td>HSS: Health workforce</td>
<td>Percentage of staff who received a supervisory visit during the reporting period</td>
<td>Monthly</td>
<td>Supervision reports</td>
<td>Geographical location, type of facility</td>
</tr>
</tbody>
</table>
4.3 Monitoring impact indicators

Monitoring a malaria program over the lifetime of Global Fund grants requires tracking outputs, outcomes and health impact. For malaria, ‘impact’ refers to reductions in case incidence and malaria-related mortality, for which targets have been set by WHO and the Roll Back Malaria partnership, and included as part of the Millennium Development Goals.

Key impact indicators (Table 3) require data collection through routine health information systems in all countries with malaria transmission risk. In high-transmission areas in sub-Saharan African, household surveys are also recommended to provide information on the health impact of malaria control (see Section 5).

4.3.1 Malaria mortality

Reducing malaria-attributed mortality is a major goal of malaria control programs, and should be included as a key program impact indicator. All programs should monitor malaria-attributed deaths in hospitals (inpatient deaths) through routine health information systems (HIS) (Table 3).

Interpretation of HIS-based mortality trends must consider geographical coverage and completeness of reporting through the HIS (see Section 5.1). When analyzing trends in malaria-attributed inpatient cases in contexts where health facility access or utilization is variable, or where HIS reporting is limited or inconsistent over time, the proportion of all-cause inpatient cases that are attributed to malaria can be used instead of the absolute number.

Where vital registration systems are functioning and producing complete and accurate data, they provide the complementary indicator of malaria-attributed mortality at a population level. Alternatively, this can be

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**TABLE 2. Recommended outcome indicators from household surveys, collected every 3-5 years, for consideration by national malaria control programs**

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Outcome indicators</th>
<th>Equity dimension</th>
<th>Global Fund Periodic Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vector control</td>
<td>Percentage of households with at least one insecticide-treated net</td>
<td>Geographical location</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Percentage of households with at least one insecticide-treated net for every two people</td>
<td>Geographical location</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of individuals with access to an insecticide-treated net within their household</td>
<td>Geographical location</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of individuals who slept under an insecticide-treated net the previous night</td>
<td>Age, sex, pregnancy status geographical location</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Percentage of households with at least one insecticide-treated net and/or sprayed by indoor residual spraying in the last 12 months</td>
<td>Geographical location</td>
<td></td>
</tr>
<tr>
<td>Prevention in pregnancy</td>
<td>Percentage of pregnant women who received at least 2 doses of intermittent preventive treatment for malaria during their last pregnancy</td>
<td>Geographical location</td>
<td>X</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Percentage of children under 5 years old with fever in the last 2 weeks who had a finger/heel stick for malaria testing</td>
<td>Geographical location, point of care</td>
<td>X</td>
</tr>
<tr>
<td>Treatment</td>
<td>Percentage of first line treatments among children under five years old with fever in last two weeks who received any antimalarial medicines</td>
<td>Geographical location, point of care</td>
<td>X</td>
</tr>
</tbody>
</table>

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18 In the column “Global Fund Periodic Review,” the indicators that are recommended for monitoring of progress at Periodic Review (see Part 1 of the Toolkit) are listed.
monitored through household surveys which include validated methods for verbal autopsy (e.g. Demographic & Health Surveys (DHS)) or in sampled vital registration systems, where vital registration is conducted in a limited number of a country’s randomly selected administrative areas.

In highly-endemic areas, including most countries in sub-Saharan Africa, all-cause mortality of children under age five (“under 5 mortality”) is a key additional impact indicator due to the high proportion of malaria-related deaths in this age group. Under 5 mortality in these countries is best measured through nationally representative household surveys, such as the DHS and the Multiple Indicator Cluster Survey (MICS), triangulated with national census data in the official estimations by the Inter-Agency Group for Child Mortality Estimation.19

All-cause under-5 mortality is not specific to malaria, therefore trends in relevant intervention outcome/coverage indicators (see Tables 1 and 2) must be analyzed concurrently to evaluate the impact of the malaria program. Mortality declines can only be associated with the impact of the malaria program if preceded by a relevant increase in the coverage of key malaria interventions. These associations should be further validated through well-planned impact evaluations.

### 4.3.2 Malaria morbidity

Key morbidity measures include (Table 3):

1. incidence of parasitologically confirmed malaria cases;
2. number or percentage of (parasitologically confirmed) in-patient malaria cases;
3. malaria test positivity rate among suspected cases given parasitological diagnosis;
4. prevalence of parasite infection;
5. and, in areas of high transmission only, the prevalence of moderate or severe anemia among children under 5 years.

The first three of these indicators are measured in health facilities, and recorded in the national HIS. These data are continually collected and should geographically reflect the whole country, in principle (but see also Part 5 of the toolkit about health systems strengthening (HSS)). For malaria, surveillance will improve significantly with the ongoing scale-up of parasitological diagnosis.

In countries with a weak or incomplete HIS, trends in HIS-based indicators should be interpreted with caution, taking into account trends in the coverage and completeness of case and death reporting. Consideration should also be given to the extent to which malaria cases seek treatment in public health facilities (which can be determined through household surveys), versus private facilities, community services or those who do not seek treatment at all. Data analysis and interpretation approaches are further discussed in Section 5 below.

Cases reported by health facilities represent an incomplete sample of all of the malaria cases in a country. WHO applies standard methods to estimate the total number of malaria cases. In countries that have high-quality and consistent case reporting as well as high and consistent utilization of health services (mainly outside Africa), malaria cases recorded in the HIS are used to infer trends. These notified cases are adjusted for HIS completeness, the extent of diagnostic testing and for the proportion of malaria cases accessing (public) health facilities in the country.

For countries in which health facility data are insufficiently complete (including many countries in sub-Saharan Africa), case incidence at the population level is estimated using population endemicity maps and fixed average case incidence rates for each endemicity category that are derived from longitudinal research studies and demographic surveillance sites.20 These estimates include an adjustment using national ITN coverage levels, to reflect the impact of ITNs in lowering case burden.

These methods provide only an estimation of case levels and trends in different settings, but this can be used to approximate the percentage of cases detected by surveillance systems and offer the best possible synthesis of available data for estimating malaria morbidity.

Parasitemia and anemia prevalence are measured through household surveys, such as DHS and Malaria Indicator Survey (MIS), but not included in the MICS. In highly endemic countries in sub-Saharan Africa, it is recommended that such surveys are conducted every 3 to 5 years.

