RBM Partnership To End Malaria

Monitoring and evaluation of malaria-related routine data during the COVID-19 pandemic

June 2020

Background

Routine disease surveillance will be critical for monitoring where malaria control, elimination and prevention of re-establishment efforts may be faltering during the pandemic as well as where COVID-19 may be spreading. Monitoring and evaluating key routine health indicators will help address key questions including:

- How are the systems that diagnose, treat, and report malaria being affected by COVID-19?
- Are unusual changes in malaria incidence occurring? If so, are these changes influenced by COVID-19?
- Are non-malaria fevers, which may be attributable to COVID-19, increasing?
- Are lessons being learnt that may inform short, medium, and long-term actions for malaria surveillance?

Most countries already have such systems in place and are regularly monitoring the situation. Leveraging existing systems to monitoring a set of disease indicators throughout the pandemic will help countries better understand whether malaria case management services continue to operate, where disruptions to service provision or care seeking may have occurred, where unexplained fevers could potentially be due to increased incidence of COVID-19 or other febrile diseases, where both COVID-19 and malaria may be circulating, and what actions may be put in place as a mitigation plan.

Approach

There are four main steps to answer these questions.

Step 1: Continuing to monitor key malaria (or malaria related) indicators to assess where disruptions to access to care and to health service provision may be occurring, where malaria control, elimination or prevention of re-establishment may be faltering, or where COVID-19 may be spreading.

Most indicators (Table 1) should already be monitored through routine health systems, although some may not always be collected and/or available in every country. The sources (and quality) of data for the indicators may vary but usually exist through a monthly reporting system (e.g., Health Management Information System - HMIS), weekly reporting system (e.g., Integrated Disease Surveillance and Response - IDSR), or program activity reports. Some new data reporting systems may have been established for COVID-19 specifically and may provide valuable information to help interpret the malaria metrics (e.g., febrile cases may not be currently collected in HMIS or IDSR but may be in new COVID-19 specific systems, or they may be collected but not properly reported yet).

Most of these indicators should already be monitored and can continue to be monitored in the absence of major COVID-19 disruptions. Under the scenario of major disruptions in health services within a COVID-19 emergency response, however, it may not be feasible to collect some of the indicators. For example, an indicator may not be available (due to a lack of reporting) or may be less relevant (if programs shift to treatment of presumptive cases). Despite these challenges, maintaining the indicators as part of ongoing data collection efforts throughout this period is important.

When health services and the reporting system(s) are operational again, key indicators to monitor will include health facility reporting and form completeness to provide insights into the feasibility of leveraging routinely collected data. Working with partners and documenting when and where these disruptions start will help in data interpretation in the short and long term.

Table 1: Key routine malaria-related indicators

Dimensions of change	Potential malaria-related indicators[1]	Impact and interpretation[2]	Relevance of the indicator during COVID-19 disruptions
Availability of commodities: Consider the Laboratory Management Information System - LMIS as a data source if available in the country.			
Availability of essential malaria commodities Evaluate whether rapid diagnostic tests (RDTs) and malaria medicines/drugs continue to reach points of care, or whether COVID-19 has affected supply chains.	Percentage of facilities that had a stockout of commodities in the last reporting period. Percentage of community health workers (CHWs) who had a stockout of commodities in the last reporting period, by type of commodity.	If there are stockouts, case management may be impacted (due to low testing) and may result in an increase in malaria cases (due to stockout of treatment) and/or increase in reporting of clinical/suspected malaria cases. Root causes for commodity stockout may involve different levels of the supply chain: - Lack of supplies at the manufacturer level. - Procurement of commodities from out of the country being impacted by overseas COVID-19 policies and lockdown procedures. - Disruption in distribution (e.g., transportation	If points of care stop collecting or reporting indicators because of COVID-19 disruptions, then CHW/facility-level stockout information will not be available and other sources of data will be necessary (e.g., procurement data).

[1] Specific indicators may vary between countries, and they may not be collected routinely in current health or disease information systems. Further guidelines and lists of indicators are available in *Malaria Surveillance, Monitoring & Evaluation: A Reference Manual* (Geneva: World Health Organization; 2018).

