Data Quality Assessment (DQA) for HIV Program Indicators in Burundi

Final Report

September 2019

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The Global Fund To Fight AIDS, Tuberculosis and Malaria

MEASURE Evaluation

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ABBREVIATIONS

ART	antiretroviral therapy
ARV	antiretroviral
C&T	counseling and testing
CDC	U.S. Centers for Disease Control and Prevention
CDS	centre de santé (Fr. health center)
DHIS2	District Health Information Software
DQA	data quality assessment
EMR	electronic medical record
GHSC-PSM	Global Health Supply Chain Program-Procurement and Supply Management
H	hôpital (Fr. hospital)
HMIS	health management information system
IP	implementing partner
LIS	laboratory information system
LQAS	lot quality assurance sampling
M&E	monitoring and evaluation
MOH	Ministry of Health
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PNLS/IST	National AIDS Control Program (Programme National de Lutte Contre le SIDA et les Infections Sexuellement Transmissibles)
RAFG	Reaching an AIDS-Free Generation in Burundi
TX_CURR	PEPFAR indicator for currently on treatment
TX_NEW	PEPFAR indicator for new initiates on treatment
TX_PVLS	PEPFAR indicator for viral load suppression
UNC	University of North Carolina at Chapel Hill
USAID	U.S. Agency for International Development
VF	verification factor
VL	viral load

INTRODUCTION

As donor funding has increased for disease control and prevention projects in developing countries, so has the need to show a return on investment in the form of public health gains. Monitoring and evaluation (M&E) of interventions are critical to demonstrate the effectiveness of health programs but are dependent on data reported by health facilities that are often of poor quality. Resources have been devoted to improving data quality in health and disease programs, yet problems persist as countries struggle to develop and maintain capacity for data management, analysis, and use.

The number of patients on treatment is a valuable indicator to monitor the effectiveness of HIV programs; however, treating patients during their lifetimes and accurately recording the results are challenging. Longitudinal treatment records (registers) for patients who return repeatedly for evaluation and treatment need to be summarized periodically in static reports. Counting accurately becomes more difficult as patients come and go from active treatment cohorts, move from one health facility to another, stop treatment because of side effects, or become lost to follow-up.

With the advent of "Test and Start"—an effort to expand the number of HIV-positive people on treatment and reduce the "waiting list" (those enrolled in care but not yet on treatment)—more scrutiny has been given to treatment results. The findings of such examinations have not always met expected standards.

The Office of HIV/AIDS at the U.S. Agency for International Development (USAID) has allocated resources to address the data quality of HIV and AIDS indicators through the MEASURE Evaluation project. The Programme National de Lutte Contre le SIDA et les Infections Sexuellement Transmissibles (PNLS/IST) (National HIV/AIDS Control Program in Burundi) and other donors and partners have also contributed resources to assessing and improving data quality for HIV in Burundi. A joint effort was made to plan and implement a joint data quality assessment (DQA) of 80 percent of the patients active on treatment in Burundi. This report summarizes the findings of the DQA and provides recommendations for follow-up.

Objective

The primary objective of the DQA was to investigate data quality issues concerning the number of people currently receiving antiretroviral therapy (ART) at a sample of health facilities representing 80 percent of patients actively on treatment in Burundi. The activity aimed to improve the accuracy and reliability of future data submissions to PEFPAR and the Ministry of Health (MOH). The assessment follows a pilot test in November 2018 to validate new assessment tools and methods. The assessment aimed to validate reported values for priority indicators at 147 sites, including sites supported by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR).

In addition, the assessment aimed to validate a proposed methodology for evaluating the quality of data in source documents, and program quality indicators. The so-called Lot Quality Assurance Sampling (LQAS) Triage System is a methodology to sample patient records within health facilities to gauge the completeness of the data, as well as the coherence of data between different data sources.

This report presents the findings of the assessment, which include systematic data quality problems affecting "Currently on ART" (TX_CURR), "Newly initiated on ART" (TX_NEW), and "Percentage of Viral Load Suppressed" (TX_PVLS). The report provides recommendations for actions that can be undertaken independently to improve data quality.

METHODS

This DQA of HIV-related indicators in Burundi was conducted from May 20 to June 28, 2019. The assessment used the recently developed DQA protocol and tools for HIV and AIDS developed by the U.S. Centers for Disease Control (CDC) and the World Health Organization (WHO), which were adapted and translated into French for application in Burundi.

Assessment Teams

The assessment was organized and conducted by MEASURE Evaluation (staff based in Washington, DC and the Burundi country team), in collaboration with the Burundi National AIDS Control Program (PNLS/IST) with support from USAID/Burundi. The Global Fund Principal Recipient in Burundi (United Nations Population Fund [UNDP]) and USAID implementing partners (IPs) FHI 360 and Chemonics played key roles, as well as provided essential financial support. A total of 20 staff divided into 10 assessment teams participated in the data collection in the field.

The assessment teams were trained on the DQA methodology and the use of the tools during a five-day workshop and practical exercise in Bujumbura before data collection. The CDC tools were translated by MEASURE Evaluation before the training, and necessary local adaptations were noted and made during the workshop.

Indicators and Reporting Period

Three indicators were assessed during the DQA:

- TX_CURR: Number of adults and children currently receiving ART
- TX_NEW: Number of adults and children newly enrolled on ART
- TX_PVLS: Percentage of ART patients with a viral load result documented in the medical record and/or laboratory information systems (LIS) within the past 12 months with a suppressed viral load (<1000 copies/ml)

The reporting period chosen for the review was PEPFAR's Quarter 2, FY 2019, which corresponds to Quarter 1 FY 2019 for the MOH's health management information system (HMIS), that is, January to March 2019. This period was selected as the most recent, complete period and reflects current data quality.

Facility Sample

Health facilities for the assessment were selected according to ART patient volume such that the top facilities with respect to patient volume, and making up 80 percent of the current "active file"—i.e., patients actively on treatment as of the end of March 2019 according to the DHIS2—for the entire country were selected. In

total, 147 health facilities across all of the *districts sanitaires* (Fr. health districts) of Burundi were selected. (Please see Appendix H for the list of sampled sites by province and district.)

Tools and Methods

The WHO/CDC DQA protocol was used for all comparisons and verifications. The tool consists of the following components:

- Site Questionnaire
- TX_CURR and TX_NEW Methods Questionnaires
- Data Verification Tools
- Cross-validation
- Data Flow Assessment

Methods associated with the use of each of these tools are as follows:

- *Site Questionnaire:* A qualitative survey is conducted with facility staff to understand data management practices, and the strengths and weaknesses of data management.

- *Data Verification*: The Data Verification Tool is a series of tally sheets to facilitate recounting of indicators by disaggregation such as age and gender. The tool also contains several tables to record indicator values taken from monthly reports and databases (e.g., DATIM), disaggregated as above. The tally sheets provide grids of zeros to tick while recounting, providing a simple way to keep track of the results across multiple age and gender categories. Age disaggregation for the Burundi HIV information system (harmonized with DATIM earlier this year) are as follows: 0–11 months, 12–59 months, 5–9 years, 10–14 years, 15–19 years, 20–24 years, 25–29 years, 30–34 years, 35–39 years, 40–44 years, 45–49 years, and 50+ years. The tool also includes a brief survey specific to Current on ART and Newly Initiated on ART to determine if data managers are correctly classifying patients according to treatment status.

  Data are verified by recreating an indicator value for a selected reporting period using the source documents, such as the ART register or medical records. The recreated value is compared with the value reported by the site for the selected reporting period and a verification factor (VF) is calculated (ratio of validated to reported results). VF values less than 1.0 are indicative of over-reporting of treatment results, whereas values greater than 1.0 indicate under-reporting. A score of 1.0 represents perfect concordance between validated and reported results.

  For the Burundi DQA, TX_CURR was recreated by reviewing all medical records in the facility to determine the status on treatment of each patient in the facility. TX_NEW was recreated on the ART Register. Verification factors were calculated for each facility, across regions, and for age and gender categories. In addition, the percentage of sites over- and under-reporting by more than 10 percent

was also calculated. An average of VFs weighted on the active patient volume was calculated to reduce the influence of small treatment sites on the over VF.

Viral load tests done in the past year and their results were counted using the medical records at the facilities. This indicator was not evaluated for data quality *per se* since the data on viral load testing and results are not typically reported up through the information system (even if there is provision on the forms for doing so). Thus, there are no reported results to which re-counted results can be compared. Instead, the value was calculated for each facility as a simple quality control exercise.

The percentage of viral load tests done and viral load suppressed was calculated for each facility, and by region and across age and gender categories. Sites supported by PEPFAR were compared against non-PEPFAR-supported sites.

The recreated values for the indicators were compared (where possible) with the values reported by the health facility in the following data sources:

- Facility monthly reports
- PEPFAR DATIM database
- MOH HMIS database (DHIS2)

A VF was calculated for each data source, for age/gender categories within the data sources, and by administrative region of the country (N=18).

- *Data Management Methods Questionnaires for TX_CURR and TX_NEW*

The WHO/CDC ART DQA tool used in the Burundi DQA includes a section on methods and data sources used to validate the indicators TX_CURR and TX_NEW. For each indicator, the tool attempts to gauge the understanding of indicator compilation methods used at the sites. The tools ask a series of questions pertaining to what data sources are used and which patients are included or excluded from recounts.

In Burundi, the definitions of the indicators "Current on ART" and "Newly initiated on ART" are becoming increasingly harmonized with the PEPFAR versions of these indicators, TX_CURR and TX_NEW. Recent changes to the indicators to align more closely with PEPFAR definitions include the addition of the age group 45–49 (male and female), whereas previously the Burundi system reported 40–49 in aggregate. In addition, pediatric cases (0–11 months, 12–59 months, 5–9 years) were reported without regard to gender, whereas now they are reported as gender-specific.

The remaining difference between the PEPFAR indicator definition for TX_CURR and the Burundi PNLS definition is the length of time required before a patient who has missed an appointment is designated as lost to follow-up and no longer counted as active on treatment. The PEPFAR standard for lost to follow-up has recently changed from 90 days to 30 days of no contact with the patient

after a missed appointment. The Burundi PNLS still uses the 90-day duration to classify lost to follow-up.

As the new PEPFAR standard has only recently been put in effect and the uptake of the new standard has been minimal, the decision was taken to evaluate TX_CURR according to the PNLS standard of 90 days for lost to follow-up only. The additional effort of re-counting the indicators by two different methods, added to an already challenging workload at each site, was deemed not worth the investment of time and resources for the information gained.