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### TABLE 3
Selected impact indicators recommended for Global Fund-supported malaria programs

<table>
<thead>
<tr>
<th>Impact indicators</th>
<th>Data collection frequency</th>
<th>Measurement tools</th>
<th>Equity dimension (recommended disaggregation)</th>
<th>Maternal, neonatal and child health</th>
<th>Global Fund periodic review</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inpatient malaria deaths per 1,000 persons per year</td>
<td>Monthly</td>
<td>HIS</td>
<td>Age, sex, geographical location</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Malaria-specific deaths per 1,000 persons per year</td>
<td>Monthly or every 3-5 years</td>
<td>National or sample vital registration system, verbal autopsy in household surveys</td>
<td>Age, sex, geographical location</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>In high-transmission areas: All-cause under 5 mortality ratio</td>
<td>Every 3-5 years</td>
<td>Population-based surveys (e.g. DHS, MICS, using direct or indirect methods)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Morbidity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirmed malaria cases per 1,000 persons per year</td>
<td>Monthly</td>
<td>HIS</td>
<td>Active/passive case detection, parasite species, point of care</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Inpatient malaria cases per 1,000 persons per year</td>
<td>Monthly</td>
<td>HIS</td>
<td>Age, sex, geographical location</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Malaria test positivity rate</td>
<td>Monthly</td>
<td>HIS</td>
<td>Type of test, age, sex, geographical location, case detection type (active/passive), parasite species, point of care</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>In high transmission areas: Parasitemia prevalence: percentage of children aged 6–59 months with malaria infection</td>
<td>Every 3–5 years (linked to transmission season)</td>
<td>Population-based surveys with parasitological testing (such as MIS)</td>
<td>Geographical location, transmission intensity</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Anemia prevalence: percentage of children aged 6–59 months with hemoglobin measurement of &lt;7 g/dl</td>
<td>Every 3–5 years</td>
<td>Population-based surveys with anemia testing (such as MIS, DHS add-on)</td>
<td>Geographical location, transmission intensity</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>In low transmission areas: Number of active malaria foci</td>
<td>Monthly</td>
<td>HIS</td>
<td>Geographical location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of malaria cases by classification</td>
<td>Monthly</td>
<td>HIS</td>
<td>Local (introduced, indigenous, relapsing, imported, induced</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21 In the column “Global Fund Periodic Review,” the indicators that are recommended for monitoring of progress at Periodic Review (see Part 1 of the Toolkit) are listed.
TABLE 4. Examples of key data elements, for routine monitoring and program management, and for calculating recommended indicators

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Data element</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vector control</td>
<td>Number of ITNs distributed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of houses covered by IRS</td>
<td></td>
</tr>
<tr>
<td>Prevention in pregnancy</td>
<td>Number of antenatal clinic attendees</td>
<td>Can be derived from number of initial ANC visits if so marked</td>
</tr>
<tr>
<td></td>
<td>Number of antenatal visits in which first dose IPTp delivered</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of antenatal visits in which second dose IPTp delivered</td>
<td></td>
</tr>
<tr>
<td>Diagnosis and treatment</td>
<td>Number of suspect malaria cases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of suspect cases tested</td>
<td>Record type of test: RDT or microscopy</td>
</tr>
<tr>
<td></td>
<td>Number of positive malaria tests (confirmed cases)</td>
<td>By type of test: RDT or microscopy</td>
</tr>
<tr>
<td></td>
<td>Number of (confirmed) cases treated</td>
<td>Record antimalarial drug or regimen used</td>
</tr>
<tr>
<td></td>
<td>Number of treated cases given first line therapy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of RDTs distributed to health facilities</td>
<td>From national malaria program, or medical store stock records</td>
</tr>
<tr>
<td></td>
<td>Number of ACTs distributed to health facilities</td>
<td>From national malaria program, or medical store stock records</td>
</tr>
<tr>
<td>Disease burden &amp; impact</td>
<td>Number of confirmed cases hospitalized</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of deaths among confirmed cases</td>
<td></td>
</tr>
</tbody>
</table>

5. Data Sources

5.1 Health information systems – facility-based recording

Most malaria-endemic countries have an operational HIS that serves as the main tool to monitor malaria control interventions, although it is not always fully functional. The HIS collects information across a range of diseases and health services, which can be cost-effective and sustainable, but may not provide the full range of data required by the malaria program. A key constraint to the effectiveness of health information systems is timely and complete reporting. National malaria control programs, or other responsible authorities, should systematically monitor reporting completeness over time and ensure that missing reports are actively followed up.

Although data should be collected nationwide for effective program management, sentinel surveillance may be considered as an interim step to developing a comprehensive HIS if the routine system is weak. Sentinel surveillance should include additional efforts to ensure data quality and reporting completeness in selected health facilities that are representative of different epidemiological areas of the country.

5.2 Vital registration & and demographic surveillance

Vital registration is the continuous collection of data on births and deaths in the country, with or without classification of the cause of death based on death certificates. Vital registration data may be collected for the entire population or in a sample of localities.

Several high-endemic countries without functioning vital registration systems use demographic surveillance sites, wherein birth and deaths are monitored continuously over time in defined areas. Demographic surveillance sites often rely on verbal autopsy to classify causes of death. In countries without a fully functional vital registration system, mortality trends from these sites are a useful complement to facility-based data, but should be interpreted with caution as they carry limitations inherent in the use of verbal autopsy and may not be representative of the broader population.

5.3 Household surveys

Household surveys complement facility-based surveillance by providing data at a population level, including people who do not access health facilities. They are especially relevant in rural or poorly accessible
areas of endemic countries in sub-Saharan Africa, where malaria cases are commonly managed at home rather than in a health facility. Surveys are also particularly useful for collecting information on young children, an age group where the malaria burden is concentrated.

Key malaria coverage indicators measured are household ownership of ITNs, use of ITNs (disaggregated by use among all age groups, children under 5 years and pregnant women), households receiving any form of vector control in the previous year, and women who received one or more dosages of intermittent preventive treatment during their most recent pregnancy. In countries where only certain areas are malaria-endemic, the national average coverage statistics may underestimate the actual coverage among populations at risk.

In addition, surveys ask about treatment-seeking behavior by respondents and their young children, such as whether services were accessed and what medications were taken for fevers in children under 5. These data are useful in order to understand what reported facility-based cases and deaths from the HIS represent among all cases and deaths, but are not specific to confirmed malaria cases. Given the WHO’s 2010 guideline to focus antimalarial treatment on parasitologically-confirmed cases in patients of all ages and in all areas irrespective of endemicity, data on treatment of fevers from any cause are no longer relevant. Household surveys can nevertheless be used to assess whether the antimalarial treatments provided are those recommended for first-line treatment.

DHS, MICS and MIS are three major household surveys that are commonly used to monitor malaria indicators. The MIS is focused solely on malaria, while DHS and MICS provide information on a broader range of health and population indicators including family planning and maternal and child health.

DHS22 and MICS23 are nationally representative surveys of between 4,000 and 12,000 women aged 15 to 49 years (and, in DHS, men in their households) who are sampled in a multiple-stage cluster design. The DHS and MICS collect data on all-cause infant and child mortality. These surveys are conducted in many low- and middle-income countries, at five-year intervals for DHS and three-year intervals for MICS. Because the questionnaires are standardized in content and structure, the results are relatively comparable between countries and over time. The DHS malaria module can be expanded to include finger prick blood collection from children under five years of age to determine the prevalence of anemia, measured as hemoglobin levels using the Hemocue test, and malaria parasite prevalence measured using microscopy or RDTs.

The sample size for MIS is smaller than for DHS and MICS, because it is used primarily to monitor intervention coverage and not child mortality. A MIS can be used in countries where no other surveys are being conducted, or to fill gaps within the three- to five-year intervals between subsequent DHS or MICS. The MIS can also be combined with measurements of hemoglobin and parasite prevalence in areas where these are considered relevant indicators of malaria burden or impact.24

For operational reasons, both DHS and MICS are typically conducted during the dry season, which is outside the peak malaria transmission season. In contrast, MIS can be targeted to the peak transmission season, thus making coverage measures such as ITN usage the night before the survey more relevant.

6. Program reviews and evaluation

This section outlines guidance on national malaria program reviews including joint external monitoring missions, and the need for planning evaluations to assess progress and impact of interventions and programs. These are discussed in the context of Global Fund requirements for program Periodic Reviews that determine grant renewals every three years.

