

Data quality standards of practice for national HIV estimation models

Contents

3	Executive summary
5	Introduction
5	Purpose
5	Background
6	The quality data imperative
7	Document scope—HIV programme indicators and estimates platforms
7	High priority programme indicators for HIV estimates
7	HIV estimation models and related platforms
10	Data quality standards of practice
11	Phase 1—Build
14	Phase 2—Manage
19	Phase 3—Optimize
22	Conclusion
23	Annexes
23	Annex 1. Indicator element matrices
28	Annex 2. Tool for monitoring known data quality issues
29	Annex 3. Sample terms of reference for national estimates teams
29	National HIV and AIDS epidemiological estimates working group
29	Terms of reference template
37	Annex 4. Additional resources
39	Acknowledgements

Executive summary

Measuring and understanding the impact and magnitude of HIV is a key component of the epidemic response in many countries. UNAIDS has been requested by the UN General Assembly to provide “ continued support...to assist countries in reporting annually on the AIDS response” (para 76. 2016 Political Declaration) ¹; the HIV estimates are integral part of reporting. UNAIDS and partners support countries to produce modelled estimates to quantify the impact and magnitude of a country’s HIV epidemic. The outputs of these estimates process are critical for multiple purposes such as: (1) identifying gaps and refocusing national HIV programmes, (2) setting and measuring progress against country programme targets, (3) budget development and resource allocation, (4) public awareness and government accountability to its citizens and donors, (5) global reporting on the epidemic and (6) designing and implementing interventions, among many other uses.

These models and the resulting estimates depend heavily on a range of data input, including routine HIV programme indicators. Considerable investments over the last two decades have helped many countries strengthen their health management information systems. These unprecedented investments have enabled even the most resource-challenged countries to monitor and evaluate their HIV programmes on a regular basis, providing facility-level data on a host of HIV service indicators. Despite significant investments in technology, process development and human capital, data quality remains a challenge.

By engaging a group of five countries across two regions with varying levels of generalized epidemics, UNAIDS identified a series of leading practices for improving the data quality of model input, now published here. We expect that countries will benefit from these standards and, as a result, be able to produce higher-quality HIV estimates. Importantly, these practices focus primarily on what may be within the mandate of national estimates teams. These practices are not meant to supplant existing national system data quality procedures. On the contrary, they are intended to strengthen the estimates team’s own capacity to participate in existing data quality programmes.

These standards of practice are organized by three stages of complexity—building, managing and optimizing. Activities in the building stage are designed to be completed within two months. The managing stage should be targeted for implementation in the short to medium-term (three to six months) and optimizing efforts may be more complex or long term in nature. Country teams may assess their own routines against these standards, identifying the most relevant and effective combination of data quality practices to adopt and implement. By working in conjunction with existing national data quality initiatives, figure 1 below outlines a series of practices estimates teams may adopt to strengthen the quality of their HIV estimates.

¹ https://www.unaids.org/sites/default/files/media_asset/2016-political-declaration-HIV-AIDS_en.pdf



Introduction

“WHILE [HIV ESTIMATES MODELS] ARE GETTING MORE SOPHISTICATED EVERY YEAR, THE QUANTITY AND QUALITY OF THE INPUT DATA—PROGRAMME, SURVEYS, SURVEILLANCE AND SIZE ESTIMATES—DO NOT KEEP PACE. SOME COUNTRIES’ DATA WERE VERY OLD, INCOMPLETE OR OF QUESTIONABLE QUALITY.”

—2021 HIV estimates workshop facilitator

Purpose

The purpose of this publication is to share leading practices for HIV data quality and to provide standards countries may use to assemble the highest possible quality of programme data for their HIV epidemiological estimates process (HIV estimates).

Measuring and understanding the impact and magnitude of HIV is a key component of the epidemic response in many countries. These efforts—known collectively as the HIV estimates process—produce modelled estimates to understand the impact and magnitude of a country’s HIV epidemic. The estimates process is supported by epidemiological models advanced by UNAIDS, UNICEF and the World Health Organization (WHO) such as Spectrum and Naomi. These models estimate and project HIV prevalence and incidence for countries. These models depend on a multitude of data input, including population as well as routinely reported programme indicators such as the number of people receiving antiretroviral therapy, the number of pregnant women who receive antiretroviral therapy to prevent the mother-to-child transmission of HIV, the number of people tested for HIV and the prevalence of HIV among pregnant women in antenatal clinics. The quality of the programme data can strongly affect model outputs. These guidelines also stress the critical importance of providing regular feedback on those input data and the modelled results to the facilities and district managers that compile those data.

Background

Considerable investments over the past two decades have helped many countries strengthen their health management information systems, including routine service statistics, disease surveillance and other critical data sources used in the response to HIV. These unprecedented investments have enabled even the most resource-challenged countries to monitor and evaluate their HIV programmes regularly, providing facility-level data on a host of HIV service indicators. Routine service statistics are typically housed in a national health management information system such as the District Health Information Software (DHIS2). Despite significant investments in technology, process development and human capital, data quality remains a challenge.

Previous rounds of UNAIDS estimates found that some countries had considerable challenges with the quality of their programme data, especially at the district and facility levels. Data quality issues that may have gone unnoticed when estimates analysis was conducted at the national level are now being revealed as countries embark on subnational modelling exercises. Even countries with advanced health information systems had major issues with the data quality checks conducted on subnational data. The issues included the following:

- ▶ Major fluctuations in the numbers of people receiving antiretroviral therapy by age and sex.
- ▶ The antiretroviral therapy totals by subnational area do not add up to the national totals entered in Spectrum.
- ▶ More women are already receiving antiretroviral therapy at the first antenatal visit than the number with known status.
- ▶ More first antenatal visits than estimated births.

In response to the data quality challenges experienced by countries, UNAIDS and its partners have developed new tools such as Naomi Input Data Quality Check (ShinyRob), which supports countries in visualizing data quality issues before the input is used in the estimates models. This publication is meant to complement these tools by establishing standard practices countries can adopt to strengthen the quality of routine programme data used in the national HIV estimates process.

The quality data imperative

As mentioned in the purpose section, the HIV estimates process serves as the foundation for national HIV programmes, establishing the baseline data to inform interventions in the HIV response. The output of the estimates process is used for a host of purposes such as: (1) identifying programme gaps and refocusing the national HIV response, (2) setting country programme targets, (3) budget development and resource allocation, (4) public awareness and government accountability to its citizens, (5) global reporting on the epidemic and (6) design and implementation of interventions, among many others. When data quality issues lead to poor output in the HIV estimates process, they can strongly affect country programmes. The downstream effects of poor data may cause national systems to over- or underestimate their targets and misallocate limited resources away from areas of greatest need. Figure 1 highlights some negative effects of ineffective estimates processes that may result from poor-quality data. Data quality strengthens the validity of these models and inspires public confidence in the HIV response.

Figure 1.

Impact of data quality issues in HIV estimates models



1. Targets

Since estimates models inform target setting, the downstream effects of poor data may cause national systems to over- or underestimate their targets.



2. Resources and interventions

Resources are allocated and interventions designed and selected based on the output of estimates models. Poor-quality data may divert resources from acute needs.



3. Public confidence

HIV estimates models are the primary source of data for the state of a country's epidemic. Inconsistent messaging about the state of the epidemic may undermine public confidence in the HIV response.

Document scope—HIV programme indicators and estimates platforms

High priority programme indicators for HIV estimates

The HIV estimation models use several data sources from population censuses, geospatial data, surveillance and routine programme indicators. Although each type of input is important to the models and the estimates process, this publication focuses on the routine programme indicators illustrated in Table 1. This publication does not address demographics, fertility rates and other population-related data obtained by methods other than routine collection. The skills for addressing data quality issues with these non-routine data sets typically lie within national statistics offices. UNAIDS encourages countries to use the United Nations Population Division's World Population Prospects for national-level demographic data where relevant.

To produce the highest-quality estimates, the models require data from the beginning of the epidemic or as far back as they are available. Past years' data are stored in the models for future years. Different models use different levels of disaggregation and time period (such as quarterly versus annual). Annex 1 provides a comprehensive indicator element matrix with data definitions for Naomi, Shiny90, Spectrum and EPP models. See subsection 2.2 for further information about the models. The 2021 Global AIDS Monitoring guidance (1) provides additional detail about these indicators and their most current definitions. Note that the definitions of indicators and their data elements may evolve over time. As such, be sure to check the most current UNAIDS guidance on the HIV estimate process for the updated requirements.