[2] Guidance on exploring temporal trends (i.e. whether the indicators increase or decrease over time) is provided in Step 2 below "Analyzing and interpreting the indicators."

		restrictions are impacting deliveries). - Supply chain work force is not fully mobilized or is hindered. - Increase in demand not forecasted (e.g., diagnostics also used for differential diagnosis for COVID-19).	
Uptake of health care services: Age-specific and sector (public, private, community) disaggregation is critical in this context.			
Health-seeking behavior and access to health care services Monitor whether all-cause health care utilization is decreasing (or increasing) as a consequence of COVID-19 interventions, disruptions, or epidemiology.	Outpatient number disaggregated by age group, by sector (public, private, community), and by lowest administration level.	Outpatient department (OPD) attendance increase, particularly for fever or influenza-like illness symptoms, could suggest an increase in the number of cases due to COVID-19 and/or malaria. Disaggregate by age to determine if the malaria incidence or test positivity rate difference is true across all age groups. A decrease in OPD attendance could also mean a shift towards care by CHWs or self-care at home because of safety concerns or fear, government policy (stay-at-home orders), lack of health care workers in facilities, confusion about service delivery with a stay-at-home order, disruptions to public transportation systems, early COVID-19 messaging encouraging	If OPD attendance decreases, there will likely be a decrease in total malaria cases tested, treated, and reported.

		people with fevers to stay at home, etc.	
Reporting: Information system (source may be HMIS, IDSR, or other).			
Data quality: reporting from facilities and other points of care Monitor the trends in reporting rates to evaluate whether the health system continues to function.	Number (percentage) of facilities (or other points of care) that submit reports within the required deadline. In elimination settings the number (percentage) of cases that have been notified within required time, as per country protocol	Low reporting (notification) rates may impact reported malaria metrics (e.g., number of malaria cases, which may falsely appear to be lower) and bias their interpretation, leading to inadequate conclusions on the malaria situation. This can also be an indication that health care and surveillance workers are not coming to work due to perceived COVID-19 exposure risks and/or lack of personal protective equipment (PPE).	If points of care stop collecting or reporting indicators because of COVID-19 disruptions, then other sources of data will be necessary. It will be important to create linkages with the COVID-19 response team to determine if reporting on malaria testing is occurring through another data flow sequence.
Data quality: form completeness Monitor the trends in completeness rate of forms from health facilities or other points of care.	Percentage of forms that are completed.	Low completeness and or investigation rates may impact the quality of the reported malaria metrics (e.g., key information may be missing) and bias their interpretation, leading to inadequate conclusions on the malaria situation.	If completeness (and case investigations) are too low in a specific area or from specific health facilities due to COVID-19 disruptions, then interpretation of other metrics will be limited and other sources of data would be necessary. In elimination settings, it becomes difficult to classify cases without complete case investigation. Interim case investigations could
Data quality: case investigation and classification Monitor the trends in completeness of case investigation and case	In elimination settings - percentage of cases that are investigated and classified		

classification			be done through phone call where possible.
Outcome: Case management Age-specific and urban/rural disaggregation is critical in this context.			
Testing Monitor the quality of case management services.	Number of malaria tests performed. Testing rate: Number of malaria tests out of number of fever and/or suspected cases of malaria.	If testing rates in normal clinic flow decrease, it may be difficult to see patterns of non-malaria fevers. Low testing rate may be the consequence of stockout of commodities (or of PPE to safely perform the tests) and/or of low health care utilization (e.g., fewer people with fevers are seeking care due to COVID-19 messaging). An increase in testing may reflect an increase in suspected malaria cases (i.e. febrile cases) linked to an actual increase in malaria cases, COVID-19, or any other febrile illness. In an area with COVID-19 there may be malaria-positive patients who would normally not have shown clinical signs.	There may be no testing done because of stockouts, lack of PPE for health care workers, or changes in testing guidelines, in which case the denominator of some indicators (e.g., treatment and incidence) will include clinical malaria cases or will not be estimated (e.g., test positivity rate). Key secondary indicators could be used for interpretation (e.g., changes in number of suspected/clinical cases).
Treatment Monitor the quality of malaria case management.	Number of malaria cases treated out of the number of confirmed malaria cases diagnosed and/or of suspected and “clinical” malaria cases.	Treatment may be impacted by supply chain challenges or changing treatment practices at points of care or low health care utilization. Low treatment rate may eventually impact malaria trends (e.g., increased malaria	The denominator may include suspected malaria cases if confirmatory tests are not available and/or used. Monitoring the proportion of malaria cases treated without

