A Guide for Conducting Malaria Data Review Meetings

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CDC CENTERS FOR DISEASE CONTROL AND PREVENTION

U.S. President's Malaria Initiative

MEASURE Evaluation

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ABBREVIATIONS

ACT	artemisinin-based combination therapy
IPTp	intermittent preventive treatment in pregnancy
LLIN	long-lasting insecticide-treated net
NMCP	national malaria control program
RDT	rapid diagnostic test

INTRODUCTION

Routine health information systems, including surveillance systems, have become critical tools to streamline malaria control efforts in endemic countries. Governments and health programs rely on health information systems to allocate resources to subpopulations to optimize interventions (Ashton, Bennett, Yukich, Bhattarai, Keating, & Eisele, 2017; World Health Organization, 2017). These systems often face data quality issues that limit their use by service providers and decision makers to better inform health services (Chilundo, Sundby, & Aanestad, 2004). To improve the quality of the data generated from these systems, national malaria control programs (NMCPs) from several malaria-endemic countries began to conduct regular data review meetings at the subnational levels (e.g., counties; health facilities) to review and address data quality issues.

These periodic data review meetings provide feedback on the quality of routine malaria data and the use of data to improve service delivery. The need for good-quality data at subnational levels, particularly at service delivery points (health facilities), increases as transmission reduces and the risk of epidemics increases; health facilities need to be analyzed more frequently to ensure early detection of a potential outbreak or abnormal increases in cases (World Health Organization, 2018). Data review meetings bring together national and subnational stakeholders to identify data quality issues more immediately and provide an opportunity to use the data to identify gaps in the performance of health services compared to national policy. The results should be converted into informational presentations to allow participants to assess trends and define action plans quickly to address data quality and performance disparities.

MEASURE Evaluation conducted a review in five malaria-endemic countries (the Democratic Republic of the Congo, Kenya, Liberia, Madagascar, and Mali) to understand how NMCPs conduct data review meetings. The review found that countries have different processes for conducting these meetings. Some countries have better structures in place to improve data quality and use data for service delivery compared to other countries. Although NMCPs conduct data review meetings periodically, we did not come across consolidated standard guidelines or protocols for conducting these meetings. In addition, few documents exist on the follow-up action plan recommended from these meetings. In light of these findings, MEASURE Evaluation proposes a brief standard protocol for these periodic data review meetings. The protocol aims to highlight the best practices for conducting data review meetings and is derived from the findings of the review (see MEASURE Evaluation, 2019). Having a standard protocol that countries can use and adapt to their specific context can streamline the validation process, optimize data use, and improve the documentation of follow-up actions to improve data quality and service delivery.

PURPOSE

Data review meetings provide an opportunity to bring together the NMCP and subnational stakeholders to do the following:

- Monitor the data quality produced at the subnational level (e.g., counties; health facilities)
- Verify data across different data sources (e.g., health registers with electronic health information systems) at health facilities
- Analyze the performance of key malaria indicators against national and subnational targets by evaluating trends
- Develop an action plan to improve data quality and use data to inform malaria-related service deliveries
- Document changes in improvement of the quality of the data

PARTICIPATION, FREQUENCY, AND DATA SOURCES

Subnational Participation

In most malaria-endemic countries, the sources for collecting primary routine health data from malaria patients are health facilities or service delivery points, including primary, secondary, and tertiary facilities. Reviewing and validating data quality at health facilities has an impact on data quality at higher levels because these data feed into secondary data sources (e.g., monthly summary forms; District Health Information Software, version 2 [DHIS2] platform) and are aggregated. Data review meetings may be held at multiple levels in the country's health care system, but reviewing and validating the data from health facilities is the most important part of the process because these facilities are collecting primary data. The processes for reviewing aggregated data at the district, provincial, or national level differ from those for reviewing primary data from health facilities. This protocol provides guidance on reviewing the data quality of primary data collected from health facilities and reviewing aggregated data from districts, provinces, and other higher subnational levels.

Number of Participants

MEASURE Evaluation conducted an assessment of data review meetings held in five sub-Saharan African countries and found that the number of health facilities attending a one-day data review meeting averaged around 15 health facilities, with a range of seven health facilities in Liberia to 38 health facilities in Madagascar. An average of 15 health facilities allowed the subnational levels to adequately review data quality and analyze trends and services across the subnational operational entity in a single day. Conducting the data review meeting in one day allows health facilities and subnational levels to review data quality regularly but does not impede the daily clinical work of health facilities. Ideally, limiting participation to 15 or 20 health facilities or subnational representatives allows data review meetings to be held in a single day. However, if the country has the capacity and resources to conduct a larger data review meeting with more than 20 health facilities and achieve a thorough review of the indicators, then the country may choose the suitable number of participants. The fewer the participants, the more rigorous and in-depth a review of the indicators can be.

