Data Quality Audit Tool

GUIDELINES FOR IMPLEMENTATION

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INTRODUCTION

A. BACKGROUND

National programs and donor-funded projects are working towards achieving ambitious goals related to the fight against diseases such as Acquired Immunodeficiency Syndrome (AIDS), Tuberculosis (TB), and Malaria. Measuring the success and improving the management of these initiatives is predicated on strong monitoring and evaluation (M&E) systems that produce quality data related to program implementation.

In the spirit of the "Three Ones," the "Stop TB Strategy," and the "RBM Global Strategic Plan," a number of multilateral and bilateral organizations have collaborated to jointly develop a Data Quality Assessment (DQA) Tool. The objective of this harmonized initiative is to provide a common approach for assessing and improving overall data quality. A single tool helps to ensure that standards are harmonized and allows for joint implementation between partners and with National Programs.

The DQA Tool focuses exclusively on (1) verifying the quality of reported data, and (2) assessing the underlying data management and reporting systems for standard program-level output indicators. The DQA Tool is not intended to assess the entire M&E system of a country's response to HIV/AIDS, Tuberculosis, or Malaria. In the context of HIV/AIDS, the DQA Tool relates to component 10 (i.e., supportive supervision and data auditing) of the "Organizing Framework for a Functional National HIV M&E System.[1]"

Figure 1. Organizing Framework for a Functional National HIV M&E System – 12 Components.

Two versions of the DQA Tool have been developed: (1) the "Data Quality Audit Tool" which provides guidelines to be used by an external audit team to assess a program/project's ability to report quality data; and (2) the "Routine Data Quality Assessment Tool" (RDQA) which is a simplified version of the DQA Tool for auditing that allows programs and projects to assess the quality of their data and strengthen their data management and reporting systems.

[1] UNAIDS (2008). Organizing Framework for a Functional National HIV Monitoring and Evaluation System. Geneva: UNAIDS.

The objectives of the DQA Tool for auditing are to:

- **Verify the quality of reported data for key indicators at selected sites; and**
- **Assess the ability of data management systems to collect and report quality data.**

In addition, for the programs/projects being audited, the findings of the DQA can also be very useful for strengthening their data management and reporting systems.

B. OBJECTIVES

The DQA Tool for auditing provides processes, protocols, and templates addressing how to:

- **Determine the scope of the data quality audit.** The DQA Tool begins with suggested criteria for selecting the country, program/project(s), and indicators to be reviewed. In most cases, the Organization Commissioning the DQA will select these parameters.
- **Engage the program/project(s) and prepare for the audit mission.** The DQA Tool includes template letters for notifying the program/project of the data quality audit (and for obtaining relevant authorizations), as well as guidelines for preparing the country mission.
- **Assess the design and implementation of the program/project's data management and reporting systems.** The DQA Tool provides steps and a protocol to identify potential risks to data quality created by the program/project's data management and reporting system.
- **Trace and verify (recount) selected indicator results.** The DQA Tool provides protocol(s) with special instructions, based on the indicator and type of Service Delivery Site (e.g. health facility or community-based). These protocols will direct the Audit Team as it verifies data for the selected indicator from source documents and compares the results to the program/project(s) reported results.
- **Develop and present the Audit Team's findings and recommendations.** The DQA Tool provides instructions on how and when to present the DQA findings and recommendations to program/project officials and how to plan for follow-up activities to ensure that agreed-upon steps to improve systems and data quality are completed.

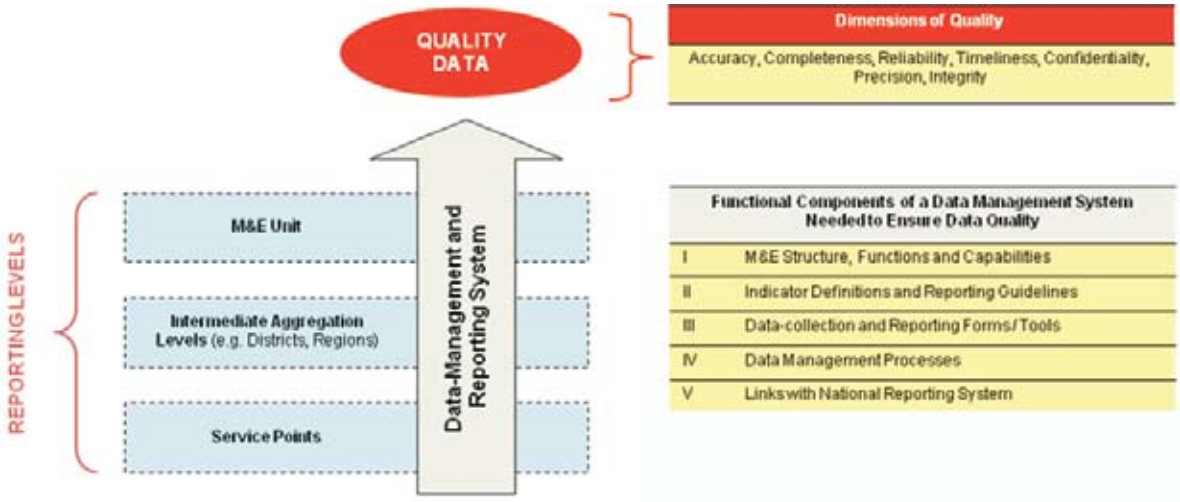
Note: While the Data Quality Audit Tool is not designed to assess the quality of services provided, its use could facilitate improvements in service quality as a result of the availability of better quality data related to program performance.

C. CONCEPTUAL FRAMEWORK

The conceptual framework for the DQA and RDQA is illustrated in the **Figure 1** (below). Generally, the quality of reported data is dependent on the underlying data management and reporting systems; stronger systems should produce better quality data. In other words, for good quality data to be produced by and flow through a data management system, key functional components need to be in place at all levels of the system — the points of service delivery, the intermediate level(s) where the data are aggregated (e.g. districts, regions), and the M&E unit at the highest level to which data are reported. The DQA and RDQA tools are therefore designed to:

(1) verify the quality of the data,
(2) assess the system that produces that data, and
(3) develop action plans to improve both.

Introduction – Figure 1. Conceptual Framework for the (R)DQA: Data Management and Reporting Systems, Functional Areas, and Data Quality.



D. METHODOLOGY

The DQA and RDQA are grounded in the components of data quality, namely, that programs and projects need accurate, reliable, precise, complete and timely data reports that managers can use to effectively direct available resources and to evaluate progress toward established goals (see **Introduction Table 1** on the following page). Furthermore, the data must have integrity to be considered credible and should be produced ensuring standards of confidentiality.

Introduction – Table 1. Data Quality Dimensions

Dimension of Data Quality	Operational Definition
Accuracy	Also known as validity. Accurate data are considered correct: the data measure what they are intended to measure. Accurate data minimize errors (e.g., recording or interviewer bias, transcription error, sampling error) to a point of being negligible.
Reliability	The data generated by a program's information system are based on protocols and procedures that do not change according to who is using them and when or how often they are used. The data are reliable because they are measured and collected consistently.
Precision	This means that the data have sufficient detail. For example, an indicator requires the number of individuals who received HIV counseling & testing and received their test results, by sex of the individual. An information system lacks precision if it is not designed to record the sex of the individual who received counseling and testing.
Completeness	Completeness means that an information system from which the results are derived is appropriately inclusive: it represents the *complete* list of eligible persons or units and not just a fraction of the list.
Timeliness	Data are timely when they are up-to-date (current), and when the information is available on time. Timeliness is affected by: (1) the rate at which the program's information system is updated; (2) the rate of change of actual program activities; and (3) when the information is actually used or required.
Integrity	Data have integrity when the system used to generate them is protected from deliberate bias or manipulation for political or personal reasons.
Confidentiality	Confidentiality means that clients are assured that their data will be maintained according to national and/or international standards for data. This means that personal data are not disclosed inappropriately, and that data in hard copy and electronic form are treated with appropriate levels of security (e.g. kept in locked cabinets and in password protected files).

Based on these dimensions of data quality, the DQA Tool is comprised of two components: (1) assessment of data management and reporting systems; and (2) verification of reported data for key indicators at selected sites.

Accordingly, the implementation of the DQA is supported by two protocols (see **ANNEX 1**):

Protocol 1: System Assessment Protocol;
Protocol 2: Data Verification Protocol.

These protocols are administered at each level of the data-collection and reporting system (i.e., program/project M&E Unit, Service Delivery Sites and, as appropriate, any Intermediate Aggregation Level – Regions or Districts).

***Protocol 1* - Assessment of Data Management and Reporting Systems:**

The purpose of Protocol 1 is to identify potential challenges to data quality created by the data management and reporting systems at three levels: (1) the program/project M&E Unit, (2) the Service Delivery Sites, and (3) any Intermediary Aggregation Level (at which reports from Service Delivery Sites are aggregated prior to being sent to the program/project M&E Unit, or other relevant level).

The assessment of the data management and reporting systems will take place in two stages:

1. *Off-site* desk review of documentation provided by the program/project;
2. *On-site* follow-up assessments at the program/project M&E Unit and at selected Service Delivery Sites and Intermediate Aggregation Levels (e.g., Districts, Regions).

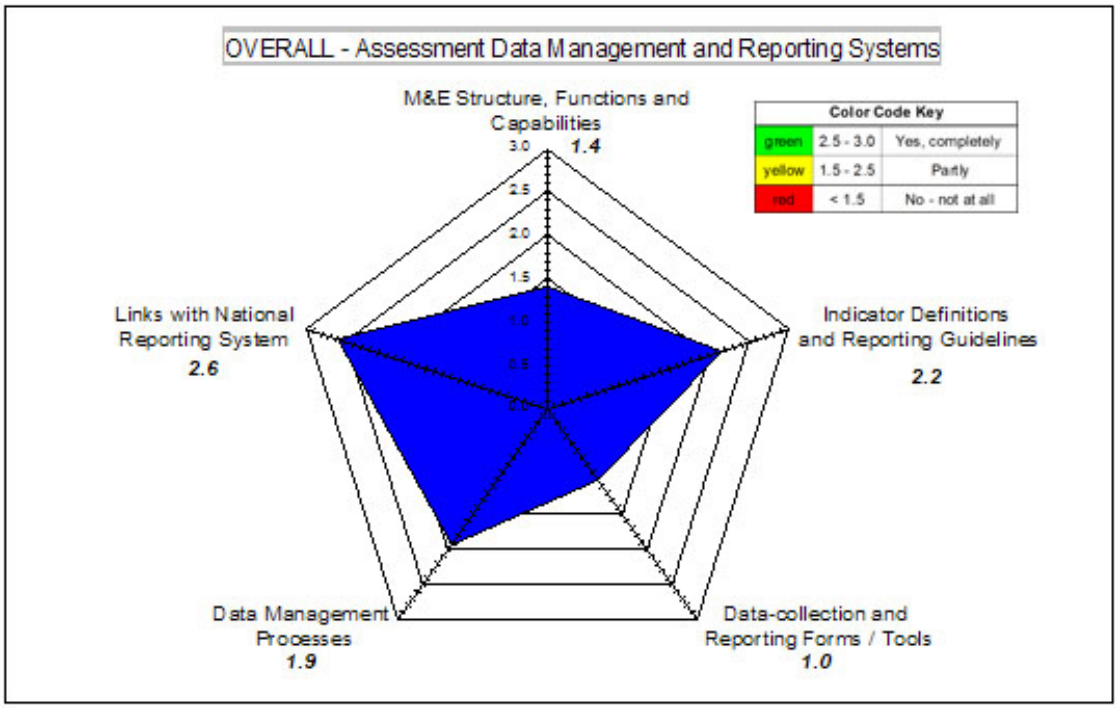
The assessment will cover five functional areas, as shown in **Introduction – Table 2.**

Introduction – Table 2. Systems Assessment Questions by Functional Area

Functional Areas		Summary Questions	
I	M&E Structures, Functions and Capabilities	1	Are key M&E and data-management staff identified with clearly assigned responsibilities?
		2	Have the majority of key M&E and data-management staff received the required training?
II	Indicator Definitions and Reporting Guidelines	3	Are there operational indicator definitions meeting relevant standards that are systematically followed by all service points?
		4	Has the program/project clearly documented (in writing) what is reported to who, and how and when reporting is required?
III	Data Collection and Reporting Forms and Tools	5	Are there standard data-collection and reporting forms that are systematically used?
		6	Is data recorded with sufficient precision/detail to measure relevant indicators?
		7	Are data maintained in accordance with international or national confidentiality guidelines?
		8	Are source documents kept and made available in accordance with a written policy?
IV	Data Management Processes	9	Does clear documentation of collection, aggregation and manipulation steps exist?
		10	Are data quality challenges identified and are mechanisms in place for addressing them?
		11	Are there clearly defined and followed procedures to identify and reconcile discrepancies in reports?
		12	Are there clearly defined and followed procedures to periodically verify source data?
V	Links with National Reporting System	13	Does the data collection and reporting system of the program/project link to the National Reporting System?

The *outcome* of this assessment will be identified strengths and weaknesses for each functional area of the data management and reporting system.

Introduction – Figure 2. Assessment of Data Management System (Illustration).



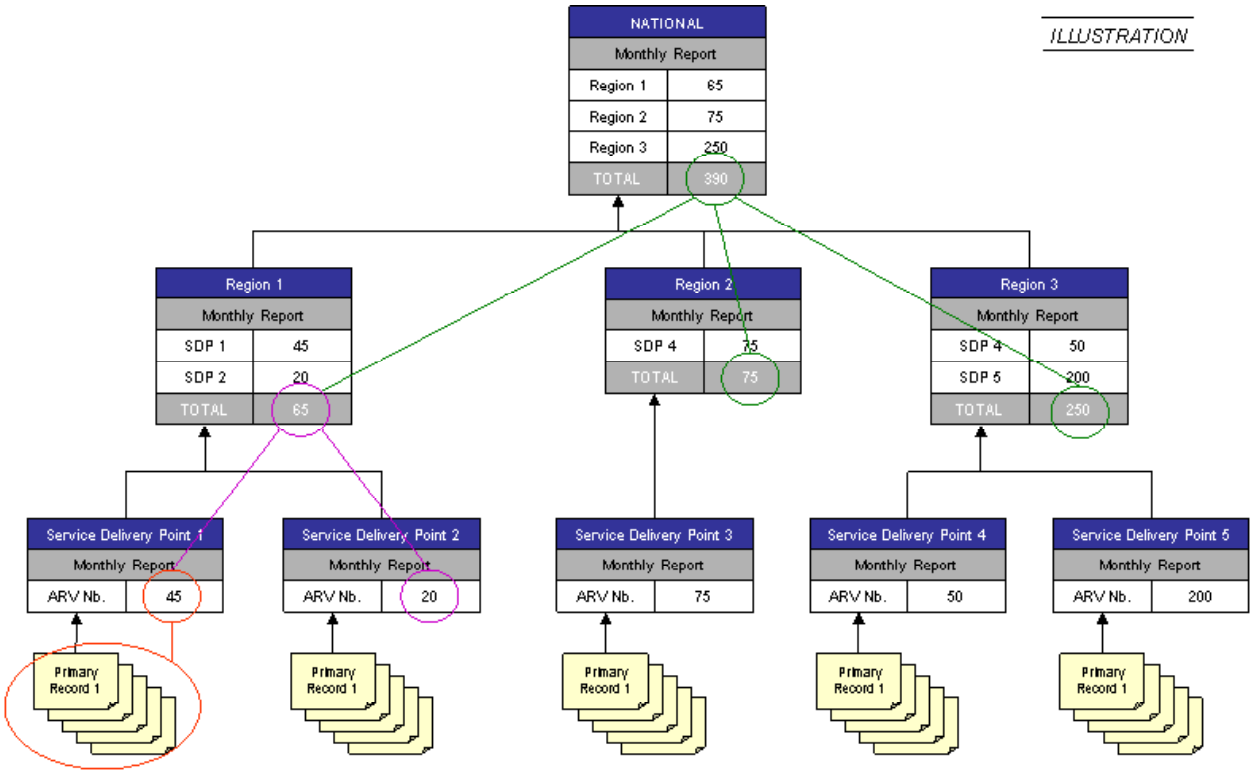
Protocol 2 **- Verification of Reported Data for Key Indicators:**

The purpose of Protocol 2 is to assess, on a limited scale, if service delivery and intermediate aggregation sites are collecting and reporting data to measure the audited indicator(s) accurately and on time — and to cross-check the reported results with other data sources. To do this, the DQA will determine if a sample of Service Delivery Sites have accurately recorded the activity related to the selected indicator(s) on source documents. It will then trace that data to see if it has been correctly aggregated and/or otherwise manipulated as it is submitted from the initial Service Delivery Sites through intermediary levels to the program/project M&E Unit.

The data verification exercise will take place in two stages:

1. In-depth verifications at the Service Delivery Sites; and
2. Follow-up verifications at the Intermediate Aggregation Levels and at the program/project M&E Unit.

Introduction – Figure 3. Tracing and Verifying Report Totals from the Service Delivery Site Through Intermediate Reporting Levels to the Program/Project M&E Unit.



The *first* stage of the data-verification occurs at the Service Delivery Sites. There are five types of standard data-verification steps that can be performed at this level (**Introduction – Table 3**):

Introduction – Table 3. Service Delivery Site: Five Types of Data Verifications

Verifications	Description	Required
1. Description	Describe the connection between the delivery of services and/or commodities and the completion of the source document to record that delivery.	In all cases
2. Documentation Review	Review availability and completeness of all indicator source documents for the selected reporting period.	In all cases
3. Trace and Verification	Trace and verify reported numbers: (1) Recount the reported numbers from available source documents; (2) Compare the verified numbers to the site reported number; (3) Identify reasons for any differences.	In all cases
4. Cross-checks	Perform "cross-checks" of the verified report totals with other data-sources (e.g. inventory records, laboratory reports, registers, etc.).	In all cases
5. Spot-checks	Perform "spot-checks" to verify the actual delivery of services and/or commodities to the target populations.	If feasible

Because there are significant differences between certain types of indicators and sites—e.g., facility-based (clinics) and community-based sites—the DQA includes *indicator-specific protocols* to perform these standard data-verification steps (e.g., Antiretroviral Therapy [ART] Protocol; Voluntary Counseling and Testing [VCT] Protocol; TB Treatment Outcome Protocol(s); Insecticide-Treated Nets [ITN] Protocol; etc.). These *indicator-specific protocols* are based on generic protocols that have been developed for facility-based data sources and community-based data sources. The Service Delivery Site Worksheet from these generic data-verification protocols are shown in **ANNEX 1.**

The *second* stage of the data-verification occurs at the Intermediate Aggregation Levels (e.g., Districts, Regions) and at the program/project M&E Unit. As illustrated in **Introduction – Figure 3**, the DQA evaluates the ability at the intermediate level to accurately aggregate or otherwise process data submitted by Service Delivery Sites, and report these data to the next level in a timely fashion. Likewise, the program/project M&E Unit must accurately aggregate data reported by intermediate levels and publish and disseminate National Program results to satisfy the information needs of stakeholders (e.g. donors).

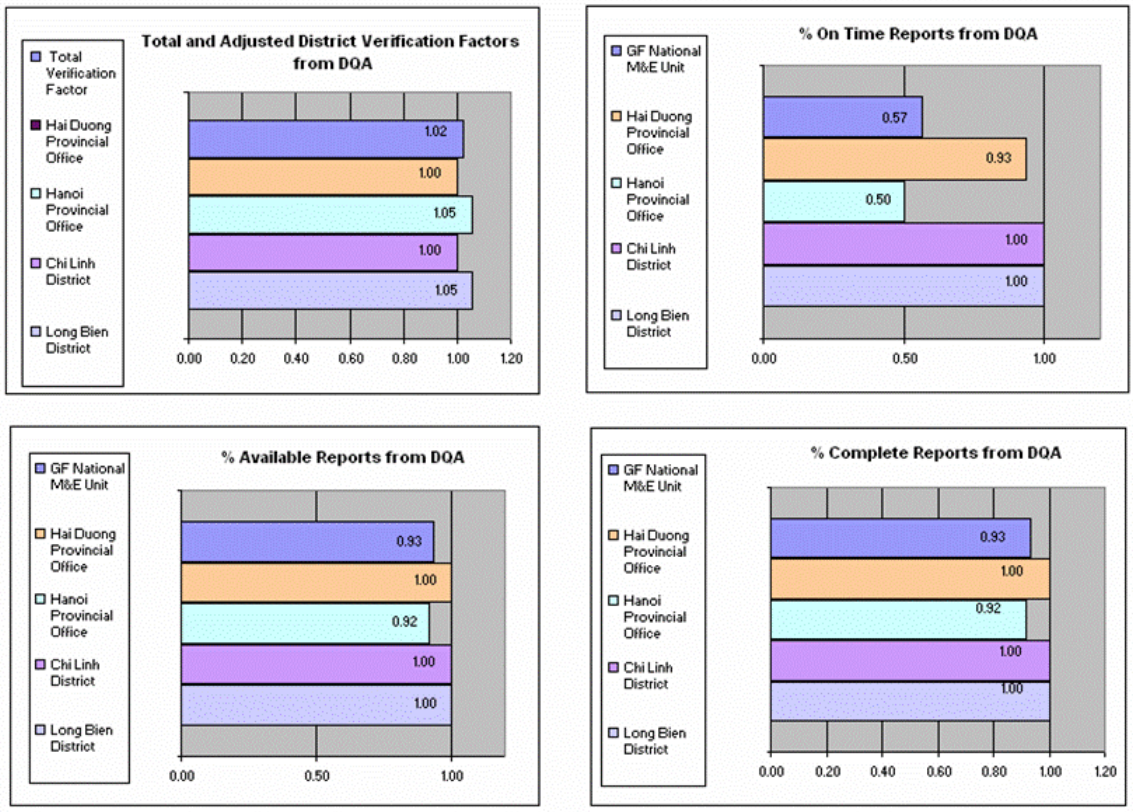
The following verifications (**Introduction - Table 4**) will therefore be performed at Intermediate Aggregation Levels. Similar verifications are performed at the M&E Unit.