		transmission). High rates of treatment may be observed in the absence of malaria diagnosis due to a potential increase in the presumptive treatment of any suspected malaria/febrile cases.	confirmation could inform any changes in practice due to COVID-19.
Preventive treatment (intermittent preventive treatment in pregnancy [IPTp]) Measure whether pregnant women are still receiving appropriate care.	Proportion of pregnant women who received three or more doses of IPTp.	Decrease may be due to challenges around commodity stockout or decreased antenatal care (ANC) visits (e.g., clinic curfews under government COVID-19 policies).	As first ANC visit attendees are often used as the denominator for measuring IPTp coverage, tracking trends in ANC attendance is essential. If COVID-19 disrupts attendance, the estimated IPTp coverage will be affected.
Impact: Malaria trends Age-specific and urban/rural disaggregation is critical in this context, including vulnerable groups if possible.			
Malaria incidence Measure changes in malaria trends.	Number of confirmed outpatient diagnoses of malaria out of estimated total population of areas at risk of malaria.	An increase may show an increase in malaria transmission and/or the presence of malaria outbreaks due to challenges in malaria care services and preventive measures. A decrease may be due to lack of reporting or a drop in transmission or a drop in care seeking due to lock down measures and more time spent at home.	This indicator may include clinical malaria cases in situations where confirmatory tests are not available and/or used, and thus could be spuriously high. The new numerator will be the number of total outpatient diagnoses of malaria (disaggregated by confirmed and clinical).
Test positivity rate Measure changes in malaria trends.	Number of positive tests out of the total number of malaria tests.	May be a useful measure to show if malaria is increasing in a certain region, assuming testing practices have not been affected (e.g., a	This indicator will not be measured if no tests are performed because of COVID-19 disruptions.

		decrease in the denominator may lead to an increase in test positivity rate, and vice-versa). An increase in test positivity rate may suggest a failure of malaria control measures; alternatively, an increasing fever rate in the absence of an increasing test positivity rate might suggest that fevers are occurring due to COVID-19.	
Trends in febrile illnesses Measure changes in febrile cases trends; may show increases in malaria or COVID-19 or any febrile illnesses.	Number of fever or suspected malaria cases.	Could be proxy indicators of illness (e.g., increase in febrile cases may be due to malaria, COVID-19, or other causes) and should be interpreted against other indicators (e.g., test positivity rate). Shifts in age patterns to older individuals could suggest a non-malaria cause(s).	
Trends in hospitalizations Measure changes in total hospital admissions; may show increases in malaria or COVID-19 (or other illnesses) and may indicate excessive burden on health system.	Number of hospitalizations, or number of patient-days in hospital.	Large increases may indicate that the health system is overwhelmed. Could be proxy indicators of severe illness due to malaria or COVID-19 (or other causes) that warrants further investigation of the causes.	

Step 2: Analyzing and interpreting the indicators.

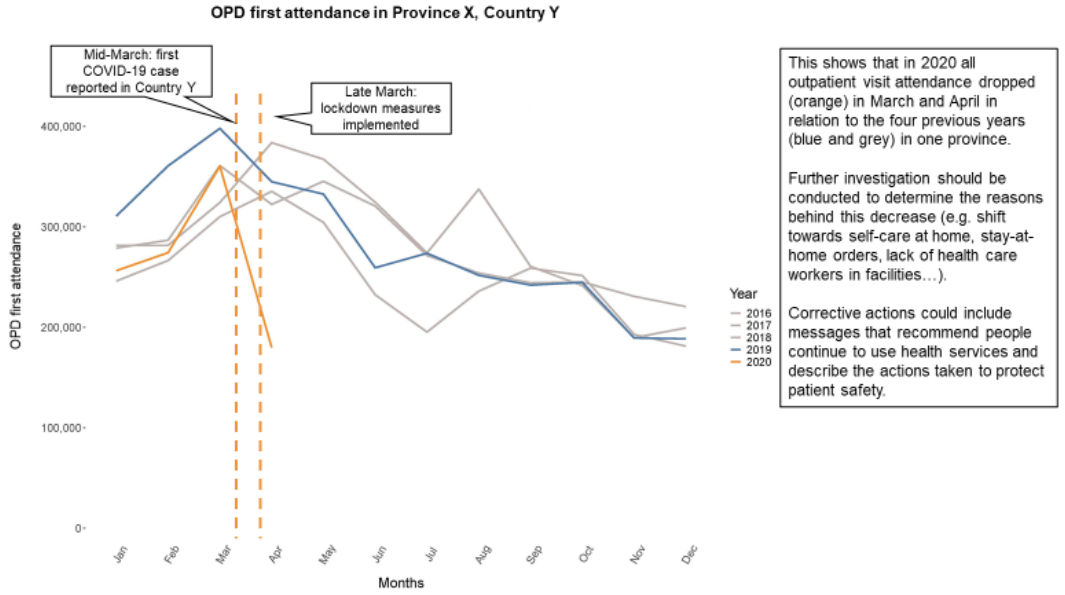
These indicators should be interpreted together to understand the impact of COVID-19 on malaria care and preventive services and epidemiology. Further guidance can be found on the Analysis and Use of Health Facility Data page of the World Health Organization (WHO) website.

