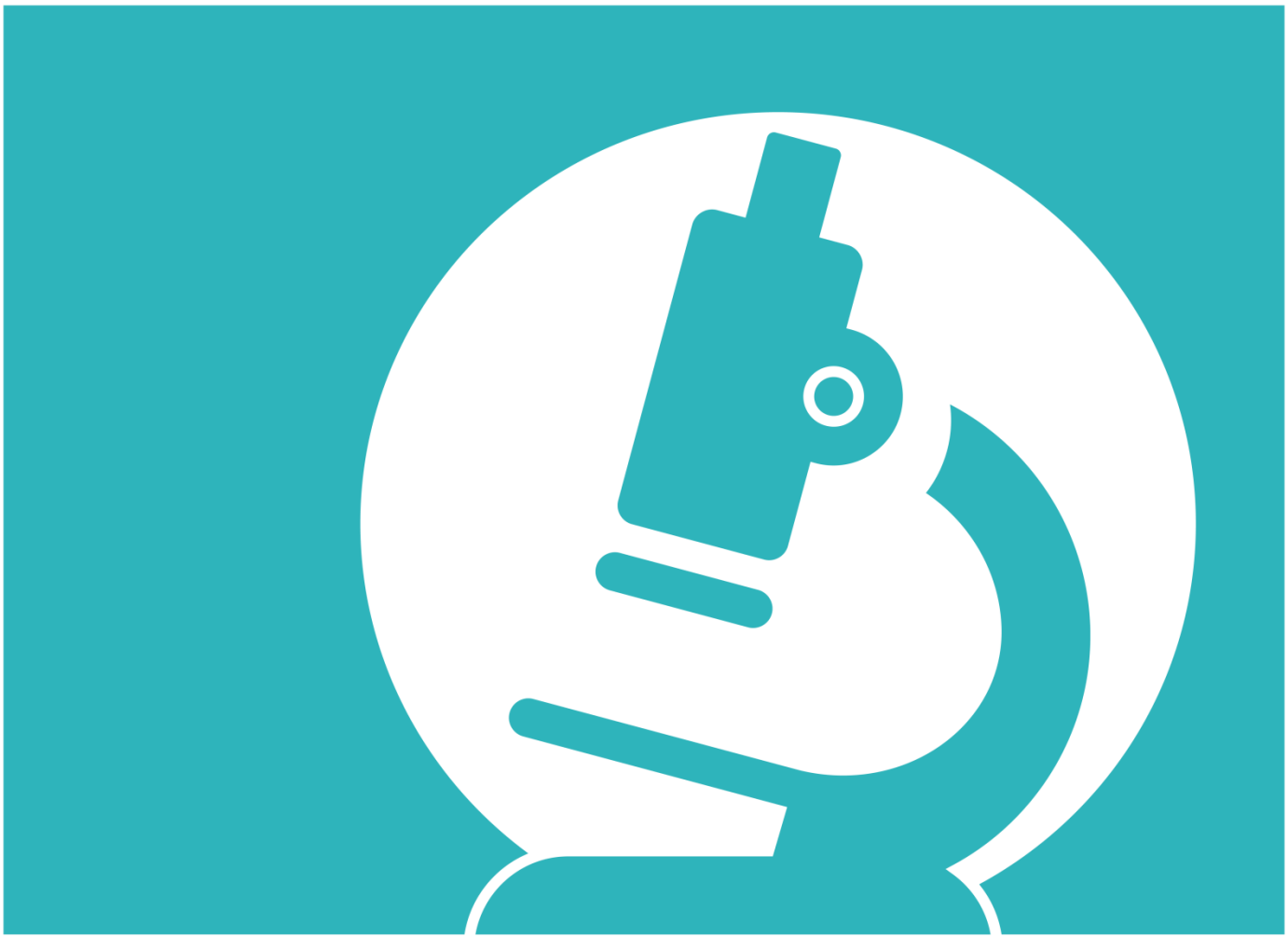


ANALYSIS AND USE OF HEALTH FACILITY DATA

Guidance for malaria programme managers

WORKING DOCUMENT, SEPTEMBER 2018

World Health Organization

ANALYSIS AND USE OF HEALTH FACILITY DATA

Guidance for malaria programme managers

WORKING DOCUMENT – SEPTEMBER 2018

World Health Organization

MODULE 5. **Guidance for malaria programme managers**

LEARNING OBJECTIVES

This module provides guidance on the analysis and use of routine malaria data collected at the facility level. The module reviews core facility indicators and analysis, provides suggestions for questions on data quality as well as considerations and limitations for using the data and analysis. By the end of this module, participants will be able to:

- Establish the key malaria data malaria elements for burden reduction (control) and elimination settings;
- Understand malaria data quality validation and implications for disease trends;
- Understand the key data indicators that are developed from the data elements and their interpretation for programmatic.

AUDIENCE

This module is relevant for different members of the health workforce working on malaria including:

- Ministry of health decision makers such as malaria program staff and health information system managers at national and sub-national levels;
- Staff of partner organizations supporting the strengthening of the malaria program or health system strengthening;
- Consultants and staff working at research institutes involved with the analysis of malaria data and/or efforts to improve the quality of malaria data.

SUGGESTED REFERENCES

- Global technical strategy for malaria 2016–2030. Geneva: World Health Organization; 2015 (http://www.who.int/malaria/areas/global_technical_strategy/en).
- Framework for malaria elimination. Geneva: World Health Organization; 2017 (http://apps.who.int/iris/bitstream/10665/254761/1/9789241511988-eng.pdf).
- Guidelines for the treatment of malaria. Third ed. Geneva: World Health Organization; 2015 (http://www.who.int/malaria/publications/atoz/9789241549127/en/).
- Program monitoring for malaria control: An operational manual. WHO, draft of October 2014.
- Malaria Surveillance, Monitoring and Evaluation: An operational manual. WHO, 2018. http://www.who.int/malaria/publications/atoz/9789241565578/en/
- Malaria program reviews: a manual for reviewing the performance of malaria control and elimination programs. WHO. March 2010
- World Malaria Report. WHO, Geneva, 2017
- WHO malaria terminology. Geneva: World Health Organization; 2016 (http://apps.who.int/iris/bitstream/10665/208815/1/WHO_HTM_GMP_2016.6_eng.pdf).
- Data Quality Review: A toolkit for facility data quality assessment. WHO. 2015

KEY AUTHORS

Maru Aregawi | Abdisalan Noor | Ryan Williams

Contents

Acknowledgements

This guidance document has been developed by the World Health Organization, Global Malaria Programme, with the support of grants from the Bill and Melinda Gates Foundation, Bloomberg Philanthropies Data for Health Initiative, Gavi, the Vaccine Alliance, The Global Fund to Fight AIDS, Tuberculosis and Malaria, and The Norwegian Agency for Development Cooperation.

1. About the data

Pillar 3 of the Global technical strategy for malaria 2016–2030 (GTS) is the transformation of malaria surveillance into a core intervention in all malaria-endemic countries and in those countries that have eliminated malaria but remain susceptible to reintroduction of transmission. Countries may decide to go for elimination in all areas or aim for subnational elimination in one part while focusing on reducing deaths and disease in another until elimination is feasible. Surveillance systems must address the programme needs in all these transmission settings.

This section is on the use of data routinely collected and reported by health facilities for surveillance for malaria morbidity and mortality and the monitoring of malaria programme interventions. The malaria control interventions include facility-based distribution of insecticide treated nets (ITNs), intermittent presumptive treatment of malaria during pregnancy (IPTp), diagnostic testing for malaria (with either microscopy or rapid diagnostic tests -- RDTs) and treatment of malaria.

Malaria transmission varies considerably between countries, between micro-environments within countries and, in the same setting, between different phases of the pathway to elimination. In moderate and high transmission settings, parasite surveys show that 10% to more than half of children are parasitaemic when tested. The goal is then to reduce the burden of malaria and gradually reduce transmission. Once transmission is low, the goal becomes reaching zero cases (elimination) of the disease.

During the burden reduction settings there are often so many malaria cases that it is not possible to investigate and react to each confirmed case individually. Instead surveillance focuses on aggregate numbers reported through passive case detection, particularly monthly or weekly reports of confirmed malaria cases submitted by public health facilities.

In contrast, in the elimination settings, it is possible, and necessary, to actively identify and respond to individual cases. Active case detection involves searching for malaria cases and diagnostic testing at the community or household level. Testing may be confined to patients with fever, or everyone may be tested (mass screening) within a specified area.

