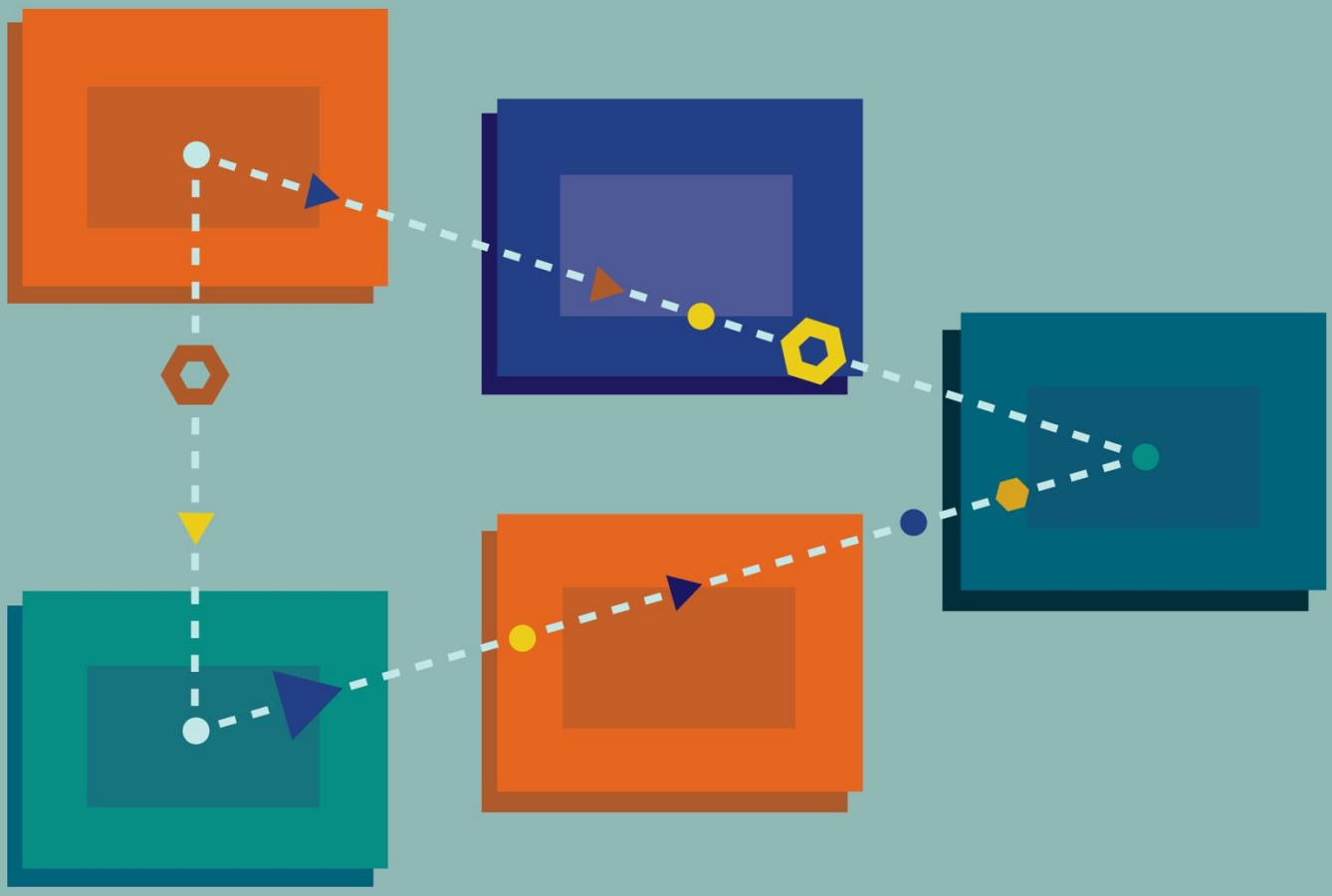

Country-Led, Holistic Data Quality Assurance

Institutionalizing Data Quality through a National Technical Working Group and the Data Quality Review

October 2018

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MEASURE Evaluation

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Holistic, country-led data quality assurance is the vision of the Division of Information, Evaluation, and Planning of the World Health Organization (WHO). What began as the Data Quality Report Card (DQRC)—a tool to evaluate routine data in health management information systems (HMIS)—became a crosscutting and routine solution for data quality assurance linked to planning, with oversight and coordination of the ministry of health. This vision for the future of data quality assurance for public health information systems soon gained adherents, including the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), Gavi, and the United States Agency for International Development (USAID).

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ABBREVIATIONS

ANC1	antenatal care, first visit
ART	antiretroviral therapy
BASICS II	Basic Support for Institutionalizing Child Survival Project
DQR	data quality review
DTP3/Penta	diphtheria-tetanus-pertussis three-dose, pentavalent vaccine
FBO	faith-based organization
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HMIS	health management information system(s)
ICC	interagency coordinating committee
IPTp3	intermittent preventive treatment for malaria
M&E	monitoring and evaluation
MA4H	Measurement and Accountability for Results in Health
MCV	measles-containing vaccine
MDR-TB	multidrug-resistant tuberculosis
MFL	master facility list
MOH	ministry of health
MOU	memorandum of understanding
PCV	pneumococcal conjugate vaccine
PEPFAR	United States President's Emergency Plan For AIDS Relief
PMTCT	prevention of mother-to-child transmission of HIV
RDT	rapid diagnostic test
RR	rifampicin-resistant
SARA	Service Availability and Readiness Assessment
TB	tuberculosis
TWG	technical working group
WHO	World Health Organization

INTRODUCTION

Data quality review (DQR) is a method to rapidly evaluate the quality and adequacy of health data used for planning. The DQR aims to institutionalize data quality assessment as a systematic and routine aspect of health sector and program planning and provide a minimum standard of quality for health data. It is intended to be applied across program areas to provide a holistic picture of a country's data quality from health facility-based information systems and identify areas in need of strengthening. The method and indicators for the DQR have been developed in consultation with international health program experts from leading donor and technical assistance agencies, such as the World Health Organization (WHO), the United States Agency for International Development (USAID), Gavi Vaccine Alliance, and the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), with consensus on a minimum standard for data quality.

The advent of disease-specific health programs, such as the United States President's Emergency Plan For AIDS Relief (PEPFAR) and the Global Fund, has led to improvements in service delivery for disease control and prevention, but it has contributed to fragmentation of health information systems in countries as parallel data streams have arisen to meet the need of donors seeking to justify investments of public funds for enhanced disease control efforts. Ad hoc and uncoordinated data quality assessments have contributed to overlap, confusion, and inefficiencies in data quality control, and added burden to health sector staff at the periphery.

Because the DQR is a holistic method designed to meet the needs of all stakeholders in a single assessment, it reduces overlap and inefficiency. A DQR assessment addresses priority health and disease programs together using a standard method for each, thereby improving the quality of information obtained for data quality.

Implementation of the DQR can help build confidence in the data for both national and external stakeholders. Knowing the data and their limitations can improve decision making during planning exercises and provide reassurance to donors and other key stakeholders that the evidence base for planning has undergone a known minimum level of scrutiny that adheres to international standards.

The DQR is a suite of tools and guidelines. The DQR electronic tools facilitate data collection and analysis. The guidelines documents provide instructions for collecting the data, preparing the data for analysis, conducting the data verifications, analyzing and interpreting results, and indicating how and when to apply the methods. The electronic analysis tools facilitate data analysis and presentation, as well as the identification of problematic data points and subnational reporting units.

Country-Led Coordination and Monitoring of Data Quality Assurance

As an integral part of national health-sector planning cycles, the DQR shows heath sector planners the strengths and limitations of their data, informing their decision making about future directions of health interventions.

The DQR holistic approach provides information on data quality across the health sector and obviates the need for ad hoc, disease-specific data quality assurance activities. The standardized approach yields results that are better quality and more comparable to past results and across countries. Such an approach, however, requires coordination and leadership, plus buy-in from international donor-supported health and disease programs.

A working group, either existing or instituted through appropriate country mechanisms and tasked with coordinating and improving data quality, can augment the level of local ownership of data quality assurance. Other mechanisms to reinforce and institutionalize data quality can also be put in place, such as standard operating procedures for data management and data quality assurance.

The framework for holistic country-led data quality assurance requires coordination at the national level by a group of stakeholders invested in the quality and use of the data. A national-level, multi-stakeholder data quality technical working group (TWG) would be tasked to oversee and coordinate data quality assurance activities for health management information systems (HMIS) and health program data used for planning.

The TWG's focus is planning and implementing the DQR. Through its holistic nature, the DQR promotes crosscutting data quality assurance in HMIS. Data managers from the HMIS and health programs need to work together to compile data for periodic reviews, known as "desk reviews," of aggregate historical data in HMIS. Program managers need to work together to conduct the data verification survey at health facilities. The output resulting from the DQR is a data quality improvement plan, which can highlight areas of overlap and improve program and information system integration. The increased knowledge of the different data system strengths and limitations will foster a more robust culture of data quality and use for decision making.

The DQR contributes to the vision of the United States Agency for International Development (USAID) of improving the evidence base for public health monitoring, evaluation, and planning, by improving the quality of routine health data. The USAID- and PEPFAR-funded MEASURE Evaluation assisted in the development of the DQR and tested approaches to improve country ownership and leadership of data quality assurance. A routine, holistic, and country-led system of data quality assurance can help institutionalize data quality in countries. This document provides guidance for establishing a TWG for holistic data quality centered around the DQR. It includes best practices for the TWG as well as implementation steps for the DQR. The TWG is modeled after the successful example of the interagency coordinating committees (ICCs) established for immunization in many countries.

TECHNICAL WORKING GROUP OBJECTIVES, ROLES, AND RESPONSIBILITIES

The data quality TWG has five principal objectives:

- To raise the profile of data quality for routine health facility and community information systems
- To coordinate data quality assurance activities among stakeholders, with the ministry of health (MOH) providing the leadership
- To provide a forum for sharing information and lessons learned among government agencies, donors, technical partners, implementing partners, and other stakeholders
- To provide the foundation for DQR, as recommended by the WHO DQR framework
- To establish closer working relationships and collaboration with government and donor agencies

Achievement of these objectives will contribute to a practical and clearly articulated vision for data quality, as part of a larger vision for the HMIS; a coordinated government approach to data quality assurance activities; stronger relations with the donors and development partners and other government agencies; an improvement in the quality of HMIS data; and a reduction in burden on health facility staff. Attaining all of these objectives will ultimately enable the MOH to better manage and coordinate data quality assurance and HMIS activities.

Recommended Roles and Responsibilities of the TWG

- Develop a harmonized plan for routine data quality assurance activities, including routine assessment and capacity building;
- Monitor data quality in HMIS and health program information systems and react to problems;
- Identify technical support requirements and source organizations and individuals to meet the need;
- Monitor information system resources, such as human and financial resources, and advocate support when needed;
- Ensure adequate governance of public health information systems, especially HMIS; and
- Coordinate the DQR to—
    - Identify technical support requirements for the DQR and identify organizations or individuals to meet the requirements;
    - Identify funding sources and lead advocacy activities;
    - Oversee the selection of core indicators and the establishment of benchmarks;
    - Monitor implementation of the DQR; and
    - Ensure dissemination and promotion of the findings.

The data quality TWG should comprise technical focal points from health-sector stakeholders from government, including the different health programs, development partners, and multinational organizations, such as WHO, GAVI, and the Global Fund. Monitoring and evaluation technical working groups or health information system governance boards, which already exist in many countries, can serve as the data quality TWG, or, as an alternative, a subcommittee of one of these can be formed. Development and technical

partners can greatly contribute to the success of efforts to improve data quality by marshalling resources, such as through the Health Data Collaborative–Measurement and Accountability for Health initiative, and should play a role on the TWG.