Introduction – Table 4. Intermediate Aggregation Levels: Two Types of Data Verifications

Verifications	Description	Required
1, Documentation Review	Review availability, timeliness, and completeness of expected reports from Service Delivery Sites for the selected reporting period.	In all cases
2. Trace and Verification	Trace and verify reported numbers: (1) Re-aggregate the numbers submitted by the Service Delivery Sites; (2) Compare the verified counts to the numbers submitted to the next level (program/project M&E Unit); (3) Identify reasons for any differences.	In all cases

The *outcome* of these verifications will be statistics on the accuracy, availability, completeness, and timeliness of reported data.

Introduction – Figure 4. Statistics on Data Quality (Illustration).



E. SELECTION OF SITES

There are four methods for selecting sites for the Data Quality Audit:

1. Purposive selection: The sites to be visited are purposely selected, for example based on their size, their geographical proximity or concerns regarding the quality of their reported data. In this case, there is no need for a sampling plan. However, the data quality audit findings produced from such a "purposive" or targeted sample cannot be used to make inferences or generalizations about all the sites, or a group of sites, in that country.
2. Restricted site design: Only one site is selected for the DQA. The benefit of this approach is that the team can maximize its efforts in one site and have a high degree of control over implementation of the audit protocols and knowledge of the site-specific systems from which the results are derived. This approach is ideal for measuring the change in data quality attributable to an intervention (e.g. data management training). In this approach, the data quality audit is implemented in a selected site; the intervention is conducted, and is followed by another data quality audit in the same site. Any change in the quality of data could therefore be most likely a result of the intervention.

3. Stratified random sampling: This involves the drawing of a stratified random sample of a sub-national group of sites where a particular variable of interest is chosen as the basis of the sites to be visited. Examples of such variables include rural sites, extremely large sites, sites run by a certain type of organization (e.g., nongovernmental organizations [NGOs]) or sites operating in a specific region or district of a country. Such stratified random sampling allows the audit team to make inferences from the sample audit findings to all the sites that belong to the stratification variable of interest (like all the rural sites, all the very large sites, all NGOs, etc.)

4. Random sampling: It is often desirable to make judgments about data quality for an entire program or country. However, in most countries, it would be far too costly and time consuming to audit all the sites reporting to a program. Furthermore, it can be inaccurate and misleading to draw conclusions for all implementing sites based on the experiences of a few. Random sampling techniques allow us to select a relatively small number of sites from which conclusions can be drawn which are generalizable to all the sites in a program/project. Such sampling relies on statistical properties (e.g., size of the sample, the variability of the parameter being measured) which must be considered when deciding which DQA approach to use. Sometimes, the minimally acceptable number of sites (in terms of statistical validity) dictated by the sampling methodology is still too many sites to realistically pursue in terms of cost and available staff. Compromising the methodology by including fewer sites than indicated, or replacing one site for another based on convenience, can yield erroneous or biased estimates of data quality. However, given the appropriate resources, random sampling offers the most powerful method for drawing inferences about data quality for an entire program or country. This method involves the random selection of a number of sites that together are representative of all the sites where activities supporting the indicator(s) under study are being implemented. *Representative* means that the selected sites are similar to the entire population of sites in terms of attributes that can affect data quality (e.g., size, volume of service, and location). The purpose of this approach is to produce quantitative estimates of data quality that can be viewed as indicative of the quality of data in the whole program/project, and not simply the selected sites.

The number of sites selected for a given DQA will depend on the resources available to conduct the audit and the level of precision desired for the national level estimate of the Verification Factor. A more precise estimate requires a larger sample of sites. The Audit Teams should work with the Organization Commissioning the DQA to determine the right number of sites for a given program and indicator.

F. OUTPUTS

In conducting the DQA, the Audit Team will collect and document: (1) evidence related to the review of the program/project's data management and reporting system; and (2) evidence related to data verification. The documentation will include:

- **Completed protocols and templates** included in the DQA Tool.
- **Write-ups of observations, interviews, and conversations** with key data quality officials at the M&E Unit, at intermediary reporting locations, and at Service Delivery Sites.

- **Preliminary findings** and draft Recommendation Notes based on evidence collected in the protocols;
- **Final Audit Report**. The Final Audit Report will summarize the evidence the Audit Team collected, identify specific audit findings or gaps related to that evidence, and include recommendations to improve data quality. The report will also include the following summary statistics that are calculated from the system assessment and data verification protocols:

  1. **Strength of the Data Management and Reporting System** based on a review of the program/project's data collection and reporting system, including responses to questions on how well the system is designed and implemented;
  2. **Accuracy of Reported Data** through the calculation of Verification Factors[2] generated from the trace and verify recounting exercise performed at each level of the reporting system (i.e., the ratio of the recounted value of the indicator to the reported value); and
  3. **Availability, Completeness and Timeliness of Reports** through percentages calculated at the Intermediate Aggregation Level(s) and the M&E Unit.

  These summary statistics, which are automatically generated in the Excel files, are developed from the system assessment and data verification protocols included in this tool.

- **All follow-up communication** with the program/project and the Organization Commissioning the DQA related to the results and recommendations of the Data Quality Audit.

G. ETHICAL CONSIDERATIONS

The data quality audits must be conducted with the utmost adherence to the ethical standards of the country and, as appropriate, of the Organization Commissioning the DQA. While the audit teams may require access to personal information (e.g., medical records) for the purposes of recounting and cross-checking reported results, under no circumstances will any personal information be disclosed in relation to the conduct of the audit or the reporting of findings and recommendations. The Audit Team should neither photocopy nor remove documents from sites.

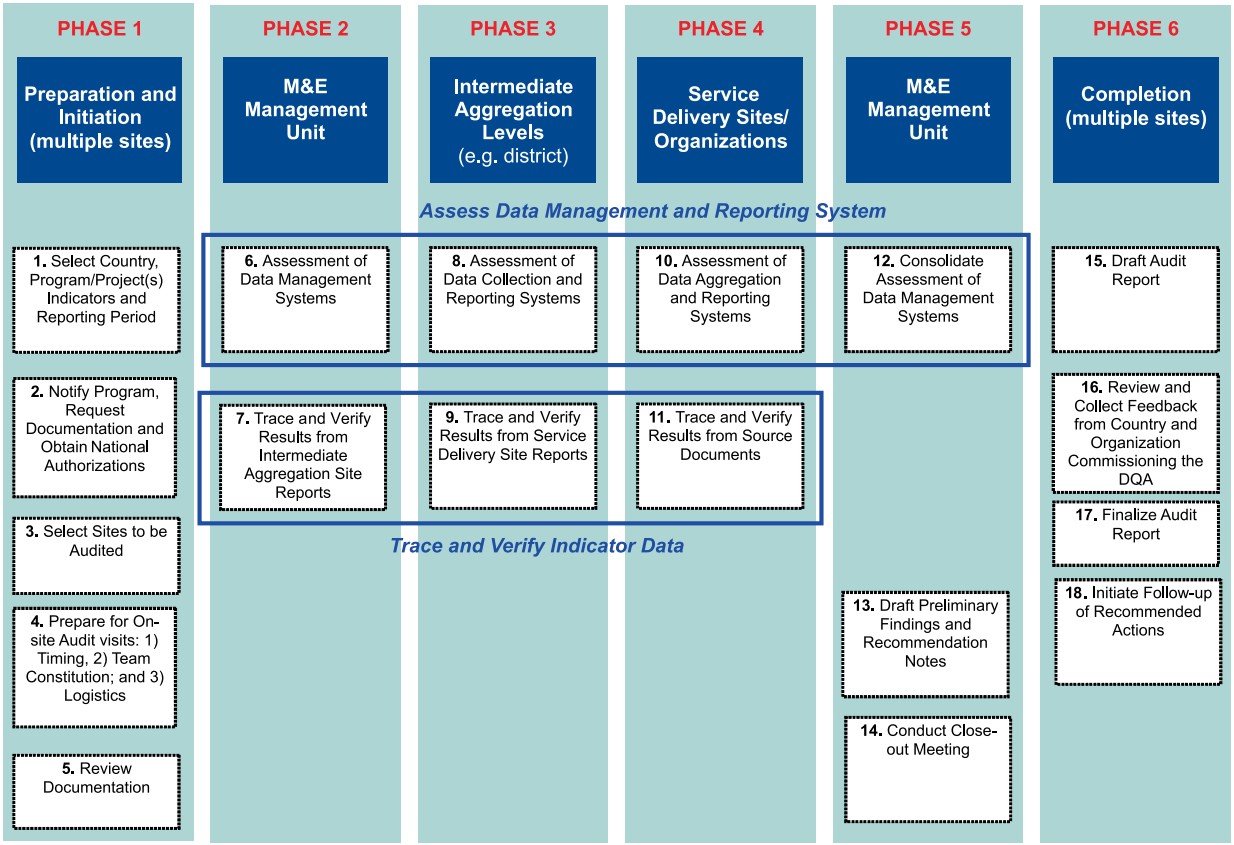
In addition, the auditor shall not accept or solicit directly or indirectly anything of economic value as a gift, gratuity, favor, entertainment or loan that is or may appear to be designed to in any manner influence official conduct, particularly from one who has interests that might be substantially affected by the performance or nonperformance of the auditor's duty. This provision does not prohibit the acceptance of food and refreshments of insignificant value on infrequent occasions in the ordinary course of a meeting, conference, or other occasion where the auditor is properly in attendance, nor the acceptance of unsolicited promotional material such as pens, calendars, and/or other items of nominal intrinsic value.

[2] Please refer to **ANNEX 5** for a description of the methodology for calculating the Composite Verification Factor.

H. IMPLEMENTATION

The Data Quality Audit will be implemented chronologically in 19 steps conducted in six phases, as shown in Introduction Figure 5.

Introduction – Figure 5. Data Quality Audit Phases and Steps.



➔ **<u>PHASE 1</u> – Steps 1-5** are performed at the **Organization Commissioning the DQA** and at the **Audit Team's Office**.

- The Organization Commissioning the DQA determines the country and program/ project(s) to be audited. The Audit Team and/or the Organization Commissioning the DQA then select(s) the corresponding indicators and reporting period ***(Step 1)***.
- The Organization Commissioning the DQA is responsible for obtaining national authorization to conduct the audit, as appropriate, and for formally notifying the program/ project of the DQA. The Audit Team follows up with a request for documentation for its review prior to visiting the program/project, including information from which to draw the sample of sites ***(Step 2)***.

- The Audit Team, in collaboration with the Organization Commissioning the DQA, identifies the number and locations of the Service Delivery Sites and related Intermediate Aggregation Levels (i.e., districts or regions) at which targeted system assessment and data verification will be conducted ***(Step 3)***.
- The Audit Team prepares for on-site visits, including establishing the timing of the visits, constituting the Audit Team and attending the requisite logistical issues ***(Step 4)***.
- The Audit Team conducts a desk review of the documentation provided by the program/project ***(Step 5)***.

➔ **PHASE 2 – Steps 6-7** are performed at the **program/project's M&E Unit**.

- The Audit Team assesses the data management and reporting system at the level of the M&E Unit ***(Step 6)***. This assessment is designed to identify potential challenges to data quality created by the program/project's data management and reporting system.
- The Audit Team begins to trace and verify data for the selected indicator(s) by reviewing the reports for the selected reporting period submitted by lower reporting levels (such as a district or regional offices) ***(Step 7)***.

➔ **PHASE 3 – Steps 8-9** are conducted at the **Intermediate Aggregation Levels** (such as a district or regional offices), if the program/project data management system has such levels.

- The Audit Team assesses the data management and reporting system by determining how data from sub-reporting levels (e.g., Service Delivery Sites) are aggregated and reported to the program/project M&E Unit (***Step 8)***.
- The Audit Team continues to trace and verify the numbers reported from the Service Delivery Sites to the intermediate level **(*Step 9*)**.

➔ **PHASE 4 – Steps 10-11** are conducted at **Service Delivery Sites** (e.g., in a health facility or a community).

- The Audit Team continues the assessment of the data management and reporting system at Service Delivery Sites by determining if a functioning system is in place to collect, check, and report data to the next level of aggregation ***(Step 10)***.
- The Audit Team also traces and verifies data for the selected indicator(s) from source documents to reported results from Service Delivery Sites (***Step 11)***.

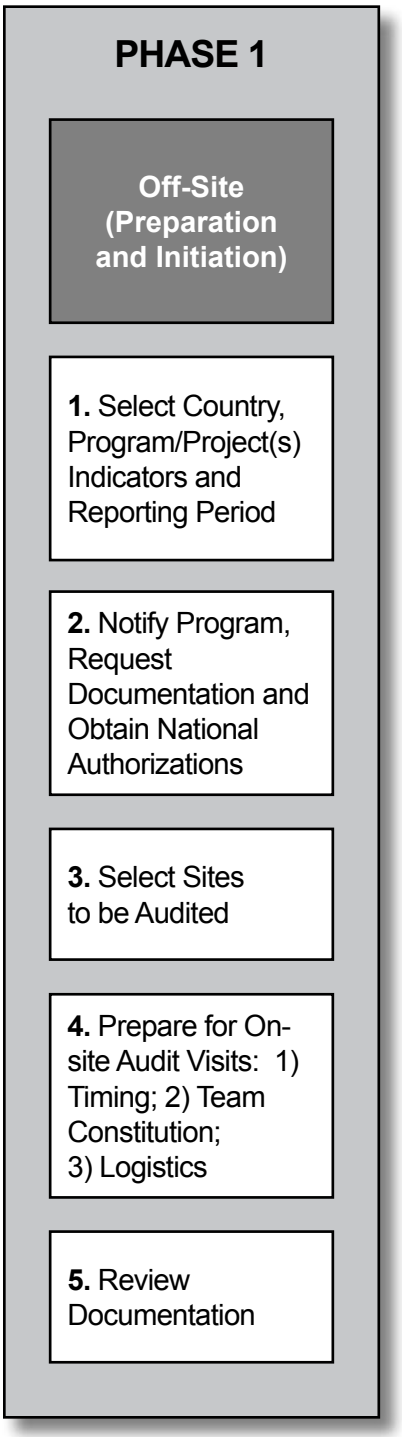
➔ **PHASE 5 – Steps 12-14** take place back at the **program/project M&E Unit**.

- The Audit Team finalizes the assessment of the data management and reporting system by answering the final Audit Summary Questions ***(Step 12)***.
- The Audit Team then drafts its preliminary DQA findings and recommendations ***(Step 13)*** and shares them with the program/project M&E officials during an Audit Closeout Meeting ***(Step 14)***. Emphasis is placed on reaching a consensus with M&E officers on what steps to take to improve data quality.

➔ **<u>PHASE 6</u> – Steps 15-18** are conducted at the **Audit Team's Office** and through meetings with the **Organization Commissioning the DQA** and the **program/project office**.

- The Audit Team completes a draft Audit Report ***(Step 15)*** which is communicated to the Organization Commissioning the DQA and the program/project ***(Step 16)***.
- Based on the feedback provided, the Audit Team completes the Final Audit Report and communicates the report to the program/project ***(Step 17)***.
- In the final audit step, the Audit Team may be asked to outline a follow-up process to help assure that improvements identified in the Final Audit Report are implemented ***(Step 18)***.

PHASE 1: PREPARATION AND INITIATION



The first phase of the DQA occurs prior to the Audit Team being on site at the location of the program/project. Responsibility for PHASE 1 rests partly with the Organization Commissioning the DQA and partly with the Audit Agency. The steps in PHASE 1 are to:

1. Identify the country and program/project and select the indicator(s) and reporting period that will be the focus of the actual data verification work at a few Service Delivery Sites.
2. Notify the selected program/project(s) of the impending data quality audit and request documentation related to the data management and reporting system that the Audit Team can review in advance of the site visits. Obtain national authorization(s), if needed, to undertake the audit. Notify key country officials and coordinate with other organizations such as donors, implementing partners and national audit agencies, as necessary.
3. Determine the type of sample and the number of sites to be the subject of on-site data quality verifications.
4. Prepare for the site visits, including determining the timing of the visit, constituting the Audit Team, and addressing logistical issues.
5. Perform a "desk review" of the provided documentation to begin to determine if the program/project's data management and reporting system is capable of reporting quality data if implemented as designed.

The steps in PHASE 1 are estimated to take four to six weeks.

STEP 1. SELECT COUNTRY, PROGRAM/PROJECT(S), INDICATOR(S), AND REPORTING PERIOD

Step 1 can be performed by the Organization Commissioning the DQA and/or the Audit Team.

A – SELECT THE COUNTRY AND PROGRAM/PROJECT(S)

In all likelihood, the Organization Commissioning the DQA will determine which country and program/project should be the subject of the Data Quality Audit. This DQA Tool presents strategies for selecting a program/project(s) for an audit by providing a list of relevant criteria and other issues to be considered. There is no single formula for choosing program/project(s) to be audited; international, local and programmatic circumstances must be taken into consideration in the decision. The audit documentation should include information about who made the selection and, to the extent known, the rationale for that decision.

An illustrative list of criteria to be used for the selection of a country and program/project is shown below in **Step 1 – Table 1**. If a National program is having the audit conducted, it can also use these criteria to select which aspects of the program (e.g. indicators) will be audited.

Step 1 – Table 1. Illustrative Criteria for Selection of a Country, Disease/Health Area, and Program/Project

1	Amount of funding invested in the countries and programs/projects within the disease/health area.
2	Results reported from countries and programs/projects (such as number of people on ART, ITNs distributed, or Directly Observed Treatment, Short Course [DOTS] Detection Numbers).
3	Large differences in results reporting from one period to the next within a country or a program/project.
4	Discrepancies between programmatic results and other data sources (e.g., expenditures for health products that are inconsistent with number of people reported on anti-retroviral [ARV] treatment).
5	Inconsistencies between reported data from a specific project and national results (e.g., reported number of ITNs distributed is inconsistent with national numbers).
6	Findings of previous M&E assessments indicating gaps in the data management and reporting systems within program(s)/project(s).
7	Opinion/references about perceived data quality weaknesses and/or risks within a program/project.
8	A periodic audit schedule associated with funding or renewal reviews.
9	A desire to have some random selection of countries and programs/projects for audit.

When Organizations Commissioning a DQA select the country and program/project to be the subject of a data quality audit, they might find it useful to rank the countries (or programs/projects) by the amount they have invested in them and/or the reported output (results). This could be done in the following sequence:

- **First**, rank the countries or program/project(s) by the investment amount for a specific disease;
- **Second**, identify the indicators relevant for ranking the countries (or the programs/projects) by reported results (this list will generally be specific to the particular Organization Commissioning the DQA);
- **Third**, determine the ranking of each Country or program/project for each of the identified indicators.

This list should help the Organization Commissioning the DQA prioritize the countries or program/project(s). **ANNEX 2, Step 1 – Template 1** is illustrative of such an analysis.

B – SELECT THE INDICATOR(S)

Other important decisions in preparing for a Data Quality Audit are to determine: (1) which indicators will be included in the audit; and (2) for what reporting period(s) the audit will be conducted. **It is recommended that up to two indicators be selected within a Disease/Health Area and that, if multiple Diseases/Health Areas are included in a Data Quality Audit, that a maximum of four indicators be included.** More than four indicators could lead to an excessive number of sites to be evaluated.

The decision regarding which indicators to include will generally be made by the Organization Commissioning the DQA and can be based on a number of criteria, including an analysis of the funding levels to various program areas (e.g., ARV, Prevention of Mother-to-Child Transmission [PMTCT], ITN, DOTS, Behavior Change Communication [BCC]) and the results reported for the related indicators. In addition, the deciding factor could also be program areas of concern to the Organization Commissioning the DQA and/or to the National program (e.g., community-based programs that may be more difficult to monitor than facility-based programs). In some cases, the Audit Agency may be asked to do an initial selection of indicators to be proposed to the Organization Commissioning the DQA. The analysis conducted in **Step 1** can help guide the selection of indicators to be included in the Data Quality Audit.

The criteria for selecting the indicators for the Data Quality Audit could be the following:

1. **"Must Review" Indicators**. Given the program/project(s) selected for auditing, the Organization Commissioning the DQA may have a list of "must review" indicators that should be selected first (e.g., indicators related to People on ARV Treatment, ITNs Distributed [or re-treated], and DOTS Detection Numbers). These are generally the indicators that are internationally reported to measure the global response to the disease. For example, for audits undertaken through the Global Fund, the indicators to be audited will generally come from its list of "Top 10 indicators." Under the President's Emergency Plan for AIDS Relief, the list

will likely come from indicators that most directly relate to the goals of putting two million people on treatment and providing 10 million people with care and support. Other donors and National programs may have different lists of important indicators to consider.

2. **Relative Magnitude of the Indicators**.

a. Relative Magnitude of Resource Investment in Activities Related to the Indicator. For example, if the program/project invests more than 25% of its funding in a specific program area, then the key indicator in that area could be selected.

b. Reported Number for an Indicator Relative to the Country Target. If the identified program/project has "substantial" reporting activity within a country for an indicator, that indicator should be considered for auditing. Substantial could be defined as generating more than 25% of the country's total reported numbers for that indicator.

3. **"Case by Case" Purposive Selection**. In some cases, the Organization Commissioning the DQA may have other reasons for including an indicator in the DQA. This could be because there are indicators for which data quality questions exist. It could also be the case for indicators that are supposedly routinely verified and for which the Organization Commissioning the DQA wants an independent audit. Those reasons should be documented as justification for inclusion.

ANNEX 2, Step 1 – Template 2 contains an illustrative template for analyzing the relative magnitude of the investments and indicator results per program area.

C – SELECT THE REPORTING PERIOD

It is also important to clearly identify the reporting period associated with the indicator(s) to be audited. Ideally, the time period should correspond to the most recent relevant reporting period for the national system or to the program/project activities associated with the Organization Commissioning the DQA. If the circumstances warrant, the time period for the audit could be less (e.g., a fraction of the reporting period, such as the last quarter or month of the reporting period). For example, the number of source documents in a busy VCT site could be voluminous, audit staff resources may be limited, or the program/project's Service Delivery Sites might produce monthly or quarterly reports related to the relevant source documents. In other cases, the time period could correspond to an earlier reporting period where large results were reported by the program/project(s).

D – DOCUMENT THE SELECTION

ANNEX 2, Step 1 – Template 3 provides a tool that can be used to document selection of the country, program/project(s), indicator(s), and reporting period being audited.

STEP 2. NOTIFY PROGRAM, REQUEST DOCUMENTATION AND OBTAIN NATIONAL AUTHORIZATIONS

Step 2 is typically performed by the Organization Commissioning the DQA.