Frequency

Data review meetings may be held monthly or quarterly—depending on the malaria situation in-country, the limited resources, and data quality challenges that need to be addressed. For high and moderate burden settings, holding meetings quarterly may be more appropriate, to allow health facilities and subnational levels to implement data quality improvements and the action plan. Holding meetings quarterly, however, may result in longer meetings because of the large amount of data to be reviewed. For low-burden settings, hosting data review meetings monthly will help identify issues promptly, but this may not be practical, because of limited resources, other competing activities, and insufficient time to implement the action plan. Ultimately, countries should decide on the frequency of data review meetings based on their malaria situation, resources, and data quality issues at the subnational levels. Regular data review meetings provide an opportunity for national and subnational levels and health facilities to review their data quality more immediately, ensure that the data are up to date, and evaluate the progress of subnational levels and health facilities.

Data Sources

Different data sources are validated depending on the data collection tools available in the country. Data review meetings should review all data collection tools that record information on malaria. At health facilities, these may include the primary source: outpatient registers, antenatal care registers, laboratory registers, commodity tracking cards (stock cards), outpatient department registers, antenatal client registers, and laboratory and commodity stock cards. Data from registers from community health workers, in countries that have them, should be compiled before data review meetings. In addition, secondary data collection tools, such as monthly summary forms and DHIS2, are other data sources that may be checked to determine discrepancies with the primary source.

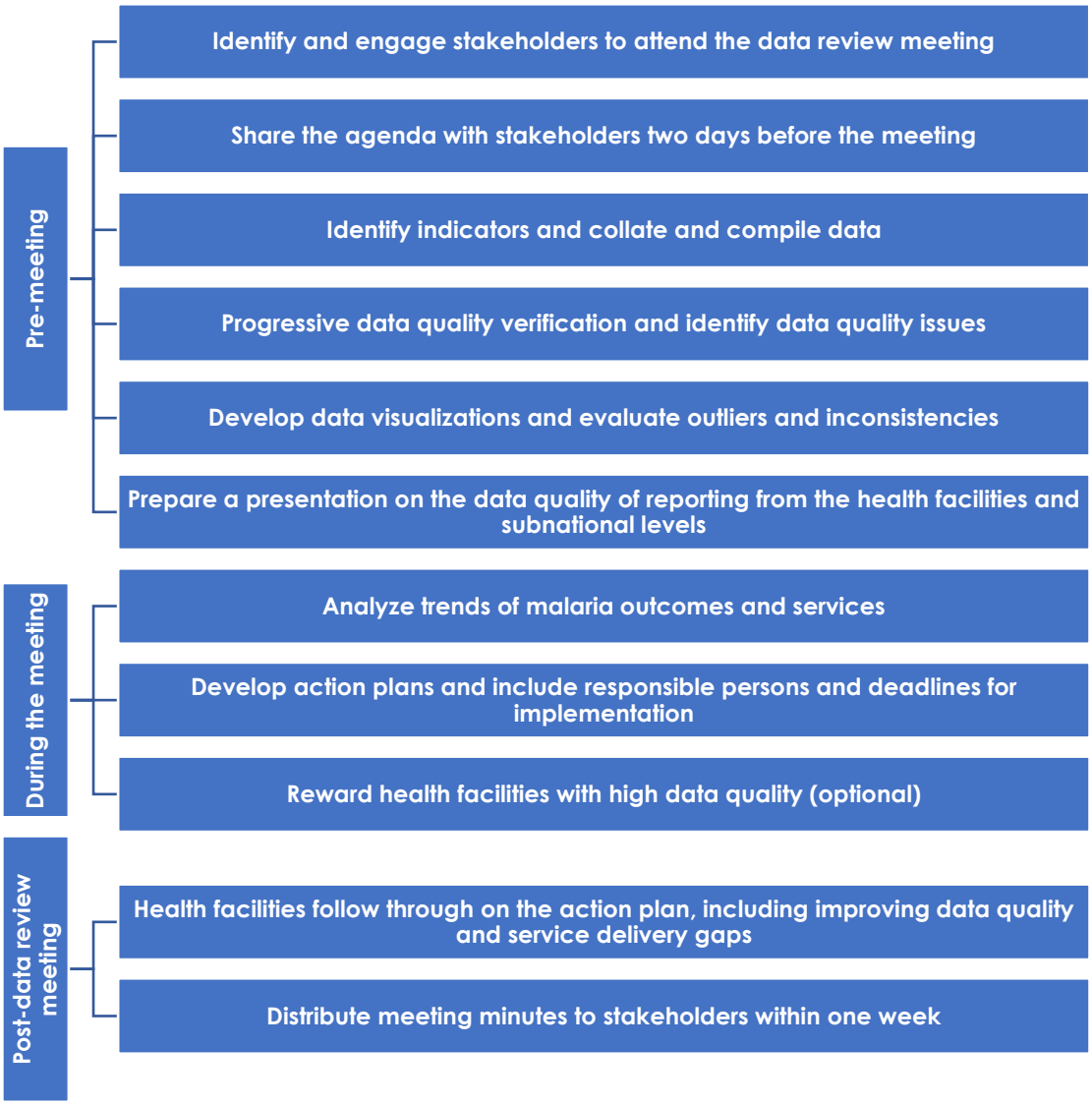
PHASES FOR CONDUCTING DATA REVIEW MEETINGS

Data review meetings should be carried out in three phases:

1. Pre-meeting
2. During the meeting
3. Post-data review meeting

These phases are interlinked, as depicted in Figure 1.