Technical Working Group Best Practices

What makes an effective inter-agency technical working group? The experience of the ICCs, long in place in many countries, provides an example. A policy brief from the Basic Support for Institutionalizing Child Survival Project (BASICS II) provides some insight into lessons learned on which factors contribute to success for inter-agency working groups.[1]

- **Harmonizing institutional agendas or priorities and merging workstyles.** ICC members already have demands on their time and internal pressures from their own organizations. If the ICC demands are excessive, the quality of participation will suffer. In the contemporary workplace of fast-paced activity and information overload, it is important that all partners respect the time demands placed on others.
- **Inclusive partnership and shared credit.** Determine in open forum who should be represented at workshops, meetings, and events. Favoritism should be avoided and personal conflicts resolved through a transparent and respectful process. Each agency's commitment and contribution should be acknowledged.
- **Continuity in staffing.** It can be difficult to ensure sustainability of initiatives when agency personnel are frequently on two-year or shorter assignments. Adequate planning ensures that activities are not dependent on individuals, and assigning a strong role for the host country staff with longer-term perspectives ensures better program continuity and institutional memory.
- **Effective leadership.** Different agencies should play facilitator roles in subcommittees and share responsibilities in organizing important meetings or workshops, sometimes with rotating leadership. Partners should encourage leadership across agencies, especially in the host country ministry.
- **Focal point for organizational issues, such as drafting documents, calling meetings, and ensuring feedback and movement on activities and reports.** Selecting a focal point can be most effective by using national staff with technical and cultural expertise, and who have the respect of partners and stakeholders and rapport with other TWG partners.
- **Sustainable strategic orientation when faced with short-term financing and contracts.** Partners need to look beyond short-term contracts used to achieve immediate, but unsustainable impact. The quest for quick solutions to deep-rooted problems could discourage partnering with some international agencies and donors, particularly if those partners lack confidence in the government and are unwilling to engage at an institutional level.
- **Decentralized planning.** Regional and district perspectives should be included in national level macro-planning meetings and at the field level, with inter-agency support from the central level.
- **Accounting and planning for different budgeting cycles.** Agencies can have difficulty implementing joint plans that have different fiscal timetables; and therefore, it is beneficial to harmonize pipelines and forecasting among donors and partners to maintain flexibility in the planning process.

[1] Available at: http://www.immunizationbasics.jsi.com/Resources_Immunization.htm.

- **Effective and well-managed meetings.** Meetings must have clear agendas and timeframes and be announced with sufficient notice. Rotating meeting venues among participating organizations encourages collaboration. Time management, adherence to the agenda, and the distribution of minutes to all partners, present and absent, are also important.
- **Clear and efficient communication.** Partners need to develop the habit of identifying important information to the group effort and ensuring that this information is shared. From cell phones and e-mail to formal and informal meetings, communication mechanisms are important for the exchange of ideas and technical and administrative information.
- **Positive external feedback.** Knowing that the country is gaining recognition for its coordination can be a motivating factor that contributes to continued collaboration. It is important that donors support the collaborative model through positive reinforcement of the results and that they remain sensitive to the needs of an effective partnership.
- **System of checks and balances to aid with compliance and collaboration.** Some checks and balances to aid with compliance and collaboration are memorandum of understanding (MOU), external annual reviews, group presentations and defense of micro-planning, and discussions and feedback with districts.
- **Collegial work environment.** Fostering a friendly atmosphere where all members are respected and opposing viewpoints are handled through good-natured debate creates group cohesion. Such an environment can be achieved by providing refreshments during meetings and organizing social events following the meeting to create opportunities for social interaction.

DQR METHOD

The DQR is envisioned as a regularly implemented crosscutting data quality assessment of priority health programs to occur before health sector planning. Ideally conducted annually, the DQR should be implemented as often as is feasible with a country's resources and feature prominently in the five-year health sector planning cycle.

The DQR "toolkit" includes guidance documents describing the method (how it is conducted) and metrics (what is assessed), data collection tools (paper and electronic), and data compilation and analysis tools.[2]

The DQR method comprises two components for data quality assessment: (1) a health facility assessment (survey) with data verification and (2) a national-level desk review of aggregate reported data from HMIS, health program-specific information systems, or both.

Health Facility Assessment with Data Verification

The DQR health facility assessment with data verification is typically implemented in a representative sample of health facilities. It can be implemented as a stand-alone data quality assessment or as a component of a larger health facility assessment, for example, to measure service availability and readiness. The DQR is meant to be a feature of the planning cycle whereby data quality assessment is conducted before planning begins, so that planners have knowledge of the strengths and limitations in the data before planning events. Thus, the health facility assessment with data verification should be scheduled several months before the health sector planning process.

Data verification is conducted for up to five tracer indicators, one tracer indicator per health program. Completeness of source documents and the completeness and timeliness of reporting are also measured from the health facility data (please see Appendix 1 for a list of steps to prepare the health facility assessment for the DQR).

Desk Review

The DQR Desk Review assesses data quality through four domains:

1. Completeness and timeliness of reporting
2. Internal consistency of reporting—an evaluation of trends and identification of gaps, inconsistencies, and outliers
3. External consistency—a comparison of routine data values to external data sources, such as population-based surveys
4. Population estimates—a review of denominator data used to calculate coverage rates

The desk review also incorporates findings from the health facility data verification, which is considered a measure of internal consistency. The DQR findings are used to develop a Data Quality Improvement Plan.

Automated tools help facilitate the desk review analysis. Countries that use the DHIS 2 district health information software platform can obtain results for DQR metrics by installing an app in on the local instance of DHIS 2. As an alternative, a DQR analysis tool in MS Excel can facilitate the desk review analysis

[2] Data Quality Review (DQR) Toolkit, available at http://www.who.int/healthinfo/tools_data_analysis/dqr_modules/en/.

in countries without DHIS 2. Data managers need only extract the relevant data from the HMIS or program databases and paste it into the Excel tool.

Indicators

The DQR is designed to assess data quality for routine health information systems holistically. It uses tracer indicators from up to five program areas to judge data quality for the whole system. Tracer indicators are indicative of data quality for all indicators in the health program. WHO recommends the indicators and programs listed in Table 1.

Table 1. Core indicators

Program Area	Indicator	Definition
Maternal health	ANC1 coverage	Number and percentage of pregnant women who attended antenatal care clinic at least once during their pregnancy
Immunization	diphtheria-tetanus-pertussis third-dose, or pentavalent vaccine (DTP3/Penta3) coverage	Number and percentage of children age <1 year who receive three doses of DTP/Penta vaccine
HIV	Currently on antiretroviral therapy (ART)	Number and percentage of people living with HIV who are currently receiving ART
TB	TB notification rate	Number of new and relapse cases of TB that are notified per 100,000 population
Malaria	Confirmed malaria cases*	Confirmed malaria cases (microscopy or RDT) per 1,000 persons per year

Note: ANC1 = antenatal care, first visit; ART = antiretroviral therapy; DTP3 = diphtheria-tetanus-pertussis third-dose vaccine; Penta = pentavalent vaccine; RDT = rapid diagnostic test; TB = tuberculosis.

*If the number of confirmed malaria cases is not collected, total malaria cases can be substituted.

Although the DQR guidelines recommend that countries assess indicators from the suggested core list of indicators, it is possible to select other indicators or expand the number of indicators, depending on the needs and available resources.

The selected tracer indicators should be indicative of data quality for an entire health program. As such, they should be neither the most difficult to collect and compile nor the easiest. Often, the selection of priority indicators is also determined by suspicions of data quality problems or the level of investment made to collect and report the data. All these factors should be weighed when selecting the appropriate indicator for each program area.

Crosscutting Assessment Compared to In-Depth Assessment

The DQR provides information on up to five program areas to give an overall view of data quality for the health system. To remain practical as a facility assessment, the information requirements need to be kept to a manageable minimum for each heath program. Not all information on data quality can be collected for all health programs. In reality, health programs often need more detail on data quality for program management and planning than can be obtained with the broader crosscutting DQR. In such cases, the DQR can be adapted periodically to focus on the information needs of a particular health program. Such application of the

DQR is referred to as "in-depth DQR," which is described in detail in the DQR Framework documents. Typically, an in-depth DQR features four or five indicators from a given health program, for example, vaccinations for priority antigens with data on commodities tracking for an immunization program or the testing and treatment cascade for HIV/AIDS. In-depth assessments can be included every few years, depending on in-country needs for a given health program.

The DQR Toolkit Module 3, Data Verification and System Assessment provides more information on applying the in-depth DQR. Appendix 2 lists suggested additional indicators by program area.

Standard DQR data collection tools, both paper and electronic, and analysis tools require adaptation for an in-depth DQR. A later chapter, Health Facility Assessment and Tool Adaptation, discusses the adaptation of DQR tools for country use.

PLANNING AND COORDINATION

This chapter discusses the implementation steps to conduct the DQR and agency and personnel roles and responsibilities. It sets out a general timeline for implementation, budget considerations, and selection of tracer indicators.

Agency Roles and Responsibilities

Country ministries of health usually lead the DQR implementation. The following section summarizes the roles and responsibilities of the key agencies involved in the DQR and data quality assurance activities.

Ministry of health: The national MOH has overall responsibility for coordinating the DQR. The MOH also facilitates and oversees data collection in the field, the compilation and analysis and results, and dissemination of findings. The MOH presides over meetings and encourages participation of appropriate governmental departments, key nongovernmental organizations, and development partners. The MOH also promotes the use of this data for policy and planning.

Implementation agency: The responsibility for conducting field data collection for DQR is usually assigned to an implementing agency, often a unit within the MOH, such as the Health Information Management Unit or Statistics Bureau. A non-governmental organization (NGO) with survey research experience could also serve as the implementing agency.

Quality assurance and technical support agency: The DQR guidelines recommend that an independent party be involved in the implementation process, either a separate national institute or an independent consultant who is responsible for supporting the implementation team to plan and implement the DQR. The quality assurance provider helps ensure due processes are followed during training, data collection, cleaning, and analyses stages, including validation visits in 5 to 10 percent of the facilities; and give assistance and oversight to the implementing team on the production of the DQR report.

Data quality TWG*:* Bringing country stakeholders together is a critical first step toward successful implementation of DQR. One of the first activities in setting up a DQR is to identify and establish a group of core stakeholders at the national level to oversee, coordinate, and facilitate the planning and implementation of the DQR and the dissemination and use of the DQR findings.

The data quality TWG should comprise technical focal points among health-sector stakeholders from government, health programs, development partners, and multinational organizations, such as WHO, GAVI, and the Global Fund. Monitoring and evaluation technical working groups or health information system governance boards, which already exist in many countries, can serve as the data quality TWG. Development and technical partners can greatly contribute to the success of efforts to improve data quality and should agree on a standardized set of data quality indicators.

The role of the data quality TWG encompasses these tasks:

- Develop a harmonized plan for data quality assessments
- Identify technical support requirements for implementation and quality assurance
- Identify funding sources
- Oversee the selection of core indicators and the establishment of benchmarks
- Monitor implementation of the DQR
- Ensure promotion and dissemination of the findings

Indicator Selection

Indicators should be selected with care. Each program indicator should be indicative of data quality for the whole program; the goal of a DQR is to assess data quality for the program based on the results of the selected tracer indicators. As such, the indicators selected should not be the most difficult to compile and report monthly, or the easiest. Often, suspicions of data quality problems, or the level of investment of time and resources for certain indicators, will ultimately determine the selection of priority indicators for the assessment. All stakeholders should have a chance to participate in the selection of indicators, and consensus reached before the selection is finalized.