A – NOTIFY PROGRAM AND REQUEST DOCUMENTATION

The Organization Commissioning the DQA should notify the program/project about the impending Data Quality Audit as soon as possible and obtain national and other relevant authorizations. They should also notify other organizations, as appropriate, about the audit and request cooperation. **The Audit Team is expected to comply with national regulations regarding data confidentiality and ethics.** It is the Audit Team's responsibility to identify such national regulations and adhere to them.

ANNEX 2, Step 2 – Template 1 contains draft language for the notification letter. This letter can be modified, as needed, in consultation with local stakeholders (e.g., the National Disease Commission, the MOH, the CCM, relevant donors). It is important that the Organization Commissioning the DQA stress the need for the relevant M&E Unit staff member(s) to accompany the Audit Team on its site visits. The letter should be accompanied by the initial documentation request from the M&E Unit, which is found in **Step 2 – Table 1**.

After the notification letter has been sent, the Organization Commissioning the DQA should send a copy of the notification letter to all relevant stakeholders, including, for example:

- Host country officials related to the program/project being audited;
- National audit agency, as appropriate; and
- Donors, development partners, international implementing partner organizations, and relevant M&E working-group representatives.

The Audit Agency should follow up with the selected program/project about the pending audit, timeframes, contact points, and the need to supply certain information and documentation in advance.

The Audit Team will need four types of documentation at least two weeks in advance of the country mission:

1. A list of all service points with latest reported results related to the indicator(s);
2. A description of the data-collection and reporting system;
3. The templates of the data-collection and reporting forms; and
4. Other available documentation relating to the data management and reporting systems and a description of the program/project (e.g., a procedures manual).

1) List of Service Delivery Sites that offer services related to the indicator(s). The Audit Team should receive a list of all Service Delivery Sites from which to select a sample of the sites to be audited. This list of service sites should include:

- **Location** – region, district, etc., and whether the site is in an urban or rural area.
- **Type of facility** – if the service site is a health facility (and what type of health facility, e.g. hospital, primary health care center) or a community-based service site.
- **Latest reporting results** for each of the Service Delivery Sites (e.g., numbers of individuals on treatment or cases successfully treated).
- **Information on other factors** (as necessary) – the Organization Commissioning the DQA may define other characteristics defining the sample of sites to be drawn. For example, the selection may include public and private sector sites or may focus on sites supported by faith-based organizations or non-governmental organizations.

Once Service Delivery Sites and the related Intermediate Aggregation Levels are selected for the audit, it is critical that the Audit Team work through the program/project to notify the selected sites and provide them with the information sheets found in ANNEX 3, Step 2 – Templates 1, 2, 3. This is meant to ensure that relevant staff is available and source documentation accessible for the indicator(s) and reporting period being audited.

2) Description of the data-collection and reporting system related to the indicator(s). The Audit Team should receive the completed template(s) found in **ANNEX 2, Step 2 – Template 2** describing the data-collection and reporting system related to the indicator(s) being audited.

3) Templates of the data-collection and reporting forms. The Audit Team should receive the templates of all data-collection and reporting forms used at all levels of the data management system for the related indicator(s) (e.g., patient records, client intake forms, registers, monthly reports, etc.).

4) Other documentation for the systems review. The other documents requested are needed so that the Audit Team can start assessing the data collection and reporting system for the selected indicator(s). These documents are listed on the following page in **Step 2 – Table 1**. In the event the program/project does not have such documentation readily available, the Audit Team should be prepared to follow-up with the program/project management once in country.

In addition, the Organization Commissioning the Audit should also provide the Audit Team with relevant background documents regarding the country and program/project being audited.

Step 2 – Table 1. List of Audit Functional Areas and Documentation to Request from Program/Project for Desk Review (if available)

Functional Areas	General Documentation Requested	Check if provided √
Contact Information	• Names and contact information for key program/project officials, including key staff responsible for data management activities.	
I – M&E Structures, Roles, and Capabilities	• Organizational chart depicting M&E responsibilities.	
	• List of M&E positions and status (e.g., full time or part time, filled or vacant).	
	• M&E Training Plan, if one exists.	
II – Indicator Definitions and Reporting Guidelines	• Instructions to reporting sites on reporting requirements and deadlines.	
	• Description of how service delivery is recorded on source documents, and on other documents such as clinic registers and periodic site reports.	
	• Detailed data flow diagram including: o from Service Delivery Sites to Intermediate Aggregation Levels (e.g., district offices, provincial offices, etc.); and o from Intermediate Aggregation Levels (if any) to the M&E Unit.	
	• National M&E Plan, if one exists.	
	• Operational definitions of indicators being audited.	
III – Data collection and Reporting Forms and Tools	• Data-collection form(s) for the indicator(s) being audited.	
	• Reporting form(s) for the indicator(s) being audited.	
	• Instructions for completing the data collection and reporting forms.	
IV – Data Management Processes	• Written documentation of data management processes including a description of all data-verification, aggregation, and manipulation steps performed at each level of the reporting system.	
	• Written procedures for addressing specific data quality challenges (e.g. double-counting, "lost to follow-up"), including instructions sent to reporting sites.	
	• Guidelines and schedules for routine supervisory site visits.	
V – Links with National Reporting System	• Documented links between the program/project data reporting system and the relevant national data reporting system.	

The systems review will be conducted by answering the questions in the **DQA Protocol 1: System Assessment Protocol.** The protocol is arranged into five functional areas with thirteen key summary questions that are critical to evaluating whether the program/project(s) data management system is well designed and implemented to produce quality data. Performing the desk review with the documentation provided prior to visiting the program/project will reduce the burden the audit will place on the data management staff at the M&E Unit.

B – OBTAIN NATIONAL AUTHORIZATION

In certain cases, special authorization for conducting the DQA may be required from another national body, such as the National Audit Agency. **ANNEX 2, Step 2 – Template 3** provides text for the letter requesting such additional authorization to conduct the Data Quality Audit. This letter should be sent by the Organization Commissioning the DQA. The recipient(s) of the authorization letter will vary according to what program or project is being audited. The national authorization and any other relevant permission to conduct the DQA from donors supporting audited sites or program/project officials should be included in the Final Audit Report as an attachment.

STEP 3. SELECT SITES TO BE AUDITED

Step 3 can be performed by the Organization Commissioning the DQA and/or the Audit Team.

In this section, four alternatives are presented for selecting the sites in which the data quality audit teams will conduct the work. The alternatives are presented in order of complexity, from Sampling Strategy A which is completely non-statistical, to Sampling Strategy D which is a multistage cluster sampling method that can be used to make statistical inferences about data quality on a national scale. Sampling Strategies B and C represent midpoints between the non-statistical and statistical approaches and offer the audit team an opportunity to tailor the audit to a specific set of sites based on need or interest.

The Organization Commissioning the DQA should decide on the sampling strategy based on the objective of the DQA and available resources. The Audit Agency will determine, based on which type of sample is used, the sites for the audit. The Organization Commissioning the DQA may want to be involved in decisions regarding site selection, particularly if the sampling is not random.

A – SELECTION METHOD A: PURPOSIVE SELECTION

This is a *pre-determined sample* that the Organization Commissioning the DQA dictates to the Data Quality Audit team. In some cases, there may be a need for a data quality audit to focus specifically on a set of service delivery points that are predetermined. In this case, there is no need for a sampling plan. **However, the data quality audit findings produced from such a "purposive" or targeted sample cannot be used to make generalized statements (or statistical inferences) about the total population of sites in that country.** The findings will be limited to those sites visited by the audit team.

B – SELECTION METHOD B: RESTRICTED SITE SELECTION

Sampling Strategy B is also called a *Restricted Site* design. It is commonly used as a substitute for probability sampling (based on a random algorithm) and is a good design for comparison of audit results over multiple periods. In the *Restricted Site* design, the audit team selects one site where all the work will occur. The benefit of this approach is that the team can maximize its efforts in one site and have a high degree of control over implementation of the audit protocols and knowledge of the site-specific systems from which the results are derived. **Sampling Strategy B is ideal for evaluating the effects of an intervention to improve data quality. For example, the DQA is implemented at a site and constitutes a baseline measurement. An intervention is conducted (e.g. training), and the DQA is implemented a second time. Since all factors that can influence data quality are the same for both the pre and post test (the same site is used), any difference in data quality found on the post test can most likely be attributable to the intervention.** Such a repeated measure approach using the data quality audit tool might be prohibitively expensive if used in conjunction with a sampling plan that involves many sites.

C – SELECTION METHOD C: PRIORITY ATTRIBUTE SELECTION

This sample is drawn by the Data Quality Audit team with the objective of maximizing exposure to important sites while minimizing the amount of time and money spent actually implementing the audit. In most cases, Sampling Strategy C involves the random selection of sites from within a particular group, where group membership is defined by an attribute of interest. Examples of such attributes include location (e.g. urban/rural, region/district), volume of service, type of organization (e.g. faith-based, non-governmental), or performance on system assessments (e.g. sites that scored poorly on the *M&E Systems Strengthening Tool)*.

The stratified random sampling used in Sampling Strategy C allows the audit team to make inferences from the audit findings to all the sites that belong to the stratification attribute of interest (like all rural sites, **all very large sites**, **all faith-based sites**, **etc.).** In this way, the audit findings can be generalized from the sample group of sites to a larger "population" of sites to which the sampled sites belong. This ability to generate statistics and make such generalizations can be important and is discussed in more detail in the section below describing Sampling Strategy D.

The stratified sampling used in Sampling Strategy C is sub-national: the data quality auditors are not attempting to make generalizations about national programs. In this sense, the strategy differs from Sampling Strategy D mainly with respect to its smaller scope. Both strategies use random sampling (explained in more detail in Annex 4), which means that within a particular grouping of sites (sampling frame), each site has an equal chance of being selected into the audit sample.

A Verification Factor can be calculated that indicates the data quality for the group with the attribute of interest but which is not national in scope.

D – SELECTION METHOD D: CLUSTER SAMPLING SELECTION

Sampling Strategy D is used to derive a ***national level Verification Factor*** for program-level indicators. It is complex and requires updated and complete information on the geographical distribution of sites (for whatever indicators have been selected) as well as the site-specific reported results (counts) for the indicator that is being evaluated. Sampling Strategy D could also be referred to as a modified two-stage cluster sample (modified in that a *stratified* random sample of sites, rather than a simple random sample, is taken within the selected clusters).

Cluster sampling is a variation on simple random sampling (where all sites would be chosen randomly) that permits a more manageable group of sites to be audited. Were all sites chosen at random they would likely be dispersed all over the country and require much time and resources to audit. Cluster sampling allows for the selection of a few districts, thereby reducing the amount of travel required by the auditors.

A scientific sampling plan implies the use of probability theory and involves statistics. The purpose of statistics in this context is to allow the auditors to produce quantitative data quality findings that can be viewed as estimates of data quality for the whole program/project, and not simply as the data quality at the selected sites. Furthermore, a scientific sample allows for the quantification of the certainty of the estimates of accuracy found by the audit (i.e. confidence intervals). The benefits of such a proportionally representative sampling plan go beyond the calculation of Verification Factors and apply to all empirical data quality audit findings.

The primary sampling unit for Sampling Strategy D is a cluster, which refers to the administrative or political or geographic unit in which Service Delivery Sites are located. In practice, the selection of a cluster is usually a geographical unit like a district. Ultimately, the selection of a cluster allows the audit team to tailor the sampling plan according to what the country program looks like.

The strategy outlined here uses probability proportionate to size (PPS) to derive the final set of sites that the audit team will visit. Sampling Strategy D generates a selection of sites to be visited by the audit team that is proportionately representative of all the sites where activities supporting the indicator(s) under study are being implemented.

Clusters are selected in the first stage using systematic random sampling, where clusters with active programs reporting on the indicator of interest are listed in a sampling frame. In the second stage, Service Delivery Sites from selected clusters are chosen using stratified random sampling where sites are stratified on volume of service.

The number of sites selected for a given DQA will depend on the resources available to conduct the audit and the level of precision desired for the national level estimate of the Verification Factor. The Audit Teams should work with the Organization Commissioning the DQA to determine the right number of sites for a given program and indicator. **Annex 4** contains a detailed discussion and an illustrative example of Sampling Strategy D for the selection of clusters and sites for the DQA.

Note: The precision of estimates of the Verification Factor found using the GAVI sampling methodology employed here have been questioned.[3] It is strongly advised that the Auditing Agency have access to a sampling specialist who can guide the development of representative samples and that the verification factors generated using these methods be interpreted with caution.

[3] Woodard S., Archer L., Zell E., Ronveaux O., Birmingham M. Design and Simulation Study of the Immunization Data Quality Audit (DQA). *Ann Epidemiol*, 2007;17:628–633.

STEP 4. PREPARE FOR ON-SITE AUDIT VISITS

Step 4 is performed by the Audit Team.

The Audit Agency will need to prepare for the audit site visits. In addition to informing the program/project and obtaining a list of relevant sites and requesting documentation (**Steps 2-3**), the Audit Agency will need to: (1) estimate the timing required for the audit (and work with the program/project to agree on dates); (2) constitute an Audit Team with the required skills; and (3) prepare materials for the site visits. Finally, the Audit Agency will need to make travel plans for the site visits.

A – ESTIMATE TIMING

Depending on the number and location of the sampled sites to be visited, the Audit Agency will need to estimate the time required to conduct the audit. As a guideline:

- The **M&E Unit** will typically require two days *(one day at the beginning and one day at the end of the site visits)*;
- Each **Intermediate Aggregation Level (e.g., District or Provincial offices)** will require between one-half and one day;
- Each **Service Delivery Site** will require between one-half and two days (i.e., *more than one day may be required for large sites with reported numbers in the several hundreds or sites that include satellite centers or when "spot-checks" are performed).*
- The Audit Team should also plan for an extra work day after completion of the site visits to prepare for the meeting with the M&E Unit.

Step 4 – Table 1 on the following page provides an illustrative daily schedule for the site visits which will help the Audit Agency plan for the total time requirement.

Step 4 – Table 1. Illustrative Daily Schedule for Data Quality Audit Site Visits and Meetings

Country:	**Indicator:**	
Date:	**Disease:**	**Team:**

	Activity	**Estimated Time**	**Notes**
	Note: Add travel and DQA team work days, as needed		
	M&E UNIT (Beginning) – 1 day		
1	Introduction and presentation of DQA process	30 min	Morning – day 1
2	Questions and answers	15 min	Morning – day 1
3	Confirm reporting period	15 min	Morning – day 1
4	Complete "DQA Protocol 1: System Assessment Protocol" a. Request additional documentation (if needed) b. Discuss and get answers to protocol questions	2 hrs	Morning – day 1
5	Complete "DQA Protocol 2: Data Verification Protocol"	2-4 hrs	Afternoon – day 1
	SERVICE DELIVERY POINT – between ½-2 days[4]		
1	Introduction and presentation of DQA process	30 min	Morning – day 1
2	Questions and answers	15 min	Morning – day 1
3	Discuss reporting period and service observation time	15 min	Morning – day 1
4	Complete "DQA Protocol 1: System Assessment Protocol" a. Request additional documentation (if needed) b. Discuss and get answers to protocol questions	1-2 hrs	Morning – day 1
5	Complete "DQA Protocol 2: Data Verification Protocol"	4-15 hours	
	-- Observation/Description	1 hr	Afternoon – day 1
	-- Documentation review	1-2 hrs	Afternoon – day 1
	-- Trace and verification	1-4 hrs	Afternoon – day 1
	-- Cross-checks	1-2 hours	Afternoon – day 1
	-- Spot-checks	0-6 hours	Day 2 (if applicable)
	INTERMEDIATE AGGREGATION LEVEL – between ½-1 day		
1	Introduction and presentation of DQA process	30 min	Morning – day 1
2	Questions and answers	15 min	Morning – day 1
3	Discuss reporting period	15 min	Morning – day 1

4 The time required at the Service Delivery Points will vary between one and two days depending on the size of the reported numbers to be verified and whether or not spot-checks are performed.

Step 4 – Table 1. Illustrative Daily Schedule for Data Quality Audit Site Visits and Meetings

Country:	**Indicator:**	
Date:	**Disease:**	**Team:**

Activity		**Estimated Time**	**Notes**
4	Complete "DQA Protocol 1: System Assessment Protocol" a. Request additional documentation (if needed) b. Discuss and get answers to protocol questions	1-2 hrs	Morning – day 1
5	Complete "DQA Protocol 2: Data Verification Protocol"	2-4 hrs	Afternoon – day 1
AUDIT TEAM WORK DAY			
1	Review and consolidate DQA Protocols 1 & 2	1-2 hrs	Morning
2	Complete preliminary findings and Recommendation Notes	3 hrs	Morning
3	Prepare final presentation for meeting with M&E Unit	4 hrs	Afternoon
M&E UNIT (End) – 1 day			
1	Conduct closeout meeting	2-3 hrs	Morning

B – CONSTITUTE THE AUDIT TEAM

While the Organization Commissioning the DQA will select the organization to conduct the data quality audit, it is recommended that the following skills be represented in the audit teams:

- Public Health (closely related to the disease area and indicator(s) being audited);
- Program Auditing;
- Program Evaluation (e.g., health information systems, M&E systems design, indicator reporting);
- Data Management (e.g., strong understanding of and skills in data models and querying/ analyzing databases);
- Excel (strong skills preferable to manipulate, modify and/or create files and worksheets); and
- Relevant Country Experience; preferable.

Audit Team members can have a combination of the skills listed above. While the total number of team members will vary by the size of the audit, it is recommended that the Audit Team comprise a minimum of two to four consultants including at least one Senior Consultant. The team may be comprised of international and/or regional consultants. In addition, if the consultants do not speak the country language, one or more independent translator(s) should be hired by the Audit Team.

When visiting the sites, the Audit Team will need to split into sub-teams and pair-up with *at least* one representative of the program/project. Each sub-team will be responsible for visiting a number of sites related to the audit (for example, one sub-team would visit the sites A, B, and C; while the second sub-team would visit the sites D, E, and F). For sub-teams visiting sites with computerized systems, one team member should have the capability to conduct queries of the relevant database.

Finally, the Organization Commissioning the DQA may have other requirements for team members or skills. It will be important for all Audit Team members to be familiar with the indicator-specific protocols being used in the audit and to become familiar with the program/project being audited.

C – PREPARE LOGISTICS

Materials to Take on the Audit Visits

When the Audit Team visits the program/project, it should be prepared with all the materials needed to carry out the on-site audit steps. A list of materials the Audit Team should be prepared with is shown in **Annex 3, Step 4 – Template 4**.

Note: While the protocols in the DQA are automated Excel files, the Audit Team should be prepared with paper copies of all needed protocols. In some cases, it may be possible to use computers during site visits, but in other cases the Audit Team will need to fill out the protocols on the paper copies and then transcribe the findings to the Excel file.

Planning Travel

The Audit Team should work with the program/project to plan for travel to the country (if the Audit Team is external) and to the sampled sites — both to set appointments and to coordinate with program/project staff that will accompany the audit team on the site visits. The Audit Team should arrange for transportation to the sampled sites and for lodging for the team.

STEP 5. REVIEW DOCUMENTATION

Step 5 is performed by the Audit Team.

The purpose of reviewing and assessing the design of the program/project's data management and reporting system is to determine if the system is able to produce reports with good data quality if implemented as planned. The review and assessment is accomplished in several steps, including a desk review of information provided in advance by the program/project, and follow-up reviews at the program/project M&E Unit, at selected Service Delivery Sites, and Intermediate Aggregation Levels. During the off-site desk review, the Audit Team will work to start addressing the questions in the **DQA Protocol 1: System Assessment Protocol** based on the documentation provided. The Audit Team should nevertheless anticipate that not all required documentation will be submitted by the program/project in advance of the country mission.

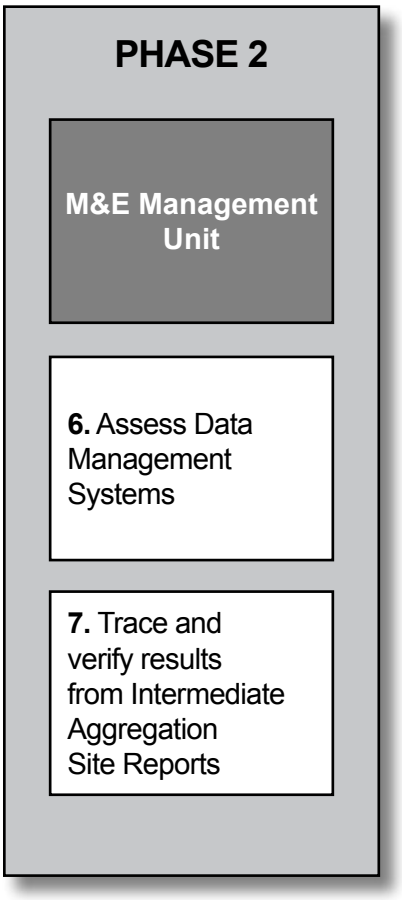
Ideally, the desk review will give the Audit Team a good understanding of the Program's reporting system — its completeness and the availability of documentation relating to the system and supporting audit trails. At a minimum, the desk review will identify the areas and issues the Audit Team will need to follow-up at the program/project M&E Unit (Phase 2).

Because the M&E system may vary among indicators and may be stronger for some indicators than others, the Audit Team will need to fill out a separate **DQA Protocol 1: System Assessment Protocol** for each indicator audited for the selected program/project. However, if indicators selected for auditing are reported through the same data reporting forms and systems (e.g., ART and OI numbers or TB Detection and Successfully Treated numbers), only one **DQA Protocol 1: System Assessment Protocol** may be completed for these indicators.

ANNEX 1 shows the list of 39 questions included in the **DQA Protocol 1: System Assessment Protocol** that the Audit Team will complete, based on its review of the documentation and the audit site visits.

As the Audit Team is working, it should keep sufficiently detailed notes or "work papers" related to the steps in the audit that will support the Audit Team's final findings. Space has been provided on the protocols for notes during meetings with program/project staff. In addition, if more detailed notes are needed at any level of the audit to support findings and recommendations, the Audit Team should identify those notes as "work papers" and the relevant "work paper" number should be referenced in the appropriate column on all DQA templates and protocols. For example, the "work papers" could be numbered and the reference number to the "work paper" noted in the appropriate column on the DQA templates and protocols. It is also important to maintain notes of key interviews or meetings with M&E managers and staff during the audit. **Annex 3, Step 5 – Template 1** provides a format for the notes of those interviews.