- *Cross Validation*: Cross validation is a technique that determines the fidelity of data from one source to another. While the CDC/WHO tool includes standard tables for recording cross-validation results, the Burundi DQA used a customized tool, albeit similar in content to the CDC/WHO tool.

  A systematic random sample of patient records was drawn at each sampled site, and results were classified according to lot quality assurance sampling (LQAS) methods.

  The sample sizes were calculated based on the hypergeometric model, which is indicated for a finite population (in this case, the group of records or "active file" for each site). (Sampling from an infinite universe of sampling elements would typically use the binomial distribution.) The sample size is determined by the benchmark for quality established equal to or above which record quality is deemed acceptable; the benchmark for quality below which record quality is deemed very unacceptable; the α error, i.e., the probability of misclassifying a lot with unacceptable performance as acceptable; and β error, i.e., the probability of misclassifying a lot with acceptable performance as unacceptable. From the sample size and these other parameters, a "decision rule" can be calculated, i.e., the number of sampled elements that must be deemed acceptable in order for the entire lot to be deemed acceptable.

  Sample size calculations for the Burundi DQA using the hypergeometric model were obtained using an online calculator.[1] Appendix A presents the table of sample sizes and associated decision rules developed for use in Burundi.

  For the Burundi DQA, the upper bound of quality was fixed at 95 percent and the lower bound at 85 percent. The acceptable alpha error was set at 0.05, and the acceptable beta error was set at 0.1. Typically, both types of errors should be minimized, but there is a tradeoff: as one is lowered, the other typically gets larger. One would rather misclassify good records as bad (β error), since the consequences are less in terms of program quality; effort is expended to improve records that do not necessarily need it, rather than letting poor-quality records pass as good quality. In the end it costs more for the program, but the quality of service is improved through accurate record keeping.

[1] LQAS Sampling Plan Calculator retrieved from http://lqas.spectraanalytics.com/.

Comparisons were made among the paper-based medical record, the electronic medical record (EMR, known as "SIDA Info" in Burundi), and the ART dispensing register. Selected data elements (Last ART Provision Date, ART Regimen at Last Provision, Date of Most Recent Viral Load Test within the Last Year, Result of Last Viral Load Test in the Past Year, and Patient Status on ART) were abstracted from each data source and compared to determine concordance between the data sources.

For date values (i.e., date of last ART provision and Viral load test date), the percentage of exact matches was calculated, as well as a match within a range of 7 seven days. The percent match was calculated, as well as the % completeness of data found in source documents for all selected data elements.

A second goal of the cross validation was to test the premise that the sampling method can be used as a routine tool to rapidly evaluate data and program quality in source documents by sampling and reviewing a smallish number of records at facilities. To judge the effectiveness of the method, we compared the findings from the sample to the exhaustive recount that was conducted for all sampled facilities for TX_CURR and Viral Load.

In the case of TX_CURR, the analogous data element from the cross validation is status on treatment, whereas TX_PVLS (Viral Load) was used to validate Result of Last Viral Load Test from the sample of patient records. The values from the exhaustive review represent the true value of the parameter at the facility, whereas the sample value is subject to sampling error.

Thus, two comparisons were conducted: (1) an evaluation of data quality comparing data elements across data sources to measure congruence (the records are deemed good quality if the number of "matches" across data sources meets or exceeds the established threshold), and (2) comparison of the percentage of patients active on treatment and viral load done and suppressed between the sample of patient records and the exhaustive review.

The sampling method is validated if the results from the sampling of patient records agree with the results of the exhaustive review, i.e. the sample percentage of the parameter of interest (e.g. patients active on treatment) exceeds the benchmark for quality [upper bound] established for the test *a priori*, and the true percentage of the parameter of interest (found by conducting the exhaustive review) is at or above the benchmark [or if both sample estimate and the true percentage are below the benchmark].)

Due to the added workload of conducting sampling and cross-validation alongside all the other data validations required by the assessment, the cross-validation was only attempted in approximately one-third of sampled sites. The survey protocol called for cross-validation to be conducted in the largest site in each of the 41 districts sanitaires in the country. In total, 44 sites were evaluated in this manner, 39 district-level sites, and five sites assessed during the November 2018 pilot. However, viral

load testing was not systematically assessed during the pilot, and thus the number of sites for this metric is 39.

- *Data Flow Mapping Tool*: This tool sketches out how patients are processed and treated, and the data flows associated with patient services being rendered at the health facilities. The data flows are compared with the standard protocol to determine whether deviations from the standard data flow have an impact on data quality. In Burundi, since a pilot study in November 2018 showed very little variation in data flow models, and the effort required to sketch these at every facility is substantial, the decision was made to only note if facilities had significant deviations from a pre-defined standard data flow model for all facilities.

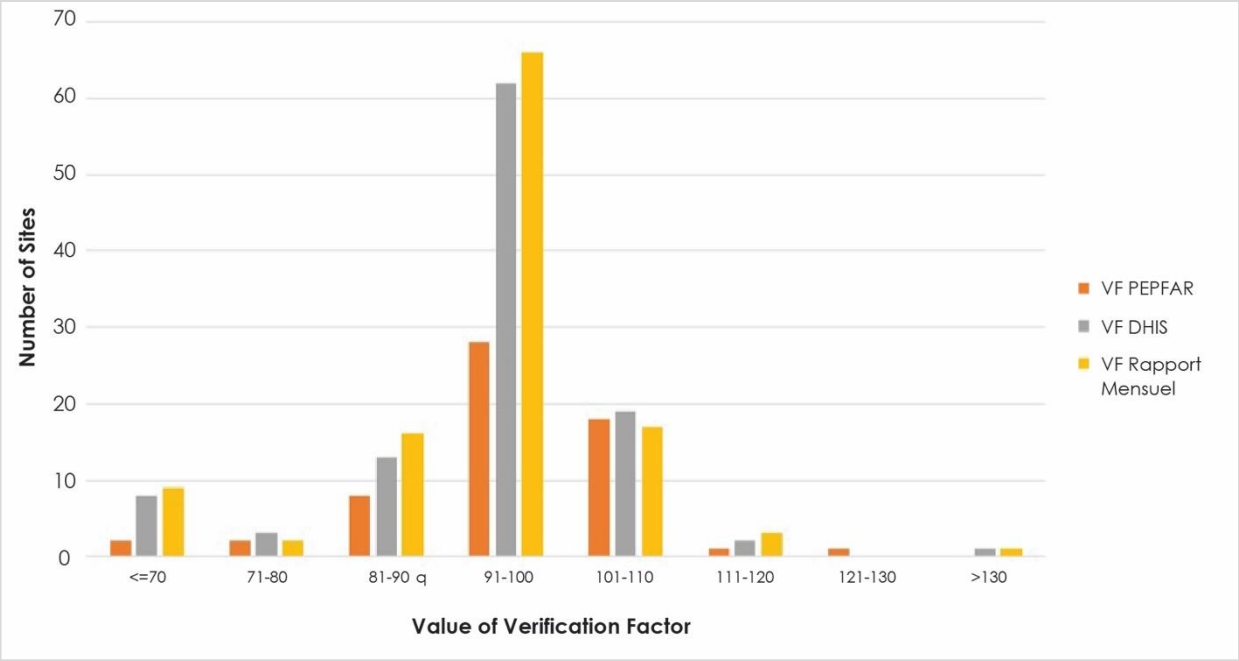
RESULTS

Data Validation

The DQA was conducted over three weeks in May–June 2019. In total, 116 sites were surveyed out of 147. The original goal of validating 80 percent of the national "active file" of patients currently on ARV therapy was not met, though patient records representing 68 percent of the active files were assessed. (See Table 21 in Appendix H for details.)

TX_CURR

Figure 1. Distribution of the health facility verification factors by data source (TX_CURR)



On aggregate, good agreement between recounted and reported was found for TX_CURR for reporting to PEPFAR and DHIS2 (VF = 98% for both) and on monthly reports (VF = 100%). However, significant discrepancies were found in a handful of sites.

Figure 1 shows the distribution of health facility verification factors (VFs) for TX_CURR by data source. The majority of sites fell within the acceptable range of 90 percent to 110 percent (PEPFAR = 77%; DHIS2 = 75%; monthly reports = 73%). Table 1 shows the details of Figure 1. While the majority of sites had acceptable accuracy for TX_CURR, there were a significant number of sites with problematic values of the VF. A problematic value is one with a VF of less than 70 percent or greater than 130 percent. Among PEPFAR sites, 3 percent had problematic values, whereas 8 percent were deemed problematic for DHIS2

and 9 percent for monthly reports. (All sites are meant to report to DHIS2, while only PEPFAR sites report to DATIM. Thus, PEPFAR sites are also DHIS2 sites.)

Missing data was problematic for evaluating reporting to DHIS2 and monthly reports. The VF could not be calculated for reporting to DHIS2 (nine sites) and on monthly reports (three sites).

Table 1. Distribution of verification factors for sampled health facilities by data source (TX_CURR)

VF Ranges (%)	VF PEPFAR	VF DHIS2	VF Monthly Report	% PEPFAR	% DHIS2	% Monthly Report
≤70	2	9	12	3%	8%	11%
71–80	3	4	2	5%	4%	2%
81–90	8	12	15	13%	11%	14%
91–100	29	60	62	48%	56%	56%
101–110	15	19	14	25%	18%	13%
111–120	2	2	4	3%	2%	4%
121–130	1	0	0	2%	0%	0%
>130	0	2	2	0%	2%	2%
Total sites	60	108	114	100%	100%	100%
VF not calculable due to missing documents	0	9	3			
% of sites within 90–110%				**77%**	**75%**	**73%**
% of sites below 70% or above 130%				**3%**	**8%**	**9%**

Table 2 shows the distribution of VF for TX_CURR by province. While all PEPFAR provinces were found to have reported with acceptable levels of accuracy, Muyinga province was found to have moderate over-reporting for both DHIS2 and monthly reports, and Rutana and Cibitoke provinces both over-reported moderately on monthly reports. Significant under-reporting was noted for Bubanza to DHIS2, and by Makamba on monthly reports. (For Bubanza, the discrepancy is largely attributable to zero-reporting to DHIS2 for TX_CURR from one site: Hôpital Gihanga.)