Figure 1. Phases and components of the data review meetings



Pre-Meeting

The pre-meeting phase activities will prepare the national level, subnational level, and health facilities to conduct the data review meeting. These activities are as follows:

- Identifying and engaging key stakeholders to attend the meeting (to include leadership, data users, and data producers)
- Setting expectations for meeting frequency and structure (programmatic or thematic review)
- Drafting and sharing the agenda
- Identifying key questions and indicators to be reviewed
- Collating and compiling the data that will be discussed at the meeting
- Verifying the data across data sources at health facilities
- Transforming the data into informational presentations to show trends in malaria outcomes and interventions at health facilities or subnational-levels
- Preparing a presentation on the data quality of reporting from the health facilities and subnational levels

The pre-meeting phase is crucial to the success of the data review meetings. It provides an opportunity for the health facilities and subnational levels to engage stakeholders and get buy-in for the data reviews and encourages participation. This phase also sets expectations and promotes ownership of the process. Pre-meeting activities should begin two to four weeks prior to the data review meeting to ensure proper engagement with potential participants and to agree on the key questions to be discussed, verification of data, and preparation of presentations (including data visualization).

Identify Stakeholders to Invite to the Meeting

The NMCP should identify which stakeholders will attend data review meetings four weeks before quarterly data review meetings and two weeks before monthly data review meetings. The meeting hosts should consider how many health facilities should attend and then decide which health facilities and national and subnational stakeholders, as well as other partners, if needed, should be invited. After identifying stakeholders, meeting invitations should be sent at least two weeks before the quarterly meeting and one week before the monthly meeting. A proposed agenda should be sent at least one week in advance of the meeting.

Possible meeting participants include malaria control coordinators for the district and subnational levels, HIS focal point, malaria focal point, integrated disease surveillance and response focal point, medical officers, the chief of the health facility, head of the pharmacy, and head of the laboratory. Prior to the meeting, roles and responsibilities should be assigned to key stakeholders. For example, the head of the laboratory should be assigned the responsibility of gathering the laboratory registers/books and verifying the data with the monthly summary forms and DHIS2 data.

Prepare the Agenda for the Data Review Meeting

Each country will adapt data review meetings for its context. The proposed agenda should include the following:

- Review past items and issues identified from the previous data review meeting that need to be resolved and get an update on status of these issues
- Verify the data across data sources by health facility if this has not been done in the pre-meeting phase
- Conduct a presentation on the data quality at the health facilities and subnational levels
- Analyze the performance of key malaria indicators at health facilities or subnational levels by looking at the trends and comparing them with the malaria targets
- Prepare action points, including how to improve data quality at health facilities or subnational levels, if needed, and what actions should be taken to improve service delivery

Appendix 1 provides a sample draft agenda.

Identify Indicators and Collate and Compile Data

Prior to the data review meeting, the meeting host will identify malaria indicators and data elements to be discussed at the meeting and request that health facilities and subnational levels collect and review these indicators. Several key indicators that may be included in every review meeting include: the number of suspected malaria cases that were tested (rapid diagnostic tests [RDTs]; microscopy), proportion of positive cases that received the recommended treatment (artemisinin-based combination therapies [ACTs]), number of reported ACT stockouts, and number of reported RDT stockouts. Initially, a country should select no more than four indicators to focus on during each meeting. Once these indicators have been verified and have consistent high-quality, additional indicators may be prioritized in future meetings, with a light review of the original four indicators for a trends analysis and continuity. Focusing on these four indicators will streamline the data review meeting and ensure sufficient time for each health facility to conduct an in-depth analysis during the one day review.

The following are key malaria indicators that should be found in registers, monthly summary forms, and DHIS2. See Appendix 2 for indicator data sources and calculations.

- Number of malaria cases
  - Number of clinical malaria cases in children <5 years
  - Number of clinical malaria cases in persons ≥5 years
  - Number of confirmed malaria cases in children <5 years
  - Number of confirmed malaria cases in persons ≥5 years
  - Number of outpatient cases in the curative register
- Artemisinin-based combination therapy (ACT) treatments
  - Number of patients <5 years treated with ACT
  - Number of patients ≥5 years treated with ACT
  - Number of <5 positive cases that received ACT
  - Number of ≥5 positive cases that received ACT
  - Number of reported ACT stockouts

- Antenatal care (ANC) and intermittent preventive treatment in pregnancy (IPTp)
  - Number of new ANC clients
  - Proportion of ANC clients who received first dose, second dose, and third dose of IPTp
- Long-lasting insecticide-treated nets (LLINs)
  - Number of LLINs distributed at ANC clinics
  - Number of LLINs distributed at child health clinics
- Diagnostic test indicators
  - Number of suspected malaria cases in children <5 years tested (RDT, microscopy)
  - Number of suspected malaria cases in persons ≥5 years tested (RDT, microscopy)
  - Total number of suspected malaria cases tested (RDT, microscopy)
  - Number of positive malaria blood slides in children <5 years
  - Number of positive malaria blood slides in persons ≥5 years
  - Proportion of positive malaria RDTs
  - Proportion of negative malaria RDTs
  - Number of reported RDT stockouts
- Morbidity and mortality indicators
  - Number of children <5 years with severe anemia
  - Number of children <5 years who died from malaria
  - Number of all persons who died from malaria

Progressive Data Quality Verification

To build confidence in the health facility data and promote use, progressive data quality verification should be executed prior to the data review meeting. This verification will include data reconciliation, data verification, and checking for data transcription cohesion (Figure 2).