PHASE 2: PROGRAM/PROJECT'S M&E UNIT



The second phase of the DQA is conducted at the M&E Unit of the program/project being audited. The steps in PHASE 2 are to:

6. Assess the design and implementation of the data management and reporting system at the M&E Unit.
7. Begin tracing and verifying results reported from Intermediate Aggregation Levels (or Service Delivery Sites) to the M&E Unit.

During PHASE 2, the Audit Team should meet the head of the M&E Unit and other key staff who are involved in data management and reporting.

The steps in PHASE 2 are estimated to take one day.

STEP 6. ASSESS DATA MANAGEMENT SYSTEMS (AT THE M&E UNIT)

Step 6 is performed by the Audit Team.

While the Data Quality Audit Team can determine a lot about the design of the data management and reporting system based on the off-site desk review, it will be necessary to perform on-site follow-up at three levels (M&E Unit, Intermediate Aggregation Levels, and Service Delivery Points) before a final assessment can be made about the ability of the overall system to collect and report quality data. The Audit Team must also anticipate the possibility that a program/project may have some data reporting systems that are strong for some indicators, but not for others. For example, a program/project may have a strong system for collecting ART treatment data and a weak system for collecting data on community-based prevention activities.

The Excel-based **DQA Protocol 1: System Assessment Protocol** contains a worksheet for the Audit Team to complete at the M&E Unit. The Audit Team will need to complete the protocol as well as obtain documentary support for answers obtained at the program/project's M&E Unit. The most expeditious way to do this is to interview the program/project's key data management official(s) and staff and to tailor the interview questions around the unresolved systems design issues following the desk review of provided documentation. Hopefully, one meeting will allow the Audit Team to complete the **DQA Protocol 1: System Assessment Protocol** section (worksheet) for the M&E Unit.

It is important that the Audit Team include notes and comments on the **DQA Protocol 1: System Assessment Protocol** in order to formally document the overall design (and implementation) of the program/project data management and reporting system and identify areas in need of improvement. Responses to the questions and the associated notes will help the Audit Team answer the 13 overarching *Audit Team Summary Questions* towards the end of the DQA (see Step 12 – Table 2 for the list of summary questions – which will be completely answered in PHASE 5 - Step 12).

As the Audit Team completes the **DQA Protocol 1: System Assessment Protocol**, it should keep in mind the following two questions that will shape the preliminary findings **(Step 13)** and the Audit Report (drafted in **Step 15** and finalized in **Step 17**):

1. Does the design of the program/project's overall data collection and reporting system ensure that, if implemented as planned, it will collect and report quality data? Why/why not?
2. Which audit findings of the data management and reporting system warrant Recommendation Notes and changes to the design in order to improve data quality? These should be documented on the **DQA Protocol 1: System Assessment Protocol**.

Note: While the Audit Team is meeting with the M&E Unit, it should determine how the audit findings will be shared with staff at the lower levels being audited. Countries have different communication protocols; therefore in some countries, the Audit Team will be able to share preliminary findings at each level, while in other countries, the M&E Unit will prefer to share findings at the end of the audit. It is important for the Audit Team to comply with the communication protocols of the country. The communication plan should be shared with all levels.

STEP 7. TRACE AND VERIFY RESULTS FROM INTERMEDIATE AGGREGATION LEVELS (AT THE M&E UNIT)

Step 7 is performed by the Audit Team.

Step 7 is the first of three data verification steps that will assess, on a limited scale, if Service Delivery Sites, Intermediate Aggregation Levels (e.g., Districts or Regions), and the M&E Unit are collecting, aggregating, and reporting data accurately and on time.

The Audit Team will use the appropriate version of the **DQA Protocol 2: Data Verification Protocol—**for the indicator(s) being audited—to determine if the sampled sites have accurately recorded the service delivery on source documents. They will then trace those data to determine if the numbers have been correctly aggregated and/or otherwise manipulated as the numbers are submitted from the initial Service Delivery Sites, through Intermediary Aggregation Levels, to the M&E Unit. The protocol has specific actions to be undertaken by the Audit Team at each level of the reporting system (for more detail on the **DQA Protocol 2: Data Verification Protocol**, see **Steps 9** and **11**). In some countries, however, Service Delivery Sites may report directly to the central M&E Unit, without passing through Intermediate Aggregation Levels (e.g., Districts or Regions). In such instances, the verifications at the M&E Unit should be based on the reports directly submitted by the Service Delivery Sites.

While the data verification exercise implies recounting numbers from the level at which they are first recorded, for purposes of logistics, the M&E Unit worksheet of the **DQA Protocol 2: Data Verification Protocol** can be completed first. Doing so provides the Audit Team with the numbers received, aggregated and reported by the M&E Unit and thus a benchmark for the numbers the Audit Team would expect to recount at the Service Delivery Sites and the Intermediate Aggregation Levels.

At the M&E Unit, the steps undertaken by the Audit Team on the **DQA Protocol 2: Data Verification Protocol** are to:

1. **Re-aggregate reported numbers from all Intermediate Aggregation Sites:** Reported results from all Intermediate Aggregation Sites (e.g., Districts or Regions) should be re-aggregated and the total compared to the number contained in the summary report prepared by the M&E Unit. The Audit Team should identify possible reasons for any differences between the verified and reported results.

➔ ***STATISTIC*:** Calculate the Result Verification Ratio for the M&E Unit.

$$\frac{\text{Sum of reported counts from all Intermediate Aggregation Sites}}{\text{Total count contained in the Summary Report prepared by the M\&E Unit}}$$

2. **Copy results for the audited Intermediate Aggregation Sites as observed in the Summary Report prepared by the M&E Unit.** To calculate the Adjustment Factor (which is necessary to derive a Composite Verification Factor — **see ANNEX 5**), the Audit Team will need to find the numbers available at the M&E Unit for the audited Intermediate Aggregation Sites. These are likely to be contained in the Summary Report prepared by the M&E Unit or in a database.
3. **Review availability, completeness, and timeliness of reports from all Intermediate Aggregation Sites.** How many reports should there have been from all Intermediate Aggregation Sites? How many are there? Were they received on time? Are they complete?

➔ ***STATISTIC:*** Calculate % of all reports that are A) available; B) on time; and C) complete.

A) % Available Reports (available to the Audit Team) =

$$\frac{\text{Number of reports } \textit{received} \text{ from all Intermediate Aggregation Sites}}{\text{Number of reports } \textit{expected} \text{ from all Intermediate Aggregation Sites}}$$

B) % On Time Reports (received by the due date) =

$$\frac{\text{Number of reports } \textit{received} \text{ on time from all Intermediate Aggregation Sites}}{\text{Number of reports } \textit{expected} \text{ from all Intermediate Aggregation Sites}}$$

C) % Complete Reports =

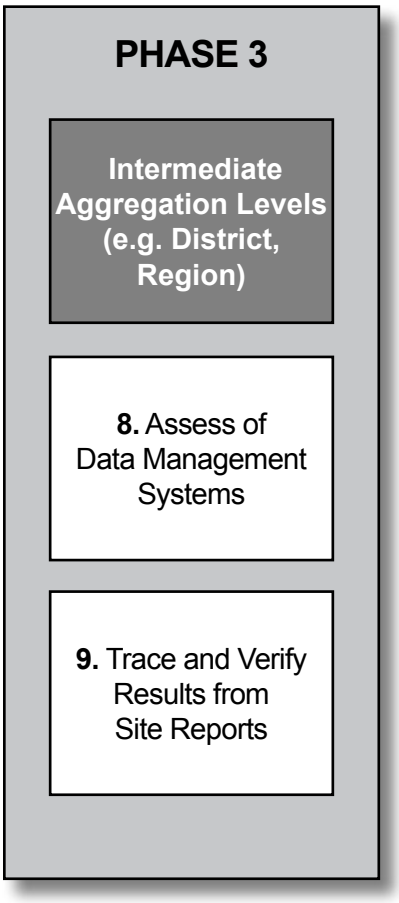
$$\frac{\text{Number of reports that are } \textit{complete} \text{ from all Intermediate Aggregation Sites}}{\text{Number of reports } \textit{expected} \text{ from all Intermediate Aggregation Sites}}$$

That is to say, for a report to be considered complete it should include at least (1) the reported count relevant to the indicator; (2) the reporting period; (3) the date of submission of the report; and (4) a signature from the staff having submitted the report.

Warning: If there are any indications that some of the reports have been fabricated (for the purpose of the audit), the Audit Team should record these reports as "unavailable" and seek other data sources to confirm the reported counts (for example, an end-of-year report from the site containing results for the reporting period being audited). As a last resort, the Audit Team may decide to visit the site(s) for which reports seem to be fabricated to obtain confirmation of the reported counts. In any event, if these reported counts cannot be confirmed, the Audit Team should dismiss the reported counts and record "0" for these sites in the **DQA Protocol 2: Data Verification Protocol**.

Note: In no circumstances should the Audit Team record personal information, photocopy or remove documents from the M&E Unit.

PHASE 3: INTERMEDIATE AGGREGATION LEVEL(S)



The third phase of the DQA takes place, where applicable, at one or more intermediary aggregation (reporting) levels where data reported by the selected Service Delivery Sites may be aggregated with data from other service sites before it is communicated to the program/project headquarters. The steps in PHASE 3 are to:

8. Determine if key elements of the program/project's data management and reporting system are being implemented at the intermediary reporting sites (e.g., Districts or Regions).
9. Trace and verify reported numbers from the Service Delivery Site(s) through any aggregation or other manipulative steps performed at the intermediary sites.

During PHASE 3, the Audit Team should meet with key staff involved in program/project M&E at the relevant Intermediate Aggregation Level — including the staff member(s) in charge of M&E and other staff who contribute to aggregating the data received from Service Delivery Sites and reporting the aggregated (or otherwise manipulated) results to the next reporting level.

NOTE: As stated earlier, in some countries, Service Delivery Sites may report directly to the central M&E Unit, without passing through Intermediate Aggregation Levels. In such instances, the Audit Team should not perform PHASE 3.

The steps in PHASE 3 are estimated to take between one-half and one day.

STEP 8. ASSESS DATA MANAGEMENT SYSTEMS (AT THE INTERMEDIATE AGGREGATION LEVELS)

Step 8 is performed by the Audit Team.

In **Step 8**, the Audit Team continues the assessment of the data management and reporting system at the intermediate aggregation levels at which data from Service Delivery Sites are aggregated and manipulated before being reported to the program/project M&E Unit. Specific instructions for completing the Intermediate Aggregation Level worksheet of the **DQA Protocol 1: System Assessment Protocol** are found in the Excel file of the protocol.

STEP 9. TRACE AND VERIFY RESULTS FROM SITE REPORTS (AT THE INTERMEDIATE AGGREGATION LEVELS)

Step 9 is performed by the Audit Team.

The Audit Team will continue with the **DQA Protocol 2: Data Verification Protocol** for **Steps 9 and 11**.

Step 9 – Table 1. Intermediate Aggregation Levels: Two Types of Data Verifications

Verifications	Description	Required
1. Documentation Review	Review availability, timeliness and completeness of expected reports from Service Delivery Sites for the selected reporting period.	In all cases
2. Trace and Verification	Trace and verify reported numbers: (1) Re-aggregate the numbers submitted by the Service Delivery Sites; (2) Compare the verified counts to the numbers submitted to the next level (program/ project M&E Unit); (3) Identify reasons for any differences.	In all cases

At this stage of the audit, the Data Quality Audit seeks to determine whether the intermediary reporting sites correctly aggregated the results reported by Service Delivery Points.

The Audit Team will perform the following data quality audit steps for each of the selected indicators at the Intermediate Aggregation Level(s):

1. **Re-aggregate reported numbers from <u>all</u> Service Delivery Points:** Reported results from all Service Delivery Points should be re-aggregated and the total compared to the number contained in the summary report prepared by the Intermediate Aggregation Site. The Audit Team should identify possible reasons for any differences between the verified and reported results.

   ➔ ***STATISTIC:*** Calculate the <u>Result Verification Ratio</u> for the Intermediate Aggregation Site.

   $$\frac{\text{Sum of reported counts from all Service Delivery Points}}{\text{Total count contained in the Summary Report prepared by the Intermediate Aggregation Site}}$$

2. **Review availability, completeness and timeliness of reports from <u>all</u> Service Delivery Points.** How many reports should there have been from all Service Delivery Points? How many are there? Were they received on time? Are they complete?

   ➔ ***STATISTIC:*** Calculate % of <u>all</u> reports that are A) <u>available</u>; B) <u>on time</u>; and C) <u>complete</u>.

A) % Available Reports (available to the Audit Team) =

$$\frac{\text{Number of reports } \textit{received} \text{ from all Service Delivery Points}}{\text{Number of reports } \textit{expected} \text{ from all Service Delivery Points}}$$

B) % On Time Reports (received by the due date) =

$$\frac{\text{Number of reports } \textit{received} \text{ on time from all Service Delivery Points}}{\text{Number of reports } \textit{expected} \text{ from all Service Delivery Points}}$$

C) % Complete Reports (i.e. contains all the relevant data to measure the indicator) =

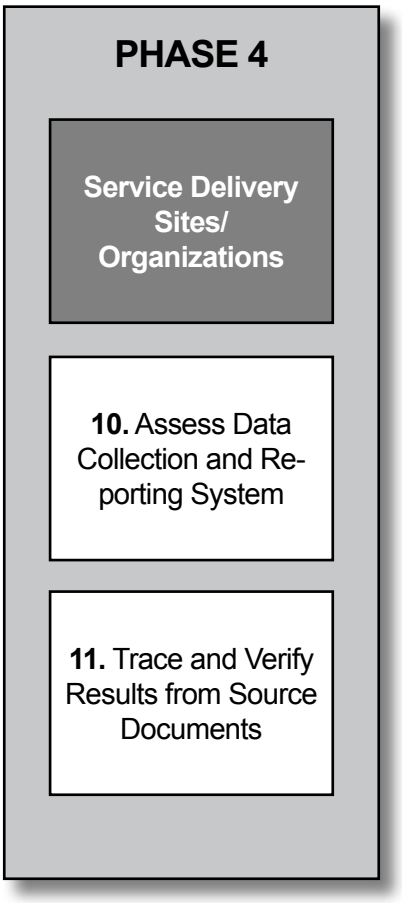
$$\frac{\text{Number of reports that are } \textit{complete} \text{ from all Service Delivery Points}}{\text{Number of reports } \textit{expected} \text{ from all Service Delivery Points}}$$

That is to say, for a report to be considered complete, it should at least include (1) the reported count relevant to the indicator; (2) the reporting period; (3) the date of submission of the report; and (4) a signature from the staff having submitted the report.

Warning: If there are any indications that some of the reports have been fabricated (for the purpose of the audit), the Audit Team should record these reports as "unavailable" and seek other data sources to confirm the reported counts (for example, an end-of-year report from the site containing results for the reporting period being audited). As a last resort, the Audit Team may decide to visit the site(s) for which reports seem to be fabricated to obtain confirmation of the reported counts. In any event, if these reported counts cannot be confirmed, the Audit Team should dismiss the reported counts and record "0" for these sites in the **DQA Protocol 2: Data Verification Protocol**.

Note: In no circumstances should the Audit Team record personal information, photocopy or remove documents from the Intermediate Aggregation Sites.

PHASE 4: SERVICE DELIVERY SITES



The fourth phase of the DQA takes place at the selected Service Delivery Sites where the following data quality audit steps are performed:

10. Determine if key elements of the program/project's data management and reporting system are being implemented at the Service Delivery Sites.
11. Trace and verify reported data from source documents for the selected indicators.

During PHASE 4, the Audit Team should meet with key data collection and management staff at the Service Delivery Site — including the staff involved in completing the source documents, in aggregating the data, and in verifying the reports before submission to the next administrative level.

The steps in PHASE 4 are estimated to take between one-half and two days. More than one day may be required for large sites (with reported numbers in the several hundreds), sites that include satellite centers, or when "spot-checks" are performed.

STEP 10. ASSESS DATA COLLECTION AND REPORTING SYSTEM (AT THE SERVICE DELIVERY POINTS)

Step 10 is performed by the Audit Team.

In **Step 10**, the Audit Team conducts the assessment of the data management and reporting system at a selection of Service Delivery Sites at which services are rendered and recorded on source documents. Data from Service Delivery Sites are then aggregated and manipulated before being reported to the Intermediate Aggregation Levels. Specific instructions for completing the Service Delivery Site worksheet of the **DQA Protocol 1: System Assessment Protocol** are found in the Excel file of the protocol.

STEP 11. TRACE AND VERIFY RESULTS FROM SOURCE DOCUMENTS (AT THE SERVICE DELIVERY POINTS)

Step 11 is performed by the Audit Team.

At the Service Delivery Site, each *indicator-specific protocol* begins with a description of the service(s) provided in order to orient the Audit Team towards what is being "counted" and reported. This will help lead the Audit Team to the relevant source documents at the Service Delivery Point, which can be significantly different for various indicators (e.g., patient records, registers, training logs).

Regardless of the indicator being verified or the nature of the Service Delivery Site (health based/ clinical or community-based), the Audit Team will perform some or all of the following data verification steps (**Step 11 – Table 1**) for each selected indicator:

Step 11 – Table 1. Service Delivery Site: Five Types of Data Verifications

Verifications	Description	Required
1. Description	Describe the connection between the delivery of services and/ or commodities and the completion of the source document that records that delivery.	In all cases
2. Documentation Review	Review availability and completeness of all indicator source documents for the selected reporting period.	In all cases
3. Trace and Verification	Trace and verify reported numbers: (1) Recount the reported numbers from available source documents; (2) Compare the verified numbers to the site reported number; (3) Identify reasons for any differences.	In all cases
4. Cross-checks	Perform "cross-checks" of the verified report totals with other data-sources (e.g. inventory records, laboratory reports, other registers, etc.).	In all cases
5. Spot-checks	Perform "spot-checks" to verify the actual delivery of services and/ or commodities to the target populations.	If feasible

Before starting the data verifications, the Audit Team will need to understand and describe the recording and reporting system related to the indicator being verified at the Service Delivery Site (i.e., from initial recording of the service delivery on source documents to the reporting of aggregated numbers to the next administrative level).

1. **DESCRIPTION** – Describe the connection between the delivery of the service and/or commodity and the completion of the source document. This step will give the Audit Team a "frame of reference" for the link between the service delivery and recording process, and obtain clues as to whether outside factors such as time delays and/or competing activities could compromise the accurate and timely recording of program activities.

2. **DOCUMENTATION REVIEW** – Review availability and completeness of all indicator source documents for the selected reporting period.

   - ❑ Review a template of the source document (by obtaining a blank copy) and determine if the site has sufficient supplies of blank source documents;
   - ❑ Check availability and completeness of source documents and ensure that all the completed source documents fall within the reporting period being audited;
   - ❑ Verify that procedures are in place to prevent reporting errors (e.g., double-counting of clients who have transferred in/out, died or are lost to follow up (if applicable).

Note that the *indicator-specific protocols* have listed likely source document(s). If the Audit Team determines that other source documents are used, the team can modify the protocol(s) accordingly and document in its work papers the change that has been made to the protocol. The Audit Team will need to maintain strict confidentiality of source documents.

3. **TRACE AND VERIFICATION** – Recount results from source documents, compare the verified numbers to the site reported numbers and explain discrepancies.

➔ ***STATISTIC:*** Calculate the Result Verification Ratio for the Service Delivery Site.

$$\frac{\text{Verified counts at selected Service Delivery Site}}{\text{Reported count at selected Service Delivery Site}}$$

Possible reasons for discrepancies could include simple data entry or arithmetic errors. The Audit Team may also need to talk to data reporting staff about possible explanations and follow-up with program data-quality officials if needed. This step is crucial to identifying ways to improve data quality at the Service Delivery Sites. It is important to note that the Audit Team could find large mistakes at a site "in both directions" (i.e., over-reporting *and* under-reporting) that results in a negligible difference between the reported and recounted figures — but are indicative of major data quality problems. Likewise, a one-time mathematical error could result in a large difference. Thus, in addition to the Verification Factor calculated for the site, the Audit Team will need to consider the nature of the findings before drawing conclusions about data quality at the site.

4. CROSS-CHECKS – Perform feasible cross-checks of the verified report totals with other data sources. For example, the team could examine separate inventory records documenting the quantities of treatment drugs, test-kits, or ITNs purchased and delivered during the reporting period to see if these numbers corroborate the reported results. Other cross-checks could include, for example, comparing treatment cards to unit, laboratory, or pharmacy registers. The Audit Team can add cross-checks to the protocol, as appropriate.

➔ ***STATISTIC:*** Calculate percent differences for each cross-check.

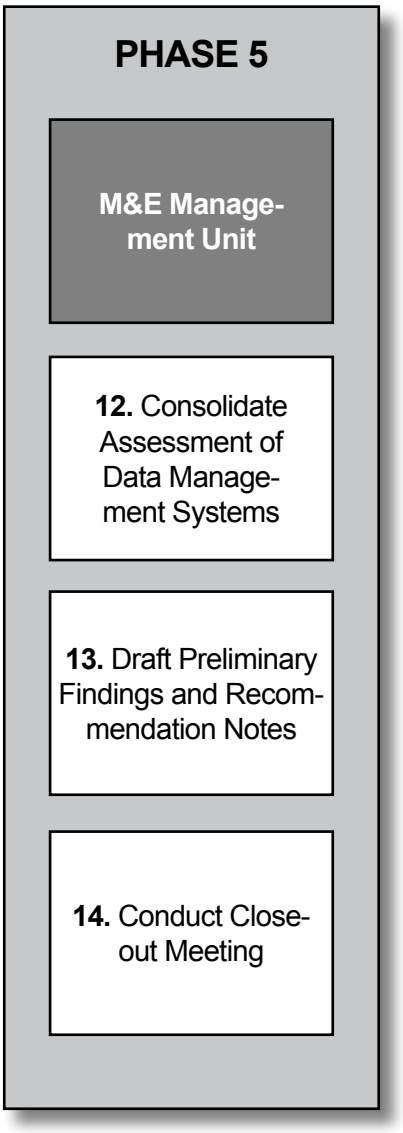
5. SPOT CHECKS – Spot-checks to verify the actual delivery of services and/or commodities can also be done, time and resources permitting. Spot-checks entail selecting a number of patients/clients (e.g., three to five) from source documents and verifying that they actually received the services and/or commodities recorded. Spot-checks can be performed in two ways: (1) the Audit Team obtains the names and addresses of people in the community and makes an effort to locate them; or (2) the Audit Team requests representatives of the site to contact the people and ask them to come to the Service Delivery Site (for example the next day). For reasons of confidentiality, spot-checks will not be possible for indicators related to some medical services, such as ART treatment for HIV.