Table 2. Distribution of verification factors by province (TX_CURR)

	No. HF	PEPFAR	DHIS2	Monthly Report	PEPFAR Recount	Recount All	VF PEPFAR	VF DHIS2	VF Monthly Report
Bujumbura	3	625	619	619	585	585	0.94	0.95	0.95
Bujumbura Mairie	14	13,365	13,328	13,540	13,156	13,156	0.98	0.99	0.97
Muyinga	10	0	2,653	2,776	0	2,288	-	0.86	0.82
Kirundo	19	4,736	4,407	4,716	4,484	4,484	0.95	1.02	0.95
Karusi	4	0	851	862	0	792	-	0.93	0.92
Gitega	12	3,872	4,855	4,856	3,831	4,918	0.99	1.01	1.01
Kayanza	7	2,050	2,084	2,084	2,082	2,082	1.02	1.00	1.00
Makamba	5	0	1,624	1,002	0	1,544	-	0.95	1.54
Cankuzo	2	0	479	500	0	501	-	1.05	1.00
Ruyigi	5	0	999	1,050	0	1,066	-	1.07	1.02
Rutana	3	0	475	587	0	498	-	1.05	0.85
Rumonge	3	0	999	998	0	1,009	-	1.01	1.01
Bururi	6	0	1,519	1,518	0	1,503	-	0.99	0.99
Mwaro	2	0	627	627	0	627	-	1.00	1.00
Muramvya	4	0	901	917	0	858	-	0.95	0.94
Cibitoke	3	0	829	958	0	841	-	1.01	0.88
Bubanza	4	0	445	726	0	685	-	1.54	0.94
Ngozi	10	3,224	3,332	3,353	3,130	3,227	0.97	0.97	0.96
Totals	116	27,872	41,026	41,689	27,268	40,664	0.98	0.99	0.98

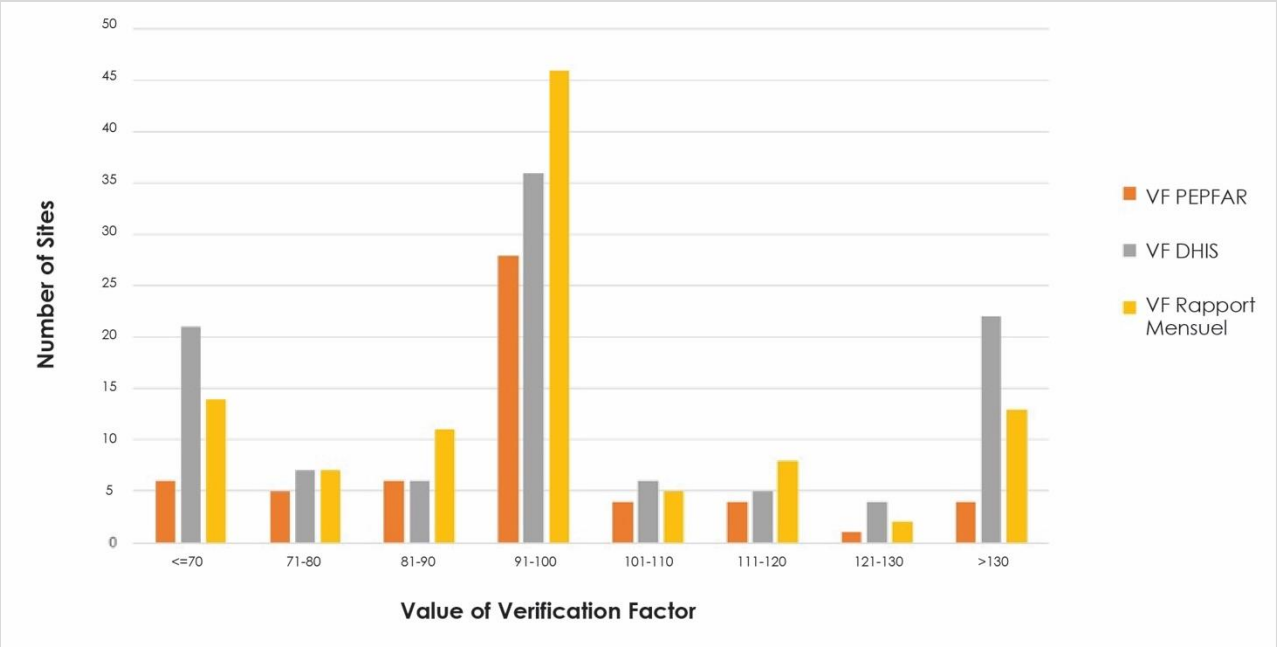
The VFs by age/gender categories showed disparities in accuracy between men and women and for different age groups. On aggregate, males and females had acceptable data quality (females had VFs ranging from 99%–101%; males ranged from 0.94–0.95 for the different data sources). Male cases active on treatment tended to be over-reported about 5 percent. Both males and females had data quality problems in the lower age groupings (0–11 months, 12–59 months), though smaller numbers tend to lead to greater diversity in the VF. Both males and females showed minor data quality issues for PEPFAR reporting (males: 20–24 years and 30–34 years; females: 10–14 years and15–19 years). Moderate inaccuracy was found for reporting male cases to DHIS2 and on monthly reports for ages ranging from 25–44 years, and 15–19 and 20–24 years for females. Interestingly, results tended to be over-reported for ages up to 50 years for both males and females, but under-reported for male and female patients 50 years of age and above (Table 3).

Table 3. Verification factors for different data sources by age and gender (TX_CURR)

Gender	Age Group	PEPFAR	DHIS2	Monthly Report	Recount PEPFAR	Recount All	VF PEPFAR	VF DHIS2	VF Monthly Report
Male	**0–11 mos.**	5	8	9	3	10	0.60	1.25	1.11
	12–59 mos.	66	119	119	54	88	0.82	0.74	0.74
	5–9 yrs.	250	390	405	230	353	0.92	0.91	0.87
	10–14 yrs.	331	555	569	321	544	0.97	0.98	0.96
	15–19 yrs.	472	678	667	460	677	0.97	1.00	1.01
	20–24 yrs.	471	622	632	411	592	0.87	0.95	0.94
	25–29 yrs.	532	784	794	491	673	0.92	0.86	0.85
	30–34 yrs.	658	952	986	556	808	0.84	0.85	0.82
	35–39 yrs.	943	1,407	1,463	877	1,265	0.93	0.90	0.86
	40–44 yrs.	1,197	1,761	1,802	1,124	1,576	0.94	0.89	0.87
	45–49 yrs.	1,180	1,736	1,768	1,092	1,624	0.93	0.94	0.92
	50+ yrs.	3,403	4,883	4,911	3,404	5,030	1.00	1.03	1.02
	Total Male	9,508	13,895	14,125	9,023	13,240	0.95	0.95	0.94
Female	**0–11 mos.**	7	9	9	1	18	0.14	2.00	2.00
	12–59 mos.	52	109	114	44	96	0.85	0.88	0.84
	5–9 yrs.	195	341	351	192	338	0.98	0.99	0.96
	10–14 yrs.	479	630	636	400	617	0.84	0.98	0.97
	15–19 yrs.	757	939	955	623	844	0.82	0.90	0.88
	20–24 yrs.	1,233	1,742	1,780	1,118	1,579	0.91	0.91	0.89
	25–29 yrs.	1,663	2,579	2,652	1,705	2,486	1.03	0.96	0.94
	30–34 yrs.	2,025	3,016	3,118	2,035	3,055	1.00	1.01	0.98
	35–39 yrs.	2,650	3,946	3,996	2,589	3,949	0.98	1.00	0.99
	40–44 yrs.	2,865	4,187	4,235	2,879	4,153	1.00	0.99	0.98
	45–49 yrs.	2,239	3,445	3,463	2,261	3,526	1.01	1.02	1.02
	50+ yrs.	4,199	6,188	6,255	4,398	6,762	1.05	1.09	1.08
	Total Female	18,364	27,131	27,564	18,245	27,423	0.99	1.01	0.99
	Total	27,872	41,026	41,689	27,268	40,663	0.98	0.99	0.98

TX_NEW

Figure 2: Distribution of health facility verification factors by data source (TX_NEW)



By comparison with TX_CURR, the aggregate numbers for TX_NEW are relatively small; therefore, more variation in the VF can be expected. However, significant discrepancies were found between recounted and reported values for TX_NEW.

Figure 2 and Table 4 show the distribution of the VFs for different data sources for TX_NEW. In Figure 2, the number of sites in the tails of the distribution (≤70%, >130%) is concerning, since values of the VF this extreme indicate significant data quality problems.

PEPFAR reporting had the highest percentage of sites within the acceptable range (90%–110%) with 55 percent of sites having acceptable data quality. Only 39 percent of sites reporting to DHIS2 were found to have acceptable levels of reporting accuracy. The percentage of sites with acceptable accuracy on monthly reports is somewhat better, at 48 percent.

A similar pattern was found for sites with "problematic" data quality, where PEPFAR reporting had the smallest percentage of sites with problematic data quality (17%), followed by monthly reports (25%), and then reporting to DHIS2 (40%) (Table 4).

Table 4. Distribution of verification factors for sampled health facilities by data source (TX_NEW)

VF Ranges (%)	VF PEPFAR	VF DHIS2	VF Monthly Report	% PEPFAR	% DHIS2	% Monthly Report
≤70	6	21	14	10%	20%	13%
71–80	5	7	7	9%	7%	7%
81–90	6	6	11	10%	6%	10%
91–100	28	36	46	48%	34%	43%
101–110	4	6	5	7%	6%	5%
111–120	4	5	8	7%	5%	8%
121–130	1	4	2	2%	4%	2%
>130	4	22	13	7%	21%	12%
Total sites	58	107	106	100%	100%	100%
VF not calculable	0	4	3			
% of sites within 90–110 %				**55%**	**39%**	**48%**
% of sites with problematic values				**17%**	**40%**	**25%**

The distribution of VFs by province for different data sources is shown in Table 5. By and large, reporting was better from PEPFAR supported provinces, as opposed to non-PEPFAR provinces. All PEPFAR provinces had values of the VF in the acceptable range except Kayanza (81%).

Reporting to DHIS2 (which includes PEPFAR sites) was more variable. Eight provinces (44%) had acceptable accuracy, three had suboptimal accuracy (17%), while seven provinces had poor accuracy (39%). Data reported on monthly reports was similar to reporting to DHIS2, whereby 10 provinces had good accuracy, one province had suboptimal accuracy, and seven provinces had poor accuracy.

On aggregate, the VF was 96 percent for PEPFAR reporting, 101 percent for reporting on monthly reports, and only 74 percent for reporting to DHIS2. The DHIS2 finding indicates that reporting to DHIS2 is over-reported by one quarter for all sampled sites for TX_NEW for the period (Table 5).