Data Reconciliation

To begin data reconciliation across data sources at health facilities, health facility staff should gather primary data sources such as outpatient registers (OPD), antenatal care registers, laboratory registers/books, commodity tracking cards (stock cards). The numbers between corresponding registers, should be verified, and any discrepancies should be reconciled. For example, the number of confirmed malaria cases in the OPD registers should match the number of positive tests found in the laboratory.

The next phase of data reconciliation focuses on consumption of malaria commodities at the health facility. Not all departments may have an official register but will have stock cards to keep track of commodities (e.g., ACTs and RDTs). These cards should be verified against the registers and reconciled. For example, the number of confirmed malaria cases treated should match the number of ACT doses administered at the health facility

Data Verification

After data reconciliation, the next step is to verify the data between the registers and monthly summary forms. Any discrepancy should be investigated, including a recount of data elements using the registers. If there are discrepancies, it is important to quantify the disparity through a verification ratio (World Health Organization, 2018).

$$\text{Verification ratio} = \frac{\text{Recounted number of events from registers}}{\text{Reported number of events from monthly summary forms}}$$

A verification ratio >1 may indicate underreporting in the monthly summary forms and a verification ratio <1 may indicate overreporting in the monthly summary forms. The verification ratio should be recorded and presented during the data review meeting. If data elements are missing from either data source, this should also be captured. The secondary sources (e.g., monthly summary form) should be revised based on the primary sources (e.g., registers). The monthly summary forms should then match what is indicated in the registers.

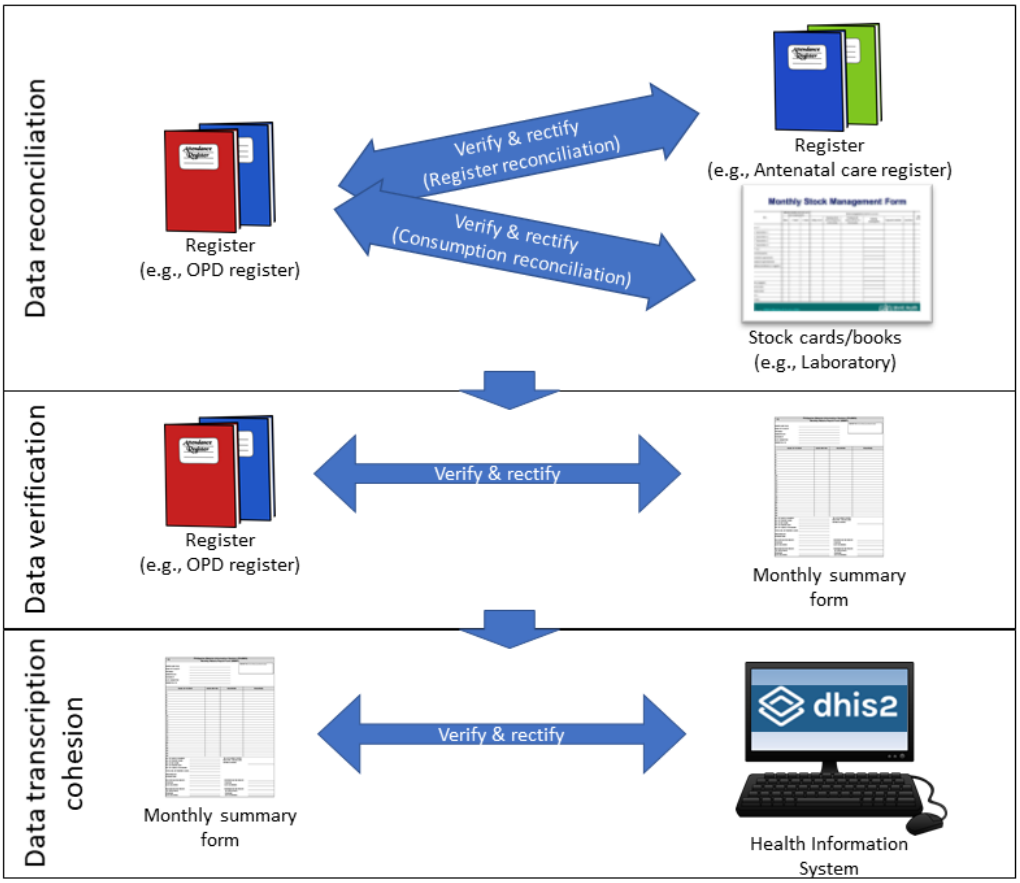
Data Transcription Cohesion

The final step in the data quality assessment entails reviewing the monthly summary forms against what is indicated in DHIS2 to check for any data transcription errors. These errors should then be rectified in DHIS2, with confidence that the monthly summary forms are correct.