As noted above, while the five data verification steps of the **DQA Protocol 2: Data Verification Protocol** should not change[5] within each verification step the protocol can be modified to better fit the program context (e.g., add cross-checks, modify the reference source document). Major modifications should be discussed with the Organization Commissioning the DQA.

Note: In no circumstances should the Audit Team record personal information, photocopy, or remove documents from sites.

[5] 1. description, 2. documentation review, 3. trace and verification, 4. cross-checks, 5. spot-checks.

PHASE 5: M&E UNIT



In the fifth phase of the DQA, the Audit Team will return to the program/project M&E Unit. The steps in PHASE 5 are to:

12. Complete the assessment of the data management and reporting system by answering the 13 overarching summary audit questions.
13. Develop preliminary audit findings and recommendation notes.
14. Communicate the preliminary findings and recommendations to the program/project's M&E officers and senior management during an audit closeout meeting.

The steps in PHASE 5 are estimated to take two days.

STEP 12. CONSOLIDATE ASSESSMENT OF DATA MANAGEMENT SYSTEMS

Step 12 is performed by the Audit Team.

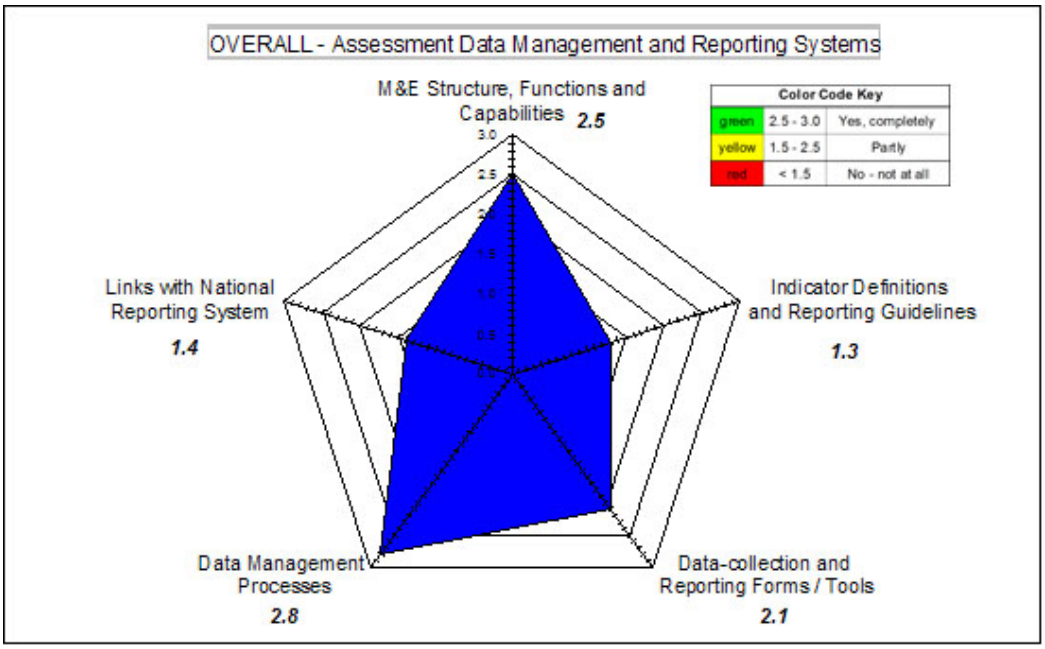
By **Step 10**, the Excel file worksheets of the **DQA Protocol 1: System Assessment Protocol** related to the M&E Unit, the Intermediate Aggregation Levels, and the Service Delivery Sites will have been completed. Based on all responses to the questions, a summary table (**Step 12 – Table 1**) will be automatically generated, as will a summary graphic of the strengths of the data management and reporting system (**Step 12 – Figure 1**). The results generated will be based on the number of *"Yes, completely,"* *"Partly,"* and *"No, not at all"* responses to the questions on the **DQA Protocol 1: System Assessment Protocol.**

Step 12 – Table 1. Summary Table: Assessment of Data Management and Reporting System (Illustration)

SUMMARY TABLE Assessment of Data Management and Reporting Systems		I M&E Structure, Functions, and Capabilities	II Indicator Definitions and Reporting Guidelines	III Data-Collection and Reporting Forms/Tools	IV Data Management Processes	V Links with National Reporting System	Average (per site)
M&E Unit							
-	National M&E Unit	1.80	1.83	1.80	1.82	1.67	1.78
Intermediate Aggregation Level Sites							
1	Collines	2.67	2.50	1.67	1.78	2.00	2.12
2	Atakora	3.00	2.25	1.33	1.67	2.50	2.15
3	Borgu	2.33	2.00	1.67	1.90	2.50	2.08
Service Delivery Points/Organizations							
1.1	Savalou	2.67	2.00	1.67	1.86	2.00	2.04
1.2	Tchetti	2.00	2.25	1.67	2.13	2.00	2.01
1.3	Djalloukou	2.67	1.75	1.67	2.00	2.25	2.07
2.1	Penjari	2.33	2.00	2.00	1.86	2.50	2.14
2.2	Ouake	2.67	2.25	1.67	1.88	2.50	2.19
2.3	Tanagou	2.67	2.75	1.67	1.88	2.75	2.34
3.1	Parakou	2.33	2.00	2.00	1.86	2.25	2.09
3.2	Kandi	2.33	2.25	1.67	2.00	2.25	2.10
3.3	Kalale	2.67	2.25	1.67	1.88	2.50	2.19
Average (per functional area)		2.46	2.15	1.76	1.92	2.30	2.12

Color Code Key		
Green	2.5 - 3.0	Yes, Completely
Yellow	1.5 - 2.5	Partly
Red	< 1.5	No, Not at All

Step 12 – Figure 1. Assessment of Data Management and Reporting System (Illustration).



Interpretation of the Output: The scores generated for each functional area on the Service Delivery Site, Intermediate Aggregation Level, and M&E Unit pages are an average of the responses which are coded 3 for "*Yes, completely,*" 2 for *"Partly,"* and 1 for *"No, not at all."* Responses coded "*N/A*" or "*Not Applicable*," are not factored into the score. The numerical value of the score is not important; the scores are intended to be compared across functional areas as a means to prioritizing system strengthening activities. That is, the scores are relative to each other and are most meaningful when comparing the performance of one functional area to another. For example, if the system scores an average of 2.5 for 'M&E Structure, Functions and Capabilities' and 1.5 for 'Data-collection and Reporting Forms/Tools,' one would reasonably conclude that resources would be more efficiently spent strengthening 'Data-collection and Reporting Forms/Tools' rather than 'M&E Structure, Functions and Capabilities.' The scores should therefore not be used exclusively to evaluate the information system. Rather, they should be interpreted within the context of the interviews, documentation reviews, data verifications, and observations made during the DQA exercise.

Using these summary statistics, the Audit Team should answer the 13 overarching questions on the Audit Summary Question Worksheet of the protocol (see **Step 12 – Table 2**). To answer these questions, the Audit Team will have the completed **DQA Protocol 1: System Assessment Protocol** worksheets for each site and level visited, as well as the summary table and graph of the findings from the protocol (see **Step 12 – Table 1 and Figure 1**). Based on these sources of information, the Audit Team will need to use its judgment to develop an overall response to the Audit Summary Questions.

Step 12 – Table 2. Summary Audit Questions

13 OVERARCHING SUMMARY AUDIT QUESTIONS			
	Program Area:		
	Indicator:		
	Question	**Answer** Yes - completely Partly No - not at all N/A	**Comments**
1	Are key M&E and data-management staff identified with clearly assigned responsibilities?		
2	Have the majority of key M&E and data-management staff received the required training?		
3	Has the program/project clearly documented (in writing) what is reported to who, and how and when reporting is required?		
4	Are there operational indicator definitions meeting relevant standards that are systematically followed by all service points?		
5	Are there standard data collection and reporting forms that are systematically used?		
6	Are data recorded with sufficient precision/detail to measure relevant indicators?		
7	Are data maintained in accordance with international or national confidentiality guidelines?		
8	Are source documents kept and made available in accordance with a written policy?		
9	Does clear documentation of collection, aggregation, and manipulation steps exist?		
10	Are data quality challenges identified and are mechanisms in place for addressing them?		
11	Are there clearly defined and followed procedures to identify and reconcile discrepancies in reports?		
12	Are there clearly defined and followed procedures to periodically verify source data?		
13	Does the data collection and reporting system of the program/ project link to the National Reporting System?		

STEP 13. DRAFT PRELIMINARY FINDINGS AND RECOMMENDATION NOTES

Step 13 is performed by the Audit Team.

By **Step 12**, the Audit Team will have completed both the system assessment and data verification protocols on selected indicators. In preparation for its close-out meeting with the M&E Unit, in **Step 13** the Audit Team drafts Preliminary Findings. Recommendation Notes for data quality issues found during the audit. **Annex 3, Step 13 – Template 1** provides a format for those Recommendation Notes. These findings and issues are presented to the program/project M&E Unit (**Step 14**) and form the basis for the Audit Report (**Steps 15 and 17**). The Audit Team should also send a copy of the Preliminary Findings and Recommendation Notes to the Organization Commissioning the DQA.

The preliminary findings and Recommendation Notes will be based on the results from the **DQA Protocol 1: System Assessment Protocol** and the **DQA Protocol 2: Data Verification Protocol** and will be developed by the Audit Team based on:

- **The notes columns of the protocols** in which the Audit Team has explained findings related to: (1) the assessment of the data-management and reporting system; and (2) the verification of a sample of data reported through the system. In each protocol, the final column requests a check (√) for any finding that requires a Recommendation Note.
- **Work papers** further documenting evidence of the Audit Team's data quality audit findings.

The findings should stress the positive aspects of the program/project M&E system as it relates to data management and reporting as well as any weaknesses identified by the Audit Team. It is important to emphasize that a finding does not necessarily mean that the program/project is deficient in its data collection system design or implementation. The program/project may have in place a number of innovative controls and effective steps to ensure that data are collected consistently and reliably.

Nevertheless, the purpose of the Data Quality Audit is to improve data quality. Thus, as the Audit Team completes its data management system and data verification reviews, it should clearly identify evidence and findings that indicate the need for improvements to strengthen the design and implementation of the M&E system. All findings should be backed by documentary evidence that the Audit Team can cite and provide along with its **Recommendation Notes.**

Examples of findings related to the design and implementation of data collection, reporting and management systems include:

- The lack of documentation describing aggregation and data manipulation steps.
- Unclear and/or inconsistent directions provided to reporting sites about when or to whom report data is to be submitted.
- The lack of designated staff to review and question submitted site reports.

- The lack of a formal process to address incomplete or inaccurate submitted site reports.
- The lack of a required training program for site data collectors and managers.
- Differences between program indicator definitions and the definition as cited on the data collection forms.
- The lack of standard data collection forms.

Examples of findings related to verification of data produced by the system could include:

- A disconnect between the delivery of services and the filling out of source documents.
- Incomplete or inaccurate source documents.
- Data entry and/or data manipulation errors.
- Misinterpretation or inaccurate application of the indicator definition.

Draft Recommendation Note(s)

In the **Recommendation Notes**, the Audit Team should cite the evidence found that indicates a threat to data quality. The team should also provide one or more recommended actions to prevent recurrence. The Audit Team may propose a deadline for the recommended actions to be completed and seek concurrence from the program/project and the Organization Commissioning the DQA. **Step 13 – Table 1** provides an example of the content of **Recommendation Notes**.

Step 13 – Table 1. Illustrative Findings and Recommendations for Country X's TB Treatment Program: Number of Smear Positive TB Cases Registered Under DOTS Who Are Successfully Treated

Country X runs an organized and long-established TB treatment program based on international treatment standards and protocols. The processes and requirements for reporting results of the TB program are specifically identified and prescribed in its *Manual of the National Tuberculosis and Leprosy Programme*. The Manual identifies required forms and reporting requirements by service sites, districts, and regions. Based on information gathered through interviews with key officials and a documentation review, the Data Quality Audit Team identified the following related to improving data quality.
Findings and Recommendations for the M&E Unit
1) M&E Training • **FINDING:** The Audit Team found a lack of a systematic and documented data management training plan that identifies training requirements, including necessary data management skills for all levels of the program from health care workers at Service Delivery Sites to district coordinators, regional staffers, and M&E Unit data managers. Currently, training is instigated, implemented, and paid for by different offices at multiple levels throughout the TB program.
RECOMMENDATION: That the National TB M&E Unit develop a plan to coordinate available training resources and identify training needs throughout the system including those needed to efficiently achieve data management requirements.

2) Supervisory checks of District Reports

- **FINDING:** The lack of supervisory checks of the files used to store submitted quarterly reports from district offices can lead to potential aggregation errors. For example, the Audit Team's verification exercise identified duplicate, out-of-date, and annual rather than quarterly reports in these files that could easily lead to data entry errors.

RECOMMENDATION: That a program management supervisor regularly review the files used to store regional reports after they are submitted, but before data entry occurs to help reduce the possibility of errors.

- **FINDING:** Approximately 2% of the submitted regional reports to the MOH lacked supervisory signatures. This signature is required to document that the report was reviewed for completeness and obvious mistakes.

RECOMMENDATION: That the MOH reinforce its requirement that submitted reports contain a supervisory signature, perhaps by initially rejecting reports that have not been reviewed.

3) Policy on Retention of Source Documents

- **FINDING:** The TB program has no policy regarding the retention of reporting documents including patient treatment cards, registers and related report. While the documents are routinely retained for years, good data management requires that a specific document retention policy be developed.

RECOMMENDATION: That the program office develop a specific document retention policy for TB program source and key reporting documents in its new reporting system.

Findings and Recommendations for the Intermediate Aggregation Level Sites

4) Quality Control in Data Entry

- **FINDING:** The Audit Team found that limited measures are taken to eliminate the possibility of data entry errors at the district level. While there are checks in the reporting software to identify out-of-range entries, the district staff could not describe any other steps taken to eliminate data entry errors.

RECOMMENDATION: That the program identify steps to eliminate data entry errors wherever report numbers are entered into the electronic reporting system.

Findings and Recommendations for the Service Delivery Sites

5) Ability to Retrieve Source Documents

- **FINDING:** At all service sites, the Audit Team had difficulty completing the data verification exercise because the site staff found it difficult or was unable to retrieve source documents—e.g., the TB patient treatment cards for patients that had completed treatment. If such verification cannot be performed, a Data Quality Audit Team cannot confirm that the reported treatment numbers are accurate and valid.

RECOMMENDATION: That TB Service Delivery Sites should systematically file and store TB treatment source documents by specific reporting periods so that they can be readily retrieved for audit purposes.

STEP 14. CONDUCT A CLOSEOUT MEETING

Step 14 is performed by the Audit Team.

At the conclusion of the site visits, the Audit Team Leader should conduct a closeout meeting with senior program/project M&E officials and the Director/Program Manager to:

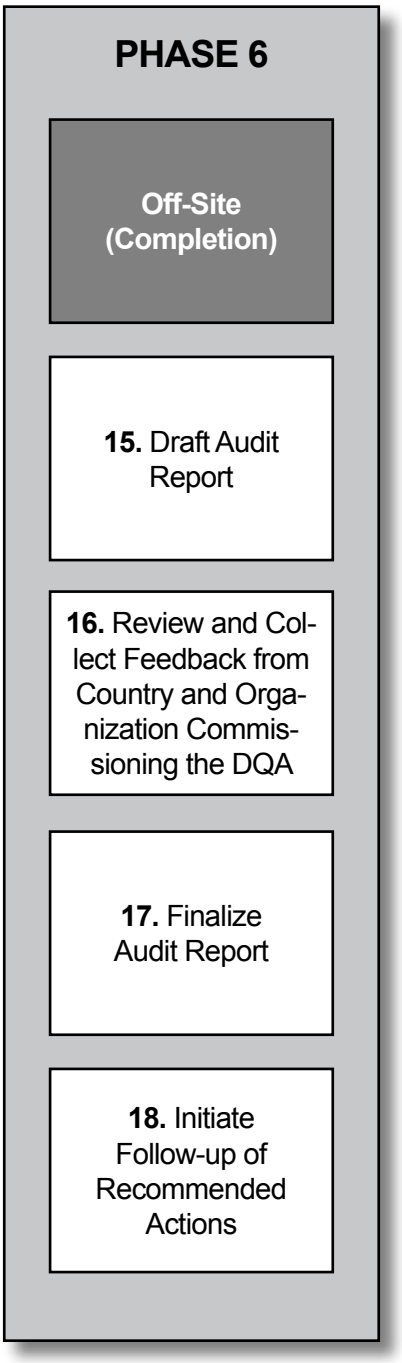
1. Share the results of the data-verifications (recounting exercise) and system review;
2. Present the preliminary findings and Recommendation Notes; and
3. Discuss potential steps to improve data quality.

A face-to-face closeout meeting gives the program/project's data management staff the opportunity to discuss the feasibility of potential improvements and related timeframes. The Audit Team Leader should stress, however, that the audit findings at this point are preliminary and subject to change once the Audit Team has had a better opportunity to review and reflect on the evidence collected on the protocols and in its work papers.

The Audit Team should encourage the program/project to share relevant findings with the appropriate stakeholders at the country-level such as multi-partner M&E working groups and the National program, as appropriate. The Audit Team should also discuss how the findings will be shared by the program/project M&E officials with the audited Service Delivery Sites and Intermediate Aggregation Levels (e.g., Regions, Districts).

As always, the closeout meeting and any agreements reached on the identification of findings and related improvements should be documented in the Audit Team's work papers in order to be reflected in the Final Audit Report.

PHASE 6: COMPLETION



The last phase of the DQA takes place at the offices of the DQA Team, and in face-to-face or phone meetings with the Organization Commissioning the DQA and the program/project. The steps in PHASE 6 are to:

15. Draft Audit Report.
16. Discuss the Draft Audit Report with the program/project and with the Organization Commissioning the DQA.
17. Complete the Final Audit Report and communicate the findings, including the final Recommendation Note(s), to the program/project and the Organization Commissioning the DQA.
18. As appropriate, initiate follow-up procedures to ensure that agreed upon changes are made.

The steps in PHASE 5 are estimated to take between two and four weeks.

STEP 15. DRAFT AUDIT REPORT

Step 15 is performed by the Audit Team.

Within 1-2 weeks, the Audit Team should complete its review of all of the audit documentation produced during the mission and complete a draft Audit Report with all findings and suggested improvements. Any major changes in the audit findings made after the closeout meeting in country should be clearly communicated to the program/project officials. The draft of the Audit Report will be sent to the program/project management staff and to the Organization Commissioning the DQA. **Step 15 – Table 1** shows the suggested outline for the Audit Report.

Step 15 – Table 1: Suggested Outline for the Final Data Quality Audit Report

Section	Contents
I	**Executive Summary**
II	**Introduction and Background** ❑ Purpose of the DQA ❑ Background on the program/project ❑ Indicators and Reporting Period – Rationale for selection ❑ Service Delivery Sites – Rationale for selection ❑ Description of the data-collection and reporting system (related to the indicators audited)
III	**Assessment of the Data Management and Reporting System** ❑ Description of the performed system assessment steps ❑ Dashboard summary statistics *(table and spider graph of functional areas – Step 12: Table 1 and Figure 1)* ❑ Key findings at the three levels: ○ Service Delivery Sites ○ Intermediate Aggregation Levels ○ M&E Unit ❑ Overall strengths and weaknesses of the Data-Management System *(based on 13 Summary Audit Questions)*

IV	**Verification of Reported Data** ❑ Description of the performed data-verifications steps ❑ Data Accuracy – Verification Factor ❑ Precision and confidentiality of reported data ❑ Availability, completeness, and timeliness of reports ❑ Key findings at the three levels: ○ Service Delivery Sites ○ Intermediate Aggregation Levels ○ M&E Unit ❑ Overall assessment of Data Quality
V	**Recommendation Notes and Suggested Improvements**
VI	**Final Data Quality Classification (if required by the Organization Commissioning the DQA).**
VII	**Country Response to DQA Findings**

STEP 16. COLLECT AND REVIEW FEEDBACK FROM COUNTRY AND ORGANIZATION COMMISSIONING THE DQA

Step 16 is performed by the Audit Team.

To build consensus and facilitate data quality improvements, the Audit Team needs to share the draft Audit Report with the Organization Commissioning the DQA and with the program/project management and M&E staff. **The program/project will be given an opportunity to provide a response to the audit findings. This response will need to be included in the Final Audit Report.**

STEP 17. FINALIZE AUDIT REPORT

Step 17 is performed by the Audit Team.

Once the program/project and the Organization Commissioning the DQA have reviewed the Draft Audit Report (given a time limit of two weeks, unless a different time period has been agreed) and provided feedback, the Audit Team will complete the Final Audit Report. **While the Audit Team should elicit feedback, it is important to note that the content of the Final Audit Report is determined by the Audit Team exclusively.**

STEP 18. INITIATE FOLLOW-UP OF RECOMMENDED ACTIONS

Step 18 can be performed by the Organization Commissioning the DQA and/or the Audit Team.