Timeline, Partners, and Budget

Timeline: Ideally, the DQR is conducted before the health sector planning begins so that the DQR results are available to inform decision making. From the planning to the results dissemination, the total time required could be as long as six months. Appendix 3 provides an example DQR implementation timeline. Surveys with regional- or district-level domain of estimation could take longer due to the larger sample size requirements. Ample time should be budgeted to ensure adequate planning and preparation for the survey implementation. If tools need to be acquired (e.g., computer tablets for electronic data entry), provisions must be made early enough to ensure arrival in-country before the survey training and implementation begin. If technical assistance is required, consultants should be identified and the contractual details worked out in advance. Finally, large surveys rarely are completed exactly as planned or on schedule. Anticipate delays and have plans, staff, and resources in place to quickly address problems as they arise and resolve them. The steps for implementation of the DQR are listed in Appendix 1.

Partners: The five-point call to action in the Measurement and Accountability for Results in Health (MA4H) Summit recommends that partner investments in health information be fully aligned with a single country platform for information and accountability. Development partners likely will be stakeholders in the DQR implementation and results; therefore, it is important to ensure that in-country partners are included in the DQR planning and implementation decision-making process. Partners can be a valuable source of technical assistance and other resources for survey implementation.

Budget: A detailed budget should be developed early before the survey implementation. This includes determining how the survey will be funded and identifying funding sources. Budgets should be developed jointly with partners through a transparent process, and the protocol for paying expenses should be agreed. Payment of stipends or per diem fees for survey implementers should comply with local policies. Finance personnel should be involved and budgeted for so that adequate accounting procedures are in place and adhered to. Appendix 4 provides a sample budget template.

HEALTH FACILITY ASSESSMENT

WHO recommends that the health facility survey component of the DQR be conducted in conjunction with a larger health facility survey to maximize efficiency and conserve resources. Often the DQR is conducted as part of a Service Availability and Readiness Assessment (SARA). Combining with an existing survey is an efficient way to obtain information from health facilities, and it may provide for a larger sample size, thereby improving the precision of survey estimates; however, the DQR health facility survey can also be administered as a stand-alone survey.

Resource Requirements

The level of effort required for data verification depends on the number of facilities to be assessed (that is, the sample size), the number of indicators included in the data verification exercise, the data volume and organization at the health facilities, and the complexity of the reporting system. It is recommended that data verifiers work in pairs to ensure quality in the data verification.

Data verification and the system assessment at small facilities generally requires 3–4 hours for an assessment of four to five indicators. Larger facilities or hospitals will require more time as the volume of service provision and the number of records increases. In general, a sample of 100 health facilities with 10 data collection teams with two people to a team will take 8–10 working days, depending on the factors noted earlier, or a total of 160–200 person-days. Depending on whether the data collection is conducted using paper or electronic versions of the questionnaire, or both, several days may be required for data entry and checking before the data analysis.

Scope of the Assessment

The data quality TWG determines the scope of the assessment, based on the needs of the health system stakeholders and planners and the resources available. While regional- or district-level survey estimates are more valuable for planning, the sample sizes required, and therefore the costs for implementation, are much higher. The data quality TWG , with donors, partners, and other stakeholders, must weigh the relative value of increased granularity of the survey estimates against the increased cost to obtain them, and determine the appropriate scope of the assessment.

Sampling

The sample size depends on the desired precision of the key estimates of interest in the health facility survey, including data accuracy and the acceptable margin of error. Other considerations include the availability of resources and the desired level of application of the estimates. Note that provincial-level estimates require a greater sample size than national-level estimates. The data quality TWG needs to work with a survey statistician and health facility survey organizers to determine the appropriate sample size for the health facility survey, depending on the country's priorities for the level of estimate application, available resources, and the estimate precision sought.

Sampling for a health facility assessment requires a complete listing of sample units, or the list frame, from which the sample is chosen. For health facilities assessments, the sampling units are facilities and the list frame is a facility list. The list frame should be as complete, accurate, and up-to-date as possible.

Master Facility List

A comprehensive facility list with unique identifiers for facilities and attribute data, known as a Master Facility List (MFL), has information on the region and district, facility type, managing authority, and urban or rural designation. An existing MFL for a country can serve as the sampling frame.

Often a list frame that is complete, accurate, and up-to-date, and covers both public and private sectors does not exist. If not, it will need to be constructed before a sample can be selected. Unless the country maintains a comprehensive MFL, authorities do not always have the country's up-to-date records on functioning health facilities. Coverage of private facilities is often incomplete and out-of-date; they may have closed or moved, and there is often no standard definition for facility type in the private sector.

If the MLF is not up-to-date, it should be complemented with information from other sources, such as private sector coordinating bodies, social ministries where NGOs register their activities, or directly from faith-based, private, and parastatal organizations. District health management teams are another good source for information on health facilities in the country. District health management officers should be consulted on the accuracy of the MFL for their respective districts and revised as necessary. In situations where it is not possible to obtain a reliable sampling frame list of facilities, a dual-frame sampling, which combines a simple random sample of hospitals and large facilities with a sample of geographically defined areas in the country. More information is available in the WHO SARA Implementation Guide, Chapter 2, Sampling,[3] and Module 3, Data Verification and System Assessment in the DQR Toolkit.[4]

Data Requirements

The health facility assessment component of the DQR requires the following information from sampled sites.

Health facility:

- Validated monthly indicator values for three consecutive reporting periods (one quarter) for selected indicators;
- Reported values for the same indicators and periods from the same facilities;
- Information on the completeness and availability of source documents and reports;
- Causes of discrepancies between recounted and reported; and
- Causes of missing source documents and reports.

District level, all health facilities in the district:

- Indicator values for facilities in the district for the selected reporting periods, and
- Information on the availability, completeness, and timeliness of reports from facilities in the district.

The DQR includes a qualitative survey conducted as an interview with the data manager or facility in-charge (that is, the person who compiles the monthly report at the facility). This information helps identify causes for weaknesses in the reporting system and interventions to help improve data quality. The system assessment includes questions on the following aspects of the reporting system:

- Reporting practices,
- Staff training,

[3] Available at http://www.who.int/healthinfo/systems/SARA_Implementation_Guide_Chapter2.pdf?ua=1.

[4] Available at http://apps.who.int/iris/bitstream/10665/259226/1/9789241512749-eng.pdf?ua=1.

- Supervision,
- Availability of data compilation and reporting guidelines,
- Availability of data collection tools and reports, and
- Analysis and use of data.

DQR Roles and Responsibilities

Numerous agencies and organizations, personnel, and resources are required to carry out a DQR assessment. This section lists the roles and responsibilities of the supervisors, data collectors, program managers, monitoring and evaluation (M&E) officers, and technical advisors, all of whom contribute to quality implementation of the DQR.

Supervisors

Field supervisors play a crucial role in ensuring data quality and consistency. They are responsible for overseeing all aspects of data collection in the survey areas for which they are responsible, which includes these tasks:

- Organizing data collection visits in facilities (making initial contact and preparing a schedule of data collection visits);
- Ensuring the availability of paper forms and functionality of electronic data collection tools, and supervising data collection activities:
    - To ensure data collection protocols are followed,
    - To ensure regular communication with data collection teams,
    - To check data collection forms at the end of each day for completeness and legibility, and
    - To ensure electronic data are transferred to the national level using a secure electronic transmission as often as possible, following established survey protocol.
- Validating data collection by re-conducting the survey at a small percentage of facilities (for example, 10 percent) and comparing results to those of data collectors;
- Collecting and storing data collection forms and sending them to the survey manager; and
- Transferring electronic data from electronic data collection devices to survey area computer or laptop, if applicable.

Further information on the role of supervisors during the DQR data collection is available in Chapter 6, Supervisor's Guide, in the SARA Implementation Guide.[5]

Data Collectors

The principal responsibility of data collectors is appropriate use of the questionnaire to collect information that is as accurate as possible by asking questions of the appropriate respondents and accurately recording responses.

The health facility assessment is completed in teams. Typically, each team includes two people who are responsible for data collection, working closely with a field supervisor. Data collectors are responsible for the following tasks:

- Visit health facilities and collect information;
- Verify geographic coordinates, if relevant;

[5] Available at http://www.who.int/healthinfo/systems/SARA_Implementation_Guide_Chapter6.pdf?ua=1.

- Complete a DQR data collection paper form or an electronic form, or both,
- Validate indicator values for the facility by re-aggregating the service delivery results for the selected period and making comparisons with the reported values (data verification);
- Back up electronic data on a memory card or USB key; and
- Report back to the field supervisor at the end of each day.

For accuracy in data collection and validity in the assessment findings, it is imperative that data collectors accurately re-count service delivery results for the selected indicators and periods. The level of experience and knowledge required of data collectors is substantial; they should have working knowledge of data collection tools for up to five program areas and know the protocols for monthly compilation of the five indicators. Attention should be paid to the quality of training for data collectors and the level of experience of staff selected to be data collectors. Training should include ample practice with sample data collection tools to build capacity for this critical task. Further information on the role of data collectors during DQR survey implementation is available in Chapter 5, Data Collector's Guide, in the SARA Implementation Guide.[6]

Data Managers

National-level data managers are responsible for receiving data from the field, in both paper and electronic formats, and reviewing it for completeness and quality. When gaps and other anomalies are found, the data managers should investigate the problem and notify supervisors for the affected health facilities so they can follow up to resolve problems and fill gaps. Automated tools using CSPro help identify gaps and inconsistencies in data collection. Data managers should be trained in the use of these tools to ensure that this critical task is performed. If capacity for data management is lacking in the country, external technical assistance can be sought, for example from WHO Country and Regional Offices.

Data managers are responsible for the following tasks:

- Assisting in the establishment of a central data server to receive and warehouse collected survey data
- Leading the process to enter data collected on paper forms in a computer database
- Compiling data as it comes in from the field and reviewing it for completeness and quality
- Reacting to data gaps and inconsistencies by informing relevant survey field personnel and following up to ensure the required fixes are enacted
- Updating the survey sampling list frame to take into account facilities that have been dropped and those that have been added during implementation, and ensuring the appropriate use of unique IDs and relevant communications with field personnel
- Cleaning the data and ensuring a complete final dataset for the analysis
- Assisting with data analysis, as appropriate
- Ensuring the master data file for the survey is up-to-date and complete
- Calculating survey indicators from the raw survey data using the standard indicator batch file in CSPro and making country-specific adaptations to the batch file as necessary
- Exporting the DQR indicators file from CSPro to other software for analysis, including the standardized MS Excel-based DQR health facility and district level Chartbooks

Further information on the role of DQR data managers and DQR data processing in general is available in Chapter 7, Data Processing, in the SARA Implementation Guide.[7]

[6] Available at http://www.who.int/healthinfo/systems/SARA_Implementation_Guide_Chapter5.pdf?ua=1.

[7] Available at http://www.who.int/healthinfo/systems/SARA_Implementation_Guide_Chapter7.pdf?ua=1.

Program Managers and M&E Officers

Program managers and M&E officers have unique insights into the dynamics of service delivery for their specific health programs. Their knowledge is invaluable for interpreting and determining the plausibility of results. They should be involved in the review and interpretation of findings, for example by participating in the results validation workshop.

During the DQR implementation survey, program managers and M&E officers play a valuable role as higher level monitors and supervisors for designated areas.

Tool Adaptation

Survey instruments should be adapted to the local health system. In particular, naming conventions for health facility types should be adapted, along with indicator names and definitions and source documents and reports. If the core indicators list is modified it is important to ensure that survey questions are appropriate for the indicator. For example, although most service delivery output indicators are cumulative, some indicators are classified as current. A cumulative indicator is one for which monthly values are added to the values in the previous month to derive a running total (e.g., number of clients counselled and tested for HIV). A current indictor uses the current month's values or replaces the previous month's value (e.g., client status on ART; tracking where a client is lost, stopped, transferred out, or died, subtracted from the total; addition of new patients; and an estimate of whether clients counted this month were most likely also counted last month). Thus, a quarterly value for a cumulative indicator would be the aggregate of the three months constituting the quarter, while a quarterly value for a current indicator would be the value of the indicator for the last month in the quarter. It is important to ensure that the data collection tools prompt for three values, one for each month of the quarter, in the case of cumulative indicators, and one value in the case of a current indicator.