There are a few factors to consider:

- **Spatial resolution level**: These metrics should be monitored together at a disaggregated level; district or facility level will be most useful for identifying problems in specific geographic regions.
- **Frequency**: These metrics should be monitored together on a monthly or weekly basis depending on the frequency of reporting in the system and compared against historical data from the same time of year (over at least three prior years) to detect any unusual changes in malaria epidemiology or case management patterns.
- **Disaggregation levels**: Indicators should be monitored at different levels including the following disaggregation factors: age, urban/rural, and point of care (e.g., community vs health facility). Further suggestions are provided in Table 1.
- **Point of care stratification**: Further analysis should be performed at the point of care level to identify which ones may be driving the observed trends (e.g., OPD decline, fever case increase, confirmed malaria case increase…) and target the response to the points of care of major importance (e.g., those with high number of outpatient).
- **Quality of the data and limitations**: Indicators should be estimated from high quality data that are complete enough (thresholds to inform whether data are high quality may vary from one country to another). Each indicator should also be interpreted against potential limitations (e.g., some infections may be asymptomatic and will not be reflected in febrile case trends). Trends can be interpreted from data of acceptable quality that is reported consistently.
- **Visualizations and analysis** should include temporal trends over a period of at least three years, by month, to compare seasonal changes. Ideally, these temporal trends can be automatically generated within accessible and user-friendly dashboards (e.g., within District Health Information System - DHIS2). **Anomaly detection algorithms**, as detailed in WHO's *Malaria Surveillance, Monitoring & Evaluation* reference manual, can help detect any significant increase and/or decrease in the monitored indicators. The observed trends may trigger further analysis to identify the factor(s) behind an increase or decrease of the indicator compared to previous years according to the disaggregation levels suggested above (e.g., low testing rate would require exploring availability and use of RDTs or whether there has been a policy shift to presumptive treatment).

Figures 1 and 2 show examples of visualizations of temporal trends and spatial patterns in malaria indicators: total outpatient visits (OPD) and test positivity rate (TPR). These have been generated both as line graphs compared with other years as well as a heat map showing the gradations of the changes. The observed temporal trends within and across geographies should be overlaid with the timelines of COVID-19 interventions (e.g., lockdown) and/or potential disruption (e.g., RDT stockout) for interpretation.

Figure 1: Examples of temporal and spatial trends in malaria indicators OPD first attendance