The program/project will be expected to send follow-up correspondences once the agreed upon changes/improvements have been made. If the Organization Commissioning the DQA wants the Audit Team to be involved in the follow-up of identified strengthening measures, an appropriate agreement may be reached. The Organization Commissioning the DQA and/or the Audit Team should maintain a "reminder" file to alert itself as to when these notifications are due (see **ANNEX 3, Step 19 – Template 1**). In general, **minor data quality issues should be remedied in one to six months** and **major issues in six to twelve months.**

ANNEXES

ANNEX 1: DQA Protocols

Protocol 1: System Assessment Protocol
Protocol 2: Data Verification Protocol

Protocol 1 – System Assessment Protocol (AIDS and Malaria)

LIST OF ALL QUESTIONS – *For reference only* (Protocol 1 - System's Assessment)						
	Component of the M&E System	Checkmark indicates reporting system level at which the question is asked			Supporting documentation required?
		M&E Unit	*Aggregation Levels*	*Service Points*	
I – M&E Structure, Functions, and Capabilities					
1	There is a documented organizational structure/chart that clearly identifies positions that have data management responsibilities at the M&E Unit.	√			Yes
2	All staff positions dedicated to M&E and data management systems are filled.	√			-
3	There is a training plan which includes staff involved in data-collection and reporting at all levels in the reporting process.	√			Yes
4	All relevant staff have received training on the data management processes and tools.	√	√	√	-
5	A senior staff member (e.g., the Program Manager) is responsible for reviewing the aggregated numbers prior to the submission/ release of reports from the M&E Unit.	√			-
6	There are designated staff responsible for reviewing the quality of data (i.e., accuracy, completeness and timeliness) received from sub-reporting levels (e.g., regions, districts, service points).	√	√		-
7	There are designated staff responsible for reviewing aggregated numbers prior to submission to the next level (e.g., to districts, to regional offices, to the central M&E Unit).		√	√	-
8	The responsibility for recording the delivery of services on source documents is clearly assigned to the relevant staff.			√	-
II – Indicator Definitions and Reporting Guidelines					
9	The M&E Unit has documented and shared the definition of the indicator(s) with all relevant levels of the reporting system (e.g., regions, districts, service points).	√			Yes
10	There is a description of the services that are related to each indicator measured by the program/project.	√			Yes
The M&E Unit has provided written guidelines to each sub-reporting level on …					
11	… *what* they are supposed to report on.	√	√	√	Yes
12	… *how* (e.g., in what specific format) reports are to be submitted.	√	√	√	Yes
13	… *to whom* the reports should be submitted.	√	√	√	Yes
14	… *when* the reports are due.	√	√	√	Yes
15	There is a written policy that states for how long *source documents* and *reporting forms* need to be retained.	√			Yes

LIST OF ALL QUESTIONS – *For reference only* (Protocol 1 - System's Assessment)						
	Component of the M&E System	Checkmark indicates reporting system level at which the question is asked			Supporting documentation required?
		M&E Unit	*Aggregation Levels*	*Service Points*	
III – Data-collection and Reporting Forms/Tools					
16	The M&E Unit has identified a standard *source document* (e.g., medical record, client intake form, register, etc.) to be used by all Service Delivery Points to record service delivery.	√			Yes
17	The M&E Unit has identified standard *reporting forms/tools* to be used by all reporting levels.	√			Yes
18	Clear instructions have been provided by the M&E Unit on how to complete the data collection and reporting forms/tools.	√	√	√	Yes
19	The *source documents* and *reporting forms/tools* specified by the M&E Unit are consistently used by all reporting levels.		√	√	-
20	If multiple organizations are implementing activities under the program/project, they all use the same reporting forms and report according to the same reporting timelines.	√	√	√	-
21	The data collected by the M&E system has sufficient precision to measure the indicator(s) (i.e., relevant data are collected by sex, age, etc., if the indicator specifies disaggregation by these characteristics).	√			-
22	All *source documents* and *reporting forms* relevant for measuring the indicator(s) are available for auditing purposes (including dated print-outs in case of computerized system).	√	√	√	-
IV – Data Management Processes					
23	The M&E Unit has clearly documented data aggregation, analysis and/or manipulation steps performed at each level of the reporting system.	√			Yes
24	There is a written procedure to address late, incomplete, inaccurate, and missing reports; including following-up with sub-reporting levels on data quality issues.	√	√		Yes
25	If data discrepancies have been uncovered in reports from sub-reporting levels, the M&E Unit or the Intermediate Aggregation Levels (e.g., districts or regions) have documented how these inconsistencies have been resolved.	√	√		-
26	Feedback is systematically provided to all sub-reporting levels on the quality of their reporting (i.e., accuracy, completeness, and timeliness).	√	√		-
27	There are quality controls in place for when data from paper-based forms are entered into a computer (e.g., double entry, post-data entry verification, etc).	√	√	√	-

LIST OF ALL QUESTIONS – *For reference only* (Protocol 1 - System's Assessment)					
	Component of the M&E System	Checkmark indicates reporting system level at which the question is asked			Supporting documentation required?
		M&E Unit	*Aggregation Levels*	*Service Points*	
28	For automated (computerized) systems, there is a clearly documented and actively implemented database administration procedure in place. This includes backup/recovery procedures, security administration, and user administration.	√	√	√	Yes
29	There is a written back-up procedure for when data entry or data processing is computerized.	√	√	√	Yes
30	If *yes*, the latest date of back-up is appropriate given the frequency of update of the computerized system (e.g., backups are weekly or monthly).	√	√	√	-
31	Relevant personal data are maintained according to national or international confidentiality guidelines.	√	√	√	-
The reporting system avoids double counting people …					
32	... *within* each point of service/organization (e.g., a person receiving the same service twice in a reporting period, a person registered as receiving the same service in two different locations, etc).	√	√	√	-
33	... *across* service points/organizations (e.g., a person registered as receiving the same service in two different service points/ organizations, etc).	√	√	√	-
34	The reporting system enables the identification and recording of a "drop out," a person "lost to follow-up," and a person who died.	√	√	√	-
35	The M&E Unit can demonstrate that regular supervisory site visits have taken place and that data quality has been reviewed.	√			Yes
V – Links with National Reporting System					
36	When available, the relevant national forms/tools are used for data-collection and reporting.	√	√	√	Yes
37	When applicable, data are reported through a single channel of the national information systems.	√	√	√	-
38	Reporting deadlines are harmonized with the relevant timelines of the National program (e.g., cut-off dates for monthly reporting).	√	√	√	-
39	The service sites are identified using ID numbers that follow a national system.	√	√	√	-

Protocol 2 – Data Verification Protocol (Illustration – Community-based Interventions)

Service Delivery Point (Protocol 2 - Data Verification)				
Number of People benefiting from Community-based Programmes				
Service Delivery Point:		-		Need for Recommendation (add YES)
Reporting Period (this is the period that is being verified from results reported from the Program/project):	From:		To:	
	Answer		Auditor Notes (include work paper reference number)	
	Yes/No	% or Number		
1. DESCRIPTION OF THE RECORDING PRACTICES IN RELATION TO SERVICE DELIVERY - Describe the connection between the delivery of the service and the completion of the source document -				
Indicator-specific notes for Verification Team: The Verification Team should ask staff to describe the process through which the source documents are filled in relation to the service being provided. Determine the source document used for this indicator at this site/organization.				
1.1 Describe the source document for recording the delivery of the service (is it a standardized form following national guidelines or a tailored form? If tailored, specify the source of the form, e.g. a project). Obtain a blank copy, if possible.				
1.2 Does the site/organization have sufficient supplies of blank source documents (prompt for experience of stock-outs of source documents)?				
1.3 Are there indication that there are delays between delivery of the service and recording of the service on the source document?				
1.4 If the service and recording of the service are not done at the same time, please describe how the disconnect might affect data quality.				
Additional Comments (if any)				
2. DOCUMENTATION REVIEW - Review availability and completeness of all indicator source documents for the selected reporting period -				
Indicator-specific notes for auditor: Source documents could be community health workers/peer educators daily record of households visited/peers counseled, facility-level register and/or client intake forms.				
A) Check Availability and Completeness of Documentation				
2.1 Review available source documents for the reporting period being verified. Is there any indication that source documents are missing? *If yes*, determine how this might have affected reported numbers?				
2.2 Are all available source documents complete? *If no*, determine how this might have affected reported numbers?				
2.3 Review the dates on the source documents. Do all dates fall within the reporting period? *If no*, determine how this might have affected reported numbers.				
C) Verify recording procedures to avoid data-quality challenges (eg. double-counting, lost to follow-up, ...)				
Indicator-specific notes for Verification Team: Mentioned below are common risks to data quality that may affect the reported counts for an indicator.				

Service Delivery Point (Protocol 2 - Data Verification)				
Number of People benefiting from Community-based Programmes				
Service Delivery Point:				Need for Recommendation (add YES)
Reporting Period (this is the period that is being verified from results reported from the Program/project):	From:		To:	
	Answer		Auditor Notes (include work paper reference number)	
	Yes/No	% or Number		

1. DESCRIPTION OF THE RECORDING PRACTICES IN RELATION TO SERVICE DELIVERY - Describe the connection between the delivery of the service and the completion of the source document -					
2.4	What units are being counted (e.g., people, cases, events)? Do these units correspond those defined in the indicator definition?				
2.5	Is there a process to ensure proper registration of cases/people lost to follow-up?				
2.6	Is there a process to ensure proper registration of people who have died?				
2.7	Is there a process to ensure proper registration of people who have transferred in/out (including through referral)?				
2.8	Is there a process to avoid double-counting of people who receive the service more than once during the reporting period? *If yes*, please describe.				
2.9	Is there a process to avoid double-counting of people who are enrolled in related services from the same organization (e.g. OVC receiving both school fees and nutritional support)? *If yes*, please describe.				
2.10	Are there any other instances with a risk of counting errors?				
	Additional Comments (if any)				

3. TRACE AND VERIFICATION - Recount results from source documents, compare the verified numbers to the summary reports and explain discrepancies -					
A) Recount results from source documents and compare the verified numbers to the site reported numbers					
3.1	Recount the number of people/cases/events recorded during the reporting period by reviewing the source document.				
3.2	Copy the number of people/cases/events reported by the site/organization during the reporting period (from the site summary report).				
	Calculate Service Point Indicator Result Verification (i.e., ratio of recounted to reported results)				
B) Identify possible reasons for any differences between the verified and reported results					

Service Delivery Point (Protocol 2 - Data Verification)				
Number of People benefiting from Community-based Programmes				
Service Delivery Point:				Need for Recommendation (add YES)
Reporting Period (this is the period that is being verified from results reported from the Program/project):	From:		To:	
	Answer		Auditor Notes (include work paper reference number)	
	Yes/No	% or Number		
1. DESCRIPTION OF THE RECORDING PRACTICES IN RELATION TO SERVICE DELIVERY - Describe the connection between the delivery of the service and the completion of the source document -				
3.3 What are the reasons for the discrepancy (if any) observed by the Audit Team (i.e., any data entry errors, arithmetic errors, missing source documents, other reason).				
Additional Comments (if any)				
4. CROSS CHECKS - Perform cross-checks of the verified report totals with other data-sources -				
Indicator-specific notes for auditor: If the community-based program includes distribution of relevant commodities, e.g. bed nets, condoms or sterile syringes, cross checks may be performed by comparing the number of persons receiving the service by the a				
CROSS CHECK 1: Between the distribution records from suppliers and the stock records at the site. Was this cross check performed?				
4.1 List the type of commodity (e.g., bed net, condom, anti-malarial medication, etc) that was distributed during the service.				
4.2 Enter the number of commodities issued to the site during the reporting period.				
4.3 Enter the number of commodities received by the site during the reporting period.				
Calculate % difference in cross check 1				
4.4 If a discrepancy between issued and received commodities occurred during the reporting period, determine why, and if and how the store or site addressed this discrepancy.				
CROSS-CHECK 2 : Between stock movement and commodities distributed by the site. Was this cross check performed?				
4.5 Enter the number of commodities in stock at the site at the beginning of the reporting period (initial in stock).				
4.6 Enter the number of commodities received by the site during the reporting period.				
4.7 Enter the number of commodities in stock at the site at the end of the reporting period (closing in stock).				
4.8 Enter the number of commodities distributed by the site during the reporting period.				
Calculate % difference in cross check 2. (i.e., Distributed / (Beginning stock + Stock received - End stock))				

Service Delivery Point (Protocol 2 - Data Verification)				
Number of People benefiting from Community-based Programmes				
Service Delivery Point:		-		Need for Recommendation (add YES)
Reporting Period (this is the period that is being verified from results reported from the Program/project):		From:	To:	
		Answer: Yes/No	Answer: % or Number	Auditor Notes (include work paper reference number)
1. DESCRIPTION OF THE RECORDING PRACTICES IN RELATION TO SERVICE DELIVERY - Describe the connection between the delivery of the service and the completion of the source document -				
4.9	If there is a discrepancy between in stock and distributed commodities during the reporting period, determine why, and if and how the store or site addressed this discrepancy.			
4.10	Any additional cross checking: (add as appropriate)			
	Additional Comments (if any)			
5. SPOT CHECKS - Perform spot checks to verify the delivery of services or commodities through Community-based Programmes -				
Indicator-specific notes for Verification Team: A sample of beneficiaries of the services may be contacted. The purpose of spot-checks is to confirm that the service was actually received by beneficiaries listed in source documents. For some services, it may not be possible to conduct spot checks due to confidentiality considerations. If in doubt, the team should check with the Organization Commissioning the Data Quality Verification on the need for, and feasibility of, spot checks.				
5.1	How many beneficiaries were visited?			
5.2	How many of the beneficiaries contacted had actually received the service?			
Calculate % difference between beneficiaries recorded as having received the service and those having actually received the service.			-	
5.3	If there is a discrepancy, what issues did the spot check results raise?			
	Additional Comments (if any)			

ANNEX 2: Templates for the Organization Commissioning the DQA

Annex 2 – Step 1. Template 1. Illustrative Table for Ranking Countries by Investment and Results Reported

Disease:	AIDS				
Countries (or programs/projects) (ranked by Dollar Invested)	**Dollar Investment**	**Ranking of Results reported**			**Notes/ Comments**
		Program Area Treatment	**Program Area** Behavioral Change Communication	**Program Area** OVC	
		Indicator 1 People on ARV	**Indicator 2** Number of Condoms Distributed	**Indicator 3** Number of OVC Receiving Care and Support	
Country X	$66 Million	2 (6,500)	4 (3 million)	8 (1,879)	
Country Y	$52 Million	1 (7,000)	NA	10 (1,254)	

Annex 2 – Step 1. Template 2. Illustrative Analysis of the Relative Magnitude of the Investments and Indicator Results per Program Area

Program/Project: _____						
Program Area	**$ Invested in the Program Area**	**% of Total Invested in the Program/Project**	**Key Indicator in the Program Area**	**Target or Reported Result for the Indicator**	**% of Targets or Results Reported in the Country**	**Notes/ Comments**
ART Treatment	$2,000,000	80%	Nb. of people on ART	20,000	80%	

Annex 2 – Step 1. Template 3. Documentation of the Selection of the Country, Disease/Health Area, Program/Project(s), Program Area and Indicators

Country	Disease/Health Area	Program/ Project	Program Area	Indicator(s)	Reporting Period	Criteria Used for Selection of Indicator and Reporting Period	Persons/ Entities Involved in Audit Determination

Annex 2 – Step 2. Template 1. Notification and Documentation Request Letter to the Selected Program/Project

Date
Address
Dear_____:

[Your organization] has been selected for a Data Quality Audit by [name of Organization Commissioning the Audit] related to [Program/Project name].

The purpose of this audit is to: (1) assess the ability of the data management systems of the program/project(s) you are managing to report quality data; and (2) verify the quality of reported data for key indicators at selected sites. [Name of Audit Agency] will be conducting the audit and will contact you soon regarding the audit.

This Data Quality Audit relates to [disease], [program area] and the verifications will focus on the following indicators:

1	[indicator name]
2	[indicator name]

The audit will:

1. Assess the design of the data management and reporting systems;
2. Check at selected Service Delivery Sites and intermediary aggregation levels (e.g., districts, regions) if the system is being implemented as designed;
3. Trace and verify past reported numbers for a limited number of indicators at a few sites; *and*
4. Communicate the audit's findings and suggested improvements in a formal Audit Report.

Prior to the audit taking place, [list name of Audit Agency] will need:

- ❑ *A list of all the Service Delivery Sites with the latest reported results (for the above indicators);*
- ❑ *The completed Template 2 (attached to this letter) describing the data-collection and reporting system (related to the above indicators);*
- ❑ *Data-collection and reporting forms (related to the above indicators).*

This information is critical for beginning the audit, therefore it is requested within two weeks of receipt of this letter and should be sent to [address of Audit Agency].

To help the Audit Team perform the initial phase of the review of your overall data management system and to limit the team's on-site presence to the extent possible, we also request that you provide the Audit Agency with the existing and available documentation listed in Table 1 (attached to this letter).

Thank you for submitting the requested documentation to _____ at _____ by _____.
If any of the documentation is available in electronic form it can be e-mailed to _____.

Following a desk review of the information and documentation provided, the Audit Agency will pursue the audit at the office that serves as the M&E management unit for the program/project and at a small number of your reporting sites and intermediary data management offices (e.g., district or regional offices). To facilitate site visits, we request that two staff members responsible for M&E, or who receives, reviews and/or compiles reports from reporting entities accompany the Audit Team to the sites for the duration of the audit.

Because the time required for the audit depends on the number and location of sampled sites, the Audit Agency will contact you with more specific information regarding timing after the sample of sites has been selected. However, you should anticipate that the audit will last between 10 and 15 days (including two days at the M&E Unit and around one day per Service Delivery Site and Intermediate Aggregation Level — e.g., Districts or Regions).

Finally, since the Audit Team will need to obtain and review source documents (e.g., client records or registration logs/ledger), it is important that official authorization be granted to access these documents. However, we would like to assure you that no details related to individuals will be recorded as part of the audit — the team will only seek to verify that the counts from "source documents" related to the service or activity are correct for the reporting period. The personal records will neither be removed from the site nor photocopied.

We would like to emphasize that we will make every effort to limit the impact our audit will have on your staff and ongoing activities. In that regard, it would be very helpful if you could provide the Audit Agency with a key contact person early on in this process (your chief data management official, if possible) so we can limit our communications to the appropriate person. If you have any questions please contact _____ at _____.

Sincerely,

cc: Government Auditing Agency
Donor/Development Partners and Implementing Partners
Other, as appropriate for the country and audit

Table 1 – List of Audit Functional Areas and Documentation to Request from Program/ Project for Desk Review (if available)

Functional Areas	General Documentation Requested	Check if provided √
Contact Information	• Names and contact information for key program/project officials, including key staff responsible for data management activities.	
I – M&E Structures, Roles and Capabilities	• Organizational chart depicting M&E responsibilities.	
	• List of M&E positions and status (e.g., full time or part time, filled or vacant).	
	• M&E Training plan, if one exists.	
II – Indicator Definitions and Reporting Guidelines	• Instructions to reporting sites on reporting requirements and deadlines.	
	• Description of how service delivery is recorded on source documents, and on other documents such as clinic registers and periodic site reports.	
	• Detailed diagram of how data flows: o from Service Delivery Sites to Intermediate Aggregation Levels (e.g. district offices, provincial offices, etc.); o from Intermediate Aggregation Levels (if any) to the M&E Unit.	
	• National M&E Plan, if one exists.	
	• Operational definitions of indicators being audited.	
III – Data collection and Reporting Forms and Tools	• Data-collection form(s) for the indicator(s) being audited.	
	• Reporting form(s) for the indicator(s) being audited.	
	• Instructions for completing the data-collection and reporting forms.	
IV – Data Management Processes	• Written documentation of data management processes including a description of all data-verification, aggregation, and manipulation steps performed at each level of the reporting system.	
	• Written procedures for addressing specific data quality challenges (e.g. double-counting, "lost to follow-up"), including instructions sent to reporting sites.	
	• Guidelines and schedules for routine supervisory site visits.	
V – Links with National Reporting System	• Documented links between the program/project data reporting system and the relevant national data reporting system.	

Annex 2 – Step 2. Template 2. Description of the Data-Collection and Reporting System

Please complete this template form <u>for each indicator</u> being verified by the Data Quality Audit (DQA)

Indicator Name	
Indicator Definition	

1. Is there a designated person responsible for data management and analysis at the M&E Management Unit at Central Level?

Yes	No

1.1. If "Yes," please give the name and e-mail address of the contact person:

Name	
e-mail	

RECORDING OF SERVICE DELIVERY ON SOURCE DOCUMENTS (at Service Delivery Points)

2. Is there a standardized national form that all Service Delivery Points use to record the delivery of the service to target populations?

Yes	No

2.1. If "No," how many different forms are being used by the Service Delivery Points? Number

3. What is the name of the form(s) used by the Service Delivery Points?

Name of the Form(s)

4. What are the key fields in the form that are relevant for the indicator?

Field 1	
Field 2	
Field 3	
Field 4	
Please add …	

REPORTING FROM SERVICE DELIVERY POINTS UP TO THE NATIONAL M&E UNIT (through any intermediary levels – Districts, Regions, etc.)

5. Please use this table to explain the reporting process in your country. In the first row, provide information about reports which are received in the central office. Show where those reports come from, how many you expect for each reporting period, and how many times per year you receive these reports.

Reports received by:	Sender	Number of senders (i.e. if reports are sent by districts, put the number of districts here)	Number of times reports are received each year (i.e. quarterly = 4 times)

6. What is the lowest level for which you have data at the M&E Management Unit at Central Level?

Individual patients	Health facilities	Districts	Region	Other … [please specify]

7. At what level is data first computerized (i.e., entered in a computer)?

Health facilities	Districts	Region	National	Other … [please specify]

8. Please provide any other comments (if applicable).

Finally, please attach the templates of the (1) source document; and (2) reports received by each level.

Annex 2 – Step 2. Template 3. Letter to Request National Authorization for the DQA

Date

Address of National Authorizing Agency for Data Quality Audit

Dear_____:

As part of its ongoing oversight activities, [name of Organization Commissioning the Audit] has selected [program/project(s)] in [country] for a Data Quality Audit. Subject to approval, the Data Quality Audit will take place between [months and], [Year].

The purpose of this Data Quality Audit is to assess the ability of the program's data management system to report quality data and to trace and verify reported results from selected service sites related to the following indicators:

1	[indicator name]
2	[indicator name]

[Name of auditing firm] has been selected by [name of Organization Commissioning the Audit] to carry out the Data Quality Audit.

Conducting this Data Quality Audit may require access to data reported through the national data reporting system on [Disease and Program Area]. The audit will include recounting data reported within selected reporting periods, including obtaining and reviewing source documents (e.g. client records or registration logs/ledgers, training log sheets, commodity distribution sheets). While the Audit Team will potentially require access to personal patient information, the Team will hold such information in strict confidence and no audit documentation will contain or disclose such personal information. The purpose of access to such information is strictly for counting and cross-checking purposes related to the audit. When necessary, the Audit Team will need to access and use such information at Service Delivery Sites. The personal records will neither be removed from the site nor photocopied.

If you have any questions about this Data Quality Audit, please contact _____ at _____.

[Name of Organization Commissioning the Audit] hereby formally requests approval to conduct this Data Quality Audit.

Please indicate approved or not approved below (with reasons for non-approval) and return this letter to _____ at _____.