Table 5. Distribution of verification factors by region (TX_NEW)

	No. HF	PEPFAR	DHIS2	Monthly Report	PEPFAR Recount	Recount All	VF PEPFAR	VF DHIS2	VF Monthly Report
Bujumbura	3	41	40	40	38	38	0.93	0.95	0.95
Bujumbura Mairie	14	237	214	222	218	218	0.92	1.02	0.98
Muyinga	10	0	86	64	0	49	-	0.57	0.77
Kirundo	19	235	176	198	233	233	0.99	1.32	1.18
Karusi	4	0	109	7	0	5	-	0.05	0.71
Gitega	12	107	420	120	102	119	0.95	0.28	0.99
Kayanza	7	54	38	45	44	44	0.81	1.16	0.98
Makamba	5	0	32	18	0	27	-	0.84	1.50
Cankuzo	2	0	18	18	0	17	-	0.94	0.94
Ruyigi	5	0	21	21	0	16	-	0.76	0.76
Rutana	4	0	11	22	0	20	-	1.82	0.91
Rumonge	3	0	32	32	0	41	-	1.28	1.28
Bururi	6	0	24	24	0	23	-	0.96	0.96
Mwaro	2	0	7	15	0	6	-	0.86	0.40
Muramvya	4	0	18	14	0	17	-	0.94	1.21
Cibitoke	3	0	44	45	0	45	-	1.02	1.00
Bubanza	4	0	10	10	0	9	-	0.90	0.90
Ngozi	10	83	83	97	90	91	1.08	1.10	0.94
	117	757	1,383	1,012	725	1,018	0.96	0.74	1.01

Table 6 shows VFs for the different data sources by age and gender for TX_NEW. A similar pattern occurs, where reporting to PEPFAR is found to have acceptable data quality, while reporting to DHIS2 and on monthly reports suffers by comparison. The aggregate gender-specific VFs are good for PEPFAR (males = 1.02; females = 0.92) and for monthly reports (males = 1.05; females = 0.98) but over-reported by about one-third for reporting to DHIS2. (males = 0.78; females = 0.71).

By age group, younger age groupings tended to have poorer accuracy, while older age categories were somewhat more accurate. Some of the discrepancy in the younger age categories can be attributed to smaller numbers, which tend to have a large effect on the VF.

Table 6. Verification factors for different data sources by age and gender (TX_NEW)

Gender	Age Group	PEPFAR	DHIS2	Monthly Report	PEPFAR Recount	Recount All	VF PEPFAR	VF DHIS2	VF Monthly Report
Male	**0–11 mos.**	1	2	2	1	2	1.00	1.00	1.00
	12–59 mos.	7	10	6	5	10	0.71	1.00	1.67
	5–9 yrs.	10	7	6	5	8	0.50	1.14	1.33
	10–14 yrs.	5	14	8	4	7	0.80	0.50	0.88
	15–19 yrs.	5	7	6	7	9	1.40	1.29	1.50
	20–24 yrs.	19	42	29	31	39	1.63	0.93	1.34
	25–29 yrs.	40	95	52	44	54	1.10	0.57	1.04
	30–34 yrs.	40	66	49	38	51	0.95	0.77	1.04
	35–39 yrs.	53	78	71	53	64	1.00	0.82	0.90
	40–44 yrs.	41	67	52	39	51	0.95	0.76	0.98
	45–49 yrs.	25	43	30	29	36	1.16	0.84	1.20
	50+ yrs.	51	89	74	47	74	0.92	0.83	1.00
	Total Male	297	520	385	303	405	1.02	0.78	1.05
Female	**0–11 mos.**	2	4	4	1	4	0.50	1.00	1.00
	12–59 mos.	1	14	11	3	9	3.00	0.64	0.82
	5–9 yrs.	4	7	5	3	4	0.75	0.57	0.80
	10–14 yrs.	9	34	13	10	15	1.11	0.44	1.15
	15–19 yrs.	49	73	57	39	46	0.80	0.63	0.81
	20–24 yrs.	92	137	120	79	115	0.86	0.84	0.96
	25–29 yrs.	99	164	142	83	121	0.84	0.74	0.85
	30–34 yrs.	63	93	91	63	94	1.00	1.01	1.03
	35–39 yrs.	60	90	65	61	82	1.02	0.91	1.26
	40–44 yrs.	36	70	45	31	44	0.86	0.63	0.98
	45–49 yrs.	23	77	34	23	36	1.00	0.47	1.06
	50+ yrs.	22	100	40	26	43	1.18	0.43	1.08
	Total Female	460	863	627	422	613	0.92	0.71	0.98
	Total	757	1,383	1,012	725	1,018	0.96	0.74	1.01

Viral Load

The evaluation of viral load testing revealed that if the viral load test was done in the past year, the result was likely to be a suppressed viral load. Viral load tests were done for only 50 percent of all HIV patients on treatment. According to treatment protocols, all patients should have their viral load tested after six months of treatment and every year thereafter. Of the viral load tests conducted, 93 percent showed undetectable viral load.

Comparing regions supported by PEPFAR against those without such support, 56 percent of patients had a viral load test done in the past year, compared to only 38 percent of patients in non-PEPFAR-supported regions. Viral load suppression was 94 percent in PEPFAR-supported regions compared to 91 percent in other regions (Table 7).

Viral load tests were done most often in Bujumbura Mairie, Ngozi, and Cancuzo provinces. They were conducted the least frequently in Bururi, Kirundo, Karusi, Rumonge, and Ruyigi provinces, which all had less than 30 percent for patients tested for viral load in the past year.

Table 7. Viral load test done and viral load suppressed, by region and partner support

Partner Support	Region	No. of HF	Total Active on Treatment	Total Tests Done - Past Year	Total Suppressed	% of Viral Load (VL) Tests Done	% of VL Suppressed	VL Test Done by Partner Support	VL Suppression by Partner Support
PEPFAR Regions	Bujumbura	3				-	-		
	Bujumbura Mairie	11	11,318	8,180	7,616	72%	93%		
	Gitega	12	5,017	1,547	1,436	31%	93%		
	Kayanza	7	2,073	986	935	48%	95%		
	Kirundo	19	4,484	1,232	1,175	27%	95%		
	Ngozi	10	3,227	2,566	2,422	80%	94%	**56%**	**94%**
Non-PEPFAR Regions	Bubanza	4	685	307	270	45%	88%		
	Bururi	6	1,503	399	340	27%	85%		
	Cankuzo	2	501	390	369	78%	95%		
	Cibitoke	3	841	330	296	39%	90%		
	Karusi	4	792	175	152	22%	87%		
	Makamba	5	1,544	795	720	51%	91%		
	Muramvya	4	840	260	227	31%	87%		
	Muyinga	10	1,771	793	728	45%	92%		
	Mwaro	2	627	199	187	32%	94%		
	Rumonge	3	1,009	272	242	27%	89%		
	Rutana	3	304	196	196	64%	100%		

	Ruyigi	**5**	1,033	251	227	24%	90%	**38%**	**91%**
		113	**37,569**	**18,878**	**17,538**	**50%**	**93%**		

Table 8 shows the viral load test results by age and gender. Females were tested at a higher rate than males (51%–49%) and were also more likely to have their viral load suppressed (96% for females, 87% for males). Viral load suppression was marginally worse among younger age groups, and tests tended to improve with older age groups, particularly for females. Results are not presented for the six facilities examined during the pilot test in November 2018, since viral load test conducted and viral load suppression were added after the pilot. Consequently, the totals for active on treatment do not correspond to totals calculated for the evaluation of data quality for TX_CURR.

Table 8. Viral load test done and viral load suppressed, by age and gender

Gender	Age Group	Total Active on Treatment	Test Done and Suppressed	Test Done and Not Suppressed	% Test Done	% of VL Suppressed
Males	**<1**	8	0	0	0	
	12–59 mos.	86	17	12	34%	59%
	5–9 yrs.	307	102	42	47%	71%
	10–14 yrs.	484	196	60	53%	77%
	15–19 yrs.	644	240	56	46%	81%
	20–24 yrs.	577	223	65	50%	77%
	25–29 yrs.	716	251	58	43%	81%
	30–34 yrs.	834	276	81	43%	77%
	35–39 yrs.	1,255	485	119	48%	80%
	40–44 yrs.	1,447	609	103	49%	86%
	45–49 yrs.	1,647	773	97	53%	89%
	50+	4,736	2,244	132	50%	94%
	Unknown		2	0	-	100%
	Total Males	**12,741**	**5,418**	**825**	**49%**	**87%**
					-	
Females	**<1**	16	0	0	0%	
	12–59 mos.	95	33	9	44%	79%
	5–9 yrs.	324	124	36	49%	78%
	10–14 yrs.	571	248	47	52%	84%
	15–19 yrs.	790	372	71	56%	84%
	20–24 yrs.	1,433	592	37	44%	94%
	25–29 yrs.	2,198	915	29	43%	97%
	30–34 yrs.	2,724	1,179	29	44%	98%
	35–39 yrs.	3,501	1,647	33	48%	98%
	40–44 yrs.	3,573	1,796	43	51%	98%
	45–49 yrs.	3,409	1,787	57	54%	97%
	50+	6,193	3,424	124	57%	97%

	Unknown		3	0	-	100%
	Total Female	**24,827**	**12,120**	**515**	**51%**	**96%**
Total		**37,568**	**17,538**	**1,340**	**50%**	**93%**

Cross-Validation

The cross-validation exercise sampled records from the cohort of patients active on treatment at the sampled health facilities and compared the information recorded in the different data sources for selected data elements. The data elements examined were Date of Last ART, ART Regimen at Last Visit, Date of Last Viral Load Test (within the past year), Result of Last Viral Load Test (within the past year), and Status on ART. The data were compared among the paper-based medical record, SIDA Info (EMR), and the ART dispensing register.

Cross-validation was conducted in a total of 44 sites during the assessment (39 sites from the current assessment and five sites from the pilot test in 2018). Not all data elements could be evaluated in all facilities since the identified data sources were either not available or incomplete. For example, 85 percent of all sampled patients had no results for last viral load in the ART register. Table 9 shows the relative completeness of data elements for the three data sources used for cross-validation.

Data element completeness was relatively high for Date of Last ART (84% average across data sources) and Regimen at Last ART (87%), and low for Date of Last Viral Load (38%) and Result of Last Viral Load (37%). Among data sources, the paper-based medical record was the most complete (70%), followed by SIDA Info (63%) and the ART Register (51%).