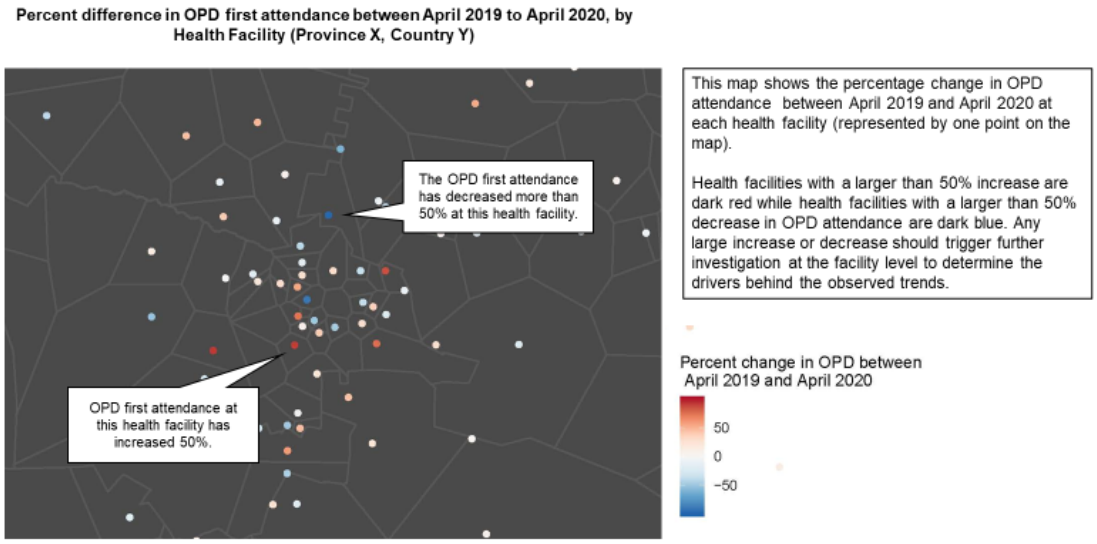
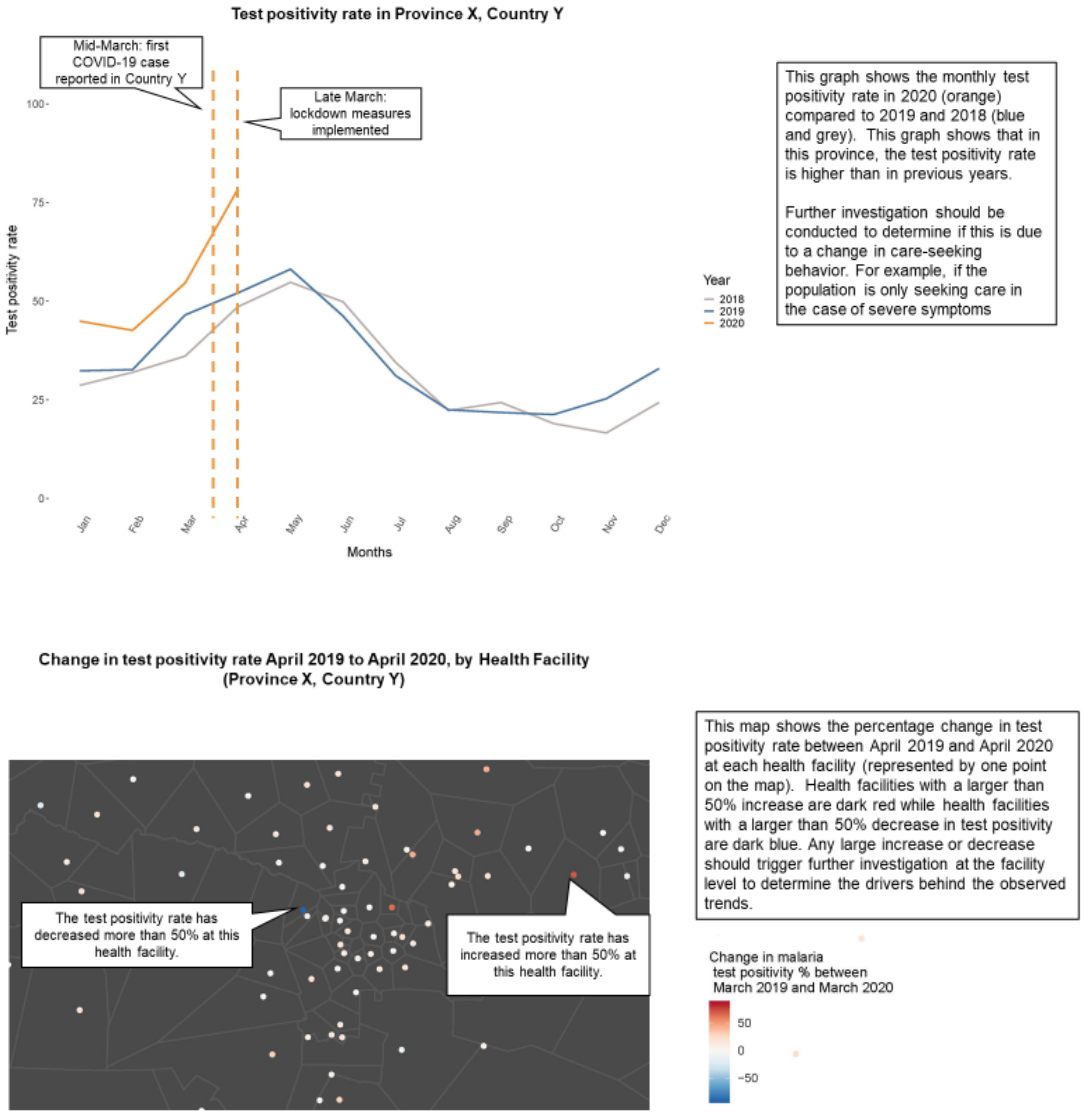