Typically, tool adaptation is informed through a workshop with program managers and other health program personnel, such as data managers and M&E officers. These personnel are knowledgeable of the intricacies of data collection and reporting for the different health programs involved in the DQR and they can provide invaluable specifics for the appropriate local adaptation of the survey instrument, both paper and electronic. It is also important to ensure adequate representation of health program personnel in the tool adaptation workshop.

After the needed adaptations are identified and agreed upon by all stakeholders, a subgroup should be tasked with updating and finalizing the survey instruments for survey implementation and making sure that the revised tools are correctly labelled, with no ambiguity as to which version of the tool is being used to collect data.

Training for Data Collectors and Supervisors

A training plan should be developed and budgeted as part of the overall DQR planning process. All personnel should be identified, recruited, and trained before the DQR starts.

The DQR is complicated to implement, with dozens of staff moving all over the country to collect data from health facilities. It requires meticulous planning and staff need to be trained to fulfill their roles adequately.

For example, data collectors are required to re-count indicator values at health facilities for up to five program areas, and each program area has a separate set of tally sheets and registers and different methods for aggregating data to derive indicator values. The exercise is complicated and requires great attention to

detail. Training for data collectors should include ample time to practice indicator compilation on example forms.

The training venue should be large enough to accommodate all data collectors and supervisors, with ample space for spreading out example data collection tools on table tops. This space should be reserved early to ensure the adequacy of the space. Experienced facilitators should be recruited to conduct the training. Facilitators should have sufficient program M&E and health facility assessment experience. A sufficient number of facilitators should be engaged so that, to the extent possible, facilitators can work individually with participants. A good estimate is at least 1 facilitator for every 10 participants.

Training needs differ according to the type of personnel and the tasks performed. These needs and the estimated number of training days required are summarized in Appendix 5, Training Requirements. An example training agenda can be found in Appendix 6.

Data Collection

DQR data are collected on paper, electronically, or with both. If the DQR uses paper forms, sufficient copies of the data collection tools should be reproduced and distributed to data collection teams before they depart for the field, including a small number of extra copies. Supervisors are responsible for collecting completed surveys at the end of each day and reviewing them for completeness and quality. The supervisor is responsible for ensuring delivery of the completed survey forms to the national level by the end of the data collection.

The survey can also be conducted on tablet computers using a CSPro data entry application specifically designed for the DQR. The CSPro application, which can be run on either an Android or Windows operating system, permits quality controls during data entry, and electronic transmission of completed surveys if a connection to the internet is available. Submitting the surveys to national-level data managers as they are collected adds another layer of quality control on survey data entry.

Specifications for tablet computers for DQR electronic data capture are summarized in Appendix 7.
A general overview of health facility assessment data collection procedures and guidance for data collectors on interviewing practices and techniques are available in Chapter 5, Data Collectors Guide, in the SARA Implementation Guide.[8]

The next paragraphs summarize the steps in the DQR data collection process.

Notify Sites and Subnational Authorities

Several weeks before the DQR implementation begins, notification should be given to the sample health facilities of the impending visit by the data collection teams. The appropriate data management staff at the selected health facilities will need to be present the day of the assessment to help facilitate access to the appropriate records, provide responses for the M&E system assessment, and otherwise assist with the completion of the survey at the facility. These staff and their supervisors need to be informed of the survey and the date of the visit to ensure their presence at the facility the day of the visit. Likewise, subnational HMIS management authorities, such as HMIS managers at the district or region levels, should also be

[8] Available at http://www.who.int/healthinfo/systems/SARA_Implementation_Guide_Chapter5.pdf?ua=1.

informed so they can satisfy administrative protocols and enlist their support and cooperation in the completion of the survey.

Conduct the Health Facility Survey

Survey teams should work in pairs to maximize efficiency and control quality during visits to health facilities. A health facility assessment usually takes one day on site to complete the multiple assessment components, such as the SARA and DQR, and at least half a day for a stand-alone DQR. The assessment should include up to five indicators for data verification, and it can take considerable time to complete the survey, depending on the volume of service given for the selected indicators (the number or records to recount) and the quality and organization of the data (ease of retrieval and recount). The M&E system assessment should require no more than an hour at the health facility. The ideal respondent for the system assessment is the facility data manager or the person responsible for compiling and reporting the data.

Conduct the District-Level Survey

The DQR is also implemented at the district HMIS management units in the data flow from sampled health facilities. At the district level, the survey team will re-aggregate the district value of the selected indicators using the values submitted on the monthly reporting forms from all facilities in the district, not just the facilities in the sample. The team will also determine the completeness and timeliness of reporting at this level. The district-level M&E system assessment module should be completed in an interview with the data or program manager. The survey teams should plan to spend about half a day at the district HMIS management unit.

Provide for Quality Assurance

The survey planning and implementation needs to include quality assurance checks during the assessment, with special attention on critical aspects, such as data collection. Working in pairs, data collectors can provide quality assurance on the work of one another. Supervisors should review data collection forms for completeness and quality and conduct a repeat assessment of a small sample of facilities. In addition, an independent group can be engaged to repeat the survey at a small percentage of facilities. The results of these parallel assessments can be compared and discrepancies quantified. Program areas or indicators with large discrepancies should be investigated further and, if the discrepancies are severe, repeat the survey.

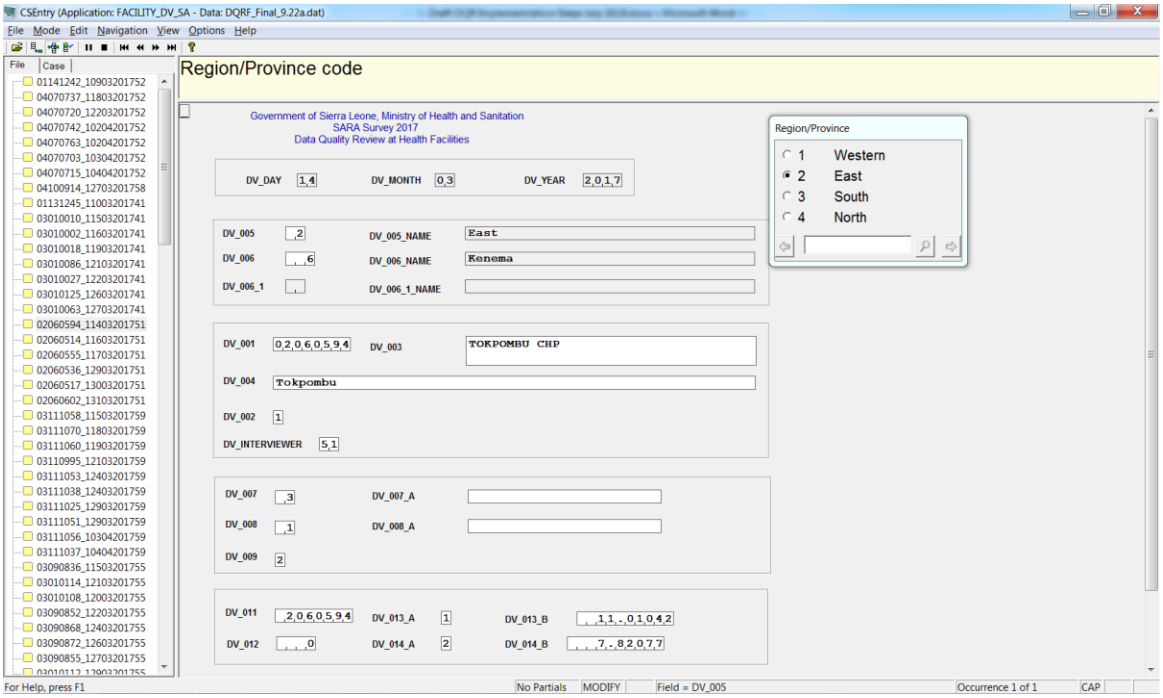
Use CSPro Survey Software and Database

The survey data collection will be stored in a CSPro database. The software, developed by the U.S. Census Bureau, is a free database management system for survey research. WHO has developed data entry applications for CSPro specifically to store DQR and SARA data (Figure 1); however, these tools require adaptations for local use. The adaptations include adding or deleting indicators and changing response categories to correspond to local needs. If technical assistance is required for adaptation of the CSPro data entry application, ensure that technical assistance providers are identified and engaged early before the data collection.

The CSPro data management software is available for download at https://www.census.gov/data/software/cspro.Download.html.

The CSPro DQR data management application was developed by and can be obtained from the Department of Information, Evidence and Research (IER) of the WHO.

Figure 1. CSPro DQR data entry application for personal computer



Calculate the DQR Indicators

The DQR CSPro database application comes with program files designed for data management tasks, such as evaluating completeness and quality and calculating indicators for data analysis. The CSPro data management application has separate program files for facility- and district-level DQR analysis, resulting in output files of calculated indicators ready for export from CSPro into Excel, pasted in the DQR Chartbooks. Details on using CSPro batch files to calculate the DQR indicators for facility and district level DQR are available in Chapter 4, CSPro for SARA + Data Verification, in the SARA Implementation Guide.[9]

Weight the Estimates to Represent the Population

Estimates derived from the DQR sample survey data should be weighted to ensure they appropriately represent the population that uses the health facilities. Because not all facilities offer all the services represented in the five target program areas, and since all facilities do not report routinely to the HMIS, these factors need accounted for to ensure generalizability of the survey results. Typically, the survey estimates will be weighted on facility type, availability of service, and non-response.

Further information on weighting of survey estimates for the DQR is available online from the WHO website at Data Quality Review: A Toolkit for Facility Data Quality Assessment, Module 3, Data Verification and System Assessment[10] and Chapter 8, Analysis and Output, in the SARA Implementation Guide,[11] section 8.3, Sample Weights.

[9] Available at http://www.who.int/healthinfo/systems/SARA_Implementation_Guide_Chapter4.pdf?ua=1.

[10] Available at http://apps.who.int/iris/bitstream/10665/259226/1/9789241512749-eng.pdf?ua=1.

[11] Available at http://www.who.int/healthinfo/systems/SARA_Implementation_Guide_Chapter8.pdf?ua=1.

Use the Automated DQR Excel Chartbooks for Data Analysis

WHO has created an automated analysis template in MS Excel to facilitate the analysis of DQR survey data. After the indicators are calculated using the indicators batch file in CSPro, the data files can be exported from CSPro to an Excel format, and the data can be pasted in the Chartbook for analysis (Figure 2).

Figure 2. Example table from DQR facility-level data analysis Excel chartbook—verification factors

Facility level data verification factor, by region, facility type, managing authority, and urban/rural

	S1_06	S2_06	S3_06	S4_06	S5_06
	ANC (N=96)	DTP3/PENTA (N=106)	HCT (N=57)	Notified cases of TB (N=35)	Malaria Cases (N=108)
Regions			HCT		Malaria Cases
Western	1.22	0.96	0.99	0.85	0.97
East	0.98	1.00	1.13	0.83	1.07
South	0.96	1.02	1.12	0.75	0.97
North	0.96	1.03	0.96	0.86	0.94
Facility type					
Hospital	0.98	0.90	0.97	1.04	1.79
CHC	0.96	1.02	1.00	0.77	0.96
CHP	1.00	0.95	1.12	1.00	0.95
MCHP	0.99	1.05	1.06		0.97
Managing authority					
Government/Public	0.96	1.02	1.05	0.82	0.98
Private	2.10	0.96	1.00	0.96	1.00
Urban/Rural					
Urban	1.08	0.94	0.96	0.96	0.95
Rural	0.97	1.03	1.08	0.79	0.99
Total	**0.98**	**1.01**	**1.05**	**0.82**	**0.98**

The Chartbooks produce tables and graphs with sample estimates stratified by facility type, managing authority, and milieu (urban or rural), and a user-specified subnational level of the health system, such as region or district (Figure 3).