Identify Data Quality Issues at Health Facilities

Based on the data verification across data sources at the health facility, stakeholders should identify any larger issues with data quality that may be systemic. For instance, are some health facilities incorrectly entering data? Are data not being transferred correctly from the health facility to the monthly reporting form or national system? Why are some health facilities submitting reports that are incomplete or not on time? Do personnel need training to enter and validate data? Are data systematically underreported or overreported across different data sources at the health facility? Stakeholders will need to develop an action plan to address data quality issues. Appendix 4 provides a sample template of how to review data quality at health facilities.

Figure 2. Progressive data quality verification



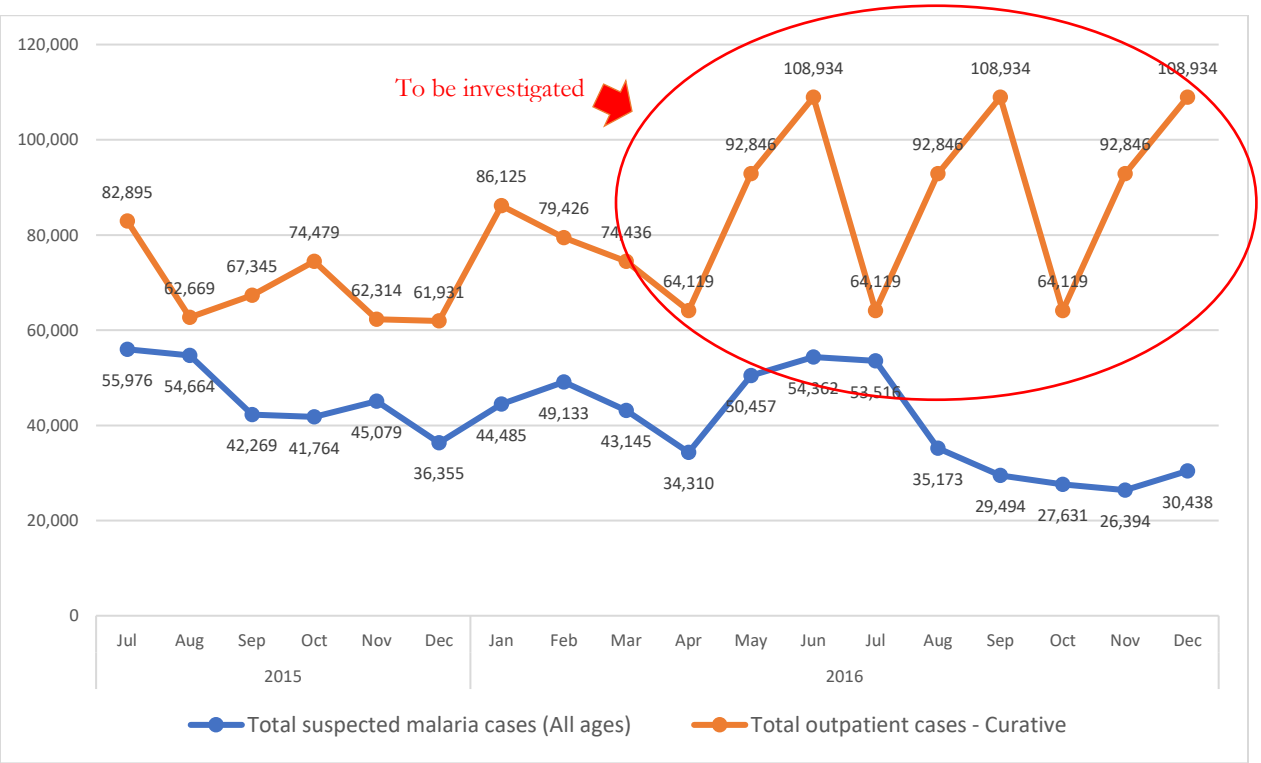
Develop Data Visualizations

Health facilities and subnational levels should transform their data into informational presentations that describe malaria indicator trends. Each health facility will take their initial four indicators that have been verified and generate graphs for each indicator, which plot the numbers taken from the monthly summary form over the previous year. This allows the data users to observe any trends and shows the performance of health services. An example taken from Kenya shows the total outpatient cases against the total suspected malaria cases for all ages (Figure 3) (MEASURE Evaluation PIMA, 2017). This visualization will also help identify outliers, which are extreme values in relation to other values in a series. These anomalies may be identified using the 85th percentile threshold, which is calculated from the previous three years of monthly numbers. Any number above the fifth highest monthly number from the previous three years may be considered an outlier (World Health Organization, 2018). Outliers may indicate problems in data quality or changes in service delivery patterns or both. These outliers should be investigated to see if they make sense. For example, an uptake in treatment could be the result of policy decisions or an increased number of cases or misreporting. In addition, these informational presentations may point to inconsistencies in the data through the comparison of trends. For example, if the data show significant increases for outpatient cases over three months, but the health facility didn't experience the same increase over the same three months in the previous years, this should be investigated as an inconsistency. Any significant fluctuations or repetition

of numbers should initiate a deeper look. In Figure 3, the total number of outpatient cases seen from April to December in 2016 appears to repeat itself. Having the exact same numbers for three months should be a red flag for investigation.