6.1 Global Fund Periodic Reviews

The Global Fund’s new grant architecture places increasing emphasis on health outcomes and impact, demonstrated through program reviews and evaluations, as a condition for renewing grant funding. Supported programs have a Periodic Review by the end of each implementation period (of up to 3 years), which reviews progress toward meeting program objectives and goals. The Periodic Review assesses performance and progress from inputs (including funding) and outputs through to outcome and impact. Periodic Reviews are conducted at the same time for all Principal Recipients and grants related to each disease or HSS program in a country, thus assessing the overall program progress.25 Countries are encouraged to plan for a program review or evaluation during each implementation period preceding the Periodic Review. The analysis of outcome and impact should ideally be a part of an existing country-led review process, including, for example, national program reviews, joint health sector reviews, or external program evaluations. For more information on Periodic Reviews, please refer to Part 1 of the toolkit.

22 Demographic and Health Surveys are organized by Macro International, Calverton, MD, USA, and are funded primarily by the United States Agency for International Development. More information is available from: http://www.measuredhs.com.
6.2 Malaria program review

Program reviews are periodic evaluations of national control programs, aimed at improving operational performance and good-quality service delivery. Program reviews focus on the operational level of service delivery – households, communities and districts, but they also address program coordination and management at all levels of the health system. These reviews can help identify best practices, lessons learned, problems and bottlenecks as well as potential solutions. A program review should produce practical recommendations and an aide-memoire agreed upon by in-country stakeholders and partners, which is then used for planning and decision-making. Further guidance on malaria program review is provided in a manual developed by the WHO Global Malaria Program, in collaboration with the RBM Partnership. These guidelines will be updated in 2012.

6.3 Malaria program evaluations

In addition to program reviews, countries should adequately plan for and strategically use evaluations to improve their malaria response. Evaluations provide the opportunity to systematically and objectively assess the relevance, performance, quality and impact of ongoing and completed programs.

Ideally, evaluations are planned at the beginning of the program for implementation at various stages of the program (such as formative or process evaluations, or outcome/impact evaluations). The design of program evaluations should coincide with the development of a national malaria strategic plan. As part of the development of a national M&E plan, the design of an integrated and comprehensive program evaluation plan should be consultative, participatory and inclusive, to ensure relevance and methodological and scientific soundness. In addition to the overall program evaluations to assess progress towards program goals and objectives, specific interventions can be evaluated for their feasibility, efficiency, effectiveness, impact, relevance and sustainability.

If not already planned with existing resources, program reviews and evaluations can be budgeted within Global Fund grant budgets, at the proposal/grant negotiation and/or grant renewal stages.

In addition to program evaluations and reviews managed by countries, the Global Fund Secretariat will implement 10 to 12 program evaluations each year in selected countries using a robust methodology. These program evaluations, commissioned by the Global Fund Secretariat, will be conducted jointly by the Secretariat’s M&E Unit and partners with greater independence from national processes. Where possible, these program evaluations will build on results from evaluations and reviews already conducted in countries.

7. Resources

7.1 General resources and technical support

Technical support to governments and programs is available through a variety of partners, notably the WHO Global Malaria Program, the RBM Partnership, UNICEF and the United States President’s Malaria Initiative.

WHO provides guidance, norms and standards on all aspects of malaria control and elimination programs. It also provides technical assistance on various components of malaria interventions through its regional, inter-country and country offices.

The RBM MERG improves coordination among key M&E partners in the RBM Partnership, and enhances communication about M&E guides, tools and technical support. The RBM partnership provides technical and management support through its Secretariat and sub-regional networks.

A number of other agencies and organizations are involved in the M&E of malaria. UNICEF provides support to national malaria control programs, and supports malaria data collection through MICS. The United States President’s Malaria Initiative supports malaria M&E activities in 15 focus countries. Other partners assisting and directing assistance requests include the Malaria Control and Evaluation Partnership in Africa (MACEPA), MEASURE Evaluation, the United States Centers for Disease Control and Prevention, and the Malaria Consortium, among others.

7.2 Guidelines and essential references

Roll Back Malaria Strategy and Global Plan


Surveillance, Monitoring and Evaluation

Roll Back Malaria Partnership. MIS package comprising questionnaire, training manual, guidance on sampling and sampling sizes with costing and analysis plans) is available at http://malariasurveys.org/


Roll Back Malaria Partnership. MERG global moderated e-mail list-serve: accessible by emailing malaria.me@who.int for subscription.


WHO. 2012. Disease surveillance for malaria control. forthcoming

WHO. 2012. Disease surveillance for malaria elimination. forthcoming


Malaria Program Review

Case management


Vector control, including insecticide-treated nets


Drug supply management


Drug & insecticide resistance


Malaria in pregnancy

29 Note: An updated set of guidelines will be available in 2012.


**Malaria epidemics**


**Elimination**


**Equity in malaria control**

8. Description of selected indicators recommended for monitoring in Global Fund-supported malaria programs

### Malaria output indicator

**Prevention - vector control**

**Number of insecticide-treated nets distributed to individuals**

**Rationale:**
In areas with high malaria transmission, particularly in rural Africa, insecticide-treated nets are often the principal strategy for preventing malaria. Insecticide-treated nets have been shown to reduce malaria-related morbidity and mortality in areas with high and moderate endemicity in sub-Saharan Africa and to reduce malaria-related morbidity in various Asian settings of moderate endemicity and in Latin America.

**Numerator:** Number of insecticide-treated nets distributed to individuals at risk

**Denominator:** None

**Measurement:**
This indicator is derived from data recorded by the malaria control program. Nets distributed to people must not be equated with the nets distributed to the point of service delivery (such as Expanded Program on Immunization clinics or antenatal clinics), because important delays could still occur in the last stage of the distribution from the service delivery point to the people targeted. In other words, “distributed to individuals” denotes “distributed to people targeted from the service delivery point”.

Although this indicator is closely related to net ownership and usage within households, it should not be equated with either of these indicators, which are measured using household surveys.

Disaggregation by age, sex and geographical areas

**Data sources:** Records of the national malaria control program, medical store stock records, health information system

**Frequency:** Monthly

### Malaria output indicator

**Prevention - vector control**

**Percentage of targeted risk group receiving an insecticide-treated net**

**Rationale:**
In areas with high malaria transmission and poor access to facility-based health care, particularly in rural Africa, insecticide-treated nets are the principal strategy for preventing malaria. Insecticide-treated nets have been shown to reduce malaria-related morbidity and mortality in areas with high and moderate endemicity in sub-Saharan Africa and to reduce malaria-related morbidity in various Asian settings of moderate endemicity. In Latin American countries, insecticide-treated nets have been shown to reduce malaria morbidity at the same level as in African settings. However, insecticide-treated nets have much more efficacy in both Latin American and Asian countries than in African countries due to differences in mosquito vectors.

**Numerator:** Number of insecticide-treated nets distributed to persons in risk groups

**Denominator:** Number of persons in risk groups targeted for receiving an insecticide-treated net

Disaggregation by age, sex and geographical areas

**Data sources:** Health information system, medical store stock records, routine surveillance system

**Frequency:** Monthly
Malaria output indicator
Prevention - vector control

Percentage of the population-at-risk potentially covered by nets distributed

Rationale:
In areas with high malaria transmission and poor access to facility-based health care, particularly in rural Africa, insecticide-treated nets are the principal strategy for preventing malaria. Insecticide-treated nets have been shown to reduce malaria-related morbidity and mortality in areas with high and moderate endemicity in sub-Saharan Africa and to reduce malaria-related morbidity in various Asian settings of moderate endemicity. In Latin American countries, insecticide-treated nets have been shown to reduce malaria morbidity at the same level as in African settings. However, insecticide-treated nets have much more efficacy in both Latin American and Asian countries than in African countries due to differences in mosquito vectors.