The data that are not specifically addressed in this section are those related to:

- Data from community-based distribution of ITNs and household insecticide residual spraying (IRS);
- Financial and human resource tracking.

2. Data quality

In the initial phases of building an effective malaria surveillance and program monitoring system, attention will focus on ensuring good-quality data. Factors determining data quality are diverse (e.g. accuracy, precision, plausibility, consistency and validity), but data are only as good as the system in which they are captured and reported. Data quality review involves assessment of:

1. Consistency of case definitions: the definition of malaria case should be consistent with the WHO Malaria Treatment Guidelines 2016, as adapted by countries in their national malaria treatment guidelines. A malaria case can be one of mild disease (uncomplicated malaria) or serious and life threatening disease (severe malaria). An essential requirement is that all suspected malaria cases are diagnosed with a parasitological test. In settings where there are frequent stock outs of diagnostic tools some health workers continue to use syndromic diagnosis (fever, chills, etc.). The mixture of these confirmed and presumed malaria results in problems of analysis burden and trends.
2. System designed to capture standard set of indicators: malaria surveillance systems should have a core set of indicators that are considered critical to measuring the burden of disease and measuring change. These indicators should be aligned with the WHO standard set of indicators provided in this curriculum.
3. Completeness of facility reporting: incomplete reporting reduces the reliability of the data. It introduces a bias in the computation of indicators. If completeness is at least 70% and roughly the same from year to year, then the data can show reliable trends for those facilities that reported. If, however, there is significant variation over time in completeness, then trends should be interpreted with great caution. It should be noted that the calculation of basic reporting completeness gives equal weight to all health facilities and may not reflect the completeness of case reporting. Different facility types (e.g. hospitals, health centres and dispensaries) and community health workers may have different reporting completeness. For this reason it is worthwhile to disaggregate reporting completeness by type of health facility/reporting unit.
4. Check for internal consistency of the data. Inconsistent data should be investigated.
    - Check for outliers – note that sometimes outliers are the result of genuine variations in program performance, for example as the result of changes in the supply of RDTs.
    - Check for inconsistency in related indicators – by definition, confirmed malaria cases treated with antimalarials (ACT for falciparum) = confirmed cases < suspected cases tested < suspected cases, unless all suspected cases are tested. If, for example, the data for the month of July 2016 for a specific health facility, show that the number of confirmed cases is greater than the number of suspected cases then this indicates a problem with data quality.
5. Check for external consistency – population-based surveys (DHS, MICs, MIS) measure coverage with IPTp and diagnostic testing of fever). These survey estimates of coverage can be compared with estimates derived from routine data. These comparisons are sometimes not straightforward as household survey samples are not always designed for the specific indicator that you want to check.

To obtain reliable data on malaria cases, another aspect of data quality assurance is to make sure that all people with suspected malaria receive a reliable diagnostic test. Special indicators are used for monitoring of laboratory testing for malaria. These are discussed in chapter 4 (Core analysis).

3. Core facility indicators

Core Indicators	Definition	Disaggregations
Surveillance in burden reduction settings		
Monitoring malaria morbidity and mortality		
Number of patients tested for malaria	Number of outpatient malaria tests	• Age (<5, 5-14, 15+) • Geographic area/residence • Method of confirmation (microscopy; RDT) • Detected by facility versus community • Detected by public versus private • Detected passively versus actively
Confirmed outpatient malaria diagnoses	Number of confirmed outpatient diagnoses of malaria	• Age (<5, 5-14, 15+) • Geographic area/residence • Method of confirmation (microscopy; RDT) • Detected by facility versus community • Detected by public versus private • Detected passively versus actively
% of positive tests with *P. falciparum*	(Number of malaria positive slides and RDTs with *P. falciparum*) x 100 / Number of malaria positive slides+RDTs	• Age (<5, 5-14, 15+) • By health facility • Geographic area
Incidence of outpatient malaria	(Annual number of confirmed outpatient diagnoses of malaria)*1,000 /(Estimated total population of areas at risk of malaria)	• Age (<5, 5-14, 15+) • Geographic area/residence • Method of confirmation (microscopy; RDT)
Presumed outpatient malaria diagnoses	Number of suspected outpatients diagnosed as having malaria without any laboratory confirmation	• Age (<5, 5-14, 15+) • Geographic area • Detected by facility versus community
Outpatient proportional morbidity • Confirmed malaria • Presumed malaria • Non-malaria [Excluding actively detected cases]	• (Number of confirmed outpatient diagnoses of malaria) x 100/ Total outpatient diagnoses • (Number of presumed outpatient diagnoses of malaria) x 100/ Total outpatient diagnoses • (Number of non-malaria outpatient diagnoses) x 100/ Total outpatient diagnoses	• Age (<5, 5-14, 15+) • Geographic area/residence • Method of confirmation (microscopy; RDT) • Detected by facility versus community • Detected by public versus private
Malaria test positivity rate	(Number of positive malaria tests) x 100/ Number of malaria tests	• Age (<5, 5-14, 15+) • Geographic area/residence • Method of confirmation (microscopy; RDT)
Inpatient malaria diagnoses	Number of inpatients with a discharge diagnosis of malaria	• Age (<5, 5-14, 15+) • Geographic area
Incidence of malaria admissions	(Annual number of patients hospitalized with malaria)*10,000 /(Estimated total population of areas at risk of malaria)	• Age (<5, 5-14, 15+) • Geographic area/residence • Method of confirmation (microscopy; RDT)
Inpatient proportional morbidity • Malaria • Non-malaria	• (Number of discharge diagnoses of malaria) x 100/ Total discharge diagnoses • (Number of discharge diagnoses other than malaria) x 100/ Total discharge diagnoses	• Age (<5, 5-14, 15+) • Geographic area/residence
Inpatient malaria deaths	Number of inpatient deaths due to malaria	• Age (<5, 5-14, 15+) • Geographic area/residence
Incidence of inpatient malaria mortality	(Annual number of inpatient deaths due to malaria)*100,000 /(Estimated total population of areas at risk of malaria)	• Age (<5, 5-14, 15+)/residence • Geographic area
Inpatient proportional mortality • Malaria • Non-malaria	- (Number of inpatient deaths due to malaria) x 100/ Total inpatient deaths - (Number of inpatient deaths due to causes other than malaria) x 100/ Total inpatient deaths	• Age (<5, 5-14, 15+) • Geographic area/residence

Core Indicators	Definition	Disaggregations
Monitoring the completeness and quality of passive malaria surveillance		
Completeness of facility reporting	(Number of reports received) x 100 / number of reports expected *Note –Typically 12 monthly reports are expected from each health facility. Where weekly reporting is the norm, this number of reports expected are same as the number of weeks in a calendar year	• Reports of outpatient diagnoses versus inpatient diagnoses versus inpatient deaths • Type of facility • Geography
Malaria diagnostic testing ratio	(Number of malaria tests performed) x 100/ (Number of suspected malaria cases) [Note: suspected malaria cases = Number of malaria tests performed + Number of presumed cases of malaria reported]	• By microscopy versus RDT • Age (<5, 5-14, 15+) • Geographic area/residence
Annual blood examination rate	(Number of malaria tests performed) x 100 / Estimated total population of areas at risk of malaria	• Age (<5, 5-14, 15+)/residence • Geographic area/residence
Monitoring malaria interventions		
Monitoring prevention of malaria		
Intermittent preventive treatment of malaria during pregnancy (IPTp) coverage	(Number of pregnant women given sulfadoxine/ pyrimethamine for IPT) x 100/ Estimated pregnancies in areas at risk [Note: first ANC visits is sometimes used as the denominator]	• By dose of SP (1, 2, 3, 4) • Geographic area • By type of facility
Facility distribution of mosquito nets	(Number of nets distributed at health facilities) x 100 / Number of target contacts [i.e. first ANC visits, first doses of DTP]	• By target group (pregnant women, infants) • Geographic area • By type of facility
Monitoring treatment of malaria		
Malaria cases given ACT	(Number of malaria cases treated with ACT) x 100/ Number of malaria cases diagnosed	• Confirmed malaria versus presumed malaria • Age Age (<5, 5-14, 15+) • Geographic area/residence/focus • Facility versus community
Inpatient case fatality rate: • Due to malaria • All cause	• (Number of inpatients deaths due to malaria) x 100/ (Number of inpatient diagnoses of malaria) • (Number of inpatient deaths from all causes) x 100/ (Number of inpatients)	• • Age (<5, 5-14, 15+) • Geographic area/residence/focus
Monitoring the supply of malaria control commodities		
Full availability of malaria control commodities	• (Number of health facilities with no stock out during the period of any tracer malaria control commodity)*100 / (Number of reporting health facilities in areas at risk of malaria)	• Commodity (vaccine or injection supply) • Geographic region • Type of facility (hospital versus health centre versus health post versus community level)
Surveillance for elimination settings (in addition to the indicators for the burden reduction settings)		
Proportion of cases with symptoms diagnosed within 24 hours	Number of malaria cases with symptoms diagnosed within 24 hours / Total malaria confirmed cases	• Age (<5, 5-14, 15+) • Geographic area/residence or focus • Public (health facility, community) versus private • Detected passively versus actively
Proportion of cases notified within 1 day of diagnosis	Number of malaria cases notified within 24 hours / Number of confirmed malaria cases	• Age (<5, 5-14, 15+)) • Geographic area • Public versus private
Proportion of cases investigated	Number of malaria cases investigated / Number of confirmed malaria cases detected passively and actively	• By delay between diagnosis and investigation (≤4 days, more) • Age (<5, 5-14, 15+) • Geographic area/residence/focus • Public versus private • Detected passively versus actively
Proportion of cases classified	Number of malaria cases classified / Number of confirmed malaria cases detected passively and actively	• Age (<5, 5-14, 15+) • Geographic area/residence/focus • Public versus private • Detected passively versus actively