This publication is largely intended to support the estimates process and thus will provide guidance to central-level teams reviewing data quality. In most cases, central-level teams have access to facility-level data in their national health management information system (such as DHIS2). The procedures and standards presented here focus on data present in the national health management information system, not facility-level registers and other primary data sources and systems that may feed the national health management information system.

This document complements the data quality assessment guidance released by WHO in 2018, which focussed on validating treatment data (see Annex 4 with the link to this tool).

HIV estimation models and related platforms

The estimation process depends on and deploys several platforms and tools that serve distinct purposes in generating the estimates output. UNAIDS and a host of partners developed these platforms. They are living systems and are routinely updated with new features to support country teams. Figure 2 illustrates the current portfolio of systems used in this process and their purpose along with the order of data flows between the systems. Updated information about the tools used in the HIV estimates process is available at the UNAIDS HIV tools website (<https://hivtools.unaids.org>).

Table 1.

Routine programme indicators used in HIV estimates models

Short name	Full name	Model			
		Naomi	Spectrum	EPP (subsection of Spectrum)	Shiny90
Currently receiving antiretroviral therapy	Number of adults (male and female) and children receiving antiretroviral therapy at the end of the reporting period	✓	✓		
Antiretroviral therapy to prevent the mother-to-child transmission of HIV	Number of pregnant women living with HIV who received antiretroviral medicine to reduce the risk of mother-to-child transmission of HIV	✓	✓	✓	
Antenatal prevalence	Percentage of pregnant women receiving care in antenatal settings who tested positive for HIV or who have known HIV-positive status at the beginning of antenatal care	✓	✓	✓	
HIV testing volume and positivity	Number of HIV tests conducted (testing volume) and the percentage of HIV-positive results returned to people (positivity) in the calendar year				✓
Viral load suppression	Number and percentage of adults and children who have suppressed viral loads among those viral loads tested for routine purposes at the end of the reporting period		✓		
Voluntary male medical circumcisión	Number of males circumcised as part of the voluntary medical male circumcision for HIV prevention programme within the reporting period		✓	✓	
Co-trimoxazole for children	Among children born to women living with HIV, the number of children receiving co-trimoxazole according to national guidelines		✓		

Notes: This table is subject to change as models are still being developed.

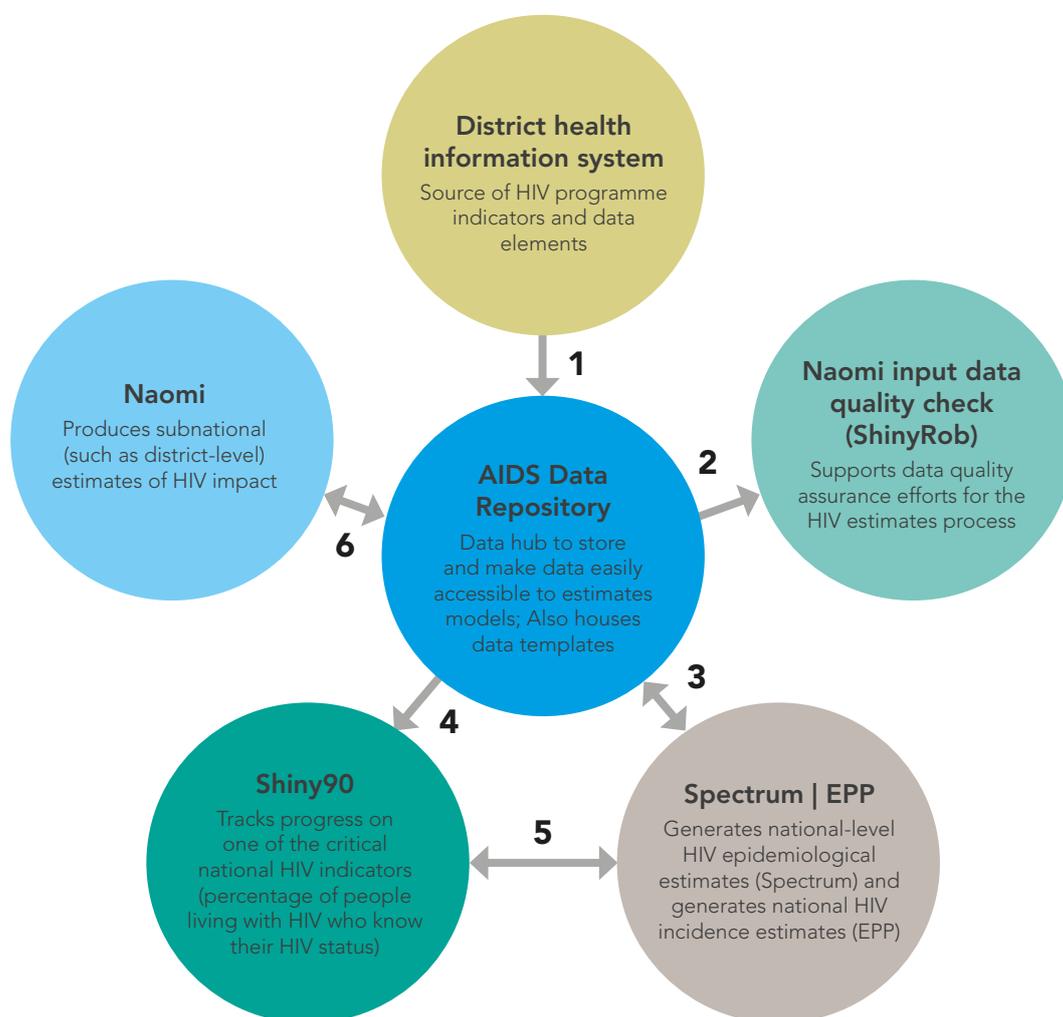
* Data on voluntary male medical circumcision are used in the Decision Makers' Program Planning Toolkit (DMPPT) 2, which is a separate tool related to Spectrum.

AIDS Data Repository

Data management is a key success factor for the HIV estimates process. UNAIDS has highlighted several challenges faced by national estimates teams related to data management, including the administrative burden of data management, hardware failure, staff turnover, data security and identifying and documenting the most current

Figure 2.

Common data and modelling platforms used in the HIV estimates process.



data sets. The AIDS Data Repository's website says: "The AIDS Data Repository aims to improve the quality, accessibility and consistency of HIV data and HIV estimates by providing a centralized platform with tools to help countries manage and share their HIV data." The AIDS Data Repository supports national HIV estimates teams in overcoming some of these challenges by providing a secure, cloud-based location to house, manage, back up and share data. The country estimates teams control access to the data stored in the AIDS Data Repository and can share items with the model tools for running data or with individuals for requesting support. It offers interoperability with other key platforms such as DHIS2, Naomi, Spectrum and the Naomi Input Data Quality Check (Shiny Rob). The AIDS Data Repository plays a key role in the HIV estimates process and strengthening data quality practices for country teams. The AIDS Data Repository was launched in 2018 and currently over 40 countries rely on the tool to manage their data and support the interoperability between tools that are used producing HIV estimates (adr.unaids.org).

Data quality standards of practice

UNAIDS developed a series of 12 leading practices for improving the data quality of model input. The practices outlined in this section are guidelines intended to assist country estimates teams to participate in national data quality initiatives and improve the quality of programme input more proactively. Since each country has unique needs and data systems, these standards can be adapted to the country context. By adopting these standards, UNAIDS expects that countries will produce higher-quality HIV estimates for their national response.

Importantly, these practices focus primarily on what may be within the mandate of national estimates teams. These practices are not meant to supplant existing national system data quality procedures. On the contrary, they are intended to strengthen the estimates team’s own capacity to participate in existing data quality programmes. Although the practices largely focus on routinely reported programme indicators, there should be some spill over benefits to improving the quality of data from other sources used in national estimates.