Targets that were developed for an indicator through national policy may also be included in the graph to observe any performance gaps. For example, if the national policy indicates that every suspected malaria case should be tested through either RDT or microscopy, any percentage of suspected cases that were tested and fall below 100 percent should result in an investigation and the development of an action plan to increase the proportion. The unique context for each health facility will guide which trends will be the most informative. In burden reduction settings, some useful trends to analyze by month include the total number of outpatient cases compared to the total number of confirmed malaria cases, the total number of suspected malaria cases compared to the total number of suspected malaria cases treated, and the total number of confirmed malaria cases compared to the total number of confirmed malaria cases treated according to national guidelines.

Figure 3. Example of a graph showing the total number of outpatient cases against malaria cases in a health sector in Kenya (MEASURE Evaluation PIMA, 2017)



Prepare a Presentation on the Data Quality of Reporting from the Health Facilities and Subnational Levels

For the data review meeting, a presentation describing the data quality of reporting at the health facilities and subnational levels should be prepared. This presentation should assess data quality across the following five dimensions: (1) completeness and timeliness of reports, (2) completeness of indicator data, (3) consistency of data over time, (4) consistency between indicators, and (5) consistency of data and indicators across different data reporting sources. Appendix 3 lists suggested subnational reporting indicators. If there is high data

quality of reporting from health facilities and subnational levels, decision makers can be confident when using data from the routine health information system to improve service delivery. Relevant personnel should prepare and submit the presentation to the coordinator before the data review meeting.

The five dimensions of data quality are defined as follows:

1. **Completeness and timeliness of reports:** Completeness measures whether all subnational entities that are supposed to report do so; timeliness measures whether entities submit reports on or before a predefined deadline. Appendix 4 shows an example table for reporting completeness and timeliness of reports from subnational levels.
2. **Completeness of indicator data:** Completeness of indicator data measures the proportion of missing values for specific indicators, including blank cells on reporting forms. Missing data differ from true zero values, which show that no reportable events occurred during a specified period, and should be treated differently.
3. **Consistency of data over time:** The internal consistency of reported data should be evaluated through trends and the history of reporting of those indicators. Evaluating trends helps determine whether the specific reported values in the selected period are extreme in relation to other reported values.
4. **Consistency between indicators:** Some program indicators are expected to have a predictable relationship, and these should be evaluated. For example, in malaria-endemic countries, because the first dose of IPTp should be given to all pregnant women as part of their first ANC visit, the indicators for the first dose of IPTp and first ANC visit should be highly correlated.
5. **Consistency of data and indicators across different data reporting sources:** Data and indicators from different data sources should be the same or have high concordance (e.g., compare health registers with DHIS2). Verifying data across different data sources ensures that data are entered accurately from the lower level and translated correctly to the higher level so that stakeholders can reliably use the data to make decisions for improving service delivery.

Quality assessments of the four indicators from each health facility should be combined and presented together. For example, examining a data element of the indicator "the proportion of positive cases that received the recommended treatment (ACTs)," each facility will have completeness data for the number of confirmed positive cases. If Health Facility A had no data reported on their monthly summary from then they would indicate one missing data element. The availability of all data elements will determine their completeness score, which is calculated by the number of data elements available divided by the total number of elements. Assuming the four indicators each contained two data elements, if Health Facility A only had three data elements available out of the possible eight and five data elements were missing, then their overall completeness score would be 38 percent. An example table of the completeness score for each health facility within the district can be found in Table 1.

Table 1. Example table of completeness scores for 10 health facilities for 8 total data elements

	Number of data elements available	Number of missing data elements	Total number of data elements	Completeness score
Health Facility A	3	5	8	38%
Health Facility B	8	0	8	100%
Health Facility C	5	3	8	63%
Health Facility D	4	4	8	50%

During the Meeting

The meeting should be organized in plenary sessions with presentations from health facilities or subnational levels. A meeting secretary should be appointed to write and disseminate meeting minutes, including to those who did not attend the meeting, if necessary. The meeting should closely follow the proposed agenda but also provide an opportunity for participants to discuss other outstanding issues.

Analyze Trends of Malaria Outcomes and Services

During the meeting, health facilities and subnational levels should review the trends of malaria indicators, conduct an analysis of the current situation, and identify health facilities that need improvement. Example questions that should be asked and discussed are as follows:

- Are some health facilities or subnational levels not receiving enough services?
- Which health facilities or subnational levels are performing less well than expected?
- How are health facilities or subnational levels performing against their own targets and the national target?
- If there are outliers, are they an issue of data quality or uptake or a decrease in service delivery?