Core Indicators	Definition	Disaggregations
Proportion of cases which are indigenous or versus imported	• Number of cases classified as indigenous / Number of confirmed malaria cases that have been classified • Number of cases classified as imported / Number of confirmed malaria cases that have been classified Note: a 100% classification of cases is expected in elimination settings	• Age (<5, 5-14, 15+) • Geographic area/residence/focus • Public versus private
Number of foci identified	Number of malaria foci identified (list of foci)	• Type of foci (active, residual non-active, cleared) • Geographic area/residence/focus
Proportion of foci investigated	Number of malaria foci investigated within the time limit specified by national guidelines / Number of malaria foci identified	• By delay between diagnosis and investigation (≤ N3 days, more) • Type of foci (active, residual non-active, cleared) • Geographic area/residence/focus
Proportion of foci classified	Number of foci classified / Number of malaria foci identified	• Type of foci (active, residual non-active, cleared) • Geographic area/residence/focus
Proportion of foci with zero local cases	(Number of foci classified as cleared up + number classified as residual non-active) / Number of malaria foci identified	• Type of foci (residual non-active, cleared) • Geographic area/residence/focus
Proportion of foci classified as active	(Number of foci classified as active) / Number of malaria foci identified	• Geographic area/residence/focus

4. Core analysis

Data from malaria surveillance systems have three principle objectives:

1. To identify high incidence geographical locations and population groups, especially in regions of variable malaria transmission. This permits managers to direct resources (e.g. ITN distribution, IRS, improved laboratory capacity, etc.) to populations in greatest need.
2. To track changes in incidence. In low transmission areas, routine data may reveal malaria outbreaks that require special responses. Regardless of the level of transmission, programme managers can use the data to track progress (or lack of progress) with control efforts.
3. To assess the effectiveness of interventions and refine policies. Using a framework that links malaria control interventions coverage to disease impact (infection, morbidity and mortality), programmes can assess the effectiveness of their interventions and refine their targeting or policies to optimize impact. These assessments can also be useful tools for advocating for additional resources.

PASSIVE CASE DETECTION SURVEILLANCE

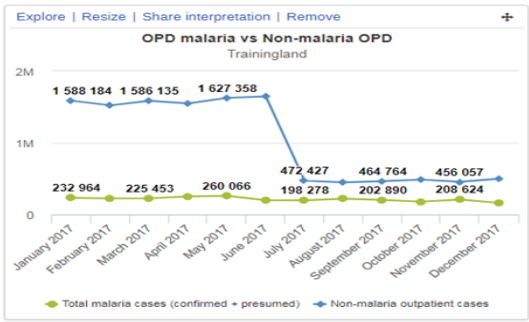
Purpose

Passive case detection (PCD): is the detection of malaria cases among people who go at their own initiative to a health facility or community health worker to get treatment, usually for febrile disease. If the population has good access to health services (public, private, NGO or community services), PCD can identify and treat majority of cases early and reduce the risk of ongoing transmission. In elimination settings, PCD should cover the whole population, including those living or working in remote areas, to increase the coverage of rapid testing, treatment and reporting. Good PCD is therefore not only critical to the reduction of the burden of disease but is a major contributor to malaria elimination.

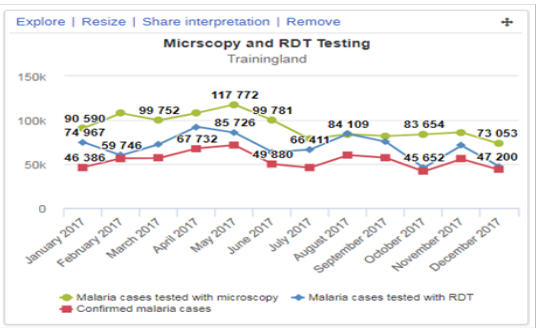
Although graphs 1 – 8 focus on the main disease trends from PCD surveillance in burden reduction settings, they are also of relevance to PCD in elimination settings.

Analysis

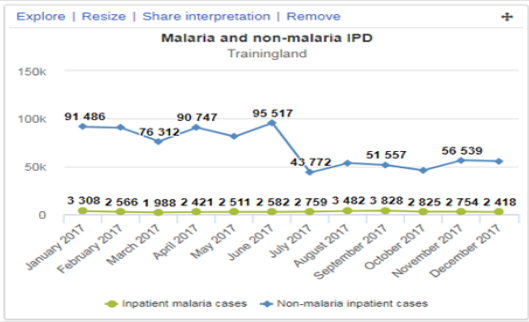
1. Month-to-month trend in reported number of outpatients, malaria versus non-malaria cases



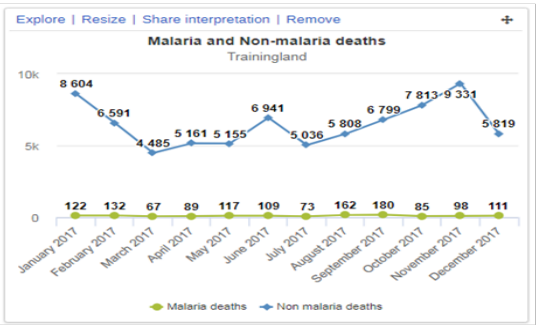
2. Month-to-month trend in reported number of microscopic tests, positive tests versus total tests



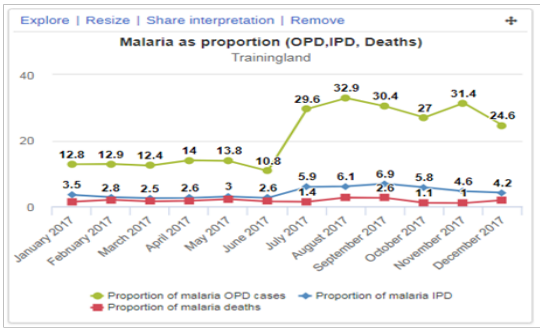
3. Month-to-month trend in reported inpatients, malaria versus non-malaria



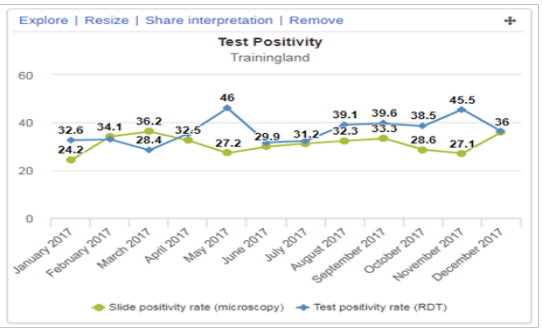
4. Month-to-month trend in reported inpatient deaths, malaria versus non-malaria



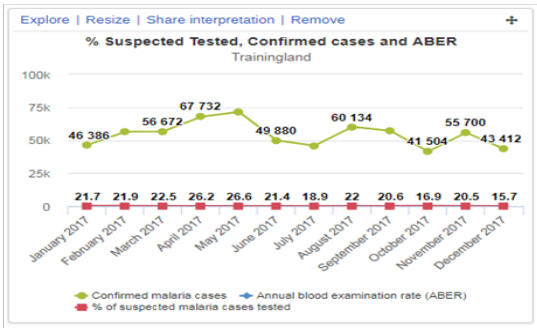
5. Month-to-month trend in malaria as a proportion of total outpatients, inpatients and inpatient deaths