The standards of practice are organized by three phases of implementation (see Figure 3): Phase 1—Build, Phase 2—Manage and Phase 3—Optimize. Build phase activities are designed to be completed within two months. The Manage phase should be targeted for implementation in the short to medium term (three to six months) and the Optimize phase activities may be more complex or long term in nature. Country teams may assess their own routines against these standards and develop a phased work plan to adopt, implement and monitor the implementation of these practices. By working in conjunction with existing national data quality initiatives, estimates teams can improve the quality of their programme data and, subsequently, the quality of their HIV epidemiological estimates.

Figure 3. Recommended phases of implementation to ensure high-quality national estimates



BUILD

- ▶ Confirm team membership
- ▶ Develop and ratify terms of reference for the HIV estimates team
- ▶ Appoint a subcommittee or focal point for data quality
- ▶ Secure direct access to routine HIV programme data
- ▶ Review and reconcile indicator definitions

Phase 1—Build

This phase focuses on five foundational practices to prepare the estimates team for success. Estimates teams should be able to complete this phase in one to two months under normal circumstances. These activities are designed to be comparatively less complex to achieve and will prepare the estimates team for data quality initiatives under Phase 2—Manage. In Phase 1—Build, estimates teams will: (1) confirm team membership and assign roles, (2) develop and ratify terms of reference for the HIV estimates team, (3) appoint a subcommittee or focal point for data quality, (4) secure direct access to routine HIV programme data and (5) review and reconcile indicator definitions.

Confirm team membership and assign roles

Estimates teams typically comprise members from a variety of stakeholder institutions. These institutions usually include representatives from government bodies such as the country's health ministry, national AIDS council, national AIDS control programme and national statistics agency or their equivalents. UNAIDS and its cosponsors such as UNICEF and WHO play key roles, as do significant bilateral funding partners and donor programmes (such as the United States President's Emergency Plan for AIDS Relief (PEPFAR)). Other members may include technical implementing partners.

Although the membership of estimates teams does vary, they often consist of a small core group of individuals together with an extended team of subject matter experts or other ad hoc members. HIV estimates teams can increase their influence and impact by selecting members purposefully. Teams should include at least one influential senior member to help incentivize or advocate for actions by external stakeholders such as information systems leaders or subnational health system representatives.

For data quality, teams may ensure the participation of at least one member from the national team responsible for conducting routine data quality reviews for the HIV programme. It could be the HIV programme's monitoring and evaluation specialist or someone from the health ministry's strategic information department. This representative will understand why data quality challenges occur and will have the network to resolve any data problems at the source. UNAIDS recommends including members from the organizations most critical for adopting and using HIV estimates. UNAIDS also recommends including key donor agencies and United Nations counterparts on the estimates team to ensure consistent understanding of how the estimates are derived and greater likelihood of all stakeholders using the same estimates data. To sustain membership, estimates teams might consider allocating specific roles and tasks from their terms of reference to key members to encourage sustained participation in the process.

Establish terms of reference for the estimates team

In some cases, HIV estimates processes are completed by an existing multistakeholder group such as the strategic information technical working group, which has a mandate beyond its role to complete the estimates exercise. As a result of this diverse membership base, estimates team members often rotate, with new individuals representing their organizations on the team with some frequency.

Members—especially new participants—will benefit from clarity regarding the mission of the national estimates team, the roles of its members and the expectations for those

SELECTING
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TERMS OF REFERENCE ESTABLISH MUTUALLY AGREED PURPOSE, STRUCTURE, GOVERNANCE, ROLES AND WORKING ARRANGEMENTS FOR THE NATIONAL ESTIMATES TEAM.

roles. These can be articulated and documented in terms of reference for the team. Terms of reference not only set expectations for member participation but also provide institutional knowledge for what is typically a dynamic membership base.

Based on input from countries participating in developing this publication, data quality activities may not currently be an explicit role for national estimates teams. Including them in the team's terms of reference specifies the activities as part of the team's overall objectives. Another considerable benefit of documenting terms of reference is understanding the specific skills required to achieve the team's mission and what skill gaps may exist in the current team membership.

Annex 4 contains a sample terms of reference document that country estimates teams could adapt.

Appoint a subcommittee or focal points for data quality

Once data quality objectives are defined in the team's terms of reference, consider appointing a subcommittee whose primary role is to lead data quality activities for HIV estimates. UNAIDS recommends that the subcommittee comprise at least one member from the institution responsible for HIV data quality within the national system. Typically, this role is performed by the health ministry's monitoring and evaluation team or members of the HIV programme. Implementing partners who support district health authorities and/or health facilities may also add significant value, since they often bring strong understanding of the challenges at the lowest levels of the health system. Finally, at least one member should have strong data management and processing skills. Annex 3 provides further details about the role of the data quality subcommittee. Activities for the subcommittee may include:

- ▶ Represent the interests of the HIV estimates process in national data quality efforts and other related processes, such as gathering requirements for the health management information system.
- ▶ Lead quarterly (or more frequent) data quality reviews with the national estimates team using the Naomi Input Data Quality Check (ShinyRob) and other globally or locally developed approaches. For countries using DHIS2, the WHO Data Quality Tool for DHIS2 is one such option.
- ▶ Ensure that routine data quality audits include programme indicators used for HIV estimates.
- ▶ Summarize and present the results of relevant data quality assurance or audit reports to the national estimates team.
- ▶ Document and monitor known data quality issues.
- ▶ Follow up on recommendations for system improvements or other recommendations that arise out of the data quality reviews.
- ▶ Use national system data quality structures and the expertise and reach of the estimates team members to act on known data quality issues.
- ▶ Serve as subject matter experts on data quality to the national estimates team.

APPOINTING A SUBCOMMITTEE FOR DATA QUALITY ELEVATES THE IMPORTANCE OF DATA QUALITY MEASURES AND CREATES ACCOUNTABILITY FOR IMPROVING DATA QUALITY

REGULAR ACCESS TO HIV PROGRAMME DATA IS REQUIRED FOR THE NATIONAL ESTIMATES TEAM TO ACHIEVE ITS MISSION AND SERVE ITS ROLE IN THE NATIONAL HIV RESPONSE

MATCHING DEFINITIONS OF PROGRAMME INDICATORS AND THEIR DATA ELEMENTS ENSURES THAT EPIDEMIOLOGICAL PROJECTION MODELS FUNCTION AS INTENDED

Secure direct access to routine programme data

The ability for the national estimates team to review data quality depends on access to routine reporting systems (ideal) or regular access to raw data exports at the facility level. In most cases, user access to regular reporting systems is controlled by the health ministry's information systems team. With a vested interest and sanctioned use of health data, the estimates team should be able to secure access to the country's primary reporting system for health facilities. The most ubiquitous platform in use is DHIS2. Ideally, two or more individuals—especially those on the data quality subcommittee—should have access to HIV data at the facility level. If there are data quality modules that require separate access (such as the WHO Data Quality Tool), estimates team members should obtain access to them as well.

Some countries have reported that access to national health management information system may be restricted to a limited number of individuals. Depending on the membership of the estimates team, influential members may be able to support the business case for data access. Given the importance of the estimates output to country programmes, estimates teams should have a legitimate need to regularly access data in the health management information system. Should attempts to gain access fail, the estimates team may be able to negotiate receiving regular reports, which would support the routine monitoring of data quality efforts. Data exported from the health management information system should enable teams to conduct most analyses mentioned in the section on conducting quarterly data quality reviews.

Review and reconcile indicator definitions

During the 2021 HIV estimates workshops, some country teams highlighted differences between the definitions of the indicators expected by estimates models and those reported by country systems. In particular, disaggregation requirements may differ between model requirements and national system sources. Data quality subcommittees can review the most current definitions of national system indicators and their data elements, comparing them against those required by estimates models.

Differences should be documented clearly and presented to the broader national estimates team for review. National indicator definitions, data elements and disaggregation requirements can be compared with those presented in Annex 1. A digital version of the indicator element matrix in Excel format is available at the HIVTools.unaids.org website which can be used to document country-level data sources and details for each indicator data element. Differences can be documented in the tool provided in Annex 2. UNAIDS Strategic Information can advise the estimates team on the impact on model output and can consult with UNAIDS headquarters experts as needed. In some cases, estimates teams may need to update national systems to match globally accepted indicator definitions. UNAIDS shares the data requirements for the HIV estimates process annually, which can be used to reconcile requirements against national system data sources. In such cases, standard country procedures for changing monitoring and evaluation systems should be followed with national counterparts and partners. Such changes may also require changes to primary registers. The results of these exercises should be documented and placed in a cloud location accessible by all team members (such as the AIDS Data Repository or the team's knowledge management system).