Numerator: Number of persons with an insecticide-treated net from number of insecticide-treated nets distributed
Denominator: Number of persons at risk of malaria

Measurement:
This indicator is calculated based on the number of LLINs and/or ITNs distributed to people at risk of malaria. LLINs are assumed to protect for 3 years and conventional ITNs or retreated nets for 1 year. A single net is assumed to protect two persons; operationally, to account for odd numbered person households encountered during distribution, each net distributed is assumed to cover 1.8 persons when calculating coverage of the population. Hence the number of people potentially covered is 1.8 x (number of LLINs distributed in last three years + number of conventional ITNs and retreatments delivered in last year). This indicator measures distribution and not hanging or use.

Data sources: Health information system, routine surveillance system
Frequency: Monthly

Malaria output indicator
Prevention - vector control

Percentage of households in designated target areas that received spraying through an indoor residual spraying campaign in the last 12 months

Rationale:
Indoor residual spraying is one of the most effective interventions for malaria, and has been employed in a variety of transmission settings. The purpose of this indicator is to measure the extent to which all susceptible houses in the target area are appropriately sprayed during a year.

Numerator: Number of households in designated target areas sprayed in the last 12 months
Denominator: Number of households in designated target areas

Measurement:
This indicator requires that program-level data be collected about each household sprayed at each spraying event in the target area. Careful attention should be given to identify houses not considered to be part of the target area so that they can be excluded from the calculation. All houses sprayed should be recorded and information regarding the location of the house should be noted. Ideally, (1) all dwellings and relevant structures in the target areas should be sprayed; (2) all sprayable surfaces in the dwelling or structure should be covered; (3) insecticide application should be uniform across surfaces; and (4) spraying should be done at intervals consistent with the manufacturer’s guidelines for specific insecticides and in consideration of the duration of malaria transmission. Collectively, these ideal activities comprise the level of adequacy referred to above and information on quality of these services would be useful.

The numerator for this indicator is obtained by counting the number of houses adequately sprayed in the target area in the last 12 months. The denominator is obtained by counting the total number of houses in the target area. Denominator information is obtained from census information, complete geo-referenced demographic surveillance systems for the target area or hand counts of houses in the target area. Recent advances in remote sensing technology enable crude estimates of the number of occupied houses in an area to be generated; this information may prove useful for calculating the denominator information in the absence of census information but is not currently recommended.

Data sources: Data from the indoor residual spraying program
Frequency: Annually
Malaria outcome indicator
Prevention – vector control

Percentage of the population-at-risk covered by indoor residual spraying

Rationale:
Indoor residual spraying (IRS) is one of the most effective interventions for malaria, especially in low or unstable and epidemic-prone areas. The purpose of this indicator is to measure the proportion of all people in the target area covered by indoor residual spraying.

Numerator: Number of persons protected by indoor residual spraying
Denominator: Number of persons at risk for malaria

Measurement:
For this indicator it is necessary to collect program-level data about each household sprayed at each spraying event in the target area. Careful attention should be given to identify houses not considered to be part of the target area and people in houses not considered part of the target population, so that they can be excluded from the calculation. The location of all houses sprayed and information on the number of people who slept in the house the night before the spraying should be recorded at each spraying event. The numerator for this indicator is obtained by counting the number of usual household residents in houses adequately sprayed. Adequacy is determined by the uniformity of spraying in the household, spraying in all rooms in the house and spraying at intervals consistent with the manufacturer’s recommendation in the target area. Denominator information is obtained from recent census information, complete demographic surveillance systems for the target area or hand counts of people in the target area.

Data sources: Health information system, routine surveillance system

Frequency: Annually

Malaria output indicator
Insecticide efficacy monitoring

Number of studies of insecticide efficacy completed according to WHO protocol

Rationale:
Insecticide resistance is a major threat to ongoing malaria control, especially prevention efforts like ITNs and IRS. Malaria control programs need to be able to monitor insecticidal efficacy in order to have timely, relevant, reliable, and comprehensive information available to make appropriate decisions regarding policy and strategies.

Numerator: Number of studies of insecticide efficacy completed according to WHO protocol
Denominator: None

Measurement:
Data is obtained through routine administrative records from different structures and institutions conducting studies.

Data sources: Records of the national malaria control program or research institutes

Frequency: Annually
## Malaria output indicator
### Prevention - prevention in pregnancy

**Percentage of pregnant women attending antenatal clinics who received at least two doses of intermittent preventive treatment for malaria**

**Rationale:**
In high burden areas with stable malaria transmission, intermittent preventive treatment with at least two doses of recommended antimalarial medication (currently sulfadoxine-pyrimethamine) during pregnancy has been shown to significantly reduce the risk for severe maternal anemia, placental parasitemia and low birth weight. WHO recommends that all pregnant women in areas with stable malaria transmission receive at least two doses of intermittent preventive treatment during regularly scheduled antenatal care visits.

**Numerator:** Number of pregnant women who received at least two doses of intermittent preventive treatment during the reporting period

**Denominator:** Number of pregnant women who made at least one antenatal care visit in 1 year

**Measurement:**
Data for this indicator should be collected at routine antenatal care visits. To facilitate data collection and avoid duplication of work, ANC registers should include records of the doses of intermittent preventive treatment (first, second or third) dispensed. Antenatal care clinic cards should reflect the same information.

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly

## Malaria output indicator
### Case management – diagnosis

**Percentage of all suspected malaria cases that received a parasitological test**

**Rationale:**
The replacement of conventional antimalarial drugs with high-cost artemisinin-based alternatives and decreasing prevalence of malaria among fever cases has created an increased need for accurate malaria diagnosis. Accurate malaria diagnosis avoids unnecessary treatment with expensive drug combinations and ensures appropriate treatment for febrile patients. Diagnosis allows for more reliable tracking of malaria burden and the impact of control interventions. Accurate diagnosis allows a more rational use of drugs that might effectively reduce drug pressure, thereby delaying the onset of drug resistance. This indicator captures the baseline levels and subsequent scaling up of diagnostic programs within malaria-endemic areas.

**Numerator:** Number of all suspected malaria cases that received a parasitological test

**Denominator:** Number of all suspected malaria cases

**Measurement:**
Data for this indicator should be collected routinely through outpatient registers and registers of patients seen at community level that include records of microscopy and RDT. To facilitate data collection and avoid duplication of work, registers should include records of slides or RDT taken and results provided to outpatients.

Disaggregation by age (<5, >5 years old), point of care

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly
### Malaria output indicator
#### Case management – diagnosis

#### Annual blood examination rate

**Rationale:**
It is useful to measure the annual blood examination rate to ensure that potential differences in diagnostic efforts or completeness of reporting are taken into account.

**Numerator:** Number of all suspected malaria cases that received a parasitological test in the last 12 months

**Denominator:** Number of people in the population

**Measurement:**
This indicator is calculated as: (number of parasitological tests examined/number of people in the population) x 100.

**Disaggregation:** Case detection type (active or passive), geographical location, point of care

**Data sources:** Health information system, routine surveillance system

**Frequency:** Annually

---

### Malaria output indicator
#### Case management – diagnosis

#### In low transmission areas: Proportion of reported cases that are fully investigated

**Rationale:**
Case investigation is part of active surveillance that should be instituted when programs move into pre-elimination phase. Its purpose is to detect new cases early and provide a quick and adequate response.