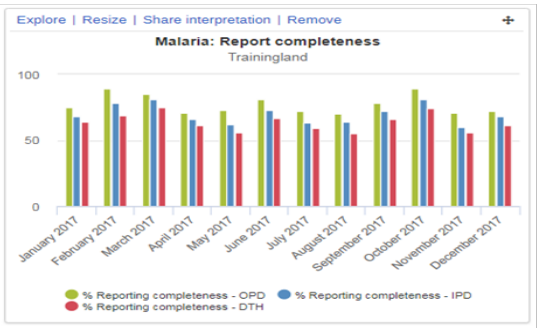
6. Month-to-month trend in test positivity rates for malaria microscopy and malaria RDTs



7. Month-to-month trend in confirmed cases versus the annual blood examination rate



8. Annual trend in outpatient attendance and hospitalizations



Considerations/issues for interpretation

Some limitations of data from passive surveillance for malaria: often data is reported from the public health sector, but only a fraction on malaria cases are seen in this sector; of those patients who seek care, some are not tested using parasitological diagnosis; not all health facilities report consistently. The proportion of malaria cases that are properly diagnosed and reported can vary by three factors:

- general outpatient attendance (see graph 1 – "non-malaria cases" serves as a proxy for total outpatient attendance) – this can be influenced by such things as changes in user fees, opening of roads, political instability, drug stock outs and geographic access to health facilities. An area with better access may, paradoxically, appear to have a higher incidence. A population which often manages illnesses at home or by visiting pharmacies or informal drug sellers may appear to have a lower incidence;
- testing practices (see graphs 7, 9, 10, 11 and 12 – ABER and other indicators of testing practice are discussed in the following section). As cases reduce substantially and the disease is concentrated in focal areas of transmission, ABER becomes less sensitive.
- reporting completeness (see graph 9) – note that, if private-for-profit and informal health providers are taken into account, reporting completeness may be even lower than is officially recognized.

The influence of the above three factors must be taken into account when attempting to assess trends or compare the incidence of malaria in one area to the incidence in another geographic area. For example, during the period that diagnostic testing is being expanded, it is likely that the number of confirmed cases will increase while the number of presumed cases decreases. Even where reporting rates in the public health sector are close to a 100%, in some countries, more than 50% of malaria patients seek care in the private sector.

When any of the above three factors have been inconsistent over time, several other analyses may be informative:

- Trends in malaria test positivity rates rather than reported cases. Note, however, that as diagnostic testing is expanded the test positivity may decline simply because more suspected cases are being tested;
- Trends in inpatient cases and deaths for anaemia and blood transfusions in children < 5 years. These are less likely to be affected by a change in the rate of testing.
- Analysis of data on outpatient cases could be confined to a subset of sentinel health facilities which are nationally representative and for which reporting completeness, testing practices and outpatient attendance have been consistent over time.

Presumptive diagnosis of malaria should be phased out

Diagnosis of malaria made without laboratory confirmation (i.e. microscopy or RDT) are difficult to meaningfully interpret. The phasing out of this indicator requires a consistently complete coverage of diagnostics. Where diagnostic coverage is still low, reporting presumed cases helps with quantifying the diagnostic rate and adjusting the estimated malaria caseload.

Detection of a significant increase in cases

The latest month's value for confirmed cases can be compared with an '85th percentile' threshold value to determine whether it is unusually low or high. The 85th percentile threshold is derived by examining the previous 3 years of monthly case numbers and calculating the fifth highest number of cases that occurred in the past 3 years[1]. If the latest month's value exceeds the 85th percentile, district

[1] In 3 years there are 36 months. The 85th percentile is the fifth highest value in the 36 months, as 15% of the monthly values will be greater than or equal to this (36 * 15% = 5).

level staff should be notified, and an investigation should be undertaken to determine whether further action is necessary. This approach is a general guide and for more detailed approach for detection of epidemics and outbreaks please refers to the *WHO Malaria Surveillance, Monitoring and Evaluation Manual* 2018.

Incidence rates versus absolute numbers of cases

In order to permit comparisons between geographic areas or analysis of trends, malaria morbidity and mortality data are often presented as incidence rates: confirmed outpatient cases per 1,000 population; malaria admissions per 10,000 population; malaria inpatient deaths per 100,000 population. In some instances, population at risk can be used instead of overall population, but this denominator may assign a higher incidence rate to an area if transmission in that area is focal. In countries that are at the latter stages of elimination, for example where cases are less than 10,000 per year, it is advisable to use absolute numbers of cases instead of incidence rates. Note that cases at health facilities reported by the health facilities may only be representative of a subset of cases depending on the level of treatment seeking. Therefore, in most settings, incidence computed from health facility data should be interpreted as crude incidence rates.

Distinguish passive versus active surveillance

Monthly reports from health facilities should distinguish between cases detected passively and actively. Otherwise, trends in the number of cases could be affected by the extent of active case detection undertaken each month. For the same reason, asymptomatic persons found to have a positive malaria test as a result of routine screening at health facilities (such as pregnant women during an antenatal visit) should not be counted as cases, but should be reported separately.

Distinguish facility-based from community-based data

Often the roll out of community health workers happens in phases and in some countries may not reach national scale up. Data from health facilities should be reported separately to those from community health workers. Otherwise, it will be hard to interpret the trends.

Malaria test positivity rate (graph 6)

This indicator measures the prevalence of parasitaemia among persons with signs and symptoms of malaria. Test positivity rates are less sensitive to changes in reporting rates, diagnostic practices and health facility utilization rates than trends in confirmed cases or incidence rates (because data that are changing are excluded from both the numerator and denominator). It can be tracked monthly at each health facility, even without knowing the size of the catchment population. It is discussed further in the Annex.

Malaria admissions and deaths reflect the incidence of severe malaria (graphs 3 and 4)

Compared to uncomplicated malaria, a higher percentage of severe malaria is likely to be seen and reported by health facilities as such patients are likely to be taken to hospitals. For this reason and because the diagnosis is more likely to be confirmed for severe malaria, in low resource settings the incidence of malaria admissions and deaths are considered to be more robust measures of trends than the incidence of outpatient malaria. However, they are also susceptible to reporting and changes in the severe disease management at health facilities. As for malaria cases, care should be taken to ensure that admission practices and reporting of inpatient cases has been consistent over time. It is therefore important to examine trends in health facility reporting rates (graph 9 – see next section), as well as total numbers of inpatients and deaths (graphs 3, 4 and 8). If there have been changes in these indicators, it may be more informative to examine trends in the proportions of inpatients and deaths due to malaria or to confine the analysis to the subset of health facilities that have reported consistently over time.

Proportional morbidity and mortality due to malaria (graph 5)

Like test positivity rates, these indicators are less sensitive to changes in reporting rates and health facility use rates. However, changes in attendance or admissions for conditions other than malaria can affect these indicators.

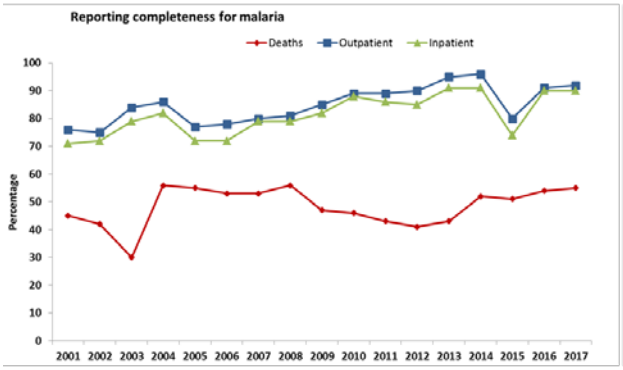
MONITOR THE COMPLETENESS AND QUALITY OF PASSIVE MALARIA SURVEILLANCE

Purpose

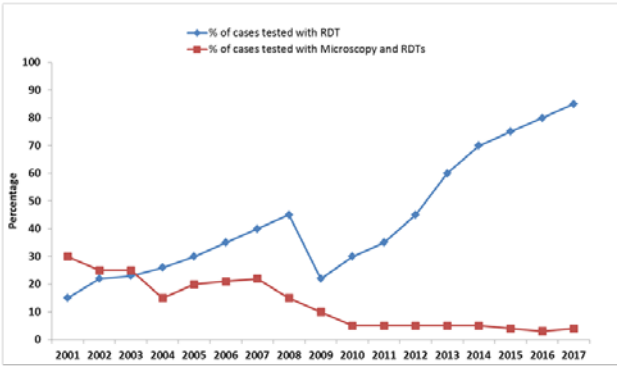
Changes in diagnostic and reporting practices can dramatically influence the reported number of malaria cases, admissions and deaths.