Figure 2: Example of temporal trends in test positivity rate during COVID-19 restrictions



Step 3: Understanding the context around the interpretation of key malaria indicators.

This would include tracking any structural changes or disruption due to COVID-19 that will directly impact malaria programs and policies, including:

- **COVID-19 interventions:** Are/were lock-down measures and travel restrictions put into place, since when/for how long, are/were these deployed in specific areas only or nationwide? How well are/were they respected? Measures may impact the malaria situation negatively (e.g., people would be less likely to seek care) or positively (e.g., people staying at home because of curfew or lock down may be less exposed to mosquito bites in geographies where vectors bite mainly outside and/or where people may be more receptive to media campaigns).
- **Health care utilization:** Are/were policies put into place that could directly impact health care utilization (e.g., access to health care for routine non-emergency situations is prohibited or disincentivized).
- **Malaria surveillance**: Are/were policies put in place that could impact reporting of malaria data (e.g., changes in fever case management such as changes in diagnostic algorithm for malaria), sharing of information (e.g., lack of transparency), investigation of cases (e.g., change to interviews by phone rather than in person) or analyzing the information (e.g., data review meetings cancelled because gatherings are prohibited).
- **Disruption in malaria prevention campaigns** (e.g., seasonal malaria chemoprevention or vector control interventions such as indoor residual spraying or insecticide-treated nets) and/or in **delivery of care in the community** (e.g., testing and treatment provided by community health workers): *Corresponding trackers of COVID-19 impact may already exist and will help interpret the routinely collected metrics*.
- **Other factors:** For example, the spread of COVID-19 impacts economic activities, which may trigger movement of economic migrants and consequently affect access to routine health care services.

Interventions along with changes in policies and guidelines may explain and/or influence trends in service delivery, case management, and reporting practices and will provide the foundation to interpret the key malaria indicators already collected in current health information systems as detailed in Step 1. There may be additional indicators not routinely collected through current systems that would provide valuable context around the interpretation (e.g., availability of human resources to understand if there are enough health workers to provide services at facility or community level, report cases, conduct supervision visits, and monitor disease trends).

Figures 1 and 2 describing TPR and OPD attendance could be analyzed together to investigate possible changes in malaria during COVID-19. This two by two table describes possible interpretations when examining the relationship between OPD visits rise or decline and changes in TPR.

Indicator direction	OPD visits rise	OPD visits decline
TPR is higher than average	Do you have an outbreak of malaria?	Are people only seeking care when very sick?
TPR is lower than average	Are there other outbreaks with fever symptoms (possible COVID?)	Are people avoiding all care seeking?

Further contextual information, and other data sources would be important to identify the drivers behind the observed trends. For example, it would be important to these changes alongside stock-out data for these health facilities to ascertain first if changes in TPR are due to lack of available tests rather than underlying causes of fever and health seeking behavior. In addition, it would be important to analyze travel orders or local lockdown measures to interpret changes in OPD attendance. If stockouts have not been an issue, and guidance allows for travel to health facility, further investigation could follow patterns seen in the table above.

Step 4: Tailoring the actions to the observed malaria trends.