**Numerator:** Number of confirmed cases fully investigated

**Denominator:** Number of confirmed cases reported

**Measurement:**
Full investigation assumes inclusion of information such as location, completion of case investigation forms and active case detection data. In pre-elimination programs the proportion of reported cases fully investigated would be expected to increase or maintained at >90%. In elimination programs the proportion of reported cases fully investigated should be maintained at 100%.

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly
Malaria output indicator
Case management – treatment

Percentage of confirmed outpatient malaria cases that received appropriate antimalarial treatment according to national policy

Rationale:
Prompt treatment with an effective antimalarial drug regimen is a key component of the technical strategy for controlling and preventing malaria. The drug regimens that are effective differ between countries and change over time depending on local drug resistance patterns. Effective antimalarial regimens should therefore be defined in the local context, which most countries do in national treatment guidelines. Currently, WHO recommends ACT for uncomplicated malaria treatment.

Numerator:  Number of confirmed outpatient malaria cases who received first line antimalarial treatment according to national policy

Denominator:  Number of confirmed outpatient malaria cases

Outpatient cases include those seen at the outpatient department of health facilities as well as those seen by community health workers.

Measurement:
Data is obtained through the routine surveillance system. First line antimalarial treatment conforming to national treatment guidelines can be ACT or another non-artemisinin-based therapy recommended in the country. For the purpose of analysis, it is preferable to report the number of treatments separately for ACT and non-artemisinin-based therapy.

National programs may collect information on treatment outcome of all suspected malaria cases beyond the recommended treatment indicator above, according to the following scheme:

**Suspected malaria cases with diagnostic test**
- With positive result: received first-line antimalarial according to national policy (numerator of recommended indicator)
- With positive result: received non-first-line antimalarial according to national policy
- With positive result: did not receive any antimalarial
- With negative result: received antimalarial
- With negative result: did not receive antimalarial

**Suspected malaria cases without diagnostic test available**
- Received antimalarial
- Did not receive antimalarial

Disaggregation by age (<5, >5 years old), type of therapy, point of care

Data sources: Health information system, routine surveillance system, This indicator can also be measured through health facility surveys every 3 to 5 years.

Frequency: Monthly
Malaria output indicator
Drug efficacy monitoring

Number of studies of drug efficacy completed

Rationale:
Antimalarial drug resistance is a major threat to ongoing malaria control efforts. As resistance to antimalarial drugs occurs and spreads, malaria control programs need to be able to monitor drug efficacy in order to have timely, relevant, reliable, and comprehensive information available to make appropriate decisions regarding policy and strategies.

Numerator: Number of studies of drug efficacy completed according to WHO protocol
Denominator: None

Measurement:
Data is obtained through routine administrative records from different structures and institutions conducting studies.
Data sources: Records of the national malaria control program or research institutes
Frequency: Annually

Malaria output indicator
HSS: Procurement and supply chain management

Percentage of health facilities reporting no stock-out of key commodities during the reporting period

Rationale:
Ensuring adequate and continued supply of the recommended antimalarial commodities is key to the success in preventing and controlling malaria through the delivery of effective treatment and preventive services at health facilities.

Numerator: Number of health facilities reporting no stock-out of key commodities at any time during the previous reporting period
Denominator: Number of health facilities

Measurement:
Data for this indicator can be collected through the health information system or during periodic supervisory visits. Stock-outs of antimalarial drugs should be measured at the level of outpatient clinics, not pharmacies, because the stocks in pharmacies do not necessarily reflect those at outpatient clinics. To avoid multiple, overlapping data collection forms, relevant questions should be included in the routine supervisory form. The frequency of data collection should be monthly but could be determined locally to ensure that data collection is in accordance with other supervisory and data collection activities and schedules. Key commodities may include antimalarials and diagnostics, but programs can select one or two commodities for monitoring.
Data sources: Health information system
Frequency: Monthly
<table>
<thead>
<tr>
<th>Malaria output indicator</th>
<th>HSS: Routine data collection, analysis and use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage of health facilities submitting timely and complete reports according to national guidelines</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Rationale:**
National programs managing the national response to malaria require timely and complete program information from all facilities. By tracking this indicator, national programs will be able to identify health facilities that may need support to improve their reporting performance.

**Numerator:** Number of health facilities that have submitted all requested (complete) reports on time during the reporting period according to national guidelines. Completeness is defined as the number of received reports out of expected reports.

**Denominator:** Number of health facilities

**Measurement:**
Data is obtained from routine administrative records by assessing the timeliness and completeness of the reports received at the next administrative level.

**Data sources:** Health information system

**Frequency:** Monthly

<table>
<thead>
<tr>
<th>Malaria output indicator</th>
<th>HSS: Health workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage of staff who received a supervisory visit during the reporting period</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Rationale:**
Supervision is a formal process of professional support and learning that enables individual practitioners to develop knowledge and competence, assume responsibility for their own practice and enhance patient protection and safety of care in complex clinical situations. The relation between the supervisor and supervisee (1) is evaluative, (2) extends over time, (3) serves to enhance the skills of the supervisee, (4) monitors the quality of the services offered by the supervisee, and (5) acts as gatekeeping to the profession.

**Numerator:** Number of staff who received a supervisory visit with feedback during the reporting period

**Denominator:** Number of staff to be supervised during the reporting period

**Measurement:**
Data is obtained through routine supervision reports. More emphasis should be put on supervision of staff at service delivery level and staff providing direct services to patients.

**Data sources:** Supervision reports

**Frequency:** Monthly
<table>
<thead>
<tr>
<th>Malaria outcome indicator</th>
<th>Prevention – vector control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage of households with at least one insecticide-treated net</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Rationale:**
This indicator measures insecticide-treated net possession among households. It can be used to estimate the level of potential community effect achieved by the ITN program or the proportion of households not yet reached by the program.

**Numerator:** Number of households surveyed with at least one ITN

**Denominator:** Number of households surveyed

**Measurement:**
The numerator for this indicator is obtained by asking household respondents if there is any mosquito net in the house that can be used while sleeping, and from determining for each net whether it is a factory treated net that does not require any treatment (an LLIN) or a net that has been soaked with insecticide within the past 12 months.

**Data sources:** Population-based surveys

**Frequency:** Every 3–5 years

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<table>
<thead>
<tr>
<th>Malaria outcome indicator</th>
<th>Prevention – vector control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage of households with at least one insecticide-treated net for every two people at risk</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Rationale:**
This indicator is used to determine the proportion of households that have a sufficient number of ITNs to cover all usual inhabitants in the area at risk (to determine progress toward universal access).

**Numerator:** Number of households with at least one ITN for every two people

**Denominator:** Number of households surveyed

**Measurement:**
The data for the numerator are obtained from determining whether each net in the household is either factory-treated (an LLIN, which does not require any treatment) or a net that has been soaked with insecticide within the past 12 months (conventional ITN). The total number of ITNs in the household is calculated, in combination with information obtained from the household questionnaire that lists the usual residents of the household (excluding guests and temporary visitors).

The numerator is calculated by dividing the number of usual household residents by the number of ITNs owned by the household and then identifying those households that have a usual household resident to ITN ratio of 0.5 or higher. The denominator is based on the number of households surveyed. This indicator provides a measure of universal ITN coverage among the population. In connection with the indicator (proportion of households with at least one ITN) it can be used to determine what proportion of households that have already reached with at least one ITN have a sufficient number of ITNs to achieve universal coverage. If the difference between these indicators is substantial, programs need to assess whether current ITN distribution strategies should be revised to fill the gap.