Analysis

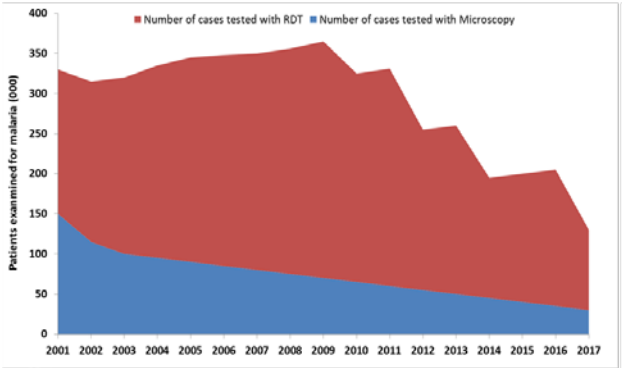
9. Annual trend in the completeness of facility reporting of malaria outpatient cases, inpatient cases and deaths



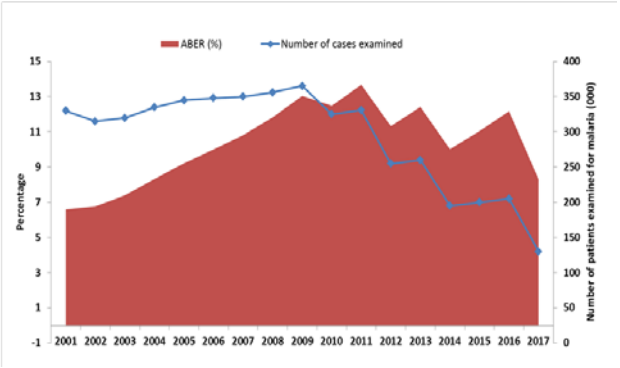
10. Annual trend in the malaria diagnostic testing ratio and in the % tests done by RDT



11. Annual trend in the number of suspected malaria patients tested by microscopy and RDT



12. Annual trend in the ABER



Considerations/issues for interpretation

Completeness of facility reporting (graph 9)

This was discussed in the above sub-section on assessing the quality of malaria data. It is important that a country has an updated list of health facilities to compute this indicator accurately.

The malaria diagnostic testing ratio (graph 10)

This indicator is computed as the: number of malaria tests / number of suspected malaria cases. A "suspected case" is one which presents with signs (i.e. fever) and symptoms of malaria. If the number of suspected cases is not reported then:

- Suspected cases = persons tested + malaria cases diagnosed without testing; or
- Suspected cases = total malaria diagnoses (confirmed + presumed) + negative malaria tests.

This indicator is less affected by variation in the percentage of health facilities reporting in a month than indicators with population as a denominator since such variation affects both the numerator and denominator.

The diagnostic testing ratio can be compared with findings from household surveys

DHS, MICS and Malaria Indicator surveys yield population-based data on the proportion of fever cases attending health facilities and whether or not they receive a diagnostic test. Large differences between the proportion of suspected cases recorded as receiving a test through routine systems compared to household surveys need to be explored.

Annual blood examination rate (ABER; graph 7)

This is the number of laboratory tests for malaria per 100 population per year. This is typically expressed as a percentage. This indicator provides information on overall diagnostic activity and can be useful in interpreting trends in malaria cases. While some past guidance suggested that the annual blood examination rate should be in the region of 10% in order to provide reliable trends, the empirical evidence for such a target is not strong. In high-transmission settings, the rate is likely to greatly exceed 10%. For ease of comparison, graph 7 plots the ABER on the same chart as the reported number of confirmed cases. ABER is not very useful measure of testing coverage when cases are very few and most of them are likely to be confirmed.

MONITOR THE TRENDS IN MALARIA PREVENTION SERVICES OFFERED AT HEALTH FACILITIES

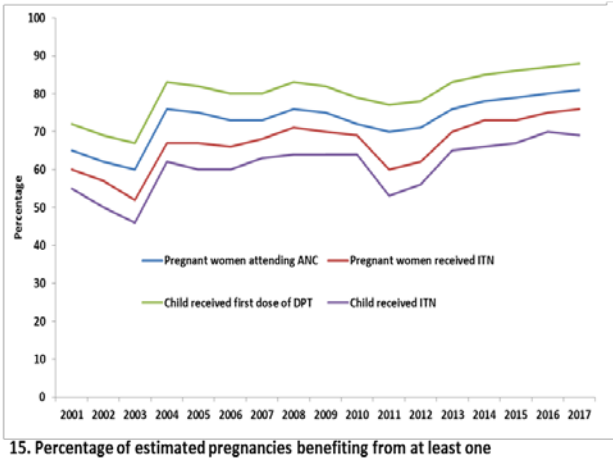
Purpose

In burden reduction settings, two malaria prevention activities are usually offered at health facilities:

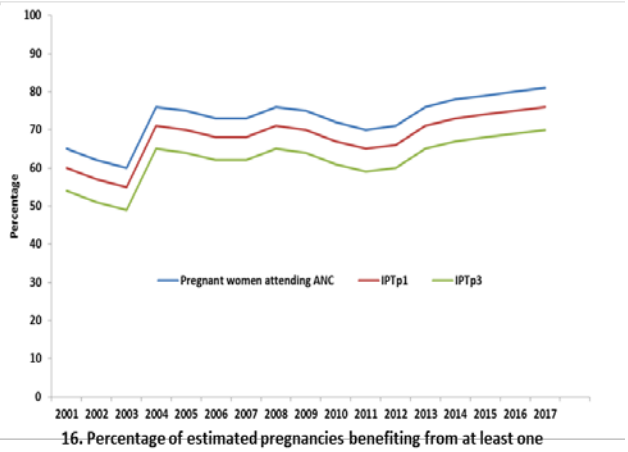
- Distribution of long lasting ITNs to pregnant women and to caretakers of infants; and
- Administration of SP to pregnant women as IPTp. In all areas with moderate to high malaria transmission in Africa, WHO recommends that IPTp is given at each scheduled antenatal care visit after the first trimester (and until the time of delivery), provided that the doses are given at least one month apart.

Analysis

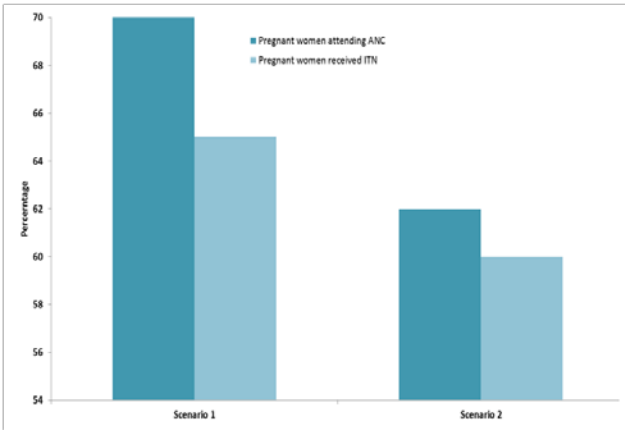
13. Month-to-month trend in coverages: ANC1, DPT1, ITNs to pregnant women and ITNs to infants, last 12 months



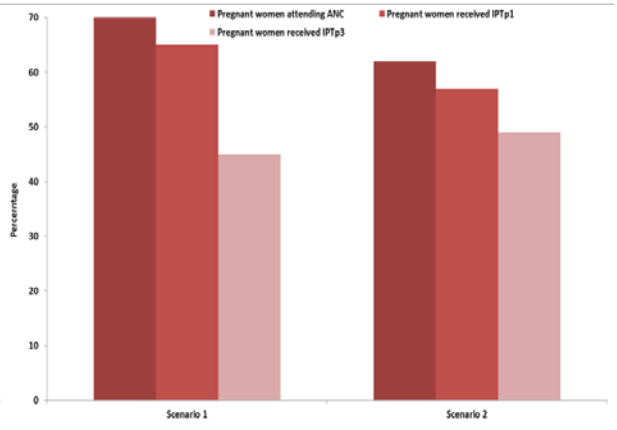
14. Month-to-month trend in coverages: ANC1, IPTp1 and IPTp3, last 12 months



15. Percentage of estimated pregnancies benefiting from at least one ANC visit and receipt of an ITN, previous year, by geographic region



16. Percentage of estimated pregnancies benefiting from at least one ANC visit and receipt of 1, 2 and 3 doses of IPTp, previous year, by geographic region



Considerations/issues for interpretation

Choice of a denominator when calculating coverage

For calculating coverage of antenatal care interventions (IPTp and net distribution), the usual denominator is either estimated pregnancies or estimated live births in areas at risk of malaria (i.e areas where IPTp is recommended). For calculating coverage with net distribution to caretakers of infants, the usual denominator is the number of surviving infants (= live births – infant deaths) in areas at risk of malaria.