The potential actions detailed for each routine indicator will be specific to each country and each context. In general, the root causes driving the observed trends should be explored and addressed. Maintaining communication with health care workers at the facilities or within the communities and at different levels of the health systems (e.g., district malaria focal points) will be key to interpreting the observed pattern for each indicator and identifying possible actions. For example, low testing may be due to true stockout or it may reflect that data on stockouts are not reported. Any challenge with stockout of commodities should trigger an investigation into what level of the supply chain is affected (e.g., manufacturer level, international distribution, supply to health facilities) and whether the issue has an effect on all regions in a country or is geographically concentrated. Challenges in terms of data reporting may trigger a simplification of the surveillance workflows (e.g., decreasing numbers of indicators) and/or a supervision visit (potentially virtual) to the underperforming facilities or sensitization of the health staff to reporting. An increase in the number of malaria cases may trigger some reactive measures used to control malaria outbreaks. Actions may differ based on the COVID-19 response phases and also may vary across different geographies within the country. Table 2 provides detailed potential actions depending on observed trends. More information about actions can be found in *Tailoring Malaria Interventions in the COVID-19 Response* (Geneva: WHO; 2020).

Table 2: Potential actions following the monitoring and evaluation of routinely collected malaria data

Dimensions of change	Potential action
Availability of commodities	
Availability of essential malaria commodities (i.e., rapid diagnostic tests [RDTs] and malaria treatment)	If there are changes in availability, explore which level of the supply chain is affected and the root causes, and address them. For example: **If there is a shortage of RDTs in the country** ● Analyze whether the shortage is due to a greater demand and re-evaluate provincial/district restocking and forecasting. ● Keep records of where shortages of RDTs occur and for how long. ● The WHO provides guidance (*Tailoring Malaria Interventions in the COVID-19 Response*) on extraordinary measures that can be implemented under exceptional situations only (e.g., presumptive

Dimensions of change	Potential action
	treatment of fever). **If there is a shortage of ACTs in the country** ● Analyze whether artemisinin-based combination therapy (ACT) consumption is rising due to testing suspected COVID-19 cases for malaria. ● Determine whether provincial/district restocking and forecasting need to be addressed. ● Keep records of where presumptive treatment or shortage of ACTs occurs and for how long.
Uptake of health care services	
Health seeking behavior and access to health care services	Any increase in OPD attendance, particularly for fever or flu symptoms, should be communicated to the COVID-19 response team. If OPD attendance decreases, there will likely be a decrease in total malaria cases reported. COVID-19 communication campaigns should include messages to continue to use other health services and describe the actions taken to protect patient safety to ensure that those most vulnerable to malaria morbidity and mortality (for example, children under 5) continue to seek care. Note any shifts in case loads reported by community health workers. This could indicate a shift from health service utilization at the facility level to the community.
Reporting: Information system (source may be HMIS, IDSR, or other).	
Data quality: reporting from facility and other points of care (PoC)	A decrease in reporting rate or completeness may suggest deteriorations in the health system for which root causes need to be addressed (e.g., overburdened staff due to increased case reporting, health care workers not at work, and/or additional reporting responsibilities for COVID-19 lead to struggling to collect and report information). Specific actions may include: ● Adaptations to data flow: e.g., concentrate reporting on minimum essential indicators, potentially bypass some administrative hierarchies. ● Substitute/switch to mobile/electronic reporting if appropriate. ● Increase general awareness of the importance of reporting. ● Target PoCs that report less and are historically driving most of the patient case load with specific supervision and messaging around malaria reporting.
Data quality: form completeness	
Data quality: divergent data sources	The COVID-19 response team may set up reporting systems that are different in their frequency or reporting channels. If these reporting systems include malaria data, it should be incorporated into routine malaria data