**Data sources:** Population-based surveys

**Frequency:** Every 3-5 years
Malaria outcome indicator
Prevention – vector control

Percentage of the population with access to an insecticide-treated net within their household

Rationale:
This indicator estimates the proportion of the population that could potentially be covered by existing ITNs, assuming that each ITN in a household can be used by two people within that household. This indicator can be compared with the indicator “proportion of population who slept under an ITN the previous night”, to assess the magnitude of the behavioral gap in ITN use (i.e., the population with access to an ITN, but not using it). This analysis is useful for informing ITN programs whether they need to focus on achieving higher ITN coverage, promoting of ITN use or both.

Numerator: Total number of usual household residents who could sleep under an ITN assuming that each ITN in the household could be used by two people

Denominator: Total number of usual household residents surveyed

Measurement:
The data for the numerator are obtained from determining for each net found in a household whether it is a factory treated net that does not require any treatment (an LLIN) or a net that has been soaked with insecticide within the past 12 months and then calculating the total number of ITN in the household, in combination with information obtained from the household questionnaire that lists the usual residents of the household (excluding guests and temporary visitors).

The data for the denominator are obtained from the household questionnaire that lists all the usual residents of the household. The calculation needs an intermediate variable which is “potential users.” It can be calculated by multiplying the number of ITNs in each household by two. The product of this calculation may be greater than the number of usual household residents if a household has more than one ITN for every two people. In this case, the “potential users” variable in that household should be modified to reflect the number of usual residents because the number of potential users in a household cannot exceed the number usual residents in that household.

This indicator can be compared with the proportion of the population sleeping under an ITN the previous night. If the difference between these indicators is substantial, the program may need to focus on behavior change and identifying the main drivers/barriers to ITN use in order to design appropriate interventions.

Disaggregation by age, sex and geographical areas

Data sources: Population-based surveys

Frequency: Every 3–5 years
## Malaria outcome indicator
### Prevention – vector control

<table>
<thead>
<tr>
<th>Percentage of individuals who slept under an insecticide-treated net the previous night</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td>This indicator measures the level of ITN use of all age groups at the time of the survey. It is useful to track usage among all age groups since coverage of the entire population will be required to accomplish large reductions in the malaria burden. While vulnerable groups, such as children under 5 years old and pregnant women, should still be prioritized, the equitable and communal benefits of wide-scale ITN use by older children and adults should be promoted and evaluated by national malaria control programs.</td>
</tr>
<tr>
<td><strong>Numerator:</strong></td>
</tr>
<tr>
<td>Number of individuals who slept under an ITN the previous night</td>
</tr>
<tr>
<td><strong>Denominator:</strong></td>
</tr>
<tr>
<td>Number of individuals who spent the previous night in surveyed households</td>
</tr>
<tr>
<td><strong>Measurement:</strong></td>
</tr>
<tr>
<td>The data for the denominator are obtained from the household questionnaire that lists all individuals who stayed in the household the previous night. The data for the numerator are obtained from a listing of the same individuals in the house who slept under a mosquito net the previous night, in combination with information on whether it is a factory treated net that does not require any treatment (an LLIN) or a net that has been soaked with insecticide within the past 12 months.</td>
</tr>
<tr>
<td>In connection with the indicator proportion of individuals that have access to an ITN within the household, this indicator can be used to define the behavioral gap in use of ITNs (i.e. the population with access to an ITN, but not using it) and distinguish it from the ownership gap (i.e. non-use because there are not enough nets in the household).</td>
</tr>
<tr>
<td><strong>Disaggregation by age, sex and geographical areas</strong></td>
</tr>
<tr>
<td><strong>Data sources:</strong> Population-based surveys</td>
</tr>
<tr>
<td><strong>Frequency:</strong> Every 3–5 years</td>
</tr>
</tbody>
</table>

## Malaria outcome indicator
### Prevention – vector control

<table>
<thead>
<tr>
<th>Percentage of households with at least one insecticide-treated net and/or sprayed by indoor residual spraying in the last 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td>This indicator allows overall national coverage of the two main vector control activities insecticide-treated net distribution and indoor residual spraying to be assessed. It is used to measure the proportion of households covered by either an ITN or IRS. In places where IRS is limited to small target areas, this indicator provides a more appropriate assessment of the vector control activities being conducted throughout the country than an indicator measuring national coverage of IRS alone.</td>
</tr>
<tr>
<td><strong>Numerator:</strong></td>
</tr>
<tr>
<td>Number of households that have at least one insecticide-treated net and/or have been sprayed by indoor residual spraying in the last 12 months</td>
</tr>
<tr>
<td><strong>Denominator:</strong></td>
</tr>
<tr>
<td>Number of households surveyed</td>
</tr>
<tr>
<td><strong>Measurement:</strong></td>
</tr>
<tr>
<td>The data for the numerator are obtained from information on which households possess an ITN, in combination with information on whether the household has been protected by indoor residual spraying in the last 12 months. The denominator is simply the total number of households in the survey.</td>
</tr>
<tr>
<td>An indoor residual spraying campaign may be conducted either as part of the national strategy for malaria control (operations conducted by governmental spraying teams) or undertaken by an NGO or private company. It is important to capture only those spraying activities that have occurred as part of an organized indoor residual spraying campaign, and to exclude spraying that was conducted by a member of the household.</td>
</tr>
<tr>
<td><strong>Data sources:</strong> Population-based surveys</td>
</tr>
<tr>
<td><strong>Frequency:</strong> Every 3–5 years</td>
</tr>
</tbody>
</table>
Malaria outcome indicator
Prevention – prevention in pregnancy

**Percentage of pregnant women who received at least 2 doses of intermittent preventive treatment for malaria during their last pregnancy**

**Rationale:**
WHO recommends that all pregnant women in areas of stable malaria transmission receive at least two doses of IPTp during regularly scheduled antenatal visits under direct observation of a health worker. This indicator is used to measure the national-level use of IPTp to prevent malaria during pregnancy among women.

Because of the limited number of women who delivered a live baby within the previous 2 years, care should be taken to ensure that surveys are conducted with a sufficient sample size and designed to allow comparison among regions and urban/rural strata.

**Numerator:** Number of women who received two or more doses of a recommended IPTp, to prevent malaria during their most recent pregnancy that led to a live birth within the last 2 years

**Denominator:** Number of women surveyed who delivered a live baby within the last 2 years

**Measurement:**
Data from the women’s questionnaire for all women who delivered a live baby within the last 2 years within surveyed households are used to calculate the denominator. The numerator is derived from the number of women who mention taking at least two doses of IPTp for prevention of malaria (not treatment) during their most recent pregnancy (from among all listed births to women in the last 2 years).

The currently recommended drug for IPTp is sulfadoxine-pyrimethamine. In order to obtain accurate data for this indicator, it is also important to differentiate between a treatment dose for prevention (as prescribed for IPTp) and actual treatment of an existing malaria infection. Although it is extremely difficult to differentiate in the context of a survey interview, the latter is curative care, and does not count as standard IPTp procedure. Similarly, women taking weekly chloroquine prophylaxis are not considered to be covered by IPTp.