MANAGE

- ▶ Conduct quarterly data quality reviews
- ▶ Document institutional knowledge systematically
- ▶ Document and monitor known data quality issues
- ▶ Practice sound knowledge management principles
- ▶ Implement rigorous data management policies

REGULAR REVIEWS IDENTIFY DATA CHALLENGES WHEN THEY CAN BE RESOLVED AND LONG BEFORE DATA ARE REQUIRED BY THE HIV ESTIMATES PROCESS.

INSTITUTIONAL KNOWLEDGE STRENGTHENS TEAM CAPACITY AND EFFICIENCY, SUPPORTING NATIONAL ESTIMATES TEAMS TO THRIVE DESPITE ROTATING MEMBERSHIP

Phase 2—Manage

This phase consists largely of ongoing practices to assess and monitor data quality and contribute to the long-term sustainability of estimates teams. Estimates teams should be able to complete this phase in months three to six under normal circumstances, although some activities such as the quarterly data quality reviews should begin as soon as possible based on the routine reporting cycle in the country. Compared with Phase 1—Build, these activities require additional investments in time and, potentially, other resources. In Phase 2—Manage, estimates teams will: (1) conduct quarterly data quality reviews, (2) document institutional knowledge systematically, (3) document and monitor known data quality issues, (4) practice sound knowledge management principles and (5) implement rigorous data management policies.

Conduct quarterly data quality reviews

Since the estimates process is annual, country estimates teams are typically most active around the time when the estimates are due to UNAIDS or required for donors. Since data are prepared for the modelling workshops, this is often the first time the national estimates team has reviewed the quality of the data for that year. In many countries, data from past quarters has already been locked in their health management information system, minimizing or eliminating the possibility of correcting data quality errors identified by the estimates team. UNAIDS strongly recommends that national estimates teams review the quality of their programme data input at least quarterly.

The data quality subcommittee should lead a quarterly quality review of key data input for the estimates process. The quarterly routine programme data should be extracted from the system and run through the Naomi Input Data Quality Check tool (ShinyRob) to identify data anomalies and work with district officers to resolve data issues immediately. For analyses not yet in the Naomi Input Data Quality Check (ShinyRob), other tools are also available for reviewing HIV data, including Excel using the PivotTable function. Teams may wish to invite external stakeholders to the review, especially HIV programme team members most knowledgeable of the underlying challenges and influential decision-makers who can spur corrective action. Table 2 provides some sample analyses that could be conducted on programme data quarterly or more frequently. In addition to responding to the potential issues, the findings from these analyses could be documented and stored for future reference as described in the sections of this publication on knowledge management and known data quality issues.

Document institutional knowledge systematically

As described above, national estimates teams are typically comprised of a range of stakeholder organizations in the country, including the health ministry (both HIV programme representatives and sector-wide strategic information representatives), national AIDS commissions, national statistics entities, donor partners (such as the United States President's Emergency Plan for AIDS Relief (PEPFAR)), multilateral organizations (such as WHO, UNAIDS and UNICEF) and others. Further, these teams are routinely evolving, with new individual members joining and others retiring from their roles. As such, it is important to document key information about the data ecosystem, any data cleaning efforts that are required after the data quality checks, assumptions made while developing the annual estimates and decisions made during the estimates process for the purposes of maintaining institutional knowledge. The estimates process for future years may face similar decisions or require applying the

Table 2.
Examples of data analyses for identifying and resolving data quality issues

Analysis	Description	Level	Impact on models (high, medium, low)
General			
Completeness	Confirm all expected data elements have been reported for each month from all facilities providing services	Facility	Spectrum—high ^a Naomi—high
Unexpected fluctuation	Available in the Naomi Input Data Quality Check (ShinyRob) for some indicators: review extreme quarterly fluctuation in reported values for the indicators and data elements, including disaggregation (such as $\pm 15\%$ or other suitable threshold based on facility size etc.); note that facilities or districts with low volumes may be subject to large but normal fluctuation	Facility, district	Spectrum—high Naomi—high
Indicator definition match	Confirm that the country definitions of all indicator data elements match those described in the UNAIDS current Global AIDS Monitoring guidance or other estimates guidance from UNAIDS (1).	National	Spectrum—medium ^b Naomi—medium to high
Antiretroviral therapy			
Antiretroviral therapy: sex ratio	Available in the Naomi Input Data Quality Check (ShinyRob), this analysis reviews the ratio of females to males among adults receiving antiretroviral therapy by quarter	Facility, district	Spectrum—medium Naomi—high
Antiretroviral therapy: children-to-adult ratio	Available in the Naomi Input Data Quality Check (ShinyRob), this analysis reviews the proportion of children receiving antiretroviral therapy by year or quarter	Facility, district	Spectrum—medium Naomi—high
90–90–90 cascade logic	Assess the logic of the 90–90–90 care cascade: downstream figures represent a subset of upstream values (known status > antiretroviral therapy current > viral load suppression).	Facility, district	Spectrum—high Naomi—high
Antenatal			
Ratio of people living with HIV to those receiving antiretroviral therapy to prevent the mother-to-child transmission of HIV	Review the ratio of the sum of women with known status and those testing positive to pregnant women receiving antiretroviral therapy to prevent the mother-to-child transmission of HIV; confirm that all facilities have ratios greater than or equal to one	Facility	Spectrum—high Naomi—low
Antenatal prevalence	Available in the Naomi Input Data Quality Check (ShinyRob): review trends in the prevalence of antenatal clients to identify potential outliers	Facility, district	Spectrum—high Naomi—medium
Trends in antenatal known positive	Available in the Naomi Input Data Quality Check (ShinyRob): review what percentage of women known to be living with HIV before pregnancy are already receiving antiretroviral therapy	Facility, district	Spectrum—medium Naomi—medium
Antenatal antiretroviral therapy coverage	Available in the Naomi Input Data Quality Check (ShinyRob): review whether the trends in women already receiving antiretroviral therapy before pregnancy are increasing over time and there is no dramatic fluctuation	Facility, district	Spectrum—medium Naomi—medium

Table 2. (continued)

Examples of data analyses for identifying and resolving data quality issues

Analysis	Description	Level	Impact on models (high, medium, low)
Antenatal ratio of women living with HIV	Analyse the ratio of pregnant women known to be living with HIV to newly identified pregnant women living with HIV	Facility	Spectrum—high Naomi—high
Antenatal first-visit trends	Monitor longitudinal fluctuations in first antenatal visits at the facility level	Facility	Spectrum—high Naomi—high
Antenatal testing cascade	Ensure the logic of key antenatal data elements. For example, the total number testing positive is less than or equal to the total number tested, and the total number tested is less than or equal to the total number of first visits to antenatal services	Facility	Spectrum—high Naomi—high
Other data quality checks			
Antiretroviral therapy duplicate care	Estimate the number of antiretroviral therapy and antenatal clients receiving services at more than one health facility using previous evaluations or data quality assessments	District	Spectrum—low Naomi—high
Antiretroviral therapy and antenatal duplicate care	Estimate the number of antiretroviral therapy and antenatal care clients receiving services at more than one health facility using previous evaluations or data quality assessments; unique identifiers have proven a valuable solution to identifying duplicate care (2).	District	Spectrum—high Naomi—high
Multiple reporting system review and reconciliation	In countries that may have multiple reporting systems (such as managed by the government and managed by a donor programme), analyse and reconcile differences in reported values for relevant data elements; country teams will determine which source is most accurate for use in estimates	Facility	Spectrum—high Naomi—high
Facility deep dive	For facilities with a known history of data quality challenges or that are identified through other analyses in this table, conduct a deep dive of all data elements for logic. The health ministry may have a list of outstanding data quality issues by facility or a list of facilities with a history of data quality challenges. Reviewing data logic, including calculating the number of people currently receiving antiretroviral therapy versus deaths, transfers and lost to follow-up.	Facility	Spectrum—low Naomi—high
Validate geographical areas	Confirm geospatial assignments to indicators, including addition, subtraction, subdivision or reassignment of administrative areas used by estimates models (such as rural to urban); ensure that child areas have the correct parent assignment (such as districts being assigned to the correct provinces); for best results, historical data should reflect the current alignment of facilities to administrative areas	National	Spectrum—low Naomi—high
Non-numeric, null and positive number analysis	Ensure that all disaggregations of data elements contain numeric, non-null, positive (or zero) values; confirm the correct meaning of any null values and, if needed, convert to zero or a positive validated integer value. ^c	Facility	Spectrum—high Naomi—high

^a Antenatal prevalence, if collected from an unbiased set of sites, will not be excessively affected by missing data points.^b Diverging definitions of antenatal prevalence are an exception and will strongly affect Spectrum output.^c In DHIS2, an aggregated report may omit a particular stratification's row or result, which may indicate that there is no result because the value is zero, missing or the stratification was simply not included in the report extracted. The correct intention should be confirmed and, if zero, should be recorded as such to distinguish from a missing value.