Dimensions of change	Potential action
	reporting. ● Frequency should be checked and malaria data incorporated into the reporting period in which routine malaria data would normally occur. ● Any incorporated data should specify the source of data (e.g., COVID-19 field hospital). ● If reporting occurs at a health facility, the name of the facility should be incorporated in the data to capture the same spatial resolution as routine data. If specific COVID-19 facilities are performing the tests, their data should be mapped to the nearest health facility. ● All testing, including any that occurs in COVID-19 facilities, should include all routine indicators including signs of fever, number of tests performed, age categories, and test results.
Data quality: Completeness of case investigation and classification	Investigate why the cases do not have a classification, and if the reason is due to mobility restrictions or other disruption, determine whether investigations by phone would be feasible. Explore appropriate responses that may be implemented to prevent outbreaks.
Outcome: Case management Age-specific and urban/rural disaggregation is critical in this context.	
Testing	A low testing or treatment rate may trigger further analysis of the data, including: ● Identify PoCs with low testing or treatment rate. ● Explore whether low testing or treatment aligns with RDT stockouts or lack of access to health care. The actions should address the root cause of low testing or low treatment and be targeted to PoCs that drive most of the observed pattern (e.g., those with historically high patient case loads) and have weaker indicators, including: ● Low RDT or treatment availability will trigger similar action at the manufacturer or distribution level. It may include restocking PoCs with commodities that are available at provincial/central level. ● If there is a low uptake of RDTs or treatment (while commodities are available) sensitization and/or training (virtual) could be delivered to health staff on continuing proper case management. The low uptake may also be due to lack of personal protective equipment (PPE) for health care workers, which would prevent safe case management practices; in this case, PPE should be procured (if possible) and training provided on best practice for its use. ● If there is an issue with reporting of these indicators (which may explain any decrease), actions similar to the ones for the reporting indicators could be implemented.
Treatment	
Preventive treatment (intermittent preventive treatment in pregnancy [IPTp])	

Dimensions of change	Potential action
Impact: Malaria trends Age-specific and urban/rural disaggregation is critical in this context.	
Malaria incidence	An increase or decrease in malaria trends (incidence or test positivity rate) may have different causes and there may be multiple factors explaining the observed trends (Table 1). Each contributing factor and associated indicators (Steps 1 and 2: commodity availability, uptake of health care services, reporting, changes in case management practices, disruption in preventive malaria services) should be analyzed against the COVID-19 context (Step 3) to identify and address the root cause. For example, there may be disruption in distribution of nets, which may lead to an increase in malaria cases. Disruptions to vector control in eliminating countries might lead to outbreaks. Similarly, a lack of access to treatment may lead to an increase in the number of cases. The WHO provides guidance for the implementation of each of the core malaria interventions (vector control, case management, chemoprevention, and extraordinary measures such as mass drug administration) in *Tailoring Malaria Interventions in the COVID-19 Response*. The malaria program may set up a task force to gather additional evidence and decide on the appropriate response; any interventions implemented to alleviate COVID-19 disruptions should be documented.
Test positivity rate	
Trends in febrile illnesses	Any changes to this indicator should be communicated to the COVID-19 response team, and the appropriate response should be implemented according to country-specific COVID-19 response plans.
Trends in total hospitalizations	Any changes to this indicator should be communicated to the COVID-19 response team, and the appropriate response should be implemented to strengthen resources in affected areas and investigate etiology of illnesses according to country-specific response plans.

Acknowledgements

This document was initiated by a taskforce on Routine Malaria Data during the COVID-19 Pandemic as part of the RBM Partnership to End Malaria's Monitoring and Evaluation Reference Group. It was done in collaboration with the WHO COVID-19 – Malaria Workstream on Modelling, Surveillance and Clinical Epidemiology. The following taskforce members contributed as authors of this document: Abdisalan Noor (WHO), Arantxa Roca-Feltrer (MERG-co-Chair, Malaria Consortium), Arnaud Le Menach (Clinton Health Access Initiative), Chris Lourenço (PSI), John Painter (PMI/CDC), Jon Cox (The Bill and Melinda Gates Foundation), Justin Cohen (Clinton Health Access Initiative), Kimberly Lindblade (WHO), Larry Slutsker (PATH), Lia Florey (PMI/USAID), Nicholas Oliphant (The Global Fund), Médoune Ndiop (MERG-co-Chair, NMCP/Senegal), Misun Choi (PMI/USAID), Molly Robertson (PATH), Yazoumé Yé (PMI Measure Malaria, ICF). The taskforce thanks all other individuals who contributed at various stages in the development of this document and supporting materials. The authors are also grateful for those who provided visualization support: Maya Fraser (PATH), Sarah Burnett (PATH), Christelle Gogue (PATH). Special thanks also go to Peder Digre (PATH) and Kyra Arnett (PATH) for managing the process, creating templates, and editing and proofreading multiple versions of this document.

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