By reviewing the presentation and asking these questions, stakeholders review the performance and implementation of health services at health facilities and subnational levels to draw important lessons that can be used to improve service delivery. The performance grades of each health facility may be based on the five dimensions of data quality (which encompass data availability, data consistency, and data validity) and on the status of the indicators examined compared to national policy (Table 2). The graphs generated by each health facility and tables collating subnational data will help identify which health facilities are performing less well than expected. Health facilities with a grade of 80 percent and below should look to make some improvements to raise their overall grade to 90 percent and above.

Table 2. Performance grades

Performance Grade	Definition
90%–100%	Outstanding • Exceeds quality threshold • None or minimal improvements needed
80%–90%	Excellent • Meets quality threshold • None or minimal improvements needed
>70%–80%	Good • Approaching quality threshold • Some improvements needed to reach threshold
≤70%	Needs Improvement • Does not meet quality threshold • Improvements required to reach threshold

Develop an Action Plan

Based on the issues identified at the data review meeting and the overall performance grade achieved, stakeholders should develop an action plan to improve data quality and service delivery at the health facilities and subnational levels. Appendix 5 provides a template for an action plan that identifies the issue, type of recommendation or action that should be taken to resolve the issue, responsible person or level, deadline for action to occur, and additional comments. Some questions for stakeholders to consider when developing their action plan are the following:

Data quality:

- What data quality issues need to be addressed at the health facility?
- How should the NMCP or higher levels be involved at the health facility to improve data quality?
- Is it necessary to have a data correction plan in place?
- Are mentoring visits needed to improve data quality?

Service delivery for malaria control and elimination:

- Where are there service gaps in controlling and eliminating malaria?
- What health facilities or subnational levels need further services based on the data shown?
- Based on the data, are there services that need to be improved to reach the target population?
- How should services be distributed, given the limited resources?

Stakeholders should discuss the feasibility of the planned activities before determining who will be responsible for carrying out the task and a deadline for completing the action. The action plan will help

stakeholders monitor and track their progress in improving data quality and service delivery for malaria control and elimination at health facilities. The action plan should be reviewed at future data review meetings.

Create a Reward Mechanism (Optional)

In some countries, health facilities were rewarded if they provided high data quality (MEASURE Evaluation, 2019). Rewards included computers, tablets, payment for high-speed Internet, and other infrastructure equipment. Ultimately, it is up to each country to implement incentives and decide what rewards should be given to facilities with high data quality.

POST-DATA REVIEW MEETING

After the meeting, minutes of the meeting should be disseminated and the action plan monitored. The meeting minutes from the data review meetings should be reviewed by stakeholders and distributed within a week following the meeting to serve as a reminder for stakeholders of the issues that were discussed and any issues that will need to be discussed at future data review meetings. Data quality issues and service delivery issues that were outlined in the action plan should be closely monitored. For example, if there are significant data quality issues, health information officers or other responsible personnel should be put in charge and set up a data correction plan. They may plan mentoring visits to health facilities because mentorship has been shown to improve data quality. Gaps in service delivery that were identified during the data review meeting should be followed up on and monitored. Following through on recommendations developed at data review meetings helps the national level, subnational level, and health facilities improve their malaria data quality and service delivery.

CONCLUSION

Data review meetings are forums that enable health facilities to identify issues in their data quality, assess the current malaria situation at the subnational level, and discuss areas to improve service delivery for malaria control and elimination. NMCPs have limited time and resources available and need to make the most of meeting with the subnational levels during data review meetings. High data quality at health facilities is essential because these data feed into aggregated data systems reviewed by higher subnational levels and the national level and are used to make decisions. Reviewing trends at the health facilities and subnational levels is an opportunity for stakeholders to assess the malaria situation and identify gaps in service delivery. Improving the data quality of reporting from health facilities and subnational levels also ensures a robust health information system on which decision makers can rely. As countries reduce transmission, health facilities and subnational levels play a pivotal role in deploying coverage and services to those most in need. Data review meetings are an opportunity for national and subnational levels to regularly provide feedback on the data quality of health facilities and subnational levels and to use data to measure the country's progress toward malaria control and elimination.

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APPENDIX 1. DRAFT AGENDA FOR DATA REVIEW MEETINGS

DATA REVIEW MEETING AGENDA		
Date:		
Activity	**Responsible personnel**	**Time**
Review previous meeting's action points and update status		9–10 a.m.
Data quality reporting at subnational levels	National Malaria Control Program	10–10:30 a.m.
Subnational presentation: Malaria outcomes in Facility X	Facility X	10:30–11 a.m.
Subnational presentation: Malaria outcomes in Facility X	Facility X	11–11:30 a.m.
Subnational presentation: Malaria outcomes in Facility X	Facility X	11:30 a.m.–12 p.m.
LUNCH		
Discussion of data quality issues	National Malaria Control Program, subnational levels	1–2 p.m.
Review and recommendations for improving service delivery	National Malaria Control Program, subnational levels	2–4 p.m.