Table 9. Completeness of source documents for cross-validation, by data element and source

Data Element	Data Source	% of Data Element Completeness (Average across Sites)	Number of Facilities with 0% Completeness	% of Facilities with 0% Completeness	Average Completeness of Data Sources across Data Elements	Average Completeness of Data Elements across Data Sources
Date of last ART	SIDA Info	77%	10	23%	63%	84%
	Medical record	89%	4	9%	70%	
	Register	87%	5	11%	51%	
Regimen at last ART	SIDA Info	81%	8	18%		87%
	Medical record	92%	3	7%		
	Register	87%	5	11%		
Date of last VL	SIDA Info	47%	11	25%		38%
	Medical record	51%	6	14%		
	Register	16%	26	59%		

Last VL result	SIDA Info	48%	11	25%		37%
	Medical record	48%	7	16%		
	Register	15%	26	59%		

While there were significant gaps in data in the identified source documents, many comparisons were possible with the available data.

Summary results of the cross-validation are presented in Table 10, and the complete results can be found in Appendix D. Facilities were judged to have met a predefined standard for quality if the number of matches of data elements between data sources met or exceeded the number indicated by LQAS (decision rule). Status on Treatment is a special case where the data abstractor makes a judgement as to whether the data source indicates that the patient is alive and on treatment (no evidence of treatment exit) at the end of the period selected for review. Thus, the completeness of this "data element" is understandably better than those that depend on entries in the data sources. If the standard is met for a particular comparison, it can be concluded that the concordance between data sources for the specific comparison is at least 95 percent for all records, the established threshold for the comparison.

Status on Treatment, among data elements, had the highest percentage of facilities where the standard was met (92%, average across data elements, excluding facilities where the comparison was not done), followed by Regimen at Last ART (86%). Agreement between data sources drops significantly for the other data elements, with the percentage of facilities meeting the standard only 30 percent for Date of Last ART, 3 percent of Last Viral Load, and 7 percent for Result of Last Viral Load.

For date value comparisons, there was a lot of variability in the data in all data sources. Conducting an exact match for dates yielded 15 facilities that met the standard (42% of facilities with completed comparison), compared to 18 facilities (50%) when a "match" was assigned when dates were within 30 days. (The 30-day standard is used for results for Date of Last ART and Date of Last Viral Load (VL) Test presented in Table 11.)

For the specific comparisons, the average across data elements of the number of facilities meeting the standard was 44 percent for the comparison between the paper-based medical record and the ART register, 41 percent between the ART register and SIDA Info, and 44 percent between the paper-based medical record and SIDA Info.

Table 10. Concordance among data sources for select data elements, across facilities

		Number of Facilities Where Standard Was Met	Number of Facilities Where Standard Was Not Met	Number of Facilities Where Comparison Not Done	Total	% of Facilities Meeting the Standard	% of Facilities Not Meeting the Standard	% of Facilities Where Comparison Was Not Done	Average for Data Element	Average for Specific Comparison
Date of Last ART	Medical record/register	18	18	8	44	50%	50%	18%	50%	46%
	Register/EMR	18	13	13	44	58%	42%	30%		47%
	Medical record/EMR	12	17	15	44	41%	59%	34%		48%
Regimen Last ART	Medical record/register	33	5	6	44	87%	13%	14%	86%	
	Register/EMR	28	5	11	44	85%	15%	25%		
	Medical Record / EMR	28	5	11	44	85%	15%	25%		
Date of Last VL	Medical record/register	0	12	32	44	0%	100%	73%	4%	
	Register/EMR	0	10	34	44	0%	100%	77%		
	Medical record/EMR	2	17	25	44	11%	89%	57%		
Result of Last VL	Medical record/register	0	11	33	44	0%	100%	75%	4%	
	Register/EMR	0	11	33	44	0%	100%	75%		
	Medical record/EMR	3	20	21	44	13%	87%	48%		
Status on Treatment	Medical record/register	33	3	8	44	92%	8%	18%	92%	
	Register/EMR	30	2	12	44	94%	6%	27%		
	Medical record/EMR	29	3	12	44	91%	9%	27%		

Effectiveness of LQAS Triage System in Identifying Quality Data in Source Documents

For the comparison of cross-validation sample results with the exhaustive review of records for TX_CURR and TX_PVLS, 44 comparisons were possible for TX_CURR and 15 for TX_PVLS. One facility had to be dropped from the comparison of TX_CURR due to missing data for the exhaustive review. For TX_PVLS, only 50 percent of patients were found to have had a viral load test, and many facilities are not systematically collecting data for viral load. As a result, missing data were extensive. Facilities with less than 75 percent completeness from any source were dropped from the analysis. In addition, the viral load indicator was added to the study protocol after the November 2018 pilot test, so results are not available from these five pilot sites. One facility was missing data on the exhaustive review and also needed to be dropped. In total, only 14 sites could be evaluated for the viral load on the sampled patient records compared with the exhaustive review.

Table 11 displays the results of comparison of the cross-validation sample against the exhaustive review of records. For the comparison of active on treatment, 40 facilities met the standard (91%) and thus, we conclude that the proportion active on treatment at the facility was greater than or equal to 95 percent. Four facilities (9%) failed to meet the standard, and we conclude the proportion active on treatment was less than 95 percent. From the exhaustive review, 31 (72%) facilities had greater than or equal to 95 percent active on treatment as the true proportion, while 12 (28%) had a proportion less than 95 percent.

Thirty facilities met the standard for the sample of records and had 95 percent or greater patients on treatment for the exhaustive review. An additional three facilities had both sample proportion and true proportion <95 percent for a combined concordance of 77 percent. Ten sites had discordant results on the comparison (23%).

For Viral Load Result in the Past Year, 13 sites (93%) failed to meet the standard on the sampling exercise, indicating sample proportions less than the standard of 95 percent. Only one site (7%) achieved the standard. On the exhaustive review, the number of facilities with a true proportion of patients' viral load tested and suppressed greater than 95 percent was 4 (29%), while the number facilities with proportion less than 95 percent was 10 (71%). The number of concordant comparisons was 11 (78%), while the number discordant was three (22%).

Table 11. Results of cross-validation sample and exhaustive reviews

Results	Number	Percent
Active on Treatment		
Standard met (sample proportion ≥ 95%)	40	91%
Standard not met (sample proportion < 95%)	4	9%
True facility proportion ≥ 95%	31	72%
True facility proportion < 95%	12	28%
Sample and true facility proportion ≥ 95%	30	70%
Sample and true facility proportion < 95%	3	7%

Sample proportion ≥ 95% and true facility proportion < 95%	9	21%
Sample proportion < 95% and true facility proportion ≥ 95%	1	2%
Concordant	33	77%
Discordant	10	23%
Viral Load Test Conducted and Viral Load Suppressed		
Standard met (sample proportion ≥ 95%)	1	7%
Standard not met (sample proportion < 95%)	13	93%
True facility proportion ≥ 95%	4	29%
True facility proportion < 95%	10	71%
Sample and true facility proportion ≥ 95%	1	7%
Sample and true facility proportion < 95%	10	71%
Sample proportion ≥ 95% and true facility proportion < 95%	0	0%
Sample proportion < 95% and true facility proportion ≥ 95%	3	22%
Concordant	11	78%
Discordant	3	22%

Site Questionnaire

Table 13 (Appendix B) shows the results of the Site Questionnaire, which examines aspects of the ART data management and reporting system.

Nearly half of sites have been offering ART services for 15 years or longer. Nearly 20 percent have been in business five to 10 years. Only 9 percent have been in operation for five years or less.

Two-thirds of sites reported using SIDA Info (68%), although not all sites reported that it was currently being used (42%). A majority of sites (56%) said that they entered data daily into the system, and only 5 percent of sites reported a backlog of data entry.

For paper-based registers, 89 percent of sites said the registers were routinely updated, and 84 percent reported keeping registers in a secure location.

Nearly 60 percent of sites submit monthly reports to the MOH on ART service provision on paper forms, while nearly 40 percent submitted reports electronically. Only 23 percent of sites reported sending PEPFAR reports electronically.

The vast majority of sites (89%) said a nurse or other clinical staff member was responsible for updating paper-based registers or the EMR. Only 10 percent of sites had a dedicated data entry clerk or M&E staff. A similar distribution was found when it came to the responsibility of calculating ART indicators and compiling monthly reports.

Many sites reported having redundancy in staff capability to ensure completion of required tasks in the event of staff absence (84%), and 77 percent of sites said that staff had been trained on the use of paper-based registers and the EMR.

Only 48 percent of sites have quality control procedures in place for data entry in data collection tools (paper and electronic), and 56 percent of sites have data quality standard operating procedures in place for ART reporting. Just 41 percent of facilities reported having a tool that can be used for conducting internal data quality checks.

Almost all sites reported receiving visits from the MOH, District Hospital, or PEPFAR staff to check the quality of the ART program data (87%), with nearly 50 percent of sites saying they received visits monthly or quarterly. While 76 percent of sites reported receiving feedback from implementing partners on the quality of their ART reports, less than a quarter of sites reported receiving feedback monthly or quarterly.

Data Management Methods Questionnaires for TX_CURR and TX_NEW

Much of the content of these tools pertains to the differences found between the PEFPAR and national program definitions of these indicators. Since the indicator definitions in Burundi are for the most part aligned (see above in Methods) the remaining pertinent aspects of these tools involves the understanding of the definition used by the treatment site. Results for the data management methods questionnaires for TX_CURR and TX_NEW can be found in Appendix C, Table 14.

For TX_CURR, 96 percent of sites included patients who transferred into the site already on treatment in the aggregate value. Patients who restarted treatment after a break were reported to be included in 97 percent of sites. Patients transferring out of the facility to another facility were excluded at 97 percent of sites, as were those who stopped treatment for whatever reason (89%). Patients who had "dropped" treatment (become lost to follow-up for more than 90 days after the last missed appointment) were excluded in 95 percent of sites, though only 88 percent of sites reported excluding patients who had died. Patients designated as "lost" (i.e., missed an appointment for drug pick-up but not yet at the threshold of 90 days) were reported by just 66 percent of sites to be included in the total current on treatment.

For TX_NEW, transfer-in patients were reported to be excluded from the total in 96 percent of sites, while those restarting after "stopped" were excluded (98%). Those patients restarting after being "lost to follow-up" were excluded from the total of newly initiated on treatment at 97 percent of sites.