**Data sources:** Population-based surveys and health information system, if available

**Frequency:** Every 3–5 years
Malaria outcome indicator
Case management: diagnosis and treatment

Percentage of children under 5 years old with fever in the last 2 weeks who had a finger/heel stick for malaria testing

Rationale:
The replacement of conventional antimalarial drugs with high-cost artemisinin-based alternatives has created an increased need for accurate disease diagnosis. In addition to avoiding unnecessary treatment with these expensive drug combinations, diagnostics allow a more rational use of drugs that might effectively reduce drug pressure, thereby delaying the onset of drug resistance. This indicator is intended to capture baseline-level coverage and subsequent scale-up of diagnostic programs.

Numerator: Number of children under 5 years old who had a fever in the previous 2 weeks who had a finger/heel stick for malaria testing

Denominator: Number of children under 5 years old who had a fever in the previous 2 weeks

Measurement:
The data for the denominator includes children under five who had a fever in the previous two weeks. These data are obtained in one of two ways, depending on the type of survey used. Some surveys use the household listing procedure whereby every child under 5 who stayed in the house the previous night is included in the sample (MICS). On the other hand, DHS and MIS surveys ask questions in the women’s questionnaire about their biological children under the age of 5; thus the denominator excludes non-biological children. The numerator is then obtained by asking all mothers or caregivers in the household whether any of the children who had a fever in the past 2 weeks received a finger/heel stick for malaria testing.

This indicator provides a proxy measure for the level of access of children under 5 years old to diagnostics for malaria infections, at the national level. As countries scale up towards universal diagnostic testing, the indicator values reported are expected to increase.

Data sources: Population-based surveys

Frequency: Every 3–5 years

Malaria outcome indicator
Case management: diagnosis and treatment

Percentage of first line treatments among children under five years old with fever in last two weeks who received any antimalarial medicines

Rationale:
Prompt treatment with an effective antimalarial drug regimen is a key component of the technical strategy for controlling and preventing malaria advocated by Roll Back Malaria. The drug regimens that are effective differ between countries and change over time depending on local drug resistance patterns.

Effective antimalarial regimens should therefore be defined in the local context, which most countries do in national treatment guidelines. Currently, WHO recommends artemisinin-based combination therapy for uncomplicated malaria treatment.

Numerator: Number of children under 5 years old surveyed with fever in the last two weeks who received the recommended first line treatment according to national policy

Denominator: Number of children under 5 years old surveyed with fever in the last two weeks who received any antimalarial medicine

Measurement:
Antimalarial treatment conforming to national treatment policy can be artemisinin-based combination therapy or another non-artemisinin-based therapy recommended in the country. For purposes of analysis, it is preferable to report the number of treatments separately for artemisinin-based combination therapy and non-artemisinin-based therapy. Appropriate memory aids may be employed by surveyors to better capture the type of treatment received reported by surveyed household members.

Data sources: Population-based surveys

Frequency: Every 3–5 years
### Malaria outcome indicator

**Prevention – Information, education, and communication/ behavior change communication**

<table>
<thead>
<tr>
<th>Percentage of people who know the cause of, symptoms of, treatment for or preventive measures for malaria</th>
</tr>
</thead>
</table>

**Rationale:**
Better knowledge of malaria (cause, symptoms, treatment and preventive measures) is a first and strong step toward changing behaviour, such as improving the use of insecticide-treated nets or care-seeking practices, especially for caretakers.

**Numerator:** Number of people who cite the cause of, symptoms of, treatment for or preventive measures for malaria

**Denominator:** Number of people surveyed

**Measurement:**
The data can be collected through special surveys such as knowledge, attitudes and practices (KAP) surveys or regular population-based surveys (DHS, MICS and MIS) or other special studies. The data can also be collected through a routine system. In this case, an attempt should be made to address the issue of double counting.

Disaggregate data by head of households, caretakers or mothers. The indicator can be disaggregated by the specific information requested: cause, symptoms, treatment or preventive measures.

**Data sources:** Population-based surveys

**Frequency:** Every 3–5 years

### Malaria impact indicator

**Mortality**

<table>
<thead>
<tr>
<th>Inpatient malaria deaths per 1,000 persons</th>
</tr>
</thead>
</table>

**Rationale:**
Mortality is a major component of the burden caused by malaria, and the overall goal of the Roll Back Malaria Partnership is to reduce malaria deaths to near zero by 2015.

**Numerator:** Number of inpatient malaria deaths per year x 1000

**Denominator:** Number of people in the population

**Measurement:**
Data for this indicator should be collected routinely through facility records. To facilitate data collection and avoid duplication of work, registers should include the results of malaria testing and diagnosis.

To facilitate data abstraction for reporting, it is advisable that records for each month be started on a new page. Data should be collected daily, with monthly summaries and monthly reporting through health information systems according to schedule.

Disaggregation by age, sex and geographical areas

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly
### Malaria impact indicator
#### Mortality

**Malaria-specific deaths per 1,000 persons**

**Rationale:**
Mortality is a major component of the burden caused by malaria, and the overall goal of the Roll Back Malaria Partnership is a 50 percent reduction in malaria-associated mortality among children under 5 years old by 2010.

**Numerator:** Number of malaria deaths per year x 1000  
**Denominator:** Number of people in the population

**Measurement:**
Data for this indicator can be collected through complete or sample vital registration systems. In addition, in some cases, verbal autopsies attached to household surveys may be able to provide information on malaria-specific mortality. Verbal autopsy is a method for determining cause of death by conducting interviews with the deceased child’s relatives, during which they are asked about the signs and symptoms of the child’s terminal illness. Verbal autopsies can be performed either by adding questions to a mortality survey or sending interviewers after the survey to those households in which deaths were identified. This survey-linked verbal autopsy approach provides a nationally representative measure of malaria-attributable mortality and can provide the data necessary to report on this indicator.

However, operational research is needed to assess and improve these methodologies, and these methods may present challenges at the national level. Therefore, it is recommended that the emphasis remains on monitoring trends in all-cause under-five mortality and tracking implementation of malaria control interventions through household surveys.

Disaggregation by age, sex and geographical areas

**Data sources:** Complete or sample vital registration systems, verbal autopsy (surveys)

**Frequency:** Monthly, every 3-5 years

### Malaria impact indicator
#### Mortality

**In high-transmission areas: All-cause under 5 mortality rate (5q0)**

**Rationale:**
In highly endemic countries trends in the all-cause mortality of children younger than 5 years can be assessed in malaria-endemic countries to evaluate the impact of interventions. In areas with stable endemicity, around 90 percent occurs among children younger than five years. Very young children bear the major burden of malaria because they have not yet developed adequate clinical immunity and have the highest risk of severe illness and death.

**Measurement:**
The mortality rate among children younger than 5 years can be derived from household survey data using direct or indirect methods. The direct method is used by the DHS and requires data collected on the date of birth and either the date of death or age at death of children to produce the probability of dying before five years of age among children exposed to mortality during the five-year period before the survey. More specifically, the DHS uses the synthetic cohort life-table approach, in which mortality probabilities for small age segments based on real cohort mortality experience are combined into larger age segments that correspond to the age group of interest.

For MICS, mortality rates among children younger than five years are calculated based on an indirect estimation technique known as the Brass method. This technique converts the proportion of children ever born who are now dead reported by women in five-year age groups from 15 to 49 years into estimates of probability of dying before attaining certain exact childhood ages. Model life tables and strong assumptions as to age patterns and time trends indirectly derive the mortality rate estimates as well as the date to which they apply.