APPENDIX 2. MALARIA INDICATORS TO BE COLLECTED BY HEALTH FACILITIES OR OTHER SUBNATIONAL LEVELS

Indicator	Definition	Disaggregation	Data source	Suggested frequency
Number of malaria cases				
Number of clinical malaria cases in children	Number of suspected outpatients diagnosed as having malaria without any laboratory confirmation	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly
Number of confirmed outpatient malaria cases	Number of confirmed outpatient diagnoses of malaria	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly
Artemisinin-based combination therapy (ACT) treatments				
Number of patients treated with ACT	Number of malaria cases treated with ACT	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly
Number of positive cases that received ACT	Number of positive malaria cases tested through rapid diagnostic test (RDT) or microscopy that received ACT	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly
Antenatal care (ANC) and Intermittent preventive treatment in pregnancy (IPTp)				
Number of new ANC clients	Number of new ANC clients		Health information system/routine surveillance system	Monthly
Proportion of ANC clients who received dose of IPTp	Number of pregnant women given sulfadoxine-pyrimethamine for IPTp/Number of ANC clients	First dose Second dose Third dose	Health information system/routine surveillance system	Monthly

Indicator	Definition	Disaggregation	Data source	Suggested frequency
Long-lasting insecticide-treated nets (LLINs)				
Number of LLINs distributed at ANC clinics	Number of LLINs distributed at ANC clinics/Number of new ANC clients		Health information system/routine surveillance system	Monthly
Number of LLINs distributed to children at vaccination clinics	Number of LLINs distributed to children under a year at vaccination clinics/Number of children attending vaccination clinics Number of LLINs distributed to children at vaccination clinics/Number of children receiving DPT1 at vaccination clinics Number of LLINs distributed to children at vaccination clinics/Number of children receiving measles vaccination at vaccination clinic		Health information system/routine surveillance system	Monthly
Diagnostic test indicators				
Number of malaria blood slides examined	Number of malaria blood slides examined	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly
Proportion of positive malaria blood slides in children	Number of malaria blood slides that were positive/Number of blood slides examined	• <5 years • ≥ 5 years	Health information system/routine surveillance system	Monthly
Number of malaria RDTs examined	Number of malaria RDTs examined	• <5 years • ≥ 5 years	Health information system/routine surveillance system	Monthly

Indicator	Definition	Disaggregation	Data source	Suggested frequency
Proportion of positive malaria RDTs	Number of malaria RDTs that were positive/Number of malaria RDTs examined	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly
Morbidity and mortality indicators				
Number of people with severe anemia	Number of people with severe anemia	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly
Number of people who died from malaria	Number of people who died from malaria	• <5 years • ≥5 years	Health information system/routine surveillance system	Monthly

APPENDIX 3. SUBNATIONAL REPORTING INDICATORS

Indicator	Numerator	Denominator	Data Source	Frequency
Completeness: Proportion of subnational reports received	Number of subnational reports received during the reporting period	Number of subnational reports expected during the reporting period	Health management information system (HMIS), program records	Monthly
Timeliness: Proportion of subnational reports received on time	Number of subnational reports received on time during the reporting period	Number of subnational reports expected during the reporting period	HMIS, program records	Monthly
Completeness of indicators	Number of subnational levels submitting indicators with non-missing values	Number of subnational reports expected during the reporting period	HMIS, program records	Monthly
Outlier indicators	Percentage of subnational unit values that are moderate outliers	Number and percentage of subnational units in which two or more of the monthly subnational unit values for the indicator over the course of one year are moderate outliers	HMIS, program records	Monthly

APPENDIX 4. SUBNATIONAL REPORTING TABLE

Number	Administrative unit	Total number of health facilities reporting to the health management information system	Total number of health facility reports received	Total number of health facility reports received by the deadline
1	District A			
2	District B			
3	District C			
4	District D			
5	District E			
6…	District F…			
…N	…District Z			

APPENDIX 5. TEMPLATE FOR ACTION PLAN AND FOLLOW-UP ON RECOMMENDATIONS FOR DATA REVIEW MEETING

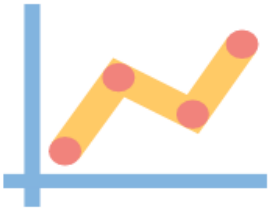
Action Plan and Follow-Up on Recommendations					
Subnational level (e.g., region/district):					
Date of data review meeting:					
Date of follow-up:					
Identified challenge or area for improvement	**Type of recommendation or action to be taken**	**Responsible person or level**	**Deadline for action to occur**	**Resources needed**	**Comments or observations**

APPENDIX 6. JOB AID FOR CONDUCTING DATA REVIEW MEETINGS

During the Meeting

Identify data quality issues at health facilities

Analyze trends of malaria outcomes and services



Develop an Action Plan

- Improve data quality issues
- Improve service delivery

Create a reward mechanism (optional)

After the Meeting

Distribute meeting minutes

Within one week to all stakeholders, including those who did not attend the meeting

Health facilities follow through on the action plan

- Improve data quality
- Improve service delivery gaps

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