DOCUMENTING
AND MONITORING
KNOWN DATA
QUALITY ISSUES
ENABLES PLANNING,
RESOLUTION AND
ACCOUNTABILITY
FOR IMPROVING
DATA QUALITY

BEYOND CREATING
EFFICIENCY,
INFORMATION
MANAGEMENT
STRENGTHENS
THE NATIONAL
RESPONSE BY
RETAINING THE
CRITICAL EXPERTISE
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same assumptions. This institutional knowledge will support data quality efforts for the estimates process now and in the future. The team may nominate a member to be responsible for maintaining institutional knowledge, which should be routinely uploaded to the AIDS Data Repository for easy accessibility by all team members.

Document and monitor known data quality issues

Country estimates teams are likely to have existing knowledge of several data quality issues affecting the HIV estimates process. Examples include (1) regular creation, merging or recategorization of geographical areas, (2) switching similar data elements during reporting such as known status versus newly tested HIV-positive pregnant women and (3) reporting all antenatal visits rather than just the first. Many of these data quality issues result from simple human error. For example, digitizing paper facility reports presents many opportunities for error. Other issues are systemic in nature. For example, capturing all HIV tests of pregnant women (versus only their first test) will overestimate the total number of tests administered. If registers and monthly summary reports are unable to identify only the first test, HIV estimates will be affected. Such an issue is systemic because it requires a nationwide change to the registries and health management information system and new training for its users. Both human error and systemic issues can affect the HIV estimates output. National estimates teams may want to document and monitor these issues regardless of their ability to address them directly.

Isolated data quality issues are typically managed by working with subnational health authorities or the facility directly. National systems usually have standard operating procedures that address these issues. The national estimates team can work with national counterparts to communicate isolated data quality issues, but they may also be tracked and monitored for resolution if they are expected to affect the HIV estimates results. Systemic issues are more likely to have significant impact and should be monitored by the data quality subcommittee. Documenting known issues will: (1) assist the team to interpret past estimates results, (2) support institutional knowledge for current and future members and (3) allow estimates procedures to progress upon resolution.

Annex 2 contains a sample tool estimates teams may adapt and use for monitoring known data quality issues. This tool can be housed on the AIDS Data Repository or a local share drive.

Practice sound knowledge management principles

National estimates teams use and produce an astounding quantity of data and information to achieve their mission. Aside from the input to and output from the estimates process, teams may produce a wealth of tools, standard operating procedures, terms of reference, meeting notes or other information assets mentioned as good practice in these guidelines. Further, many national system guidelines and other documents are foundational and used by estimates teams. Indeed, these assets used or produced by the national estimates team are of enormous value to the national response to HIV.

However, the diverse and rotating membership base of estimates teams places considerable stress on the ability to retain these knowledge assets. As noted above, national estimates teams typically comprise a multisectoral group of institutions. Individual representatives often rotate year over year. This rotating membership—

although necessary and sometimes even advantageous—can create inefficiency as new team members come onboard and historical data and team knowledge are lost with outgoing members.

UNAIDS has developed solutions to assist countries with this challenge. For example, the AIDS Data Repository is a cloud-based data management platform where national estimates teams store estimates-related data as annual input packages. The AIDS Data Repository can also be used to house other knowledge from estimates teams such as documented assumptions behind the data input or known data quality issues with the health management information system to strengthen institutional knowledge around HIV estimates. If needed, national estimates teams can use other platforms such as Google Drive, Dropbox, SharePoint or Microsoft Teams in accordance with local data policies. Teams should consult available resources for sound practices in knowledge management (3).

Implement rigorous data management policies and procedures

The WHO Data Principles highlight data management practices and standards, including the FAIR Guiding Principles for scientific data management and stewardship (4, 5) that espouse findability, accessibility, interoperability and reuse of data. Many of the detailed principles under these categories are relevant to national estimates teams. Some principles are related to other recommended practices in this publication, including knowledge management and reconciling national indicator definitions with those required by the estimates models. Data management practices central to the success of the HIV estimates process include the following.

- ▶ **Access.** Data input and output should be securely available to the right people for relevant use. Data sets of broader interest should be available in a secure shared environment. Documented governance principles should guide who has access and for which purposes.
- ▶ **Metadata.** Clear definitions of data elements are essential to understanding data and increasing reuse. Ideally, metadata accompany archived data sets.
- ▶ **Version management.** The estimates process is iterative in nature and produces multiple versions of the same data set as data are validated and altered for different tasks. Poor version management can result in incorrect estimates output or, at best, inefficiency in the process. Final data input should be saved and labelled appropriately. Spectrum, specifically, allows users to enter notes when data input is uploaded. Documenting changes and assumptions through this function supports strong data management.
- ▶ **Traceability.** Estimates teams depend on data from a range of sources, including surveys and national health information systems (such as DHIS2). Data sets used by the estimates process should be clearly labelled so they are traceable to their origin in case of additional enquiries or need for greater understanding of their underlying content.
- ▶ **Archiving.** The estimates process produces high-value data sets used by countries for global reporting purposes as well as a host of domestic uses such as resource allocation, programme design and target setting. Estimates teams should ensure that sound archiving procedures are in place, with restrictions on user ability to make changes to the final, archived versions of data sets.

Fortunately, tools such as the AIDS Data Repository offer country teams the opportunity to practice these data management principles. In AIDS Data Repository, data sets can be stored, accessed, managed and reused. However, estimates teams will have to define and adhere to the processes, which are not enforced by the AIDS Data Repository or other data management systems used by countries. Additional resources are available to support country teams in developing their processes and governance policies around data management (Annex 4) (6, 7).

Phase 3—Optimize

OPTIMIZE

- ▶ Engage subnational stakeholders for strengthening data quality
- ▶ Advocate systematically for data quality with influential stakeholders
- ▶ Shape the requirements of national health information systems

This third and final phase includes activities linked to high-performing estimates teams that systematically and proactively engage a range of stakeholders to reform and build systems for improving data quality. In principle, these activities could begin at any time. However, some depend on extended programme cycles of external processes such as gathering and implementing the requirements of national health information systems. Others may be complex for political reasons such as directly engaging subnational stakeholders. Political hierarchies may create obstacles for estimates teams to engage these stakeholders outside established channels, so estimates teams need to determine what is most appropriate for their countries. Compared with the Build and Manage phases, the Optimize phase activities require long-term, sustained commitment and effort but will yield high-impact results. In Phase 3—Optimize, estimates teams will: (1) engage subnational stakeholders for strengthening data quality, (2) advocate systematically for data quality with influential stakeholders and (3) shape the requirements of national health information systems.

Engage subnational stakeholders for strengthening data quality

SUBNATIONAL
STAKEHOLDER
ENGAGEMENT
BRINGS NATIONAL
ESTIMATES TEAMS
CLOSER TO WHERE
MOST DATA QUALITY
CHALLENGES OCCUR

As the HIV estimates process continues to place a greater focus on subnational geography, authorities and health workers from these areas necessarily become important stakeholders. Most countries already have a process by which national-level strategic information managers (or HIV programme representatives) engage counterparts at the provincial, district and even facility level to address data quality challenges. The national estimates team should engage subnational stakeholders for the purpose of distributing HIV estimates results, requesting their review of national reports or other needs.