Measuring missed opportunities

The drop in coverage between ANC 1 and IPTp 1 measures missed opportunities for delivery of IPTp to women who attended their first ANC visit[2]. Likewise, coverage with net distribution to pregnant women or coverage with net distribution to infants can be compared to ANC1 coverage and DPT1 coverage respectively to assess whether opportunities are being missed for these interventions.

Women receiving regular antenatal care, can be given 4 or more doses of SP. However, because the coverage of just two doses is still low in many countries, malaria control programmes may choose to track the progress in the proportion of women who receive at least 3 doses.

IPTp coverage estimates based upon routine health data can be compared to coverage measured through population-based surveys such as DHS, MICS and MIS. If IPTp coverage has recently increased, this may not be reflected in the most recent survey estimates which represent coverage from several years earlier.

[2]If a significant percentage of pregnant women first attend ANC clinic during their first trimester (at which time a pregnant women is not eligible for IPTp), a more appropriate comparison may be that between ANC 2 coverage and IPTp1 coverage.

MONITOR TREATMENT AND CASE MANAGEMENT OF MALARIA

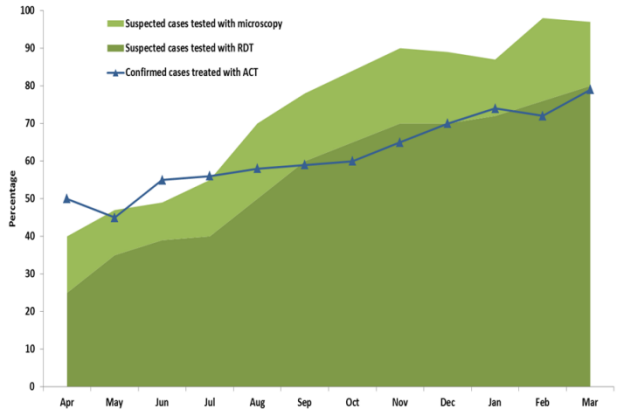
Purpose

Two indicators can be monitored routinely to monitor the quality of malaria case management:

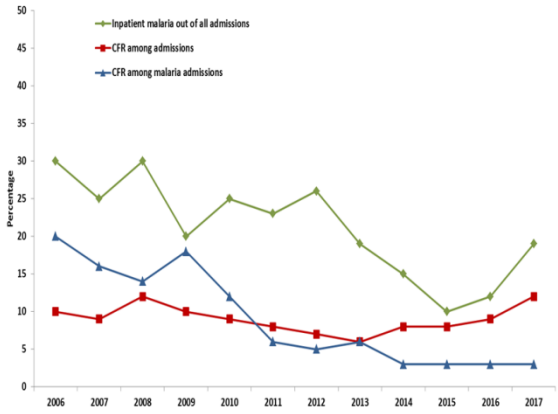
- The percentage of confirmed malaria that is treated with ACT;
- Inpatient malaria case fatality.

Analysis

17. Month-to-month trend in % of confirmed cases treated with ACT, last 12 months



18. Month-to-month trend in the inpatient malaria case fatality rate



Considerations/issues for interpretation

Percentage of confirmed cases treated with ACT

Not all health information systems are able to generate reliable data on the % of confirmed cases treated with ACT. It is not sufficient to record total ACT treatments given and compare with the number of positive cases since it is possible that some patients who were given ACT were test negative and others were untested but suspected cases. Reporting on this indicator should be possible if the register and the form for reporting aggregate data on each parasitological test result (test positive, test negative, not tested) disaggregate the data for each of these classifications into those given ACT and those not given ACT. Some countries have designed their general outpatient register and their general outpatient report to capture such data. Other countries have elected to introduce a separate register and a separate form for this. Gaps in such reporting may prevent the indicator from being calculated correctly.

Monitoring inpatient malaria case fatality

The inpatient malaria case fatality rate (CFR) can vary based upon numerous factors, some of which are beyond the control of the inpatient facility providing the treatment: patients age, immunity to malaria, nutritional status, level of parasitaemia, duration since onset, pre-referral treatments, clinical presentation (cerebral malaria, severe anaemia, metabolic disturbances,…), etc… For this reason it is difficult to interpret levels and trends in inpatient case fatality. A sudden spike in the malaria inpatient CFR could represent a change in the inpatient quality of care and/or a change in the patient mix. Any substantial change in such an indicator warrants further investigation.

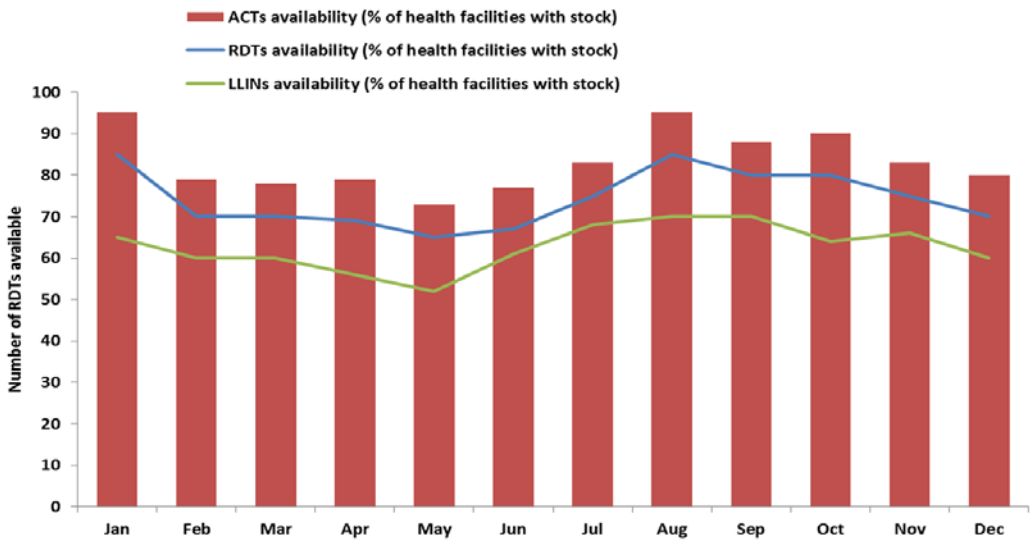
MONITOR STOCK OUTS OF MALARIA COMMODITIES

Purpose

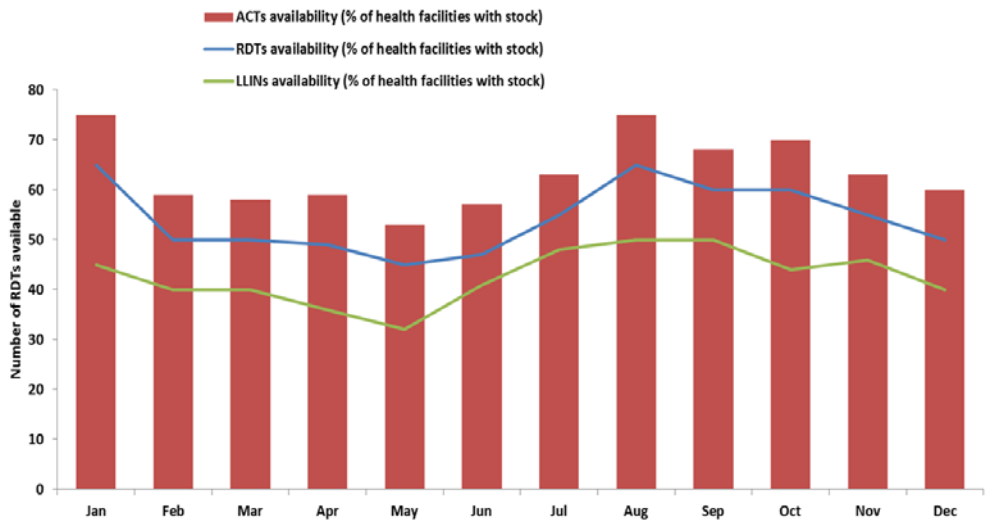
Availability of essential commodities (ITNs, anti-malarials and laboratory supplies) is a pre-requisite for malaria control activities. At least the minimal data on stock outs should be available to those analysing and interpreting other health data. In many cases, a separate information system may be used to collect and manage the full set of data required for stock management. Data from such a "logistics management information system" (LMIS) may not be integrated with the core health management information system and may not be available to those analysing and interpreting other health data. In such a case, one solution is to add to monthly aggregated reporting forms the data elements required for monthly reporting on stock outs of tracer commodities. As an alternative, where there is a well-developed but separate LMIS, data on stock out as well as data on net consumption of commodities can be exported from the LMIS to be used by those analysing and interpreting other health data