Figure 3. Example table from DQR facility-level data analysis Excel chartbook—system assessment

	DATA QUALITY AND SUPERVISION				
	Routine process for checking quality of reports	Accuracy check are routinely conducted	Consistency checks of summarized data routinely conducted	Checks for timely entry and completeness routinely conducted	Written documentation of the results of data quality controls
Facility type					
Hospital	73%	73%	64%	82%	27%
CHC	45%	40%	38%	62%	21%
CHP	43%	29%	29%	49%	26%
MCHP	26%	38%	38%	49%	19%
Region					
Western	17%	27%	24%	36%	17%
East	31%	44%	44%	58%	28%
South	32%	25%	25%	39%	30%
North	49%	44%	44%	65%	11%
Managing authority					
Government/Public	37%	37%	37%	52%	21%
Private	11%	11%	6%	39%	21%
Urban/Rural					
Urban	21%	27%	31%	46%	33%
Rural	39%	38%	36%	53%	19%
Total	**36%**	**36%**	**35%**	**52%**	**21%**

DQR DESK REVIEW

Plan the Desk Review

If feasible, the desk review should be conducted by an independent entity such as a national institute or a consultant. An independent review will help ensure that the DQR results in an unbiased evaluation of data quality. The desk review requires compiling aggregate routine service delivery data for the relevant indicators in a specified format. The data for the selected indicators are obtained from the HMIS and health programs. The consultant or national institute tasked with the desk review should work with the MOH focal points to acquire and prepare the data.

In general, a DQR desk review requires about 1.5–2 weeks (8–10 person-days) for the acquisition and preparation of the data, and about 1–1.5 weeks for the analysis and reporting. The total time required is about 20 person days. The level of effort may be more or less, depending on the number of indicators selected for review and the source and organization of the data.

Select the Tool

The desk review is supported by automated tools to facilitate the analysis. Countries that use the DHIS 2 program can download an app, WHO Data Quality Tool, from the DHIS 2 app store. Countries that do not use DHIS 2 can use an MS Excel version of the tool. The pre-programmed analyses and outputs are the same in each tool, with the principal difference being that data must be input in the Excel version, whereas the DHIS 2 version accesses data tables already populated in the DHIS 2 data structure. Another limitation to the Excel tool is that the granularity of the analysis is limited to the level for which data are entered in the tool. For example, if aggregate district-level data are input, it is not then possible to drill-down to facility-level results. This limitation is also true of the DHIS 2 version because the analyses are limited to the level for which data are entered. If the facility-level detail is entered in DHIS 2, that information is available for drill-down, even if the district is selected as the level of analysis. This is not the case in the Excel version; if facility level detail is required these data need to be entered in the tool.

Gather the Data

The main purpose of the DQR is to assess the quality of health facility data being used for planning and, therefore, the data that should be analysed are the input data necessary for informed planning, such as, health sector reviews. In many countries, health facility data on key program areas come mainly from the HMIS. In other countries, where the HMIS is weak, there are parallel reporting systems for specific health programs, such as immunization, HIV/AIDS, and TB. Even in countries with strong HMIS, certain programs persist in maintaining separate systems. The principle criterion for the selection of a particular data source is whether the data are used for planning, that is, which data source is used to measure progress toward objectives? For example, if the immunization program does not rely on the HMIS data and uses only data collected and reported within the program, the data for immunization indicators included in the DQR should come from the immunization program.

If the HMIS data are generally what is used for planning and the DHIS 2 tool is used, the data need not be gathered because it is already available in DHIS 2. There are, however, typically several sources of data for each program area (data elements and indicators) and the desk review must make an appropriate choice of data source to most accurately show the results of the different data quality metrics. A knowledgeable HMIS

staff member at the national level should be consulted on the most appropriate data sources (that is, data tables) for tracer indicators in the desk review analysis.

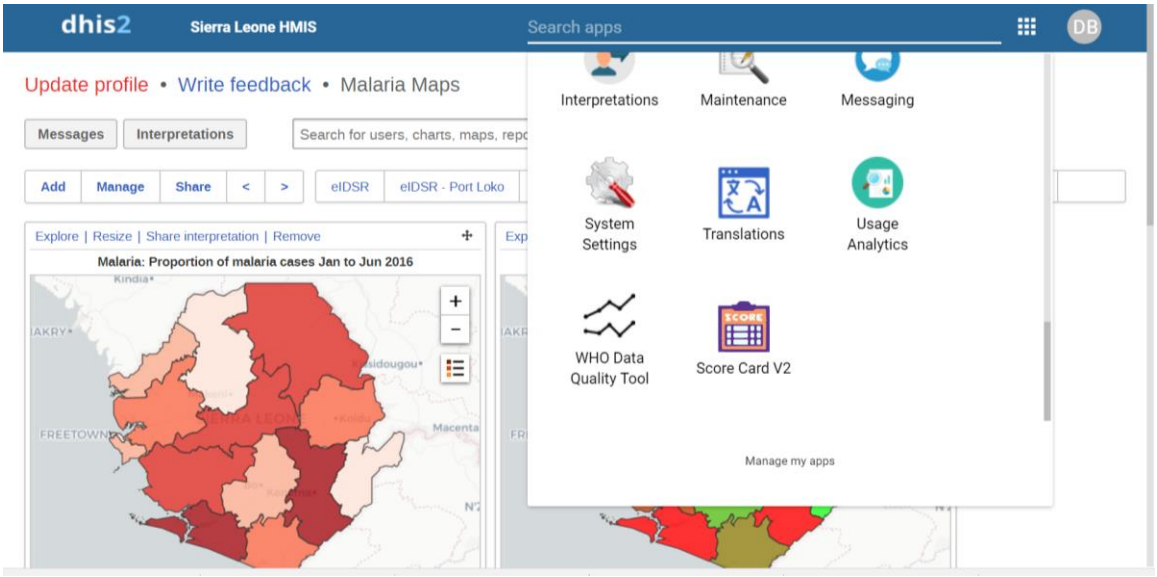
Review Data Requirements

The desk review requires selection of monthly values by district or other level of analysis for the most recent complete year for tracer indicators. Annual aggregate values for the last three years are also required for these same indicators, for the level selected. Other data needs include denominator data for calculating coverage rates for these indicators and survey results from the most recent population-based survey, such as Multiple Indicator Cluster Survey, Demographic Health Surveys, and immunization coverage surveys. Denominator data include total number of expected pregnancies, total number of expected deliveries, total number of surviving infants, and total population. Information on completeness and timeliness of reporting is also required, either from the HMIS if reporting is integrated or from specific health programs if reporting is program specific, such as the number of reports received by district compared to the number of reports expected or the number of these reports submitted by the deadline of reporting. A table of data requirements for the DQR is included in Appendix 8. Further detail on the DQR desk review is available in the DQR Toolkit, Module 2, Desk Review of Data Quality.[12]

Install and Use the DQR DHIS 2 Tool

From the DHIS 2 home page for the local use of DHIS 2, navigate to the app store and select the WHO Data Quality Tool. After the app has downloaded, a yellow up arrow will appear next to the app in the app manager. Click to install the app on the local use DHIS 2. After the app is installed, it should be available in the apps section of DHIS 2 (see Figure 4).

Figure 4. WHO Data Quality Tool app, available in the DHIS 2 apps repository



[12] Available at http://apps.who.int/iris/bitstream/10665/259225/1/9789241512732-eng.pdf?ua=1.

Figure 5. Configure the WHO Data Quality Tool for analysis

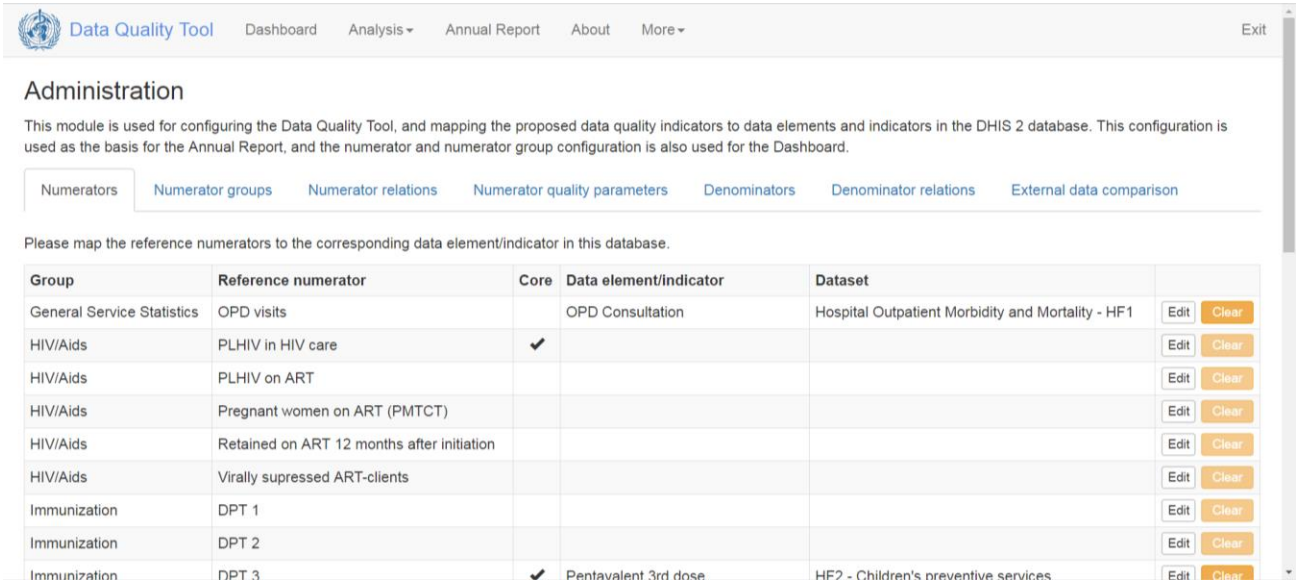
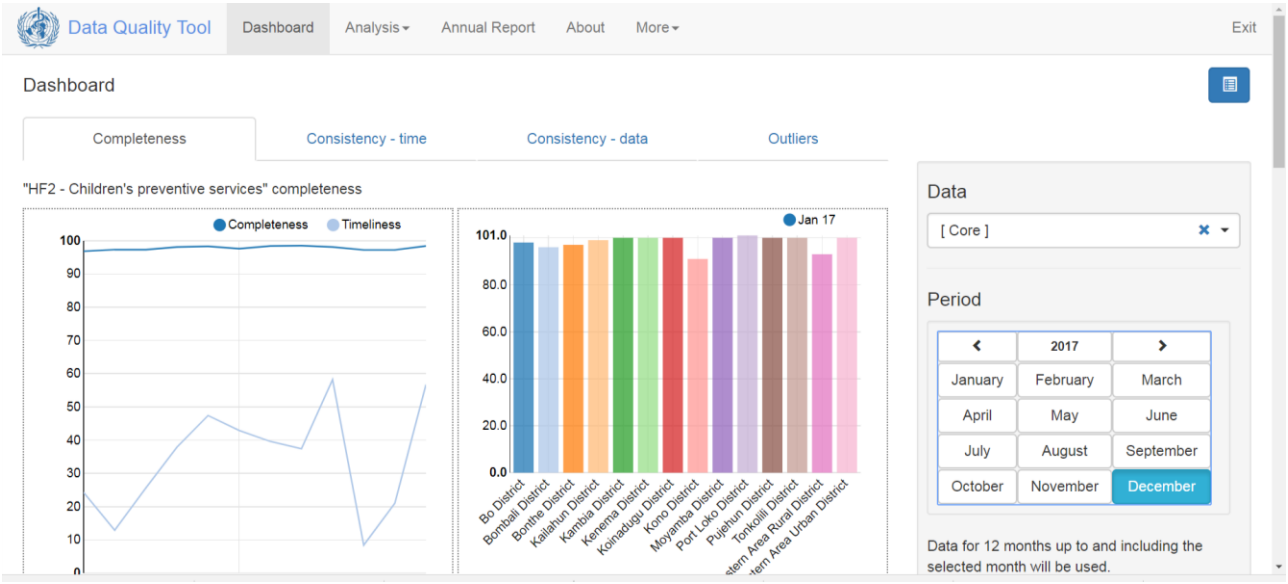


Figure 6. WHO Data Quality Tool dashboard



Configure the DHIS 2 DQR Data Quality App

The DQR app requires configuration for the analysis, which involves selecting the appropriate indicators, setting quality benchmarks, and selecting the different types of comparisons to be made. A dashboard can also be set up to automatically display the results of analyses configured during the setup process. Further

information on configuring the DHIS 2 DQR app is available in the DHIS2 Quality Tool Manual, Understanding the Basics of Improving Data Quality.[13]

Configuring the DHIS 2 DQR app requires detailed knowledge of the data structure for the local use of DHIS 2 in country. Often several data tables are available with information that can inform the data quality metrics. Some are more complete or appropriate than others. Indicators in the DHIS 2 may be disaggregated by other variables, such as by gender and age, and new indicators may need to be created to evaluate the indicator holistically. Ensure that sufficient expertise is available to configure the DHIS 2 DQR app before conducting the analysis.