At minimum, estimates teams should work with national system counterparts to make data quality issues known and to monitor their resolution through subnational engagement. Each country should determine its preferred approach. Some may opt to participate in existing national data quality efforts, ensuring that the challenges identified by the estimates team are resolved at their source. In such a case, the data quality subcommittee could liaise with these existing procedures to ensure that the interests of the estimates team are represented. Other countries may allow estimates teams to work directly with facilities or subnational authorities to address data quality challenges for the relevant indicators. A simple log can be used with the Naomi Input Data Quality Check (ShinyRob) tool to document district-level data quality issues and ensure automate the follow up with districts.

Advocate systematically for data quality with influential stakeholders

SUCCESSFUL DATA QUALITY ADVOCACY SECURES RESOURCES AND SUPPORT FROM LEADERSHIP TO ACHIEVE CHANGE

The global response to HIV is one of the greatest success stories of public health advocacy. Using an evidence-driven approach, advocates from around the world have garnered support from a broad range of public and private stakeholders in the response to HIV. The HIV response has demonstrated advocacy to be one of the primary channels for securing commitment and resources from decision-makers. Effective advocacy creates change. Improving data quality requires a complex combination of changes to people, processes and technology. Successfully changing any of these requires support from stakeholders.

National commitment to and resources for data quality initiatives tend to ebb and flow. Maintaining a continuous message from national leaders about data quality requires a systematic advocacy effort. Many available resources to guide advocacy could be adopted to the context of data quality (8–10). By adapting the WHO advocacy toolkit on the global epidemic of chronic disease (8), estimates teams may consider the approach below to successfully advocate for data quality resources and commitment to change. (See Figure 4.)

Figure 4.

Approach to advocacy for data quality improvement



1 Define the case for change

What is the impact of poor-quality data on your country? Use these guidelines and inputs from the estimates team to define the problem.



2 Establish goals

Establish specific and measurable goals. The rest of your advocacy plan should be designed to achieve them.



3 Identify audiences

Who are the influencers most likely to be able to help you address data quality?



4 Craft messages

Advocacy is the process of influencing people to create change. What motivates your audiences? What incentives can you create to encourage them to act? Who should deliver the messages?



5 Implement advocacy plan

Once audiences are identified and messages have been crafted, the estimates team can leverage its members to implement the advocacy plan. Be sure to identify champions and support them with talking points. Deliver simple, actionable messages and follow up. Be sure to monitor and document the advocacy's impact and communicate it back to target audiences.

These are general phases and guidelines for how to approach advocacy for data quality initiatives and resources. Advocacy toolkits are widely available, such as those cited in Annex 4, and can be adapted by country teams to suit their specific needs. The critical components of successful advocacy are defining what change you hope to create, identifying the audiences who can create that change and crafting targeted messages that position data quality in alignment with their interests. The estimates team may consider adding someone with these skills to its membership to lead advocacy.

HIV ESTIMATES TEAMS ARE CRITICAL STAKEHOLDERS IN NATIONAL HEALTH INFORMATION SYSTEMS AND SHOULD PLAY AN ACTIVE ROLE IN DEVELOPING THEIR REQUIREMENTS

Shape the requirements of national health information systems

Health management information systems include the paper and digital systems used to collect, report and manage health data. These systems are critical in ensuring high-quality data are collected from community- and facility-based health services related to HIV. Most countries have an appointed team at the health ministry whose role includes developing system requirements and adapting the health management information system to the evolving needs of health programmes. HIV estimates teams are important stakeholders with specific and legitimate needs regarding the health management information system. As the health sector gathers requirements from stakeholders, the HIV estimates team must be sure that the data elements required for the estimates are provided for developing the paper-based registers, monthly tally sheets and electronic reporting systems. A well-organized HIV estimates team will ensure that this input is formally incorporated into the health management information system requirements on a regular basis. Additionally, the estimates team needs to ensure that the data elements required for the programme data in the estimates are not removed from the data collection processes.

Conclusion

The HIV estimates produced by the teams are critical for reviews of national strategic plans, and setting targets to end AIDS by 2030. The estimates are used for reporting on progress for the global targets through the Global AIDS Monitoring process. HIV estimates produced by estimates teams are simultaneously becoming more critical to the national response and more complex as they expand to increasingly smaller geographical areas. These factors, combined with the increasing sophistication of estimates models, place greater pressure on countries to resolve programme data quality challenges. These standards of practice, developed by UNAIDS in conjunction with national estimates teams from five countries with varying degrees of generalized epidemics, represent holistic long-term solutions to data quality challenges. They are designed to be fully within the mandate of most estimates teams, intended to complement existing national system data quality initiatives while ensuring that the needs of the estimates process are well represented in these initiatives.

Country teams now possess a clearly defined blueprint and timeline for implementing these actions through the three-phased Build, Manage and Optimize framework. The Build phase can begin immediately and contains discrete actions to be completed and verified in one to two months. The Manage phase represents sustainable, long-term practices that will require time and resource investments up front while becoming a normal part of doing business for estimates teams once established. The Optimize phase will reward high-performing, influential estimates teams with quality programme data, strong HIV epidemiological estimates and, in principle, a more successful response to their country's epidemic.

With this blueprint in hand, national estimates teams should develop their own work plan for implementing the three phases. To ensure accountability for the work plan, UNAIDS recommends appointing a senior influential member to lead its design, implementation and monitoring. With support from UNAIDS and key in-country stakeholders, HIV estimates teams can strengthen their national systems and improve services for those affected by HIV.

Annexes

Annex 1. Indicator element matrices

Antenatal care prevalence

Percentage of pregnant women receiving care in antenatal care settings who tested positive for HIV or who have known HIV-positive status at the beginning of the antenatal care (numerator: known positives + tested positive during pregnancy; denominator: number tested + known positives)

Indicator element Sex Age	Model Geographical level	Time period
Number of unique clients attending antenatal care for the first visit during a pregnancy in the calendar year	Naomi: district	By calendar year since last survey (or quarterly if available)
	Spectrum: level of Spectrum file (national or province)	By calendar year 2000 through the current year
	EPP: by curve level (urban versus rural or province)	By calendar year 2000 through the current year
Number of unique antenatal care clients who are tested for HIV during their pregnancy	Naomi: district	By calendar year since the last survey (or quarterly if available)
	Spectrum: level of Spectrum files	By calendar year 2000 through the current year
	EPP: by curve level (urban versus rural or province)	By calendar year 2000 through the current year
Number of antenatal care clients who test HIV positive at the first HIV test during a given pregnancy	Naomi: district	Calendar year since the last survey (or quarterly if available)
	Spectrum: level of Spectrum files	By calendar year 2000 through the current year
	EPP: by curve level (urban versus rural or province)	By calendar year 2000 through the current year
Number of antenatal care clients who self-report known HIV positive before the first antenatal care visit and are not tested for HIV	Naomi: district	Calendar year since the last survey (or quarterly if available)
	Spectrum: level of Spectrum files	By calendar year 2000 through the current year
	EPP: by curve level (urban versus rural or province)	By calendar year 2000 through the current year

Preventing mother-to-child transmission

Number of pregnant women living with HIV who received antiretroviral medicine to reduce the risk of mother-to-child transmission of HIV

Indicator element Sex Age	Model Geographical level	Time period
Number of pregnant women already on ART at the beginning of pregnancy	Naomi: district	By calendar year 2000 through the current year
	Spectrum: level of Spectrum file	By calendar year 2000 through the current year
	EPP: by curve level (urban versus rural or province)	By calendar year 2000 through the current year
% of pregnant women retained at delivery among those receiving treatment before pregnancy	Spectrum: Level of Spectrum file	By calendar year 2000 through the current year
Number of pregnant women newly receiving antiretroviral therapy during the current pregnancy started more than four weeks before delivery	Spectrum: Level of Spectrum file	By calendar year 2000 through the current year
Number of pregnant women newly on antiretroviral therapy during the current pregnancy started less than four weeks before delivery	Spectrum: Level of Spectrum file	By calendar year 2000 through the current year
% of pregnant women retained at delivery among those women started on treatment during the pregnancy (includes those starting >4 and <4 weeks before delivery)	Spectrum: Level of Spectrum file	By calendar year 2000 through the current year
Number of breastfeeding women retained on antiretroviral therapy 0–11 months	Spectrum: Level of Spectrum file	By calendar year 2000 through the current year
Number of breastfeeding women retained on antiretroviral therapy 12+ months	Spectrum: Level of Spectrum file	By calendar year 2000 through the current year