**Data sources:** Population-based surveys (e.g. DHS, MICS, using direct or indirect methods)

**Frequency:** Every 3-5 years

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30 More information on the Brass Method is available from: [http://www.unicef.org/media/files/BACKGROUND_NOTE_ON_METHODOLOGY_FOR_UNDER-FIVE_MORTALITY_ESTIMATION_web.pdf](http://www.unicef.org/media/files/BACKGROUND_NOTE_ON_METHODOLOGY_FOR_UNDER-FIVE_MORTALITY_ESTIMATION_web.pdf)
### Malaria impact indicator

#### Morbidity

<table>
<thead>
<tr>
<th>Confirmed malaria cases per 1,000 persons</th>
</tr>
</thead>
</table>

**Rationale:**

This indicator assesses the burden of malaria infection in the general population.

- **Numerator:** Number of laboratory confirmed malaria cases per year x 1000
- **Denominator:** Number of people in the population

**Measurement:**

Data are obtained through regular data collection through the routine information system. Laboratory confirmation can be based on microscopy or RDTs.

Disaggregation by age, sex, geographical area, and point of care.

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly

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<table>
<thead>
<tr>
<th>Inpatient malaria cases per 1,000 persons</th>
</tr>
</thead>
</table>

**Rationale:**

This indicator assesses the burden of malaria through the health system and provides trends of the burden of malaria in the general population in a stable malaria endemicity and stable reporting system.

- **Numerator:** Number of inpatient malaria cases per year x 1000
- **Denominator:** Number of people in the population

**Measurement:**

Data are obtained through the regular health facility data collection system. Inpatient cases include all malaria cases, probable and confirmed.

Disaggregation by age, sex and geographical areas

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly
### Malaria impact indicator

#### Morbidity

#### Malaria test positivity rate

**Rationale:**
The test positivity rate assesses the proportion of tests (microscopy and/or RDT) that are positive for malaria among the fever patients tested. The test positivity rate is usually computed for a specified period of case detection activities. In areas with unstable malaria, an increasing test positivity rate among fever patients is one of the warning signs of a possible epidemic.

**Numerator:** Number of laboratory-confirmed malaria cases  
**Denominator:** Number of suspected malaria cases with a parasitological test

**Measurement:**
This information could be collected through a health facility routine data collection system and supervision, especially laboratory supervision. High coverage is a key factor for interpreting the test positivity rate.

**Disaggregation by age, sex, geographical areas, and point of care**

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly

### Malaria impact indicator

#### Morbidity

#### In high transmission areas: Parasitemia prevalence: percentage of children aged 6–59 months with malaria infection (by microscopy and RDT)

**Rationale:**
The prevalence of parasitemia is a useful indicator of the burden of malaria. With intervention coverage data and repeated estimation, understanding of the epidemiology of malaria can be improved and progress of control efforts can be tracked more effectively if estimates of parasitemia prevalence are available.

**Numerator:** Number of children aged 6-59 months with malaria infection detected by microscopy and/or RDT  
**Denominator:** Number of children aged 6-59 months tested for malaria parasites by microscopy and/or RDT

**Measurement:**
Parasitemia testing should be included in surveys that are conducted during the high-transmission season for malaria. In some cases when transmission is perennial, seasonal peaks may still influence the prevalence in parasitemia and seasonality should be taken into account for planning. The MIS should ideally be conducted during or immediately after the rainy season and no later than six weeks after the rains end. This time frame is associated with peak transmission and is therefore suitable for including parasitemia measurement. The DHS and MICS are typically not suitable for including parasitemia because they are not usually conducted during the high transmission season.

The prevalence of parasitemia should be based on microscopically examined blood films prepared in the field and read in a quality-controlled laboratory by well-trained microscopists. Thick blood films are sufficient where P. falciparum is dominant, but thin films are also warranted where species determination is required to estimate levels of infection with P. vivax or other species. Although rapid diagnostic tests should be included for field detection of infected individuals, all of whom should be treated or referred according to national policy, microscopy is currently the recommended method for laboratory confirmation and estimation of parasitemia prevalence.

This indicator provides a direct national-level measure of the prevalence of parasitemia among children aged 6–59 months.

**Data sources:** Population-based surveys with diagnostics (such as MIS)

**Frequency:** Every 3–5 years (linked to transmission season)
Malaria impact indicator
Morbidity

In high transmission areas: Anemia prevalence: percentage of children aged 6–59 months with hemoglobin measurement of <8 g/dl

Rationale:
Anemia, defined by a hemoglobin concentration below established cut-off levels, is a widespread public health problem. It is useful to follow trends in anemia prevalence, as it is a reliable indicator of malaria morbidity that can reflect the impact of malaria interventions. Malaria interventions have been associated with a 60 percent reduction in the risk of moderate-to-severe anemia (hemoglobin <8 g/dl).

Numerator: Number of children aged 6-59 months with anemia (Hg <8g/dl)
Denominator: Number of children aged 6-59 months tested for hemoglobin level

Measurement:
Monitoring of anemia through household surveys has become a more viable option due to the development of the HemoCue® test of fingerprick blood, which is used to measure the distribution of hemoglobin concentration in large-scale household surveys. Anemia should be measured in children 6–59 months old. Surveys should record hemoglobin measurements to the 0.1 g/dl precision level using HemoCue® on capillary blood sampled while the child is sitting.

This indicator measures the prevalence of hemoglobin levels of less than 8 g/dl, as intervention trials have shown that malaria control reduces the prevalence of moderate-to-severe anemia (such as less than 8 g/dl) more so than it reduces the prevalence of milder anemia (such as below 11 g/dl). Further, sample size considerations cause a classification system using a 7 g/dl cut-off to be impractical in terms of survey logistics.

Data sources: Population-based surveys with anemia testing (such as MIS, DHS)
Frequency: Every 3–5 years

Malaria impact indicator
Prevention - vector control

In low-transmission areas: Number of active foci reported

Rationale:
A focus is a defined and circumscribed locality situated in a currently or formerly malarious area and containing the continuous or intermittent epidemiological factors necessary for malaria transmission. Monitoring of the situation by foci, with accurate identification of their functional status (active or non-active, new or residual) is a cornerstone for success in interruption of transmission or prevention of reintroduction of malaria.

Numerator: Number of active foci reported per year
Denominator: None

Measurement:
Data is obtained through routine surveillance system. Programs should develop a complete roster of foci and follow up through regular visits to foci.

Data sources: Health information system, routine surveillance system.
Frequency: Monthly
## Malaria impact indicator
### Case management – diagnosis

| **In low transmission areas: Number of malaria cases by classification** |

**Rationale:**
A malaria case is a person in whom, regardless of the presence or absence of clinical symptoms, malaria parasites have been confirmed by quality controlled laboratory diagnosis. For malaria elimination programs classification of cases has important program management implications.

* **Numerator:** Number of malaria cases by classification
* **Denominator:** None

**Measurement:**
Data is obtained through the routine surveillance system.

Disaggregated by the following classifications:
- Indigenous: mosquito-borne transmission of malaria in a geographic area where malaria occurs regularly.
- Introduced: mosquito-borne transmission of malaria from a person with an imported case in an area where malaria does not occur regularly.
- Imported malaria: malaria acquired outside a specific area.
- Induced malaria: malaria acquired through artificial means (e.g., blood transfusion, organ transplantation or by using shared syringes).
- Relapsing malaria: recurrence of disease after it has been apparently cured. In malaria, true relapses are caused by reactivation of dormant liver stage parasites (hypnozoites) of P. vivax and P. ovale.

**Data sources:** Health information system, routine surveillance system

**Frequency:** Monthly