Approved/Not approved (please circle one)

Sincerely, Date:

_____ _____

Title

cc: Program/project Director, Donor/Development Partners and Implementing Partners, Other, as appropriate for the Audit.

ANNEX 3: Templates for the Audit Agency and Team

Annex 3, Step 2 – Template 1. Information Sheet for the M&E Unit Involved in the DQA

1. Objective of the DQA

The objectives of the Data Quality Audit are to:

- ❑ Verify that appropriate data management systems are in place; *and*
- ❑ Verify the quality of reported data for key indicators at selected sites.

2. Program Areas Included in the Audit

- to be completed by Audit Team -

3. Tasks Performed by the Audit Team at the M&E Unit

- ❑ Interview Program Manager and staff involved in M&E and data-management.
- ❑ Review availability, completeness, and timeliness of reports received from reporting sites.
- ❑ Re-count numbers from received reports and compare result to the numbers reported by the M&E Unit.

4. Staff to Be Available at the M&E Unit during the DQA

- ❑ Program Manager.
- ❑ Chief Data-management Official.
- ❑ Staff involved in reviewing and compiling reports received from reporting sites.
- ❑ IT staff involved in database management, if applicable.
- ❑ Relevant staff from partner organizations working on M&E systems strengthening, if applicable.

4. Documentation to Prepare in Advance of Arrival of Audit Team

- ❑ Reported results by the M&E Unit for the selected reporting period (*see Point 3 above*).
- ❑ Access to the site summary reports submitted for the period (*see Point 3 above*).
- ❑ Organizational chart depicting M&E responsibilities.
- ❑ List of M&E positions and status (e.g., full time or part time, filled or vacant).
- ❑ M&E Training Plan, if one exists.
- ❑ Instructions to reporting sites on reporting requirements and deadlines.
- ❑ Description of how service delivery is recorded on source documents, and on other documents such as clinic registers and periodic site reports.
- ❑ Detailed diagram of how data flows from Service Delivery Sites to the M&E Unit.
- ❑ National M&E Plan, if one exists.
- ❑ Operational definitions of indicators being audited *(see Point 2 above)*.
- ❑ Template data-collection and reporting form(s) for the indicator(s) being audited (with the instructions).
- ❑ Written documentation of data-management processes including a description of all data-verification, aggregation, and manipulation steps performed at each level of the reporting system.
- ❑ Written procedures for addressing specific data quality challenges (e.g., double-counting, "lost to follow-up"), including instructions sent to reporting sites.
- ❑ Guidelines and schedules for routine supervisory site visits.

5. Expected time of Audit Team at the M&E Unit
To be completed by Audit Team *[Guideline: two days – one day at the beginning and one day at the end of the DQA]*

WARNING: In no circumstances should reports be fabricated for the purpose of the audit.

Annex 3, Step 2 – Template 2. Information Sheet for the Intermediate Aggregation Levels Selected for the DQA

1. Objective of the DQA
The objectives of the Data Quality Audit are to: ❑ Verify that appropriate data management systems are in place; *and* ❑ Verify the quality of reported data for key indicators at selected sites.
2. Program Areas Included in the Audit
- to be completed by Audit Team -
3. Tasks Performed by the Audit Team at the Intermediate Aggregation Level
❑ Interview Site Manager and staff involved in data-management and compilation. ❑ Review availability, completeness, and timeliness of reports received from reporting sites. ❑ Re-count numbers from received reports and compare result to the numbers reported to the next level.
4. Staff to Be Available at the Intermediate Aggregation Level during the DQA
❑ Site Manager ❑ Staff involved in reviewing and compiling reports received from reporting sites. ❑ IT staff involved in database management, if applicable.
5. Documentation to Prepare in Advance of Arrival of Audit Team
❑ Reported results to the next level for the selected reporting period (*see Point 3 above*). ❑ Access to the site summary reports submitted for the period (*see Point 3 above*). ❑ Description of aggregation and/or manipulation steps performed on data submitted by reporting sites.
6. Expected Time of Audit Team at the Intermediate Aggregation Level
To be completed by Audit Team *[Guideline: between one-half and one day at each Intermediate Aggregation Level Site]*

WARNING: In no circumstances should reports be fabricated for the purpose of the audit.

Annex 3, Step 2 – Template 3. Information Sheet for all Service Delivery Sites Selected for the DQA

1. Objective of the DQA

The objectives of the Data Quality Audit are to:

- ❑ Verify that appropriate data management systems are in place; *and*
- ❑ Verify the quality of reported data for key indicators at selected sites.

2. Program Areas Included in the Audit

- to be completed by Audit Team -

3. Tasks Performed by the Audit Team at the Service Delivery Site

- ❑ Interview Site Manager and staff involved in data-collection and compilation.
- ❑ Understand how and when source documents are completed in relation to the delivery of services.
- ❑ Review availability and completeness of all source documents for the selected reporting period.
- ❑ Recount the recorded numbers from available source documents and compare result to the numbers reported by the site.
- ❑ Compare reported numbers with other data sources (e.g., inventory records, laboratory reports, etc.).
- ❑ Verify the actual delivery of services and/or commodities to the target populations (if feasible).

4. Staff to Be Available at the Service Delivery Site during the DQA

- ❑ Site Manager.
- ❑ Staff responsible for completing the source documents (e.g., patient treatment cards, clinic registers, etc.).
- ❑ Staff responsible for entering data in registers or computing systems (as appropriate).
- ❑ Staff responsible for compiling the periodic reports (e.g., monthly, quarterly, etc.).

5. Documentation to Prepare in Advance of Arrival of Audit Team

- ❑ Reported results to the next level for the selected reporting period (*see Point 3 above*).
- ❑ All source documents for the selected reporting period, including source documents from auxiliary/peripheral/satellite sites (*see Point 3 above*).
- ❑ Description of aggregation and/or manipulation steps performed on data submitted to the next level.

6. Expected Time of Audit Team at the Service Delivery Site

To be completed by Audit Team
[Guideline: between one-half and two days (i.e., more than one day may be required for large sites with reported numbers in the several hundreds or sites that include satellite centers or when "spot-checks" are performed).]

WARNING: In no circumstances should source documents or reports be fabricated for the purpose of the audit.

Annex 3, Step 4 – Template 4. Checklist for Audit Team Preparation for Audit Site Visits

No.	Item	Check when completed (√)
1	Letter of authorization	
2	Guidelines for implementation	
3	DQA Protocol 1: System Assessment Protocol (paper copy of all relevant worksheets and computer file)	
4	DQA Protocol 2: Data Verification Protocol(s) (paper copy of all relevant worksheets and computer file)	
5	List of sites and contacts	
6	Confirmed schedule of site visits	
7	Laptop computer (at least one per sub-team)	
8	Plan for logistical support for the audit	
9	Relevant documentation provided by program/project for the desk review	
10	Other	

Annex 3, Step 5 - Template 1. Format for Recoding Notes of Interviews/Meetings with Key M&E Managers and Staff

Name and Address of Program/Project:	
Contract Number (if relevant):	
Name of Person(s) Interviewed:	
Auditor:	Interview Date:
Program Area:	Relevant Indicator(s):
Work Paper Reference or Index Number:	
Purpose of the Interview:	
Narrative Description of Discussions:	
Auditor Signature:	Date:

Annex 3, Step 13 - Template 1. Data Quality Audit Recommendation Note

Name and Address of Program/Project:	
Contract Number (if relevant):	
Contact Person:	
Auditor:	Audit Date:
Location:	Relevant Indicator(s):
Classification: Major/Minor	Data Quality Dimension:[6]
Explanation of Findings (including evidence):	
Recommended Action for Correction *(complete prior to closeout meeting with the program/project):*	
Notes from Closeout Meeting Discussion with Program/Project:	
Final Recommended Action *(complete after closeout meeting with the program/project)*:	
Expected Completion Date (if applicable):	
Auditor Signature:	Date:

[6] The data quality dimensions are: Accuracy, reliability, precision, completeness, timeliness, integrity, and confidentiality.

Annex 3, Step 19 - Template 1: Reminder File for M&E Data Quality Strengthening Activities of Program/Project

Name and Address of Program/Project:				
Contract Number (if relevant):				
Contact Person:				
Auditor:		Audit Date:		
Program Area:		Relevant Indicator(s):		
Activity Title and Description	Estimated Date of Completion	Person(s) Responsible	Date checked	Outcome

ANNEX 4: Site Selection Using Cluster Sampling Techniques

Instructions for Sampling using Sampling Strategy D – Cluster Sampling Selection:

1. *Determine the number of clusters and sites.* The Audit Team should work with the Organization Commissioning the DQA to determine the number of clusters and sites within clusters.
2. *More than one intermediate level.* In the event there is more than one Intermediate Aggregation Level (i.e., the data flows from district to region before going to national level), a three-stage cluster sample should be drawn. That is, two regions should be sampled and then two districts sampled from each region.
3. *No intermediate level.* If the data is reported directly from Service Delivery Sites to the national level (i.e., no Intermediate Aggregation Sites), the site selection will be conducted as above (cluster sampling with the district as the primary sampling unit), but the calculation of the Verification Factor will change. In this case, there is no adjustment for the error occurring between the district and national level.
4. *Prepare the sampling frame.* The first step in the selection of clusters for the audit will be to prepare a sampling frame, or a listing of all districts (or clusters) where the activity is being conducted (e.g., districts with ART treatment sites). The methodology calls for selecting clusters proportionate to size, i.e. the volume of service. Often it is helpful to expand the sampling frame so that each cluster is listed proportionate to the size of the program in the cluster. For example, if a given cluster is responsible for 15% of the clients served, that cluster should comprise 15% of the elements in the sampling frame. See the *Illustrative Example Sampling Strategy D* (Annex 4, Table 3) for more details. Be careful not to order the sampling frame in a way that will bias the selection of the clusters. Ordering the clusters can introduce *periodicity*; e.g. every 10th cluster is a rural district. Ordering alphabetically is generally a harmless way of ordering the clusters.
5. *Calculate the sampling interval.* The sampling interval is obtained by dividing the number of elements in the sampling frame by the number of elements to be sampled. Using a random number table (Annex 4, Table 5) or similar method, randomly choose a starting point on the sampling frame. This is the first sampled district. Then proceed through the sampling frame selecting districts which coincide with multiples of the sample interval.
6. *Randomly select a starting point.* Use the random number table in Annex 4, Table 5 to generate a random starting number. Select a starting point on the table by looking away and marking a dot on the table with a pencil. Draw a line above the row nearest the dot, and a line to the left of the column nearest the dot. Moving down and right of your starting point select the first number read from the table whose last X digits are between 0 and N. (If N is a two digit number, then X would be 2; if it is a four digit number, X would be 4; etc.).

Example:
N = 300; M = 50; starting point is column 3, row 2 on Random Number Table; read down. You would select 043 as your starting number.

59468
99699
14043
15013
12600
33122
94169
etc...

7. *Select clusters.* Move down the ordered and numbered list of clusters and stop at the starting number. This is the first cluster. Now proceed down the sampling frame a number of elements equal to the sampling interval. The starting number + sampling interval = 2nd cluster. The starting number + 2 (sampling interval) = 3rd cluster etc.
8. *Stratify Service Delivery Points.* Order the Service Delivery Points within each of the sampled districts by volume of service, i.e. the value of the indicator for the audited reporting period. Divide the list into strata according to the number of sites to be selected. If possible, select an equal number of sites from each strata. For example, if you are selecting three sites, create three strata (small, medium, and large). If selecting two sites, create two strata. For six sites, create three strata and select two sites per stratum and so on. Divide the range (subtract the smallest value from the largest) by the number of strata to establish the cut points of the strata. If the sites are not equally distributed among the strata use your judgment to assign sites to strata.
9. *Select Service Delivery Points.* For a large number of sites you can use a random number table and select sites systematically as above. For a small number of sites, simple random sampling can be used to select sites within clusters.
10. *Select 'back up' sites.* If possible, select a back up site for each stratum. Use this site only if you are unable to visit the originally selected sites due to security concerns or other factors. Start over with a fresh sampling frame to select this site (excluding the sites already selected). Do not replace sites based on convenience. The replacement of sites should be discussed with the Organization Commissioning the DQA if possible.
11. *Know your sampling methodology.* The sites are intended to be selected for auditing as randomly (and equitably) as possible while benefiting from the convenience and economy associated with cluster sampling. You may be asked to explain why a given site has been selected. Be prepared to describe the sampling methods and explain the equitable selection of sites.

Illustrative Example – Sampling Strategy D: Cluster Sampling Selection

In the following example, Sampling Strategy D (modified two-stage cluster sample) is used to draw a sample of ART sites in "Our Country" in order to derive an estimate of data quality at the national level. In a cluster sampling design, the final sample is derived in stages. Each stage consists of two activities: (1) listing; and (2) sampling. Listing means drawing a complete list of all the elements from which a number will be selected. Sampling is when a pre-determined number of elements are chosen at random from the complete listing of elements. A sample is only as good as the list from which it is derived. The list, also called a sampling frame, is "good" (valid) if it is comprehensive, i.e. it includes all the known elements that comprise the population of elements. For ART sites in a country, a *good* sampling frame means that every single ART site in the country is properly identified in the list.

1. Illustrative Indicator for this application = Number of Individuals Receiving Anti-Retroviral Therapy (ART)
2. Audit Objective: to verify the consistency of *Our Country's* national reports of ART progress based on administrative monitoring systems.

3. Sampling Plan: two-stage cluster design is used to select three districts and then to select three ART sites in each of the selected districts.
4. Sampling Stage 1: (a) list all districts; (b) select three districts.
5. Problem: Listing all districts is inefficient because ART sites may not be located in every district of *Our Country*. Therefore, to make sampling of districts more efficient, first find out which districts have ART sites. In the illustrative grid below (**Annex 4, Table 1**), the highlighted cells represent those districts (n=12) in which ART sites are located. These 12 highlighted districts comprise the initial sampling frame.

Annex 4, Table 1. Illustrative Grid Display of All Districts in *Our Country*

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

6. Sampling Frame for Stage 1: The list in **Annex 4, Table 2** on the following page is called a sampling frame. It contains a complete list of districts that are relevant for auditing ART sites, because only the districts in which ART sites are located are included in the list.
7. The first column of the frame contains a simple numbering scheme beginning with "1" and ending with the final element in the list, which in this case is 12, because only 12 districts in "*Our Country"* contain ART sites.
8. The second column of the frame contains the number of the district that corresponds to the illustrative grid display shown in the previous table. These were the highlighted cells that showed which districts contained ART sites. Column 2 (District Number) does not list the selected districts. Rather, it lists only those districts in "*Our Country"* where ART sites are located. The sample of three districts will be drawn from Column 2.
9. The third column shows how many ART sites are located in each district. This is important because the selection of districts will be proportional to the number of individuals receiving ART in each district.

Annex 4, Table 2. Sampling Frame for Selection of Districts in Our Country

Sampling Frame Simple Ascending Number	District Number	Number of ART Sites per district	Number of Individuals Receiving ART per District
1	1	2	300
2	3	1	100
3	9	2	200
4	12	3	500
5	16	3	500
6	19	1	60
7	20	1	70
8	21	2	300
9	22	1	90
10	26	5	600
11	27	1	80
12	28	2	200
Total		24	3000

10. The next step in this stage of sampling is to use the sampling frame to select the three districts where the auditors will conduct the audit at specific ART sites. We are attempting to estimate a parameter (data quality) for all the districts/sites in the country using a select few. Therefore we would like that the few we select be as 'typical' as possible so as to provide an estimate as close to the actual value as possible. Some districts may contribute more, or less to the average of data quality in the whole country. Since we are interested in selecting districts that are representative of all districts with ART sites in the country, and we know that some districts with ART sites may not be typical (or representative) of all districts with ART sites, we need to ensure that districts with a high volume of service (which contribute more to the average data quality of all districts) are included in our sample. Therefore, the sampling technique will select districts using "probability proportionate to size."
11. In other words, the chance of a district being selected for the audit depends on the number of individuals being treated in the district. This information can be found in column 4 of **Annex 4, Table 2**: "Number of Individuals Receiving ART per District." Usually this number corresponds to quarterly reports.
12. One way to link the probability of selection of a district to the volume of service is to inflate the sampling frame according to the number of individuals receiving ART in each district. For example, if in District 1 a total of 300 individuals are receiving ART, then District 1 should be listed in the sampling frame 300 times.
13. To make this easier, divide the values in Column 4 (Number of Individuals Receiving ART) by 10. For example, now District 1 should appear 30 times instead of 300 times. District 3 should appear 10 times instead of 100 times, and so on. This inflated sampling frame is shown on in Table 3 of this section.

14. Using the inflated sampling frame shown in Annex 4, Table 3 we are ready to use systematic random sampling to select three districts.
15. In systematic random sampling, every kth element in the sampling frame is chosen for inclusion in the final audit sample. If the list (the sampling frame) contains 1,000 elements and you want a sample of 100 elements, you will select every 10th element for your sample. To ensure against bias, the standard approach is to select the first element at random. In this case, you would randomly select a number between 1 and 10; that number would represent the first element in your sample. Counting 10 elements beyond that number would represent the second element in your sample, and so on.
16. In this ART site example, we want to select three districts, and then within each of those three selected districts we want to select three ART sites. Therefore, our desired sample size is nine ART sites. It is a two stage sample: the first stage involves listing and sampling districts. The second stage involves listing and sampling ART sites.
17. Our sampling frame is organized by a Probability Proportionate to Size methodology because the list is weighted by the number of individuals receiving ART per district. In other words, we will have a higher probability of selecting a district where a high number of individuals are receiving ART, because these districts are listed more often (that is what the "inflation" of the sampling frame accomplished).
18. In systematic random sampling, the sampling interval is calculated by dividing the desired sampling size (three districts) by the number of elements in the sampling frame (300 in the frame shown in Annex 3, Table 3). So, our sampling interval is 300/3, which equals 100.

Annex 4, Table 3. Sampling Frame for Selection of Districts Based on Probability Proportionate to Size

#	Distr.	#	Distr.	#	Distr.	#	Distr.	#	Distr.	#	Distr.	#	Distr.
1	1	51	9	101	12	151	16	201	21	251	26	301	
2	1	52	9	102	12	152	16	202	21	252	26	302	
3	1	53	9	103	12	153	16	203	21	253	26	303	
4	1	54	9	104	12	154	16	204	22	254	26	304	
5	1	55	9	105	12	155	16	205	22	255	26	305	
6	1	56	9	106	12	156	16	206	22	256	26	306	
7	1	57	9	107	12	157	16	207	22	257	26	307	
8	1	58	9	108	12	158	16	208	22	258	26	308	
9	1	59	9	109	12	159	16	209	22	259	26	309	
10	1	60	9	110	12	160	16	210	22	260	26	310	
11	1	61	12	111	16	161	19	211	22	261	26	311	
12	1	62	12	112	16	162	19	212	22	262	26	312	
13	1	63	12	113	16	163	19	213	26	263	26	313	
14	1	64	12	114	16	164	19	214	26	264	26	314	
15	1	65	12	115	16	165	19	215	26	265	26	315	
16	1	66	12	116	16	166	19	216	26	266	26	316	
17	1	67	12	117	16	167	20	217	26	267	26	317	
18	1	68	12	118	16	168	20	218	26	268	26	318	
19	1	69	12	119	16	169	20	219	26	269	26	319	
20	1	70	12	120	16	170	20	220	26	270	26	320	
21	1	71	12	121	16	171	20	221	26	271	26	321	
22	1	72	12	122	16	172	20	222	26	272	26	322	
23	1	73	12	123	16	173	20	223	26	273	27	323	
24	1	74	12	124	16	174	21	224	26	274	27	324	
25	1	75	12	125	16	175	21	225	26	275	27	325	
26	1	76	12	126	16	176	21	226	26	276	27	326	
27	1	77	12	127	16	177	21	227	26	277	27	327	
28	1	78	12	128	16	178	21	228	26	278	27	328	
29	1	79	12	129	16	179	21	229	26	279	27	329	
30	1	80	12	130	16	180	21	230	26	280	27	330	
31	3	81	12	131	16	181	21	231	26	281	28	331	
32	3	82	12	132	16	182	21	232	26	282	28	332	
33	3	83	12	133	16	183	21	233	26	283	28	333	
34	3	84	12	134	16	184	21	234	26	284	28	334	
35	3	85	12	135	16	185	21	235	26	285	28	335	
36	3	86	12	136	16	186	21	236	26	286	28	336	
37	3	87	12	137	16	187	21	237	26	287	28	337	
38	3	88	12	138	16	188	21	238	26	288	28	338	
39	3	89	12	139	16	189	21	239	26	289	28	339	
40	3	90	12	140	16	190	21	240	26	290	28	340	
41	9	91	12	141	16	191	21	241	26	291	28	341	
42	9	92	12	142	16	192	21	242	26	292	28	342	
43	9	93	12	143	16	193	21	243	26	293	28	343	
44	9	94	12	144	16	194	21	244	26	294	28	344	
45	9	95	12	145	16	195	21	245	26	295	28	345	
46	9	96	12	146	16	196	21	246	26	296	28	346	
47	9	97	12	147	16	197	21	247	26	297	28	347	
48	9	98	12	148	16	198	21	248	26	298	28	348	
49	9	99	12	149	16	199	21	249	26	299	28	349	
50	9	100	12	150	16	200	21	250	26	300	28	350	

19. Using a random start methodology, let us now select a random number between 1 and 100. Use the random number table in Annex 4, Table 5 to generate this random number. Select a starting point on the table by looking away and marking a dot on the table with a pencil. Draw a line above the row nearest the dot, and a line to the left of the column nearest the dot. From the starting point (the dot) go down the column to the right of the vertical line until you arrive at a number less than the sampling interval. This number is your starting point and first sampled district. In this case the random number equaled 14. This now becomes the first element selected from the sampling frame, and corresponds to District #1.
20. In a systematic random sample we move systematically down the list based on the sampling interval. Our calculated sampling interval is 100. Since our random start was 14, the task is now to move 100 rows down the list to arrive at our next selected district. 14 plus 100 equals 114; this location in our list refers to District #16. This is our next selected district.
21. Moving down the list by our sampling interval (100) from 114 means that our next district is 114 + 100 = 214, which corresponds to District #26. This is our third selected district.
22. Stage 1 of the sampling strategy generated the three districts from which the actual ART sites to be audited will be drawn in Stage 2.
23. Using the exact same methodology that was used in Stage 1 of this sampling strategy, list all the ART sites in District 1, District 16, and District 26, (**Annex 4, Table 4**).