After the tool and dashboards are configured, they can be updated periodically with current data to assess the changes in data quality over time. Different users can configure their own dashboards for the level or region desired. Thus the tool can serve as a powerful source of routine information on data quality for program and data managers throughout the health sector and at different levels.

Enter Data in the Excel Tool

After data are collected from the HMIS and health program databases, the data need to be entered in the Excel tool, and the tool needs to be configured, which requires selecting appropriate values from pre-defined drop-down lists on the Input Basic Info tab. Following is a list of the required information:

- Country of interest
- Year of analysis
- Data flow model
- Administrative level for the analysis (e.g., district)
    - Periodicity of reporting from this level (e.g., monthly or quarterly)
- Periodicity of reporting from health facilities
- Periodicity of reporting from aggregation levels (only administrative levels where data are aggregated)
- Administrative level for which data will be entered in the tool
- Domain of estimation (i.e., administrative level) of the population-based survey that will be used for external comparisons
- First period in the year of analysis (e.g., January or 1st quarter)
- Type of reporting conducted in the country, either integrated, in which all indicators are reporting on the same HMIS form, or program-specific, in which different health programs report independently from health facilities

Select program areas and indicators: On the Program Areas and Indicators tab use the drop-down lists to select the tracer indicators for the analysis. If the data quality TWG selects indicators that do not appear on the drop-down list, a user-defined indicator can be input by selecting the option Other–Specify. Input a tracer indicator and a related indicator for the Domain 2 comparisons.

Define quality thresholds: To judge the quality of data using the metrics in the DQR, it is necessary to define benchmarks of quality to use for comparison of the results. WHO has recommended thresholds for each metric, which can be found on the Quality Thresholds tab. Often global standards are not relevant if a country's information system is immature or is undergoing reform. If the recommended thresholds are

[13] Available at https://www.ssb.no/helse/artikler-og-publikasjoner/_attachment/291371?_ts=159abfc9bc0.

inappropriate, user-defined thresholds can be supplied by entering the values in column 2 on the Quality Thresholds tab to override the recommended thresholds.

Input indicator data: After the analysis is configured, tracer indicator data are in flat files for each administrative unit for the level of analysis selected. They appear in one line and months appear in columns (Figure 7). When data are entered, they should be pasted in as unformatted text.

Figure 7. Data structure for DQR Excel tool–tracer indicators

No.	Administrative Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	District A												
2	District B												
3	District C												
4	District D												
5	District E												
6…	District F…												
…N	…District Z												

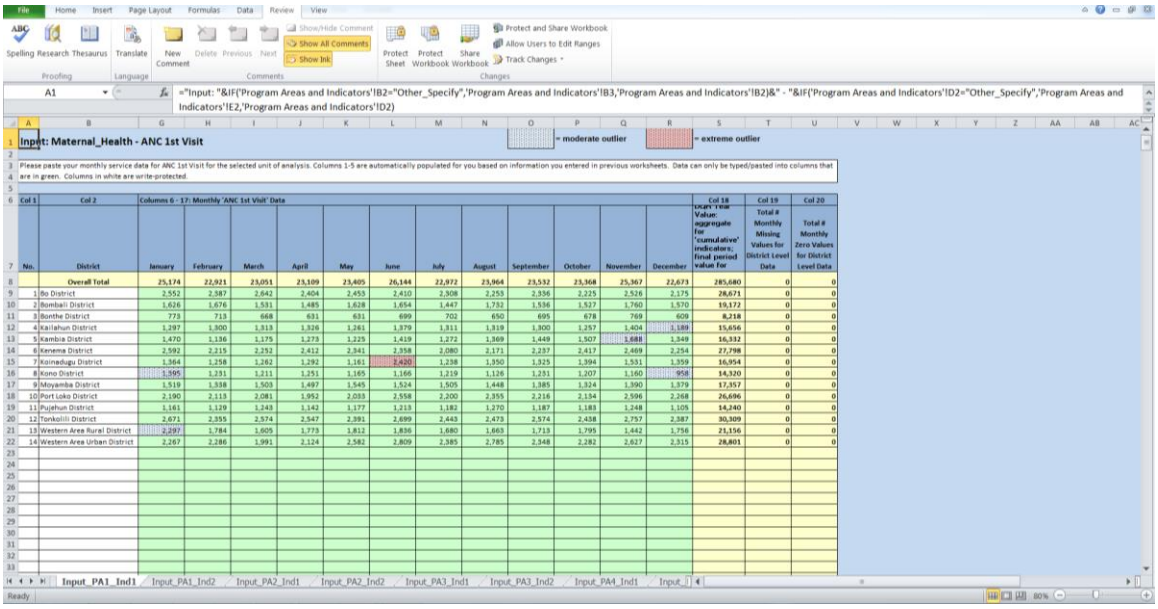
The following list of other information also needs to be input in the tool (Figure 8):

- Administrative units in the country
- Mapping of administrative units to survey aggregation units
- Population-based survey values and associated standard errors (by survey administrative unit)
- Indicator denominators by administrative unit
- Monthly indicator data by administrative unit for related indicators in the comparisons under Domain 2—Internal Consistency
- Population data for selected target populations (to evaluate adequacy of population data in Domain 4)
- Annual tracer indicator values for the three preceding years (to evaluate trends)
- Data on completeness and timeliness of reporting

Further information on inputting data in the DQR Excel tool is available in the DQR Excel Tool Users Guide.[14]

[14] Available at https://www.measureevaluation.org/our-work/data-quality/data-quality-review-tool.

Figure 8. Data entry tab for tracer indicators

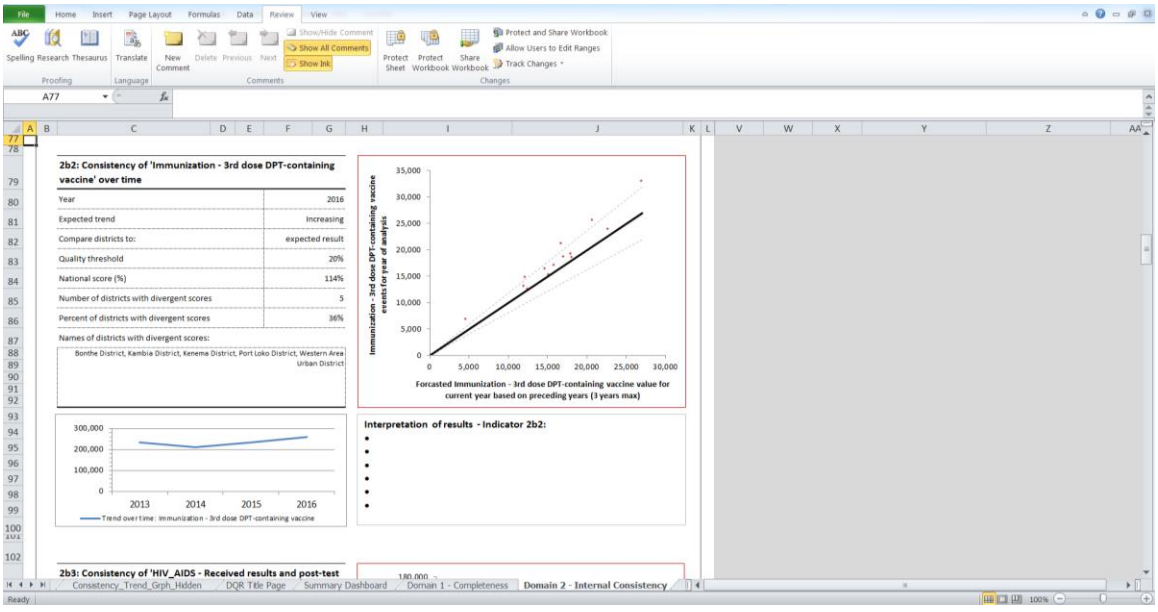


Review the Output on the Desk Review Dashboards

The analyzed results of the Desk Review in Excel are found in five dashboards contained within the tool:

1. Overall Summary Dashboard
2. Domain 1: Completeness and timeliness of reporting dashboard
3. Domain 2: Internal consistency dashboard (see Figure 9)
4. Domain 3: External comparisons
5. Domain 4: Population data dashboard

Figure 9. DQR Excel tool dashboard—internal consistency



DATA ANALYSIS, DISSEMINATION, AND USE

Data Analysis and Validation Workshop

After the data are cleaned and analysed in the Excel Chartbooks, a data analysis and validation workshop should be conducted with health program and data managers to review the results and interpret the findings. This workshop is critical in determining whether the results are plausible and within the range of expectations. Health program managers have detailed knowledge of service delivery patterns for the specific health programs, and they are the best source for determining plausibility. They can also determine the most noteworthy assessment results to highlight in written reports. Data managers can help uncover data quality problems, if necessary.

Results should be projected so that the workshop assembly can review and discuss the findings. Open and honest discussion of the results among health sector stakeholders will improve the quality and acceptability of the results. From the assembled participants, a smaller group can be identified to draft the final report. A sample workshop agenda is shown in Appendix 9.

Final Report

The validated DQR results should be written up in a narrative form as a report, with graphics depicting results to support the narrative. Graphics can be cut and pasted from the DQR Excel Chartbooks. Key survey findings should be included, with recommendations for interventions to address shortcomings in data quality. The report should be disseminated several weeks before the planning event to all staff members who are expected to participate in health-sector planning initiatives (e.g., health sector review). Other stakeholders, such as donors, technical assistance organizations, relevant national and international NGOs, private-sector bodies (e.g., universities and civil society organizations), and concerned ministries, should receive copies of the report.

The report should contain the following sections:

- Overview—to place the assessment and findings in the proper context for the reader
- Methods—to describe how the assessment was designed, especially departures taken from the standardized method
- Results—what was found on the DQR health facility survey, including—
    - Completeness and timeliness of reporting
    - Verification factors for tracer indicators
    - Distribution of discrepancies among health facilities
    - Reasons for discrepancies
    - Reasons for missing source documents and reports
    - System assessment findings
- Discussion—to let the reader know why highlighted results are important
- Recommendations—to let the reader know what possible remedies can be applied to rectify data quality problems (a list of recommendations also facilitates the drafting of the Data Quality Improvement Plan)

Appendix 10 provides a sample template for a DQR Final Report.