Analysis

19. Nationwide trend over recent year in Full availability of malaria control commodities



20. Provincial trend over recent year in Full availability of malaria control commodities



Considerations/issues for interpretation

Definition of full availability

Full availability is absence of a stock out during the period. A stock out might be defined as 7 days or more (not necessarily consecutive) of stock-out in a given period, usually 3 months. This may depend on the strength of the supply system. A period of 7 days may be too long for countries with very good systems of supply as the indicator may not reveal any health facilities having stock-outs. Such countries could select a lower threshold of 1 or 3 days of stock-out. However, low thresholds may not be useful where brief stock-outs are common.

ACTIVE CASE DETECTION (ACD) SURVEILLANCE

Purpose

The aim of the elimination phase is to stop local transmission of malaria, in contrast to the burden reduction phase, during which the objective is to reduce the number of cases to low levels but not necessarily interrupt local transmission. In the elimination phase of malaria control, cases occur sporadically or in distinct foci. The objective of a malaria surveillance system in the elimination phase is to detect majority if not all malaria infections, whether symptomatic or not, and ensure that they are radically cured so early that they do not generate secondary cases. PCD is therefore supplemented with ACD so as to achieve these objectives. ACD is the detection by health workers of malaria cases at community and household level, sometimes in population groups that are considered to be at high risk. ACD can be conducted as fever screening followed by parasitological examination of all febrile patients, or as parasitological examination of the target population without prior fever screening.

ACD is further classified into proactive case detection (PACD) and reactive case detection (RACD). PACD is undertaken in populations that have limited access to facilities, inadequate health-seeking behaviour or in high risk groups (e.g. remote and/or migrant populations, refugees, armed forces, forest workers, long distance drivers). PACD is not prompted by an index case and is done regularly at specific times (mainly during transmission season) to confirm the existence of active local transmission in target populations and to detect cases early.

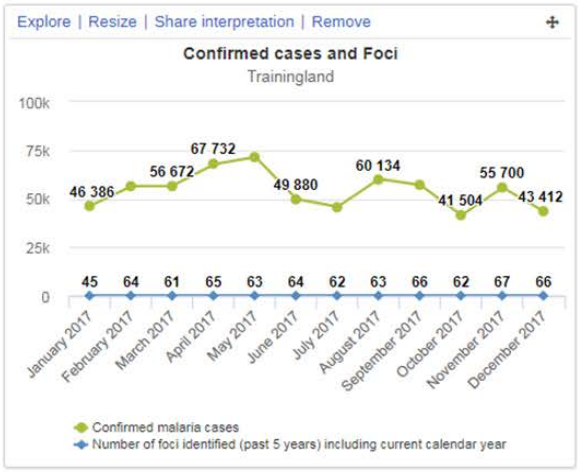
RACD, on the other hand, may be undertaken in response to an index case. An 'index case' is one whose epidemiological characteristics trigger additional ACD in which a household or a population potentially linked to such cases is tested or screened for symptoms and tested before treatment. Index cases are usually seen at a health facility. ACD for *P. vivax* and *P. ovale* malaria may still miss a substantial proportion of cases because hypnozoites cannot be detected with current testing methods. Since the majority of relapses occur within the first three months of infection with *P. vivax* and *P. ovale*, it is advisable to combine RACD with PACD conducted at appropriate intervals, especially across the peak transmission seasons.

Case investigation- This is a requirement in elimination settings when case are very few (for example ≤3 case per investigation team per week). The aim of the investigation is to determine whether if an infection was acquired locally and where, and therefore whether there is ongoing indigenous local malaria transmission or factors that may lead to onward transmission. Cases are either identified passively (reported by health facilities) or actively (by specialized community-based health workers in population groups that are considered to be at high risk). Each confirmed case is immediately notified to district, provincial and central levels. A full field investigation of each case is then undertaken (ideally within 1 to 2 days) to determine whether it was imported, acquired locally by mosquito-borne transmission (introduced, indigenous, relapsed) or induced. The investigating team consists of the district-level malaria focal point, a skilled laboratory technician, epidemiological and entomological staff from intermediate or central levels and local health facility personnel. The presence of indigenous and/or introduced cases indicates active transmission. Thus case investigations identify all f*oci* with local transmission of malaria.

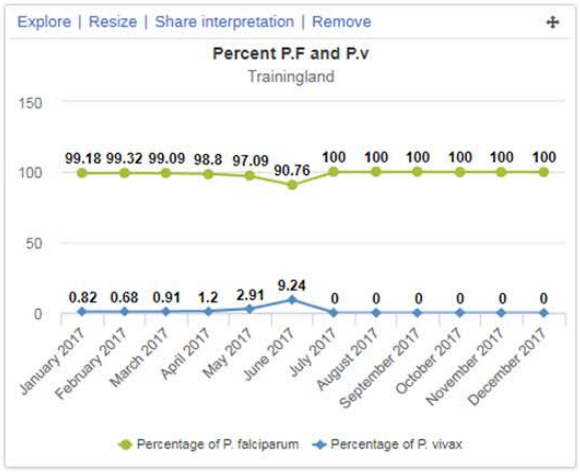
Focus investigation – A focus is defined as a circumscribed area situated in a currently or formerly malarious area that contains the epidemiologic and ecological factors necessary for malaria transmission. Focus investigation is a requirement only in elimination settings when transmission remains in few definable areas. However, it could be important in areas of generally very low transmission where residual foci of high transmission persist despite intensive intervention coverage. The focus investigation identifies the main features of the location, including the populations at greatest risk, the distribution of vectors responsible for transmission, and when transmission occurs.

Analysis

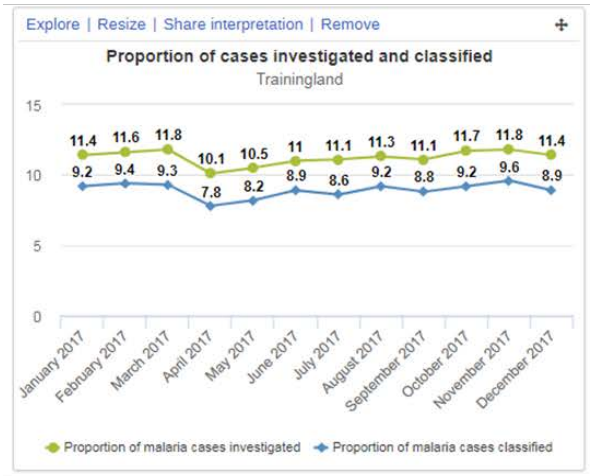
21. Annual trend in the number of foci identified and the number of confirmed malaria cases.