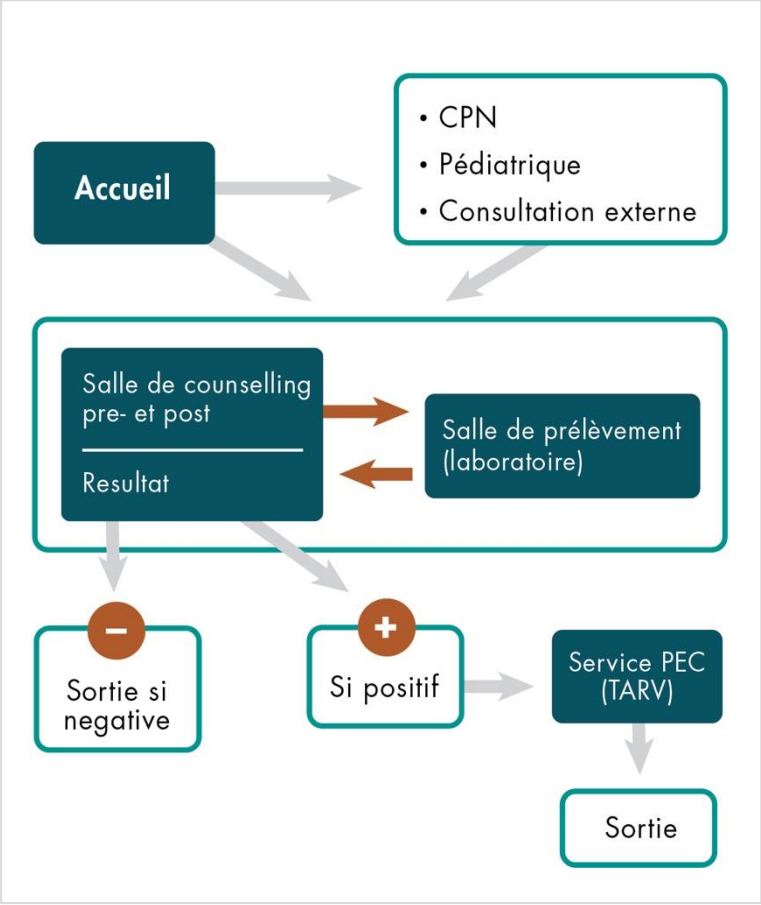
Data Flow Model

The standard data flow models based on PNLS protocol are depicted below. Significant departures from the standards were noted for sampled sites, if found. In general, the data flow at all facilities adhered fairly closely to the standard laid out by the national program.

General Description of Patient and Data Flows at HIV Treatment Sites in Burundi

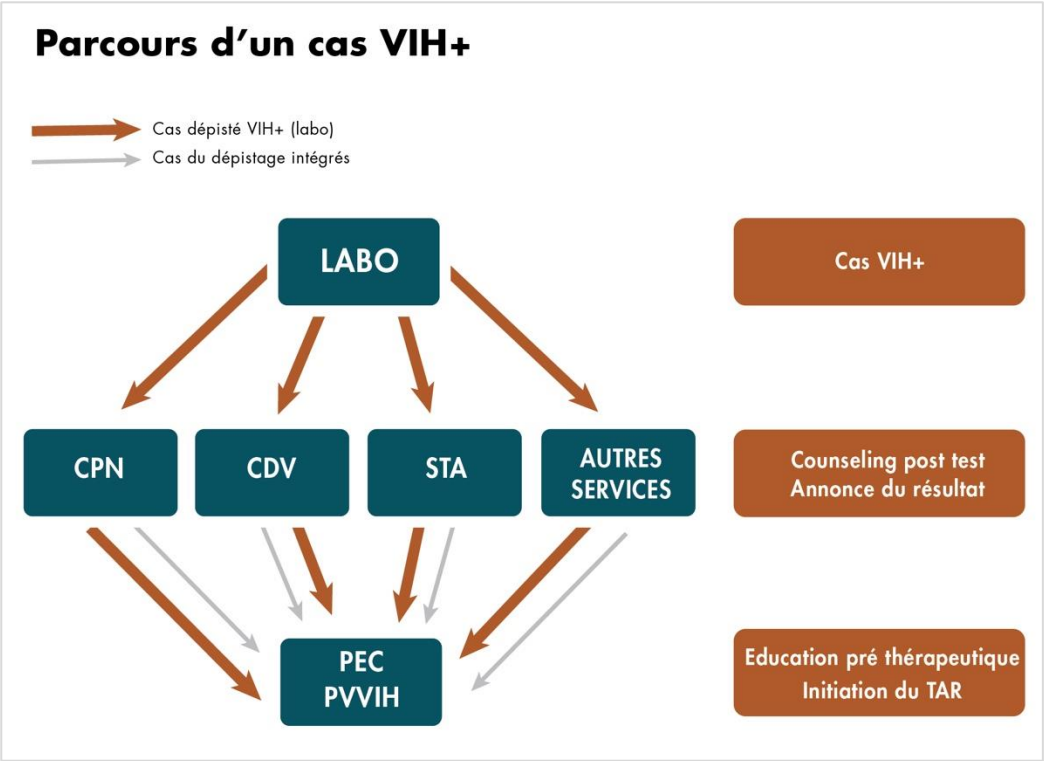
Patients arriving at a facility for services first present at a welcome desk. If they have an appointment and documentation, they are sent to that service. If they have a complaint and have not been seen before, they are sent for a consultation with a nurse and a social worker. Their information is entered in the consultation register. Depending on the site (primary care facility or hospital), they are triaged and sent to the outpatient department or for hospitalization (referred to a hospital if the initial consultation is done in an outpatient site). They are then seen by a physician.

Figure 3. Standard data flow model for counseling and testing



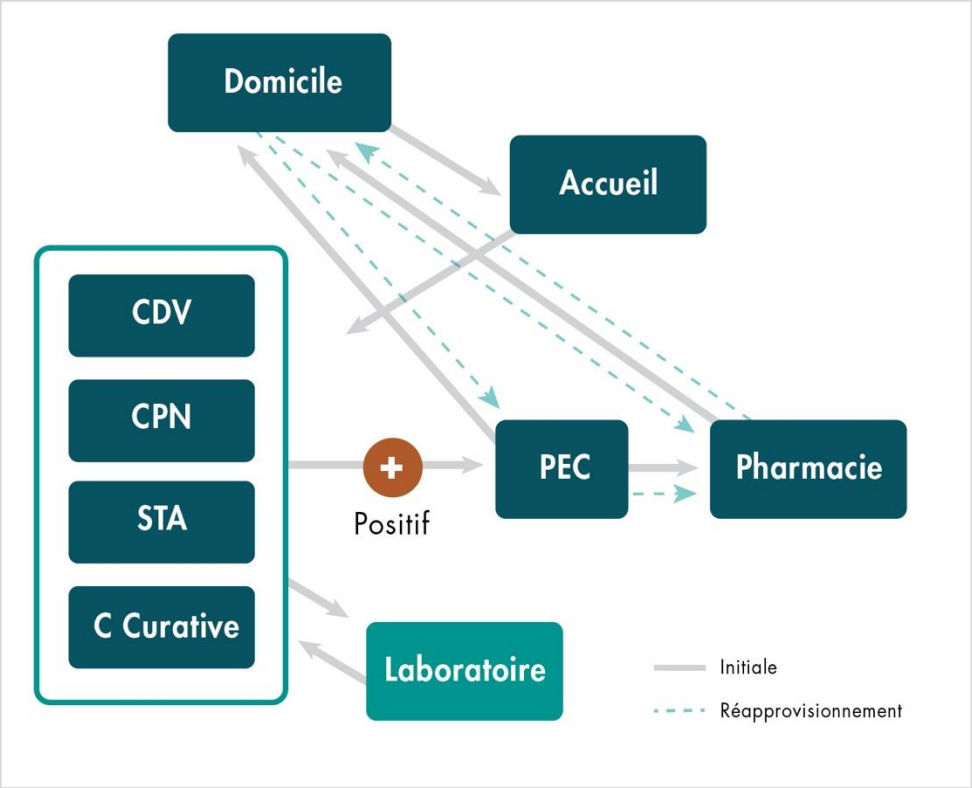
Once entered in outpatient/inpatient care and seen by a physician, the patient is offered counseling and testing (C&T) for HIV (Figure 3). They are entered in the C&T register. If he or she consents to be tested, the HIV test is done and the sample is sent to the laboratory. Once the result is available, it is given to the patient; if negative, the patient is treated for the original complaint and sent home. If positive, the patient receives post-test counseling by a psychologist. The patient is sent to the HIV care unit and is assigned a unique treatment number; he or she signs the consent form and receives a ticket (carnet) to receive antiretrovirals (ARVs) from the pharmacy (Figure 4). The patient needs to buy a notebook to keep a record of his or her visits, the treatment protocol, and to record any subsequent visits.

Figure 4. Standard data flow model for ART



A new medical record is opened that contains a summary sheet for ARV dispensing. The patient receives a unique treatment number on the medical record, which is also used in the ART register. Each time the patient comes for a consultation with a physician (once a month initially), the patient is given a prescription for ART that is filled at the pharmacy in the facility. The record of the provision of ART is entered on a line in the ART dispensing register, which is then updated throughout the calendar year (Figure 5). Each year, the facility opens a new register, and each active patient gets a new line in the register once the patient picks up his or her ARVs for the first time that year. The ART summary form in the medical record is also updated. Each day, the same information should be entered in SIDA Info. Patients receive a different unique treatment number in SIDA Info.

Figure 5. Standard data flow model for ART provision via the pharmacy



Medical records are retrieved from the filing cabinets by a nurse when the patient comes for consultation. At the end of each consultation, the patient is given a new appointment, the timing of which depends on the status of the patient. If the patient is stable and adherent, he or she can be given a multiple-month prescription and seen less often.

Returning patients have their unique treatment numbers verified by the pharmacy staff to avoid double counting of patients. The pharmacy staff and HIV clinic personnel are responsible for maintaining the ART dispensing register. It should be updated each day when patients fill their prescriptions at the facility.

Patients should have their viral loads assessed periodically during the course of treatment. New cases should be tested at six months of treatment. If the result is "undetectable," the viral load should be checked again in one year if the patient remains stable. If there is a detectable result, the patient should be evaluated by a physician and potentially put on a different ARV regimen. Patients should have their viral loads reassessed after three months and every three months thereafter while the viral load remains detectable.