Data Quality Improvement Plan

Based on the results of the DQR, the TWG should lead the development of a Data Quality Improvement Plan to ensure the involvement of relevant stakeholders. The Improvement Plan should map out interventions designed to address problems found in the assessment and improve the quality of data. The plan should identify responsible agencies with appropriate staff to implement the plan, the timeline, and resources required to ensure completion. If sufficient funding is not available in the current budget to implement the improvement plan, the data quality TWG should conduct advocacy among the donor community to raise the necessary funding. Interventions to improve the quality of data should be prioritized so that those with the highest likelihood of success and those making the greatest impact on overall data quality should be implemented first. Appendix 11 shows a sample outline for a Data Quality Improvement Plan.

APPENDIX 1. IMPLEMENTATION STEPS FOR DQR

Steps	Survey activities
1. Survey planning and preparation	• Establish a survey TWG of country stakeholders to oversee and facilitate the objectives, scope, design, implementation, and analysis. • Obtain a list of all health facility sites (public, private, nongovernmental organizations (NGOs) and faith-based organizations (FBOs)), including country facility registry codes. • Determine appropriate design method (census or sample), develop an implementation plan and budget, and secure funding. • Review and adapt questionnaires to meet country-specific needs. • Recruit survey personnel (survey manager, field supervisors, data collectors, data entry and processing personnel, and data analysts). • Prepare a survey schedule. • Identify the survey sites (sampling frame). Select the sample size and sample of health facilities (if sampling method is chosen), • Procure logistics, including equipment and transport, taking into consideration the number of sites to be visited, the number of data collection teams, drivers, vehicles, and fuel. • Plan and conduct training courses for interviewers and field supervisors. • Pilot test the survey in a selected number of health facilities, evaluate results, and make amendments if necessary.
2. Data collection in the field	• Plan the data collection visits (prepare a letter of introduction, contact each site, prepare a schedule of visits). • Prepare materials and tools for data collectors. • Arrange for transport and regular communications during fieldwork. • Assemble materials necessary for local data collection. • Confirm appointments with health facilities. • Visit health facilities and collect DQR data in teams (usually two interviewers and a driver). • At the end of the interview, check questionnaire and resolve missing or unreliable information. • Return completed forms and transfer electronic files to field supervisor at the conclusion of each day. • Return forms (paper and electronic) to survey manager when data collection is complete. • Conduct validation visits in surveyed sites (5-10 percent) to ensure quality of the collected data.
3. Data processing, analysis, and interpretation	• Enter data using the CSPro application[1] (on site or at the end of the day). • Edit, validate, clean data set, and check for consistency and accuracy.

	• Export the data set for analysis (DQR indicators). • Conduct analyses of DQR core indicators using the DQR Chartbook automated tables and graphs and any country-specific indicators of interest. • Conduct desk review analyses of routine data available at the national level.
4. Results dissemination	• Meet with the survey TWG to analyze and interpret survey results and finalize recommendations. • Conduct data and results validation workshop to determine if the results are plausible and reasonable. • Prepare the final report. • Plan and implement dissemination activities. The results should be used to support annual health reviews and feed into the health sector planning process. • Document and archive the survey using metadata standards.

APPENDIX 2. ADDITIONAL INDICATORS FOR DQR DATA VERIFICATION AND CROSS-CHECK

Additional DQR indicators		
Program area	**Indicator name**	**Full indicator**
General	Service utilization	Number of outpatient department visits per person per year
Maternal health	Antenatal care, 4th visit (ANC4)	Percentage of women ages 15-49 years with a live birth in a given time period who received antenatal care, four times or more
	Institutional delivery coverage	Number and percentage of deliveries that took place in a health facility
	Postpartum care coverage	Percentage of mothers and babies who received postpartum care within two days of childbirth, regardless of place of delivery
	Tetanus toxoid 1st dose coverage	Percentage of pregnant women who received the first dose of tetanus-toxoid vaccine
Immunization	DTP1-3/Penta1-3 coverage	Percentage of children age <1 year receiving first dose, second dose, and third dose of DTP/Penta vaccines
	MCV1 coverage	Percentage of infants who have received at least one dose of measles-containing vaccine (MCV) by age 1 year
	PCV 1-32 coverage	Percentage of children <1 year receiving 1st dose, 2nd dose, 3rd dose of pneumococcal vaccines
HIV	People living with HIV who have been diagnosed	Percentage of people living with HIV who have been diagnosed
	HIV care coverage	Percentage of people living with HIV who are receiving HIV care (including [antiretroviral therapy] ART)
	Prevention of mother-to-child transmission of HIV (PMTCT) ART coverage	Percentage of HIV-positive pregnant women who received ART during pregnancy
	ART retention	Percentage of people living with HIV and on ART who are retained on ART 12 months after initiation (and 24, 36, 48, and 60 months)
	Viral suppression	Percentage of people on ART who have suppressed viral load

Additional DQR indicators		
Program area	**Indicator name**	**Full indicator**
TB	Notified cases of all forms of TB	Number of new and relapse cases of TB that are notified per 100,000 population; assess if quarterly case notification report blocks 1 and 2[15] are correct according to standards and benchmarks (B1.4) for paper-based systems[16]
	TB treatment success rate	Percentage of TB cases successfully treated (cured plus treatment completed) among TB cases notified to the national health authorities during a specified period; Assess if quarterly treatment outcome report block 1 is correct as per standards and benchmarks (B.14) for paper-based systems
	Second-line TB treatment success rate	Percentage of TB cases successfully treated (cured plus treatment completed) among all confirmed rifampicin-resistant-tuberculosis/multidrug-resistant tuberculosis (RR-TB/MDR-TB) cases started on second-line treatment during the period of assessment
TB-HIV	Proportion of registered new and relapse TB patients with documented HIV status	Number of new and relapse TB patients who had an HIV test result recorded in the TB register, expressed as a percentage of the number registered during the reporting period
	Proportion of HIV-positive new and relapse TB patients on ART during TB treatment	Number of HIV-positive new and relapse TB patients who received ART during TB treatment, expressed as a percentage of those registered during the reporting period
Malaria	Malaria diagnostic testing rate	Percentage of all suspected malaria cases that received a parasitological test [Number tested÷(number tested + number presumed)]
	Confirmed malaria cases receiving treatment	Percentage of confirmed malaria cases treated that received first-line antimalarial treatment according to national policy at public-sector facilities
	Malaria cases (suspected and confirmed) receiving treatment	Percentage of malaria cases (presumed and confirmed) that received first-line antimalarial treatment
	IPTp3	Percentage of pregnant women attending antenatal clinics who received three or more doses of intermittent preventive treatment for malaria

Note: ANC = antenatal care; ART = antiretroviral therapy; DTP = diphtheria-tetanus-pertussis; MCV = measles-containing vaccine; MDR-TB = multidrug-resistant tuberculosis; PCV = pneumococcal conjugate vaccine; PMTCT = prevention of mother-to-child transmission of HIV; RR = rifampicin-resistant.

[15] Definitions and reporting framework for tuberculosis, 2013 revision. Geneva, Switzerland: World Health Organization; 2013. Available at WHO/HTM/TB/2013.2; http://apps.who.int/iris/bitstream/10665/79199/1/9789241505345_eng.pdf?ua=1.

[16] Standards and benchmarks for tuberculosis surveillance and vital registration systems: Checklist and user guide. Geneva, Switzerland: World Health Organization; 2014 (WHO/HTM/TB/2014.02; http://apps.who.int/iris/bitstream/10665/112673/1/9789241506724_eng.pdf?ua=1.

APPENDIX 3. EXAMPLE TIMELINE FOR IMPLEMENTATION (GANTT CHART)

Task	Responsible	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22
Initial Planning Meeting - Develop preliminary work plan and budget	DQR Core Team	x																			
Hire local consultant	DQR Core Team, WHO		x				x	x	x		x	x	x	x	x	x	x	x	x	x	
Determine content of survey	DQR Core Team, TWG, other stakeholders		x																		
M&E TWG discusses/approves SARA content - identify members of SARA technical group - develop TOR	TWG																				
Meeting of SARA Core Team	Core Team lead		x			x			x				x				x		x		
Planning Meeting with Stakeholders/technical partners - 1-2 day workshop local partners meet to plan elements of the survey	Core Team , Partners			x																	
Finalize survey instrument Finalize sampling methods,	-DQR Core Team (WHO funding) - 1-2 day workshop				x																
Finalize Master Facility List (MFL)	DQR Core Team,																				
draw a sample	DQR Core Team			x	x	x	x														
source tablets	DQR Core Team			x	x	x	x														
customize CSPro database and chartbooks	DQR Core Team					x	x	x	x												
Tool adaptation workshop	DQR Core Team								x												
Develop Training Materials	DQR Core Team					x	x	x	x												
Pilot test survey instruments								x	x												
Print copies of survey Confirm software application	DQR Core Team,								x												
Conduct training	DQR Core Team , Partners									x	x										
Implement survey	All											x	x	x	x						
data quality re-check	DQR Core Team , Partners											x	x	x	x						
Data compilation and cleaning	MOH Designee, WHO, DQR Consultants															x					
Data analysis	DQR Core Team , Partners																x	x			
DQR Desk Review	DQR Core Team , Partners, DQR Consultant, HMIS																x	x			
Data Analysis and Report Writing Workshop	DQR Core Team , Partners, DQR Consultant, HMIS, Health Programs																		x		
Validation / Dissemination Meeting	DQR Core Team , Partners, Health Programs																				x

APPENDIX 4. BUDGET TEMPLATE FOR DQR IMPLEMENTATION

Area of work	Activities	Quantity (number)	Frequency	Cost per unit	Total
1. Preparation	Planning meetings				
Survey adaptation	Adaptation of the questionnaires and data entry application Translation of the questionnaire, if applicable				
Training of data collectors	Training workshop for field supervisors and data collectors (xx data collectors and xx supervisors): - per diem xx USD * number of people * number of days (8–10 days) - travel cost of participants, if applicable - venue, lunch				
	Printing training documents				
	Technical assistance (travel, fee, and per diem for facilitators)				
Pilot testing	Pilot testing in at least 3 facilities - USD xx per diem * number of people * 1 day - USD xx transportation * 3 facilities * 1 day				
	Subtotal				
2. Field survey	Data collector per diem (USD xx per diem * number of people * number of days)				
	Field supervisors per diem (USD xx per diem * number of people * number of days)				
	Drivers, vehicles, and fuel @ USD xx * number of days				
	Equipment; data collection devices * number needed Supplies (e.g., paper forms, mobile phone + units)				
	Subtotal				

Area of work	Activities	Quantity (number)	Frequency	Cost per unit	Total
3. Data processing, analysis, and dissemination	Data processing and analysis - manager/analyst * 6 weeks - statistician/analyst * 6 weeks				
	Analytical workshop - per diem xx USD * number of people * 1 day travel - cost of participants (if applicable)				
	Presentation of analytical report - venue, lunch				
	Validation workshop - per diem xx USD *number of people * number of days				
	Dissemination of results (report printing and distribution, web posting, etc.)				
	Subtotal				
	Total activities				
	Contingency, unpredictable costs (around 10%)				
	GRAND TOTAL				

APPENDIX 5. TRAINING REQUIREMENTS BY DQR COMPONENT AND PERSONNEL

Component	Personnel	Training Needs	Number of Days
Desk Review	HMIS managers & program managers from central level	Training on the DQR method, data compilation, analysis and interpretation tools	5–7 days
Data Verification	Statistician, HMIS manager	Training on the data verification method, in particular sampling, weighting, data analysis	2–4 days
	HMIS managers & program managers from central level	Training on the data verification method, particularly data analysis and interpretation, health facility site visit indicators and source documents, M&E system assessment tools, and data cleaning	5–7 days
	Data verifiers	Training on data verification method and tools. Data verifiers should be familiar with the indicators to be verified, methods for compiling indicators, cross-checks and spot checks to be conducted, and the source documents to be used	4–8 days
Improvement Plan	Data Quality coordination group, HMIS managers, program managers	Interpretation of results and development of Improvement Plan. Training on follow up of Improvement Plan	2–3 days