Annex 4, Table 4. The Four Selected Districts and the Listing of ART Sites within District 12

The 4 Districts Selected into the Audit Sample				**Illustrative Listing of ART Sites within the Selected Districts (District 16 is highlighted)**			
District Number	Sites per District	Aggregate Reported Count: Individuals on ART		District Number	Aggregate Reported Count: Individuals on ART	Site Number	Site Specific Reported Count
1	2	300					
16	3	500	➔	16	500	#1	100
26	5	600				#2	350
						#3	50
					Total:	3	500

24. The task is now to select three ART sites in each of the selected districts. But, as can be seen, District 1 only has two ART sites; District 16 has three sites; and District 26 has five sites.
25. Depending on the population distribution of the country and the epidemiology of the disease of interest, there may be many sites per district, or comparatively few. Given the relative maturity of TB programs and the generalized distribution of both TB and Malaria, sites with programs addressing these diseases are likely to be fairly numerous per district. On the other hand, sites with HIV/AIDS programs will be relatively few, particularly in countries with low prevalence or countries with concentrated epidemics (i.e., cases found primarily in high risk groups). In our ART example there are very few sites per district. With these small

numbers of sites per district, any kind of random (chance) algorithm can be used to derive the 9 ART sites that will comprise the audit sample. A simple random sample algorithm is perhaps easiest to use in this case. In the case of many sites per district, sites should be ranked per district according to the volume of service and three sites chosen using stratified random sampling. That is, stratify the sites into large, medium and small volume (number of patients treated, number of commodities distributed) and select one site at random from within each stratum. This will ensure adequate representation of all sites with respect to the volume of service

26. At this point, a sample of 9 ART sites has been drawn. Now the data quality auditors know which districts to visit and which sites within those districts are to be audited, so the team can plan its work accordingly. After the Audit Team has completed work at these nine sites, the next step is to calculate Verification Factors.

Note: the combination of number of clusters and number of sites within clusters is not fixed; rather, this combination should be based on the distribution of sites across a programmatic landscape. Fewer sites per district can be selected when volume of services is heavily concentrated. For example, in "*Our Country"* we could have selected four districts and then two sites per district in order to ensure more geographical representation of sites. While increasing the number of districts in the sample leads to greater statistical power of the analysis (i.e., greater precision of the estimate of data quality), the expense and time required for traveling to the additional districts will likely out-weigh the marginal improvement in precision (see Woodard et al.[7] for a discussion on the precision of estimates using the GAVI DQA sampling methodology).

The total number of clusters and sites will be determined by the Organization Commissioning the DQA in consultation with the Auditing Agency, but is ultimately dependent upon the resources available to conduct the Data Quality Audit. The main constraints in this regard are: (1) the time that an Audit Team can devote to the in-country work; (2) the composition (number and training) of the audit team in-country; and (3) the funding available to support the implementation of the audit.

How Big Should the Sample Be?

There is no right or wrong answer to this question. The question is really asking, "how many clusters (e.g., districts) should we select and how many sites per cluster should we select in order to generate statistics that are accurate?"

Accurate statistics in this case mean that the verification factors that are calculated for the sampled districts are representative of the verification factors for all the districts that were not selected into the data quality audit sample.

In other words, random sampling allows the DQA team to estimate a national Verification Factor by verifying reported counts in only a fraction of the total (national) number of sites. How good is this estimation? How closely do the results found by the auditors at this *fraction* of sites represent the results that might be found for the whole?

[7] Woodard S., Archer L., Zell E., Ronveaux O., Birmingham M. Design and Simulation Study of the Immunization Data Quality Audit (DQA). *Ann Epidemiol*, 2007;17:628–633.

The answer lies in sampling errors. A sampling error is a measure of how much the sample estimates deviate from the so-called true values. (The true values are usually called the parameters.) Sampling errors are a function of two things: (1) sample size; and (2) variability of the parameter. Sampling errors decrease as the sample size increases. The larger your sample, the lower your sampling error, and the more accurate your results are. Sampling error also depends on the variability of the parameter. For example, if the true national verification factor (data quality parameter) happens to be 0.95, it is likely a reflection of good reporting practices in the majority of sites in the country. Therefore, it is probable that a random sample would contain sites with good reporting performance. In this sample, the data quality is uniformly good and you would not need a large sample to demonstrate this.

On the other hand, if the true national verification factor is 0.50, then it probably reflects a combination of good and poor data quality across all sites in the country. It would take a larger sample to ensure that enough of these "good" and "bad" sites were represented in the sample just as they are distributed overall in the country.

The sampling error is a mathematical construct that permits the calculation of confidence intervals. It specifically relates to the number of standard deviations (plus or minus) that your sample results deviate from the "true" results (the parameter). Most statistical textbooks have tables of sampling errors in appendix form, where the specific value of the sampling error is indicated according to sample size and variability of the parameter.

The key to reducing sampling errors in the context of the data quality audit is to remember that sample size is not how many clusters (e.g. districts) are in the sample, nor is it how many sites are in the sample; rather, sample size pertains to how many instances of a health service (a visit to the site by an ART patient) are recorded at the site.

In Annex 4, we use an example where three districts are selected and three sites are selected per district. The auditors are verifying reported counts of ART patients receiving ART services at the selected sites. The total reported number of ART patients is 1,400. This is the actual number that the data quality auditors are attempting to verify and it constitutes an effective sample size when considering statistical issues of sample accuracy.

How big is this sample? In Uganda, the total reported number of individuals receiving ART services directly from sites in 2005 was 49,600. Fourteen hundred individuals is about three percent of that total, which under most conditions is a reasonable sample size for that population. In Nigeria, the total direct number of individuals reached with ART services was 18,900 in 2005. For Nigeria our hypothetical sample size of 1,400 individuals represents about eight percent of the total – an 8% sample is robust in most applications.

So unless a country has a very large number of sites where important health services are occurring (e.g., South Africa, Kenya, Uganda), it is usually possible to capture a robust fraction of services by visiting 8-12 sites using a probability proportionate to size methodology.

However, mathematical modeling of the modified two-stage cluster sampling technique described here has determined that the precision of estimates of the verification factor for immunization coverage data is too low for realistic use at the national level.2 In simulations, Woodard et al. found that up to 30 districts would need to be sampled to achieve precision in the neighborhood of +/-10%. Given the investment of time, staff and financial resources required to visit 30 districts, the calculation of a precise national verification factor is unlikely.

That said, it is possible to gain an insight into the overall quality of data in a program/project without reliance on the national estimate of verification factor. The qualitative aspects of the DQA are adequate to determine the strengths and weaknesses of a given reporting system. For example, if indicator definitions are poorly understood in a majority of a representative sample of sites, it is quite likely that indicator definitions are poorly understood in non-sampled districts as well. The recounting of indicators and comparison with reported values for a sample of sites is similarly adequate to determine in a general sense whether data quality is good, mediocre or poor, even without the benefit of a precise national estimate. Missing reports or large disparities between recounted and reported results in a handful of sites is indicative of similar disparities elsewhere.

Ultimately, the national verification factor should be interpreted with caution. For the purposes of the Data Quality Audit, it should be used as an indication of data quality (or lack of data quality), rather than an exact measure.

Annex 4, Table 5. Random Number Table

Random Number Table

13962	70992	65172	28053	02190	83634	66012	70305	66761	88344
43905	46941	72300	11641	43548	30455	07686	31840	03261	89139
00504	48658	38051	59408	16508	82979	92002	63606	41078	86326
61274	57238	47267	35303	29066	02140	60867	39847	50968	96719
43753	21159	16239	50595	62509	61207	86816	29902	23395	72640
83503	51662	21636	68192	84294	38754	84755	34053	94582	29215
36807	71420	35804	44862	23577	79551	42003	58684	09271	68396
19110	55680	18792	41487	16614	83053	00812	16749	45347	88199
82615	86984	93290	87971	60022	35415	20852	02909	99476	45568
05621	26584	36493	63013	68181	57702	49510	75304	38724	15712
06936	37293	55875	71213	83025	46063	74665	12178	10741	58362
84981	60458	16194	92403	80951	80068	47076	23310	74899	87929
66354	88441	96191	04794	14714	64749	43097	83976	83281	72038
49602	94109	36460	62353	00721	66980	82554	90270	12312	56299
78430	72391	96973	70437	97803	78683	04670	70667	58912	21883
33331	51803	15934	75807	46561	80188	78984	29317	27971	16440
62843	84445	56652	91797	45284	25842	96246	73504	21631	81223
19528	15445	77764	33446	41204	70067	33354	70680	66664	75486
16737	01887	50934	43306	75190	86997	56561	79018	34273	25196
99389	06685	45945	62000	76228	60645	87750	46329	46544	95665
36160	38196	77705	28891	12106	56281	86222	66116	39626	06080
05505	45420	44016	79662	92069	27628	50002	32540	19848	27319
85962	19758	92795	00458	71289	05884	37963	23322	73243	98185
28763	04900	54460	22083	89279	43492	00066	40857	86568	49336
42222	40446	82240	79159	44168	38213	46839	26598	29983	67645
43626	40039	51492	36488	70280	24218	14596	04744	89336	35630
97761	43444	95895	24102	07006	71923	04800	32062	41425	66862
49275	44270	52512	03951	21651	53867	73531	70073	45542	22831
15797	75134	39856	73527	78417	36208	59510	76913	22499	68467
04497	24853	43879	07613	26400	17180	18880	66083	02196	10638
95468	87411	30647	88711	01765	57688	60665	57636	36070	37285
01420	74218	71047	14401	74537	14820	45248	78007	65911	38583
74633	40171	97092	79137	30698	97915	36305	42613	87251	75608
46662	99688	59576	04887	02310	35508	69481	30300	94047	57096
10853	10393	03013	90372	89639	65800	88532	71789	59964	50681
68583	01032	67938	29733	71176	35699	10551	15091	52947	20134
75818	78982	24258	93051	02081	83890	66944	99856	87950	13952
16395	16837	00538	57133	89398	78205	72122	99655	25294	20941
53892	15105	40963	69267	85534	00533	27130	90420	72584	84576
66009	26869	91829	65078	89616	49016	14200	97469	88307	92282
45292	93427	92326	70206	15847	14302	60043	30530	57149	08642
34033	45008	41621	79437	98745	84455	66769	94729	17975	50963
13364	09937	00535	88122	47278	90758	23542	35273	67912	97670
03343	62593	93332	09921	25306	57483	98115	33460	55304	43572
46145	24476	62507	19530	41257	97919	02290	40357	38408	50031
37703	51658	17420	30593	39637	64220	45486	03698	80220	12139
12622	98083	17689	59677	56603	93316	79858	52548	67367	72416
56043	00251	70085	28067	78135	53000	18138	40564	77086	49557
43401	35924	28308	55140	07515	53854	23023	70268	80435	24269
18053	53460	32125	81357	26935	67234	78460	47833	20496	35645

From The Rand Corporation, *A Million Random Digits with 100,000 Normal Deviates* (New York: The Free Press, 1955)

ANNEX 5: Calculation of the Verification Factor

In a data quality audit, one of the most fundamental questions is the extent to which reported results match verified results. More specifically, *"for the indicator being audited, what proportion of sites in {country name} reported accurate results over the previous time period?"* The Verification Factor represents a way to summarize the answer to this question in a standard, quantitative measure.

The use of Verification Factors can be applied to the full set of health indicators that this Data Quality Audit Tool is designed to cover — **provided that the sampling strategy used by the Audit Team is statistically representative of the country-wide program (or an important subset of the country-wide program) and that the actual number of sites in the sample is large enough to generate robust estimates of reporting consistency.**

The Verification Factor is an indicator of reporting consistency that is measured at three levels: (1) the Service Delivery Site level; (2) the district administrative level; and (3) the national administrative level. It is often called a *district-based* indicator of reporting consistency because the primary sampling units for estimating Verification Factors are districts (or 'intermediate aggregation levels'). It can also be referred to as a district-based indicator because in the GAVI approach Verification Factors are constructed at the district level and at the national level.

The equation to derive Verification Factors consists of **four factors:**

Factor 1: the Audit Team's verified count at a selected site.
Factor 2: the observed reported count at a selected Service Delivery Site.
Factor 3: the observed reported count from all sites in a selected cluster (district).*
Factor 4: the reported count of a selected cluster (district) as observed at the national level.**

* Cluster level refers to an administrative/geographical unit like a district, a province, a region, etc.

** National level refers to the final place where aggregation of reported counts occur, like the relevant unit within the host country national government or the Strategic Liaison Officer within the USG team under the President's Emergency Plan for AIDS Relief.

Calculation of the Verification Factor consists of **three steps.**

Step One:

Divide Factor 1 by Factor 2:

$$\frac{\text{Verified count at selected site}}{\text{Reported count at selected site}}$$

This result equals the proportion of reported counts at a selected site that is verified by the Audit Team. This result can be called the **Verified Site Count**.

Step Two:

Divide Factor 3 by Factor 4:

$$\frac{\text{Reported count from all sites in selected cluster (district)}}{\text{Reported count of selected cluster (district) as observed at the national level}}$$

This result equals the proportion of the selected cluster or district-level reporting that is completely consistent with the national-level reporting. This result is called the cluster consistency ratio, or **Adjustment Factor.**

The adjustment factor answers the following question: *"Were the results reported at the selected district level (for all sites in the selected district — not just those sites that were visited by the Audit Team) exactly the same as the results (for the selected district) that were observed at the national level?"*

Step Three:

For each sampled district, sum the recounted values for the audited sites and divide by the sum of the reported values for the audited sites. Multiply this result for each sampled district by the adjustment factor appropriate for each district. This result, when further adjusted with "district" weights as shown below, is the **National Verification Factor**.

It is important to remember that the units of time should be equivalent across each of the factors used to calculate the Verification Factor. What this means is that if the auditor is tracing and verifying reported results for the past 12 months at a selected site, then this time period (past 12 months) should be used as the basis for the other factors in the equation.

The Verification Factor can be expressed using statistical notation as follows:

$$VF_i = \left[\frac{\sum_{j=1}^{4} x_{ij}}{\sum_{j=1}^{4} y_{ij}} \right] \times \frac{Rd_i}{Rn_i}$$

where

i = selected district (i = 1, 2, 3) and

j = selected site (j = 1, 2, 3)

and where

X_{ij} = the validated count from the j^{th} site of the i^{th} district

Y_{ij} = the observed reported count from the j^{th} site of the i^{th} district

Rd_i = at the district level, the reported count from all the sites in the i^{th} district that were prepared for submission to the national level

Rn_i = at the national level, the observed count as reported from the i^{th} district.

In order to derive a National Verification Factor, it is necessary to first calculate Verification Factors at the district level. The national Verification Factor is calculated as the *weighted average* of the district Verification Factors.

The example showing how Verification Factors are derived assumes that the Data Quality Audit Team is working in the three districts that were selected in the random sample section outlined previously. These three districts (1, 16, 26) and the ART sites embedded within them are shown in Annex 5, Table 1.

Annex 5, Table 1. The Flow of Reported ART Counts from the Selected Site Level Up to the Selected District (i = 1, 16, 26) Level and Up to the National Level

Aggregation of Reported Counts from Districts (N) ➔ National Level (300) + (500) + (700) = 1,500										
Aggregation of Reported Counts from Sites (N) ➔ District Level: District Identification Number (*I*)										
1 (300)			**16 (500)**				**26 (600)**			
1 (150)	**2 (150)**		**3 (100)**	**4 (350)**	**5 (50)**		**6 (200)**	**7 (100)**	**8 (100)**	**NA* (100)**	**9 (100)**
Site Level: Selected Site Identification Number (*j*) and Reported ART Count (*y*) **Note that the aggregated ART reported count at District 26 (600) is misreported at the National Level (700)** *** NA = This site not randomly selected**										

Two-stage cluster sampling, as discussed above, resulted in three districts and a total of 10 ART sites. In accordance with the GAVI approach, this strategy requires a set number of sites to be selected per district. In this example, three sites are to be selected per district. The problem is that since District #1 only has two ART sites it is not possible to select three.

One solution to this problem is to select both ART sites in District #1, all three sites in District 16, and randomly select four of the five sites in District 26. Please note that there are a number of alternatives available to address the sampling problem shown above – this Data Quality Audit Tool is not the place to discuss these alternatives.

Once an alternative to the sampling issue shown above is identified, then the Audit Team can begin to complete the matrix required to calculate Verification Factors. The matrix can be illustrated as below:

Illustrative Calculation Matrix for Verification Factors

I = selected district (i = 1, i = 16, i = 26)
j= selected ART site located in the i^{th} district
x = verified count at selected site j
y = reported count at selected site j

Annex 5, Table 2 illustrates the calculations derived from the calculation matrix.

Annex 5, Table 2. Calculations of i, j, x, and y

i	*j*	*x*	*y*	*x/y*
1	1	145	150	0.96
1	2	130	150	0.86
Total:	2	275	300	0.91
16	3	100	100	1.00
16	4	355	350	1.01
16	5	45	50	0.90
Total:	3	500	500	1.00
26	6	100	200	0.50
26	7	50	100	0.50
26	8	75	100	0.75
26	9	40	100	0.40
Total:	4	265	500	0.53

One of the rows in the matrix is highlighted for the purpose of further understanding how the Verification Factor is derived. The row is associated with District 26 (i=26) and Site number 7 (j=7). The third column in the matrix shows (x), or the verified count of ART patients that the auditors came up with at the site (50). The fourth column in the matrix shows (y), or the reported count of ART patients at this site (100). This part of the Verification Factor is derived by simply dividing the verified count (50) by the reported counted (100) = (0.50).

The matrix illustrates how sites are clustered together within districts, because the verification factors are calculated at the district level by pooling the audit results from each selected site within a district. Thus the Verification Factor for District 1 in the matrix is 0.91, which is derived by pooling the [x/y] results from the two sites in District 1.

Pooling is straightforward: the total of the *x* column (275) is divided by the total of the *y* column (300) to calculate the district level Verification Factor for District 1. This is done for each of the selected districts.

Judging from these verification factors (based on hypothetical values typed into the *x* column), the matrix suggests that District 26 over-reported the number of ART patients served in its sites. Here, the total number of reported ART patients was 500, while the total verified count that was derived by the Data Quality Audit Team examining source documents at the four selected sites was 265; 265 divided by 500 equals 0.53, which implies that the auditors were able to verify only about half of all the ART patients that were reported in this district.

The final two steps to deriving a national Verification Factor is to (1) calculate the adjustment factor [Rd_i/Rn_i] for each cluster; and (2) multiply this adjustment factor by the weighted district-level Verification Factors.

Calculation of the Adjustment Factor

Annex 5 Table 1 shows the flow of reported ART counts from the selected site level up to the selected district (or cluster) level, and then finally up to the national (or final aggregate) level. In our example, the table indicates that the aggregated ART reported count at the district level (District 26) was not reflected at the national level. Specifically, the 600 reported ART patients as found in the District 26 health offices was found not to match the 700 reported ART patients for District 26 at the national health office.

This fact was uncovered by a member of the Data Quality Audit Team who was tracing the district level results to what could be observed at the national level. As a result of this work by the Data Quality Audit Team that occurs in levels of aggregation higher than the site (namely intermediate and final levels of aggregation), we now have what we need to calculate the Adjustment Factor.

Rd_i/Rn_i is equal to:

1. The reported aggregate count from all sites in a selected district as observed by the auditor at the district (or intermediate) level of aggregation
2. Divided by
3. The reported aggregate count from all sites in a selected district as observed by the auditor at the national (or highest) level of aggregation.

In our example, the adjustment factors for each district would be:

- District 1: 300/300 = 1.0
- District 16: 500/500 = 1.0
- District 26: 600/700 = 0.86

The adjustment factor is applied by multiplying it against the Verification Factor for each district. Thus, the adjusted verification factors for each district are:

- District 1: 0.91 x 1.0 = 0.91
- District 16: 1.0 x 1.0 = 1.0
- District 26: 0.53 x 0.86 = 0.46

The next step in the calculation is to weight the adjusted district Verification Factors by the verified counts at district level. We weight the adjusted district Verification Factors because we want to assign more importance to a Verification Factor that represents a large number of clients, and proportionately less importance to a Verification Factor that represents a small number of clients.

In other words, based on our hypothetical example of the three districts, it looks like District 16 has the highest volume of ART patient services and that District 26 has the smallest volume of ART patient services during this time period. When we construct an average Verification Factor for all of the three districts, we ideally would like to assign proportionately more weight to the verification results from District 16, proportionately less weight to District 26, and so on.

The matrix below shows the intermediate and final calculations that are required to construct a weighted average of all the District Verification Factors.

Annex 5, Table 3. Calculation of the Average and Weighted Average of the District Verification Factors

	i = 1	*i = 16*	*i = 26*	*Summed Total*
District-level Verified Count *(x)*	275	500	265	1040
District-level Reported Count *(y)*	300	500	500	1300
District Verification Factor (*x*/*y*)	0.91	1.00	0.53	2.44
Adjustment Factor	1.0	1.0	0.86	
Adjusted District Verification Factor	0.91	1.0	0.46	2.37
Weight*	275	500	265	1040
Verification Factor (Weight)	250.25	500.00	121.9	872.15
District Average				0.81
Weighted District Average				0.84

* The weight used here is the verified number of patients on ART (*x*)

The District Average is calculated by summing the three District Verification Factors for each district (0.92+1.00+0.53 = 2.44) and then dividing by three (2.44/3 = 0.813).

Weighted District Average is calculated by first multiplying each of the three adjusted District Verification Factors by the district-level weight that has been assigned. In this example, the weight is equal to the district-level verified count (x). In the matrix, this value is shown in the row labeled

Verification Factor (Weight). Next you take the sum of the weighted values, which is shown in the last column of the row labeled Verification Factor (Weight) = 872.2. Then, you divide this value by the sum of the weights themselves (1040). So, 872.2/1040 = 0.84.

Based on the calculations shown in Annex 5, Table 3, the simple arithmetic average of the combined Verification Factors across all three districts is 0.813, while the weighted average is 0.840. The weighted average is higher because its calculation took into account the fact that District 16 had more ART patients than the other districts. Since the Verification Factor for District 16 was 1.00, this (perfect) Verification Factor was applicable to more ART patients and thus it had more influence on the overall average.