If a patient fails to show up for a scheduled visit, the facility nurse tries to reach the person on the telephone if a phone number is available. If the patient cannot be reached and encouraged to come back via the telephone, a community extension worker tries to reach him or her at the address on file at the facility. All

attempts are made to contact the individual and get him or her to return for treatment. The number of defaulters (i.e., lost to follow-up), deaths, and transfers-out are tracked and reported on the monthly reporting form. There is a standard protocol in use in Burundi to designate a patient as lost to follow-up: the patient should be missing for 90 days after the last documented visit to the facility. If the patient defaults, dies, or transfers, the patient file is put in a separate filing cabinet for treatment exits.

At the end of the month, the data manager (or designated staff member) compiles the monthly summary report for the MOH HMIS. There is a different summary reporting form for primary care units and for hospitals. Both forms have the same grid for reporting on ARV treatment. There is also a form to fill for PEPFAR via the USAID IP, FHI 360. Each form has a different schema for age/gender disaggregation. The Burundi MOH HMIS form has children ages under one to nine years broken down into three categories: zero to 11 months, 12 to 59 months, and five to nine years. The HMIS uses five-year age categories thereafter until the last category, age 50 and over. The FHI 360 form has the same three age categories for children, and five-year age categories thereafter until age 40, whereupon there is a 10-year age category (40 to 49), followed by age 50 and over. The PEPFAR indicators are meant to be reported using two age categories for children (0 to 11 months, one to nine years), and five-year age categories until age 40, then ages 40 to 49, and ending with age 50 and over. All age categories for all forms are subdivided by gender, except for children (up to age nine years), which are reported in aggregate.

The USAID IP visits the treatment sites frequently (monthly in most cases), as does the MOH M&E Unit.

DISCUSSION

The HIV service delivery data in Burundi were of fairly high quality. We found patient medical records in good order, filed neatly and appropriately in most facilities. The files were, for the most part, easily retrievable and the required information was generally available. The facility staff were knowledgeable, helpful, and keen on reporting accurately and maintaining coherent records.

The VFs for TX_CURR in the aggregate showed a high level of data quality. Many sites were found to have VFs in the acceptable range of 0.90 to 1.10 (PEPFAR, 0.77; DHIS2, 0.75). Only 3 percent of sites reporting to PEPFAR, and 8 percent of sites reporting to DHIS2 were found to have problematic values of the VF (i.e., ≤ 0.70, > 1.30).

A measure of data management quality is the number of sites with perfect agreement between recounted and reported. For TX_CURR, 7 percent of sites had perfect agreement for PEPFAR reporting, while the figure was 10 percent for DHIS2, and 13 percent for reporting on monthly reports. Three percent of sites under-reported by more than 10 percent (all data sources), while 20 percent of sites over-reported by more than 10 percent to PEPFAR, 22 percent over-reported by 10 percent to DHIS2, and 22 percent over-reported by 10 percent on monthly reports.

As for problematic sites in terms of VF, for PEPFAR reporting, centre de santé (CDS) (Fr. health center) Marembo, Kirundo province had the lowest VF (63%), whereby 174 patients were reported as active on treatment as opposed to 109 verified. A total of 174 patients were also reported to DHIS2 and on monthly reports. CDS Rutare, also in Kirundo province, had a VF of 0.69 resulting from 110 cases reported as active on treatment (all data sources), versus only 76 verified. These significant cases of over-reporting could result from patients not being excluded from the active roster after a treatment exit, or from missing patient documentation on the day of the audit (Table 18, Appendix F).

At the other extreme of the VF, CDS Bunyari, and CDS Buhoro (Kirundo province) both under-reported TX_CURR (by 28% and 18%, respectively). Under-reporting can occur as a result of missing source documents at the facilities or incomplete data entry.

For TX_NEW, the data were not found to be of such good quality. Only a handful of new initiates on ART were reported each month, and the VF was prone to variability with small numbers. Almost half of the sites (46%) reported less than five cases for the quarter, and 72 percent reported 10 or fewer cases. It is not, therefore, unexpected to see significant discrepancies in the VF—a small difference produces a large effect with small numbers. However, the aggregate VF numbers were good for PEPFAR reporting (0.96) and for reporting on monthly reports (1.01). The aggregate VF for reporting to DHIS2 fared much worse (0.74), with over-reporting by a quarter of cases. The VF for TX_NEW for reporting to DHIS2 when limited to sites not supported by PEPFAR was only 0.41.

The problems with the VF for reporting to DHIS2 can be mostly attributed to reporting from a handful of sites, particularly in two regions, Gitega and Karusi. In Gitega, CDS Nyabiraba reported 290 new initiates on

ART for the three-month period as opposed to a recount of four, and a monthly report total of four for the three months. Similarly, CDS Gitaramuka reported 101 new initiates against a recounted value of one (one also on monthly reports). Removing these two facilities from the aggregate VF for DHIS2 reporting changes the VF from 0.74 to 1.03, a far more acceptable result.

Specific reasons for these anomalies are not yet known but can be surmised. In the case of over-reporting to DHIS2, the problem could be data entry errors at the district where the data are first entered into the system. Problems with the monthly report can be ruled out, since these values were recorded as more in line with the recounted results. A lack of data quality checks on the DHIS2 certainly plays a role, since these values are extreme and would be identified with even a cursory check of the database. For reporting on monthly reports, anomalous values could arise from lack of understanding of the indicator definition at the health facility.

For PEPFAR reporting, 35 percent of sampled sites had perfect agreement, a good finding. For reporting to DHIS2, 32 percent of sites had perfect agreement, while totals from monthly reports matched recounts in 42 percent of sites.

When evaluating the VF by different age categories, the variability in the VF is greater. While these issues are more difficult to identify, there are some instances of anomalies in reporting by different age/gender categories. Given the recent changes in reporting protocols by age and gender (splitting the age group 40–49 into 40–44 and 45–49, gender specification for child cases), these results are not unexpected.

Cross-Validation and the LQAS Triage System

Cross-validation is an important tool for data quality assessment since it can often uncover problems evident in one data source that are less obvious in another. The Burundi DQA looked at three data sources for the same data; the EMR (SIDA Info), the paper-based medical record, and the ART dispensing register. Patients were randomly sampled by patient number and their files reviewed and data abstracted for four data elements: date and regimen of last ART, and date and results of last viral load test. The aim of the cross-validation was to evaluate whether any of these data sources was deficient for determining the number of people on treatment and the quality of that treatment. Each data source has a role to play, and each is important in its own way. They are all vital to effective management of patients within the ART program.

From a data quality perspective, we wanted to determine the completeness of the data sources and the concordance between them. Date of Last ART and Regimen at Last ART had relatively good completeness across data sources, while Date of Last Viral Load and Result of Last Viral Load were fairly incomplete. The viral load data are not extensively reported in the Burundi ART program, though the reporting forms have been adapted to accommodate the data. If program managers need to know about viral load results, someone has to go to the facilities to abstract the data. As for data sources, none were better than 70 percent complete (average across data elements).

Data completeness affected the evaluation of concordance between data sources. The comparison of Viral Load data elements suffered the worst from incompleteness. The comparisons for viral load were not possible due to missing data in 77 percent of facilities for Date of Last VL Test between the register and EMR, and 75 percent for Result of Last VL between the register and EMR. The register was the main culprit,

as in many sites it is not standard practice to record the viral load in the register, even if many others are doing so. For the most part, for the facilities that are recording the data and maintaining the sources up-to-date, the concordance between the data sources is fairly good. Regimen at Last ART is a good example of good concordance between data sources; 87 percent of facilities met the standard for this comparison between the medical record and register, allowing the conclusion that the data are 95 percent concordant in all these sites, despite the variability in coding conventions used in facilities (i.e., trade names vs. generic names).

The data elements that are date values suffer from the variability in date conventions used in facilities and the general error-prone nature of date values in recorded data. Dates are often difficult to read in registers and medical records and are subject to data entry errors when input into the computer. Extensive data cleaning and assumption-making was required to make the data pertaining to dates usable for analysis. Despite these problems, the Date of Last ART was within 30 days between the EMR and register, and between the medical record and register in roughly half the sites surveyed.

LQAS Triage System

For the evaluation of the LQAS sampling method used with cross-validation as a means for accurately estimating program quality parameters, the test proved effective at classifying sites as above or below a pre-defined threshold (roughly 75% concordance for both indicators between sample results and true facility proportions). The indicators selected for testing, status on treatment, and viral load test done and suppressed proved somewhat extreme in Burundi; data management performance is very high for maintaining records that permit the determination of the current status of a patient, while for viral load data the opposite was true.

In retrospect, better concordance between the sample results and the true facility proportion might have been obtained if the pre-defined standard of Viral Load Test Done and Suppressed was lower and wider. The pre-defined standard was high (85%–95%), since data found on the pilot for active on treatment indicated a high level of performance for the indicator. Since viral load was not addressed in this manner in the pilot, there was no advance knowledge of the performance of the indicator prior to the assessment.

The pre-determined thresholds for quality may have been somewhat low for the evaluation of current on treatment. In a population of facilities with high levels of accuracy for current on treatment, the LQAS triage system was effective at identifying the higher performing sites (only one facility with high true proportion was misclassified as low), but less effective at identifying poorer performing sites (i.e., proportion < 95%); nine sites were misclassified as high by the sampling scheme when the true prevalence was below the cutoff.

Increasing the bounds of quality when already near the extreme of the range of possible values (95% is quite high) has the effect of lowering the sample size but raising the decision rule. For example, with a 97 percent upper bound for quality and 87 percent lower bound, the sample size would be 49 and decision rule 46 (for $\alpha < 0.05$, $\beta < 0.1$, for a site with 500 patients active on treatment).

While the LQAS triage system offers promise as means of rapidly identifying facilities in need of data management interventions, more testing is probably in order given the somewhat fence-straddling results. More experience with the method in specific countries and programs would also allow better determination of accurate quality thresholds and presumably more accurate classification.

Ideally the system would be used routinely to identify only the worst of the worst. That would mean using a high standard and the acknowledgment that some sites with poor performance would be misclassified as good performing, but that on repeated attempts (e.g., as a part of routine supervision) the facility would be caught the next time. Facilities classified as high performing would be good to go until the next supervision visit, while poor-performing facilities would be scheduled for an exhaustive record review. This approach is manageable, affordable, and relatively simple.