APPENDIX 6. TEMPLATE: TRAINING AGENDA FOR DATA COLLECTORS AND SUPERVISORS

Objectives

1. To establish a common understanding of the Data Quality Review (DQR) by all participants
2. To train field supervisors in the DQR survey procedures and introduce their roles and responsibilities during the survey
3. To train data collectors in using the DQR questionnaire (paper and electronic tools) and introduce their roles and responsibilities during data collection
4. To develop a detailed timeline and plan for the field implementation

Example Training Agenda

Time	Day 1	Day 2	Day 3	Day 4	Day 5
8:30–9:00	Welcome; workshop objectives and expected outputs	Data validation at health facility level–ANC1 -Review of source documents and reports -Practical exercise	Data validation–TB cases notified -Review of data collection tools and reports -Practical exercise	Field Practicum Teams visit health facilities to practice data collection for data verification and system assessment	Logistics for DQR implementation Team assignments and schedules
9:00–10:30	DQR Framework and Overview				
10:30–10:45	**Break**	**Break**	**Break**	**Break**	**Break**
10:45–13:00	DQR data collection tools -HF data verification -HF system assessment (paper and electronic)	Data validation–DTP3 -Review of source documents and reports -Practical exercise	Data validation–confirmed malaria cases -Review of source documents and reports -Practical exercise	Field practicum (continued)	Final recap, discussion, and logistics
13:00–14:00	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**
14:00–16:00	Conducting the assessment -Teams -Schedule and timing -Data management	Data validation–current on ART -Review of source documents and reports	District-level data collection tools -Data verification -System assessment	Field Practicum (continued)	TBD (as necessary)
16:00–16:15	**Break**	**Break**	**Break**	**Break**	**Break**
16:15–18:00	Quality assurance	Practical exercise	Overview and logistics of field practicum	Recap and discussion	

APPENDIX 7. COMPUTER HARDWARE AND SOFTWARE SPECIFICATIONS

CSPro 7.0 runs on Windows XP, Vista, 7, and 8 operating systems. It does not run under Windows 8 RT operating system. The Android data entry module requires Android version 4.0 or higher.

The following specifications are the recommended configuration for questionnaire development

- Desktop or laptop computer
- Pentium processor
- 512 MB of ram
- SVGA monitor
- Mouse or touchscreen
- 100MB of free hard drive space
- Microsoft Windows XP, Vista, 7 or 8 (Note that CSPro does not run on Windows 8 RT)

The following specifications are the recommended configuration for the interviewer's application

Windows 8 touch screen tablet (or Windows 7, 8, or Vista laptop computer with mouse) or Android tablet with operating system 4.0 or higher.

APPENDIX 8. DATA REQUIREMENTS: DATA QUALITY DESK REVIEW

Program	Data Type		Indicator
General Service Statistics	Population		▪ Total population
	Routine		▪ Total outpatient visits
Maternal Health	Population		▪ Estimated number of pregnant women ▪ Estimated number of deliveries
	Survey	Core	▪ ANC1 coverage ▪ Institutional deliveries
		In-depth	▪ Tetanus toxoid (TT) 1st dose
	Routine	Core	▪ ANC 1st visit
		In-depth	▪ ANC 4th visit ▪ Institutional deliveries ▪ ITP1 ▪ Tetanus toxoid (TT) 1st dose ▪ Postpartum care coverage
Immunization	Population		▪ Estimated number of children <1 year (surviving infants)
	Survey		▪ Estimated coverage with 3rd dose DTP-containing vaccine
	Routine	Core	▪ 3rd dose DTP-containing vaccine in children <1 year
		In-depth	▪ 1st, 2nd, 3rd dose DTP-containing vaccine (DTP1-3/Penta1-3) ▪ Number of children vaccinated with 1st dose of measles-containing vaccine ▪ Doses of PCV1–3 in children <1 year[1]
HIV/AIDS	Population		▪ Total population ▪ HIV prevalence to estimate population in need
	Survey	Core	▪ Currently on ART is not normally assessed by household surveys
		In-depth	▪ HIV counselling and testing during last 12 months ▪ Pregnant women HIV-tested in ANC
	Routine	Core	▪ Number and percentage of PLHIV who are receiving HIV care (including ART services) (HIV coverage)
		In-depth	▪ Percentage of HIV-positive persons on ART (or ART coverage)[2] ▪ PMTCT ART coverage ▪ ART retention at 12 months ▪ Viral suppression

Program	Data Type		Indicator
TB	Population		▪ Total population
	Routine	Core	▪ Number of notified TB cases (all forms of TB)
		In-depth	▪ Number of TB cases successfully treated (all forms of TB) ▪ Number of TB cases (new and relapse) tested for HIV ▪ Number of HIV-positive TB patients initiated on ART ▪ Number of MDR-TB cases detected ▪ Number of MDR-TB cases successfully treated
Malaria	Population		▪ Total population
	Survey	Core	▪ Malaria confirmation by health facilities is not normally assessed by household surveys
		In-depth	▪ Proportion of pregnant women treated with 3 or more doses of IPTp ▪ Percentage of children with fever who took first-line antimalarial among those given any antimalarial treatment
	Routine	Core	▪ Number of cases of malaria confirmed by microscopy or RDT
		In-depth	▪ Number of malaria diagnostic tests performed (microscopy or RDT; positive or negative) ▪ Number of confirmed malaria cases (positive microscopy or RDT) ▪ Number of presumed malaria cases ▪ Number of confirmed malaria cases treated ▪ Total number of malaria cases (suspected and confirmed) treated ▪ Number of pregnant women attending antenatal clinics treated with 3 or more doses of IPTp

Note: ANC = antenatal care; ART = antiretroviral therapy; DTP3 = diphtheria-tetanus-pertussis; IPT = intermittent preventive therapy; MDR-TB = multidrug resistant tuberculosis; PLHIV = people living with HIV; PMTCT = Prevention of mother-to-child transmission; RDT = rapid diagnostic test.

[1] If the country has implemented vaccination with PCV, note that some countries may use this in a 2+1 schedule by which the third dose may be given at or after 12 months.

[2] Depending on the country's policies on ARV coverage (e.g., adoption of WHO's 2013 ARV guidelines recommendation of 85% of HIV-infected persons on treatment).

APPENDIX 9. TEMPLATE: AGENDA FOR DATA ANALYSIS AND VERIFICATION WORKSHOP

Objectives

1. To review and validate DQR findings
2. To finalize data analysis and presentation of data
3. To interpret results
4. To plan actions for system strengthening—draft a data quality improvement plan

Time	Day 1	Day 2	Day 3	Day 4	Day 5
8:30–9:00	Welcome, workshop objectives and expected outputs	Expected outputs (overview and summary report)	**Report writing by indicator** Group work -Production of tables and graphics -Draft of narrative	**Report back from group work** -Presentation of analysed data and results -Presentation of proposed interventions	**Presentation of Data Quality Improvement Plan**
9:00–10:30	Field survey and data collection Data entry Response rate Lessons learned from the field experience: Strengths and weaknesses	Data quality metrics–results and analysis			
10:30–10:45	**Break**	**Break**	**Break**	**Break**	**Break**
10:45–13:00	**Overview of DQR data processing and analysis** Steps in data processing -Data cleaning -Validation by field supervisors	**Data validation by indicator** Group work -Review of results -Discussion of plausibility -Stakeholder buy-in and intervention planning	**Report writing by indicator** Group work, continued -Production of tables and graphics -Draft of narrative	**Session on cross-cutting data quality challenges** -Discussion on addressing data quality issues that affect all program areas, interventions to address crosscutting issues	**Synthesis and next steps**
13:00–14:00	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**
14:00–16:00	**DQR indicator calculation** -Adaptation of the batch edit in CSPro (DQR specificities) -DQR indicators calculation - Demonstration and practice	**Data validation by indicator** Group work, continued -Review of results and findings -Discussion of plausibility -Stakeholder buy-in and	**Report writing by indicator** Group work, continued -Production of tables and graphics -Draft of narrative	**Drafting the Data Quality Improvement Plan** -Issues and interventions -Budget -Stakeholders -Mechanism of intervention -Timeline	

		intervention planning			
16:00–16:15	**Break**	**Break**	**Break**	**Break**	**Break**
16:15–18:00	**Use of the Excel tool for automated production of standard DQR tables and graphs** -Demonstration and practice	**Report back from group work** -Presentation of findings from data quality assessment and proposed interventions	**Report writing by indicator** Group work, continued -Production of tables and graphics -Draft of narrative	**Drafting the Data Quality Improvement Plan,** continued	

APPENDIX 10. OUTLINE FOR DATA QUALITY REVIEW FINAL REPORT

1. Introduction—what are goals and objectives of the assessment
2. Background—to place the assessment and findings in the proper context for the reader and relate what has come before
3. Methods—describe how the assessment was conducted, especially departures taken from the standardized method
    3.1. Indicator selection
    3.2. Master facility list
    3.3. Sampling
        3.3.1. Weighting of indicators
    3.4. Data collection
    3.5. Data validation and analysis
    3.6. Quality assurance
4. Results—what was found in the DQR health facility survey:
    4.1. Completeness and timeliness of reporting
    4.2. Verification factors for tracer indicators
    4.3. Distribution of discrepancies among health facilities
    4.4. Reasons for discrepancies
    4.5. Reasons for missing source documents and reports
    4.6. System assessment findings
5. Discussion—to let the reader know why highlighted results are important
    5.1. Principal findings and what they mean
    5.2. Unexpected results
    5.3. Challenges encountered
    5.4. Limitations to the survey results, if any
6. Recommendations—to let the reader know what possible remedies can be applied to rectify data quality problems
7. Annex of data tables
    7.1. Survey estimates by indicator
    7.2. Other results

APPENDIX 11. OUTLINE FOR DATA QUALITY IMPROVEMENT PLAN

1. Introduction
   1.1. Background
   1.2. DQR method
2. Results of DQR
   2.1. Accuracy by indicator
   2.2. Timeliness and completeness
   2.3. System assessment
3. Crosscutting interventions to address crosscutting data quality problems
   3.1. Activities
   3.2. Responsible agencies and partners
   3.3. Budget
   3.4. Timeline
   3.5. Agency or unit responsible for monitoring and follow-up of implementation
4. Maternal and child health interventions to address MCH data quality problems
   4.1. Activities
   4.2. Responsible agencies and partners
   4.3. Budget
   4.4. Timeline
   4.5. Agency or unit responsible for monitoring and follow-up of implementation
5. Immunization program interventions to address immunization program data quality problems
   5.1. Activities
   5.2. Responsible agencies and partners
   5.3. Budget
   5.4. Timeline
   5.5. Agency or unit responsible for monitoring and follow-up of implementation
6. HIV/AIDS program interventions to address HIV/AIDS program data quality problems
   6.1. Activities
   6.2. Responsible agencies and partners
   6.3. Budget
   6.4. Timeline
   6.5. Agency or unit responsible for monitoring and follow-up of implementation
7. TB Program interventions to address TB program data quality problems
   7.1. Activities
   7.2. Responsible agencies and partners
   7.3. Budget
   7.4. Timeline
   7.5. Agency or unit responsible for monitoring and follow-up of implementation
8. Malaria program interventions to address malaria program data quality problems
   8.1. Activities
   8.2. Responsible agencies and partners
   8.3. Budget
   8.4. Timeline
   8.5. Agency or unit responsible for monitoring and follow-up of implementation

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