HIV testing volume and positivity

Number of HIV tests conducted (testing volume) and the percentage of HIV-positive results returned to people (positivity) in the calendar year

Indicator element Sex Age	Model Geographical level	Time period
Number of tests performed outside antenatal care clinics with the results received by a person (testing volume)—women age 15+ years	Shiny90: level of Spectrum files	By calendar year 2000 through the current year
Number of tests performed outside antenatal care clinics with the results received by a person (testing volume)—men age 15+ years	Shiny90: level of Spectrum files	By calendar year 2000 through the current year
Number of tests performed outside antenatal care clinics with the results received by a person (testing volume)—both sexes age 15+ years	Shiny90: level of Spectrum files	By calendar year 2000 through the current year
Number of tests conducted outside antenatal care clinics with an HIV-positive result returned to a person (positivity)—women age 15+ years	Shiny90: level of Spectrum files	By calendar year 2000 through the current year
Number of tests conducted outside antenatal care clinics with an HIV-positive result returned to a person (positivity)—men age 15+ years	Shiny90: level of Spectrum files	By calendar year 2000 through the current year
Number of tests conducted outside antenatal care clinics with an HIV-positive result returned to a person (positivity)—both sexes age 15+ years	Shiny90: level of Spectrum files	By calendar year 2000 through the current year

Treatment

Number of adults and children receiving antiretroviral therapy among all adults and children living with HIV at the end of the reporting period

Indicator element Sex Age	Model Geographical level	Time period
Number of people receiving antiretroviral therapy at the end of the reporting period—children age 0–14 years	Naomi: district	Quarterly from the last survey through the current year
Number of people receiving antiretroviral therapy at the end of the reporting period—women age 15+ years	Naomi: district	Quarterly from the last survey through the current year
Number of people receiving antiretroviral therapy at the end of the reporting period—men age 15+ years	Naomi: district	Quarterly from the last survey through the current year
Number of people receiving antiretroviral therapy at the end of the reporting period—females by 5-year age groups, if available	Spectrum: level of Spectrum file	By calendar year 2000 through the current year
Number of people receiving antiretroviral therapy at the end of the reporting period—males by 5-year age groups, if available	Spectrum: level of Spectrum file	By calendar year 2000 through the current year
Number of young children born to women living with HIV receiving co-trimoxazole	Spectrum: level of Spectrum file	By calendar year 2000 through the current year
[Optional] Number of people newly initiating antiretroviral therapy by quarter—children age 0–14 years	Naomi: district	Quarterly from the last survey through the current year
[Optional] Number of people newly initiating antiretroviral therapy by quarter—women 15+ years	Naomi: district	Quarterly from the last survey through the current year
[Optional] Number of people newly initiating antiretroviral therapy by quarter—men 15+ years	Naomi: district	Quarterly from the last survey through the current year

Viral load suppression

Number of adults living with HIV who have suppressed viral loads at the end of the reporting period

Indicator element Sex Age	Model Geographical level	Time period
Number of people tested for viral suppression among those on treatment—children age 0–14 years	Spectrum: level of Spectrum file	By calendar year 2000 through the current year
Number of people tested for viral suppression among those on treatment—women age 15+ years by 5-year age groups	Spectrum: level of Spectrum file	By calendar year 2000 through the current year
Number of people tested for viral suppression among those on treatment—men age 15+ years by 5-year age group	Spectrum: level of Spectrum file	By calendar year 2000 through the current year

Voluntary male medical circumcision

Number of males circumcised as part of the voluntary medical male circumcision programme for HIV prevention within the reporting period

Indicator element Sex Age	Model Geographical level	Time period
Number of males circumcised as part of the voluntary medical male circumcision programme for HIV prevention—males by 5-year age group	DMPPT2: district	Annual (or quarterly if available) from 2008 through the current year
	EPP: by curve level (urban/rural or province)	By calendar year 2008 through the current year

Annex 2. Tool for monitoring known data quality issues

This tool is provided to country estimates teams to support them in identifying and monitoring known data quality issues. Documenting such issues: (1) contributes to sound knowledge management practices, (2) supports teams in better understanding how the issues affect HIV estimates and (3) enables teams to monitor and resolve data quality issues for improving the quality of HIV estimates.

Date identified	Description	System, form or register	Implication for HIV estimates	Proposed solution	Status
Date or month and year the issue was first identified	Describe, in detail, the issue and its underlying cause. Be sure to include the specific indicator, data element, survey or other estimates input affected by the issue. Is it systemic in nature or due to human error?	Which are the relevant registers, forms or information systems?	How does the issue affect the HIV estimates process? For example, does it cause the models to overestimate prevalence in a specific population?	How is the country proposing to resolve the issue? Who on the estimates team is monitoring and supporting the solution?	What is the status of the solution?

Annex 3. Sample terms of reference for national estimates teams

National HIV and AIDS epidemiological estimates working group

Terms of reference template

Background and overview

Briefly describe the HIV and AIDS epidemiological estimates process for your country. When was this working group founded? What is its purpose? How are the estimates used to monitor the epidemic in the country? Provide a high-level overview of the membership of the working group. Why do these groups participate in the process? Is the estimates team a part of another group or constituency, such as strategic information or a monitoring and evaluation technical working group?

Sample text:

Measuring and understanding the impact and magnitude of HIV infection is a key component of the epidemic response in [NAME OF COUNTRY]. These efforts—known collectively as the HIV estimates process—produce modelled estimates to understand the impact and magnitude of the HIV epidemic. Indeed, [COUNTRY]'s HIV estimates process serves as a foundational component of our response to the epidemic. The estimates are used to set programme targets, allocate resources and inform interventions to serve [COUNTRY]'s citizens affected by HIV.

HIV estimates were first produced in [COUNTRY] in [YEAR]. Since then, this critical process has been completed annually. The HIV estimates process is led by [LEAD GOVERNMENT ORGANIZATION(S)] and is governed by [ADD TECHNICAL WORKING GROUP, BOARD OR OTHER SUPERIOR GOVERNANCE BODY AS NEEDED]. Member organizations provide expertise in the process and use the HIV estimates to strengthen their own programmes and policies.

These stakeholders collaborate to produce and disseminate HIV estimates annually to a wide range of audiences at various levels of the country (such as central, provincial and district health authorities) and to international bodies such as UNAIDS and [LIST OTHER INTERNATIONAL STAKEHOLDERS WHO RECEIVE THE ANNUAL ESTIMATES].

Objectives

List three to five overarching objectives of the HIV estimates team appropriate for your country. Examples include: (1) to produce annual epidemiological estimates output for use in the national and subnational response to HIV, (2) to serve as the subject matter experts on HIV projections for the country, (3) to provide technical assistance to other groups in interpreting and using HIV estimates output, (4) to advocate for sound HIV data quality principles with relevant national and subnational stakeholders, (5) to serve as expert advisers to the HIV programme, the national AIDS council and other stakeholders, (6) to provide data for national and global reporting requirements (such as Global AIDS Monitoring) and (7) to be caretakers of institutional knowledge related to HIV epidemiological data and estimates.

Sample text:

The HIV estimates process seeks to achieve [NUMBER] key objectives:

- ▶ To produce annual epidemiological estimates output for use in the national and subnational response to HIV.
- ▶ To serve as the subject matter experts on HIV projections for the country.
- ▶ To provide technical assistance to other groups in interpreting and using HIV estimates output.
- ▶ To advocate for sound HIV data quality principles with relevant national and subnational stakeholders.
- ▶ To serve as expert advisers to the HIV programme, the national AIDS council and other stakeholders.
- ▶ To provide data for national and global reporting requirements (such as Global AIDS Monitoring).
- ▶ To be caretakers of institutional knowledge related to HIV epidemiological data and estimates.

Member organizations

List the primary and secondary organizations that comprise the HIV estimates team. Typically, organizations include the health ministry, national AIDS council, national statistics agency, UNAIDS, academia, donor representatives, implementing partners and others. The list of individuals currently on the team may be maintained in an annex for retention of institutional knowledge but is not required here.