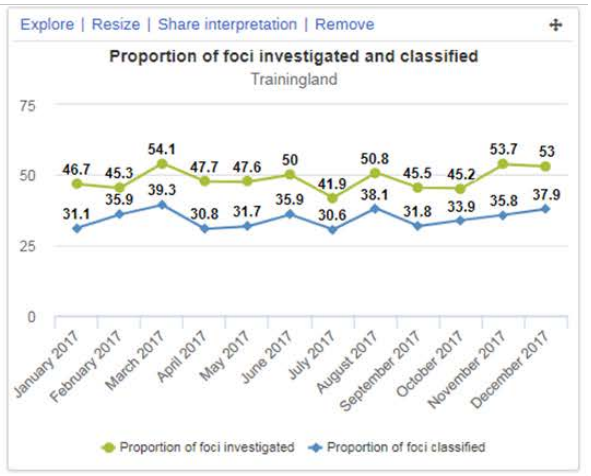
22. Annual trend in the percentage of confirmed cases by species (*P. falciparum* versus *P. vivax)*



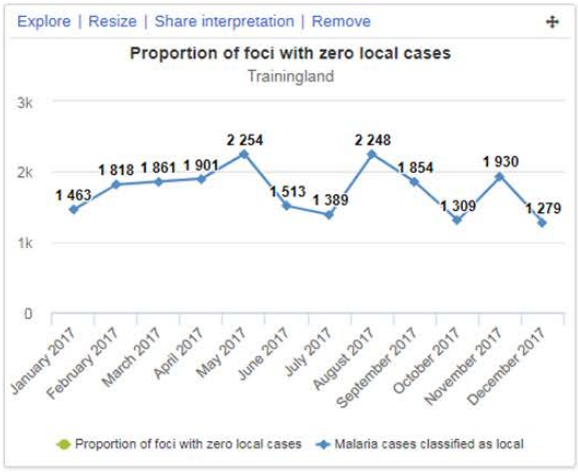
23. Annual trend in the proportion of cases investigated and proportion of cases classified



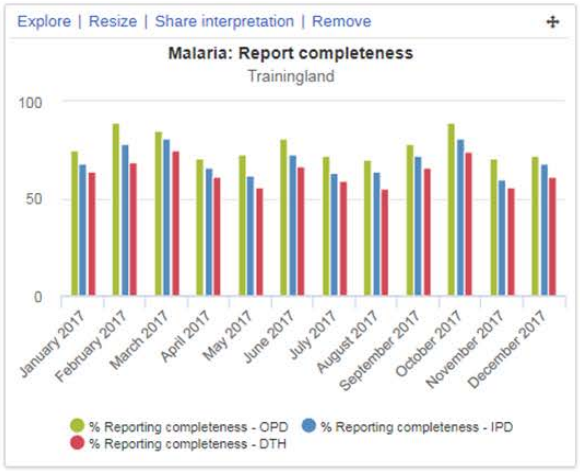
24. Annual trend in the proportion of foci investigated and proportion of foci classified



25. Annual trend in the proportion of foci with local cases and the proportion of foci with interrupted transmission



26. Annual trend in the completeness of facility reporting of malaria outpatient cases, malaria inpatient cases and malaria deaths



Considerations/issues for interpretation

Percentage of cases due to *P. falciparum* and *P. vivax*

In areas in which more than one species of Plasmodium is present, when control measures are intensified, the proportion of cases due to *P. falciparum* may decrease. *P. vivax* appears to respond less quickly to control measures because it can tolerate a wider range of environmental conditions and because the dormant liver stage (hypnozoite) enables infections to persist in the absence of mosquito transmission.

Targets for the annual blood examination rate of each focus

For active and residual non-active foci, managers should consider the indicative target to be 10% of the population in the focus. The surveillance work of staff at the primary level should be seen as service provision and not be quota-driven. An operational emphasis on annual blood examination rate targets could obscure the main objective, which is to ensure that any ongoing local transmission of malaria is detected in a timely manner.

Target for case investigation

100% of cases should be fully investigated (including completion of the case investigation form). Case based reporting is the initial stage of case investigation. Confirmatory case investigations at the community should only start when cases are very low, e.g. ≤3 cases per investigation team.

Target for foci investigation

100% of foci should be fully investigated (including completion of the malaria focus investigation with findings from an entomological investigation) and registered (on register, with maps of each focus). The case investigation of index case in the community and subsequent ACD are part of focus investigation. Focus investigation may also be done without a case investigation or ACD to determine the cause of transmission including entomological, ecological or intervention coverage and quality.

Timeliness of malaria testing, malaria treatment and notification

Testing and treatment should be provided within 24 hours of the onset of symptoms. Notification should take place on the day of diagnosis. Community level case and foci investigations should take place preferably in 3 and 7 days respectively.

Annual quality assurance of malaria testing laboratories

Each year, all malaria testing laboratories should have all positive slides and 10% of negative slides sent for retesting. In addition, staff of each laboratory should pass an annual blind proficiency test each year. Staff supervision in the use of both microscopy and RDTs should be undertaken at least annually.

5. Data limitations

Malaria test positivity rate

Malaria test positivity rate measures the prevalence of parasitaemia among persons with signs and symptoms of malaria. Test positivity rates are less sensitive to changes in reporting rates, diagnostic practices and health facility utilization rates than trends in confirmed cases or incidence rates (because data that are changing are excluded from both the numerator and denominator). It can be tracked monthly at each health facility, even without knowing the size of the catchment population. For these reasons, malaria test positivity they may be more helpful in identifying areas in which malaria transmission is most intense than malaria incidence rates (which require estimation of the catchment population and are particularly affected by the accessibility and use of health facilities as well as reporting rates).

In some settings, test positivity rates have decreased from 30–60% to < 10% in response to control measures implemented in the previous 2–3 years. Test positivity rates can vary by season, and the peak test positivity rate seen during a year might be quite different from the annual average.

Malaria test positivity rates are not immune to distortion. For example, test positivity rates can increase if parasitological diagnosis has been extended to populations living in more intense transmission areas where testing was not available previously. As another example, test positivity rates are reduced if results are included from routine screening such as during antenatal visits. Attention should also be paid to the quality of diagnostic testing and potential changes over time; in some health facilities, poor-quality microscopy can lead to considerable over-diagnosis of malaria. Depending upon the type of RDT, rapid diagnostic test results may remain positive for days to weeks after successful treatment with an anti-malarial. For this reason, it is standard practice to report RDT test positivity rates separately from microscopic positivity rates.

Percentage of cases due to *P. falciparum*

In areas in which more than one species of Plasmodium is present, when control measures are intensified, the proportion of cases due to P. falciparum may decrease; *P. vivax* appears to be respond less quickly to control measures because it can tolerate a wider range of environmental conditions and because the dormant liver stage (hypnozoite) enables infections to persist in the absence of mosquito transmission.

What percentage of all deaths are reported by health facilities?

To gain an impression of the completeness of reporting of deaths by health facilities, malaria programs should compare the total number of deaths reported by health facilities with the total number of deaths expected to occur in a country or area, by age group (<5 versus ≥5)[3]. Of course the completeness of reporting of malaria deaths may differ from the reporting of deaths overall.

Case investigation of malaria admissions and deaths

Even during the initial phase of malaria burden reduction, it is recommended that each severe malaria case and death be investigated at health facility level, with the support of district staff, to identify and address programme weaknesses (such as poor coverage with ITNs, delays in seeking treatment, stock-outs of antimalarial medicines and sub-optimal inpatient care). In addition to the aggregate data that is reported to district and higher administrative levels, line lists of inpatients and inpatient deaths should be forwarded to district level, and, when caseloads and district capacity permit (for example, <150 patients per district per month), lists of all confirmed cases should be submitted monthly.

[3] "Life tables" with estimates of age-specific mortality rates by country can be accessed from http://apps.who.int/gho/data/node.main.687?lang=en

Assess the consistency of data on malaria testing

The health worker who performs and reports on a laboratory test is typically different from the health worker who performs and reports on diagnoses. Reporting is often done on separate forms. This separation of duties can lead to inconsistencies in the reported data. Now that heavy emphasis is being placed on laboratory confirmation of malaria, malaria control programs are confronting this challenge. At present, however, inconsistencies may remain. For this reason, it is important for the analyst to review the quality and the consistency of the malaria testing data. For example, the fully disaggregated data set may include a number of monthly reports for which the number of confirmed cases of malaria differs markedly from the number of positive malaria tests. If necessary, clearly inconsistent data may need to be omitted or imputed.

There is no target for the ABER

Unlike the malaria diagnostic testing ratio (for which the target is 100%) there is no set threshold or target for ABER. While some past guidance suggested that the annual blood examination rate should be in the region of 10% in order to provide reliable trends, the empirical evidence for such a target is not strong. In high-transmission settings, the rate is likely to greatly exceed 10%. Rather, it is the trend in ABER that is informative.

When calculating the ABER and the diagnostic testing ratio, some tests are not counted

Patients tested by both RDT and microscopy should be counted only once (as tested by microscopy). Admitted patients that have multiple tests should be counted only once. Count only cases found by passive case detection - patients identified by active case detection and screening tests performed regardless of symptoms (e.g. at antenatal clinics) should be excluded.

Disaggregate the diagnostic testing ratio

Ideally, the indicator should be calculated for both public and private health facilities as well as for patients seen by community health workers (although data from community health workers should be distinguished from data from public health facilities when reported).

World Health Organization
20, Avenue Appia
1211 Geneva 27
Switzerland