Sample text:

Although individual team members evolve over time, the core member organizations in the HIV estimates team include:

- ▶ [COUNTRY] government Institutions: [LIST ALL COUNTRY GOVERNMENT ORGANIZATIONS REGULARLY PARTICIPATING IN THE HIV ESTIMATES PROCESS. THEY TYPICALLY INCLUDE THE HEALTH MINISTRY, NATIONAL AIDS CONTROL PROGRAMME, NATIONAL AIDS COUNCIL, SUBNATIONAL HEALTH AUTHORITY REPRESENTATIVES AND THE NATIONAL STATISTICS AGENCY].
- ▶ Donor partner organizations: [LIST ALL DONOR PARTNER ORGANIZATIONS REGULARLY PARTICIPATING IN THE HIV ESTIMATES PROCESS].
- ▶ Implementing partner organizations: [LIST ALL IMPLEMENTING PARTNER ORGANIZATIONS REGULARLY PARTICIPATING IN THE HIV ESTIMATES PROCESS].
- ▶ Academia: [LIST ALL ACADEMIC PARTNER ORGANIZATIONS REGULARLY PARTICIPATING IN THE HIV ESTIMATES PROCESS].
- ▶ Other: [LIST ALL OTHER ORGANIZATIONS SUCH AS PRIVATE SECTOR INSTITUTIONS REGULARLY PARTICIPATING IN THE HIV ESTIMATES PROCESS].

Structure, governance and communication

In this section, describe the general organizational model of the HIV estimates team. Which organization has overall responsibility and leadership for the team? Are there subcommittees? If so, which and what are their roles? If the estimates team is a part of a larger working group, how does it interact with that group and what lines of governance and communication exist between the two? How frequently does the team meet? How and where are meeting minutes documented? What are general expectations of members? How will communication be managed among members? When will members be informed of scheduled meetings?

Sample text:

The health ministry AIDS control programme and the national AIDS council co-chair the estimates team and have overall responsibility for achieving its objectives. The estimates team has three subcommittees with a focal point for each. They include:

- ▶ Subcommittee for data quality—represents the needs of the estimates team in national data quality initiatives, coordinates quarterly data quality reviews and leads all other data quality tasks described below.
- ▶ Subcommittee for management, partnership and dissemination—develops estimates-related communication and engages stakeholders internal and external to the estimates team. Sets meeting agendas, documents meeting minutes, coordinates knowledge management. Responsible for coordinating all estimates dissemination activities.
- ▶ Subcommittee for epidemiology, data science and modelling—provides subject matter expertise on the subject themes and leads the use of the HIV tools and models to complete the annual HIV estimates in conjunction with estimates team leaders.

The estimates team works in conjunction with two main national bodies—the strategic information technical working group and the HIV partner community. All official communication and publications from the team must be cleared by one or both chairs. Individual members or their delegates are expected to attend 90% of estimates team meetings. Attendance will be documented through meeting minutes.

Primary tasks—core team

Provide a list of the core activities implemented by the HIV estimates team.

Sample text:

Illustrative tasks include:

- ▶ Gather and transform data needed for the estimates.
- ▶ Serve as experts and advise on HIV estimates models such as Spectrum and Naomi as well as other platforms such as the AIDS Data Repository, Naomi Input Data Quality Check (ShinyRob) and Shiny90.
- ▶ Participate in HIV estimates training events delivered by UNAIDS and its partners.
- ▶ Develop standard operating procedures as needed.
- ▶ Liaise with UNAIDS to complete HIV estimates activities.
- ▶ Document every step of the process.
- ▶ Produce and publish annual estimates model results.
- ▶ Ensure that team members possess the skills and capabilities required for all roles (such as data quality, advocacy, data science etc.).
- ▶ Disseminate and facilitate the use of estimates results with national, subnational and global stakeholders.
- ▶ Maintain institutional knowledge about the estimates process and provide access to team members and other relevant stakeholders.
- ▶ Advocate for data quality initiatives, including resources, with senior decision-makers.

Primary tasks—subcommittee for data quality

Sample text:

Key tasks for the subcommittee include:

- ▶ Implement sound data quality principles on behalf of the estimates team such as those described in the UNAIDS HIV estimates data quality standards of practice.
- ▶ Conduct regular data quality reviews of estimates input (at least quarterly).
- ▶ Use data quality tools such as the Naomi Input Data Quality Check (ShinyRob) to detect data quality issues with routine programme input for the estimates process.
- ▶ Maintain HIV indicator definitions consistent with those required by estimates models.
- ▶ Secure access to the national health information systems for relevant members of the HIV estimates team.
- ▶ Monitor known data quality issues due to information systems or human capital challenges, advising on and advocating for their resolution.
- ▶ Engage subnational stakeholders to correct known data quality issues.
- ▶ Represent the interests of the HIV estimates team by participating in formulating requirements for national information systems and other relevant processes.

Primary tasks—[OTHER SUBCOMMITTEES]

.....

Provide task lists for other confirmed subcommittees or subgroups of the estimates team.

.....

Knowledge management

This section will explain how key files related to the estimates (input and output), meeting minutes and other team knowledge are documented and managed. You may describe the team’s knowledge management system, including guidance for what gets documented and how it is organized for and accessible to team members. It should also include details on who administers the team’s AIDS Data Repository and has editing rights and viewing rights.

Sample text:

The estimates team—led by the subcommittee for management, partnerships and dissemination—practices rigorous knowledge management policies for both data and other institutional knowledge relevant to HIV estimates. Data snapshots used as input into the estimates process will be stored and managed through the AIDS Data Repository using data management practices outlined in the UNAIDS HIV estimates data quality standards of practice. Other relevant documents as well as published estimates, stakeholder communication, presentations, data quality assessments, training materials and these terms of reference are stored on the estimates team’s Dropbox share drive. These activities are the responsibility of the subcommittee for management, partnership and dissemination. This subcommittee manages user access and user levels for all systems, including the AIDS Data Repository and the team’s Dropbox.

Ratification

Ratify the terms of reference document by securing the signature of the chair and, if needed, one other senior member of the team.

Current members

.....

This optional section may be completed each year as membership changes.

.....

Name	Role	Organization	AIDS Data Repository role	E-mail
	Chair		Administrator	
	Deputy chair		Editor	
	Lead, data quality subcommittee		Editor	
	Subject matter adviser, epidemiology		Editor (can update data)	
	Subject matter adviser, data science		Member (view only)	
	Data quality advocacy		Member (view only)	
	Health management information system requirements		Member (view only)	
	Spectrum lead		Editor (can update data)	
	Naomi lead		Editor (can update data)	
	Knowledge management			

Annex 4. Additional resources

Global AIDS Monitoring 2021. Indicators for monitoring the 2016 Political Declaration on Ending AIDS. Geneva: UNAIDS; 2021
(<https://www.unaids.org/en/global-aids-monitoring>).

12 components monitoring and evaluation system assessment: guidelines to support preparation, implementation and follow-up activities. Geneva: UNAIDS; 2009
(https://www.unaids.org/sites/default/files/sub_landing/files/1_MERG_Assessment_12_Components_ME_System.pdf).

Comparative analysis of data quality assessment tools. Chapel Hill (NC): MEASURE Evaluation; 2018
(<https://www.measureevaluation.org/resources/publications/tr-18-300>).

Routine data quality assessment (RDQA) curriculum materials. Chapel Hill (NC): MEASURE Evaluation; 2017 (<https://www.measureevaluation.org/resources/tools/data-quality/routine-data-quality-assessment-rdqa-curriculum-materials>).

Guidelines for data management standards in routine health information systems. Chapel Hill (NC): MEASURE Evaluation; 2015
(<https://www.measureevaluation.org/resources/publications/ms-15-99>).

Data quality assessment of national and partner HIV treatment and patient monitoring systems. Geneva: World Health Organization; 2018
(<https://www.who.int/hiv/pub/toolkits/hiv-data-quality-assessment/en>).

Consolidated guidelines on person-centred HIV patient monitoring and case surveillance. Geneva: World Health Organization; 2017
(<https://www.who.int/hiv/pub/guidelines/person-centred-hiv-monitoring-guidelines/en>).

Guidelines on estimating the size of populations most at risk to HIV. Geneva: UNAIDS; 2011 (https://www.unaids.org/en/resources/documents/2011/2011_Estimating_Populations).

Stop the global epidemic of chronic disease – a practical guide to successful advocacy. Geneva: World Health Organization; 2017
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