Data Management Questionnaires

The site questionnaire on ART data management capacity and the data management methods questionnaires are intended to identify problems in data management that lead to discrepancies in the recounts. However, and this is perhaps more attributable to survey implementation than survey design, the questionnaires were not very helpful in identifying the causes of data quality anomalies. For example, the methods questionnaire for TX_CURR asks whether various types of patients are excluded from the total when they should be (e.g., lost-to-follow-up cases). However, some sites (e.g., H Gashoho, Muyinga province, CDS Nyabiraba, Gitega province) over-reported extensively, and yet the methods questionnaire indicates that all patients with treatment exits are excluded at these sites.

Nevertheless, the data management questionnaires do indicate good data management practices in the aggregate, and in reality, the data are fairly good quality on aggregate (VFs near 100% for all data sources for TX_CURR, and for PEPFAR reporting and reporting on monthly reports for TX_New). The over-reporting to DHIS2 (VF = 66%) gives pause, but it may also indicate that the data quality problems lie at the district where the data are entered into the computer for most sites.

Data Flow Assessment

Similar to the Data Management Questionnaires, the Data Flow Assessment also provided little information of use for identifying data quality problems. The exercise is intended to identify data quality bottlenecks within facilities so that they can be resolved. However, it is a tedious exercise on top of many other tasks during a data quality assessment, and most facilities are following a standard practice for patient and data flow within the facilities. So this task (and the data management questionnaires) becomes a rote exercise where too little effort is applied to delve deep enough to identify differences that could affect data quality. In future applications of this tool, it should probably be limited to sites where discrepancies are found on the recounts.

In summary, the data quality for HIV in Burundi is fairly high quality on aggregate, but with some worrisome disparities when examined by age and gender, and subnationally. This may be expected given the recent changes in reporting protocols (i.e., new age groupings, and gender-specific reporting for child cases). The viral load assessment revealed effective use of the viral load test (93% VL suppressed) to gauge treatment effectiveness, though with poor coverage (50%). The cross-validation revealed data sources that were less

than complete but fairly good congruence between data sources when data were available. The LQAS triage system was accurate in identifying good and poor performing sites based on a smallish sample of patient records about 75 percent of the time.

RECOMMENDATIONS

- Investigate thoroughly the discrepancy in reporting to DHIS2. At present, the data in DHIS2 are over-reported by one-third, and the evidence points to data entry.
- Investigate more thoroughly sites with extreme values of the VF for TX_CURR and TX_NEW. Currently, there are obvious and widely erroneous values in DHIS2. For example, CDS Karusi, CDS Nyabiraba, CDS Gitaramuka all reported more than 100 new initiates on ART for the quarter. Other extreme values point to different problems; H Buhiga reported 109 new initiates on ART for the quarter on monthly reports.
- Investigate more thoroughly discrepancies in age/gender disaggregation. Make changes to the database and monthly reports where necessary. Follow up with sites that show large discrepancies, and ensure proper understanding in reporting protocols and use of the data collection tools.
- Provide support to facilities to make better use of the SIDA Info database. Currently, 65 percent of sites report having access to the database, but only 42 percent said it is currently being used.
- Improve data recording in source documents. Currently, there are extensive missing data in source documents, particularly for viral load. Instruct facilities to record VL dates and results in the preferred data source (SIDA Info, ART register) so that the medical record need not be pulled to aggregate patient data for viral load. Currently, there is no system for evaluating VL other than a special effort made by IPs.
- Develop simple tools (or introduce the CDC Cross-Validation Tool) for use by facility staff to check their own data source concordance. Conduct training on these techniques for facility data managers.
- Standardize the nomenclature for coding ART regimens in program source documents.
- Some facilities use multiple patient unique IDs, which causes confusion and makes the process for retrieving patient medical records convoluted. The system of assigning patients unique IDs in HIV treatment facilities should be reviewed and standardized to avoid this confusion.

APPENDIX A. SAMPLE SIZES AND ASSOCIATED DECISION RULES FOR LQAS SAMPLING USING THE HYPERGEOMETRIC MODEL

Table 12. LQAS Sampling

Patient Load	Sample Size	Decision Rule	Patient Load	Sample Size	Decision Rule
0–50	all	--	451–500	66	59
51–60	36	32	501–600	67	60
61–70	38	34	601–700	67	60
71–-80	37	33	701–800	67	60
81–90	39	35	801–900	67	60
91–100	46	41	901–1,000	67	60
101–120	47	42	1,001–2,000	68	61
121–140	47	42	2,001–3,000	68	61
141–160	55	49	3,001–4,000	68	61
161–180	56	50	4,001–5,000	68	61
181–200	56	50	5,001–6,000	68	61
201–250	58	52	6,001–7,000	68	61
251–300	58	52	7,001–8,000	68	61
351–400	66	59	8,001–9,000	76	68
401–450	67	60	9,001–10,000	76	68

APPENDIX B. SITE QUESTIONNAIRE

Table 13. Site questionnaire results

Question		Result	
Site Questionnaire		Number	Percent
Years of operation of HIV Program at the site			
	≤2 years	3	3%
	3–5 years	6	6%
	5–10 years	20	18%
	10–15 years	46	42%
	15–20 years	4	4%
	>20 years	2	2%
	Missing	29	26%
2.1. What data collection systems/patient monitoring systems is this site using?			
	Electronic system	65	60%
	Paper registers	42	39%
	Missing	2	2%
Electronic Register or EMR			
2.2. Does the site have an electronic register or EMR for ART for collecting ART program data or reporting ART program data?			
	Yes	75	68%
	No	6	5%
	Missing	29	26%
2.3. Is the electronic register or EMR currently being used?			
	Yes	46	42%
	No	32	29%
	Missing	32	29%
2.4. How often are data entered in the system?			
	Daily	62	56%
	Weekly	5	5%
	Monthly	3	3%
	Other	3	3%
	Missing	37	34%
2.5. Is there a data entry backlog?			
	Yes	5	5%
	No	17	15%
	Missing	88	80%

2.6. Is the computer that has the electronic register or EMR password-protected?			
	Yes	58	53%
	No	52	47%
	Missing	0	0%
2.7. Does the site keep a paper backup other than patient charts?			
	Yes	68	62%
	No	42	38%
	Missing	0	0%
Paper Registers			
2.8. Are the paper registers routinely updated?			
	Yes	98	89%
	No	8	7%
	Missing	4	4%
2.9. Are the paper-based registers currently up-to-date?			
	Yes	96	87%
	No	9	8%
	Missing	5	5%
2.10 Are paper registers and reports kept in a secure location (e.g., locked cabinet, room with controlled access)?			
	Yes	92	84%
	No	16	15%
	Missing	2	2%
Reporting to Partners			
3.1. How does the site submit monthly reports to the MOH for ART?			
	Electronic report	42	38%
	Paper form	65	59%
	Missing	3	3%
3.2. How does the site submit reports to the PEPFAR implementing partner?			
	Electronic report	25	23%
	Paper form	58	53%
	Missing	27	25%
Personnel			
4.1. Who is responsible for completing the paper registers or updating the electronic register or EMR? (Please mark all that apply)			
	Dedicated M&E specialist hired by MOH/implementing partner	5	5%
	Data entry clerk	5	5%
	Nurse or other clinical staff member	95	86%

	Case worker (médiateur de santé)	11	9%
	Other	6	5%
4.2. Who is responsible for calculating ART indicators and completing monthly reports to the implementing partner? (Please mark all that apply)			
	Dedicated site-based M&E specialist hired by MOH/implementing partner	2	2%
	M&E specialist hired by the MOH who visits the site on a routine basis	7	6%
	Data entry clerk	4	4%
	Nurse or other clinical staff member	91	83%
	Case worker (médiateur de santé)	11	9%
	Other	3	3%
4.3. Are there processes in place to make sure that ART data compilation and reporting are completed in the case that the designated staff member is not available?			
	Yes	92	84%
	No	18	16%
	Missing	0	0%
4.4. Have staff been trained on how to use and complete paper-based registers and the EMR system and reporting forms?			
	Yes	85	77%
	No	25	23%
	Missing	0	0%
Data Quality			
5.1. Does the site follow quality control procedures for data entry in the electronic register or EMR or paper-based register?			
	Yes	53	48%
	No	57	52%
	Missing	0	0%
5.2. Does the site have data quality standard operating procedures for monthly ART reporting processes?			
	Yes	62	56%
	No	48	44%
	Missing	0	0%
5.3. Does the site have a tool that can be used for conducting internal data quality checks?			
	Yes	45	41%
	No	65	59%
	Missing	0	0%

5.4. Does the site receive feedback from the implementing partner on the quality of its ART reports?			
	Yes	84	76%
	No	26	24%
How often is the feedback received?			
	Missing	68	62%
	Monthly	18	16%
	Quarterly	9	8%
	Each report	4	4%
	Frequently	3	3%
	Rarely	3	3%
	Biannually	2	2%
	As needed	2	2%
	Weekly	1	1%
5.5. Does this facility receive visits from the MOH, District Hospital, or PEPFAR staff to check the quality of the ART program data?			
	Yes	96	87%
	No	14	13%
	Missing	0	0%
How often are the visits received?			
	Null	24	22%
	More than once a month	7	6%
	Monthly	25	23%
	Quarterly	26	24%
	Frequently	2	2%
	Biannually	11	10%
	Annually	4	4%
	Rarely	11	10%

APPENDIX C. METHODS QUESTIONNAIRE FOR TX_CURR AND TX_NEW

Table 14. Methodology questionnaire results

Tx_Curr Methods	True	False	% True
Were you able to calculate the site method	102	10	91%
Were you able to calculate the PEPFAR method?	2	109	2%
Data sources used to validate TX_CURR (site method)			
ART register	91	21	81%
ART patient card	11	101	10%
Pharmacy tools	94	18	84%
Electronic register or EMR	42	70	38%
Other:	14	98	13%
Data sources used to validate TX_CURR (PEPFAR method)			
ART register	1	111	1%
ART patient card	0	112	0%
Pharmacy tools	1	111	1%
Electronic register or EMR	1	111	1%
Other:	0	112	0%
1. Is the site method consistent with the PEPFAR method?	73	39	65%
2. Are transfers-in included?	96	16	86%
3. Are restarts included?	97	15	87%
4. Are transfers-out excluded?	97	15	87%
5. Are stopped ART excluded?	89	23	79%
6. Are dead excluded?	88	24	79%
7. Are dropped (LTFU) excluded?	95	17	85%
8. Are lost (missed drug pick-up) included?	66	46	59%
Tx_New Methods	**True**	**False**	**% True**
Were you able to calculate the site method?	100	11	90%
Were you able to calculate the PEPFAR method?	4	107	4%
Data sources used to validate TX_NEW (site method)			
ART register	89	22	80%
ART patient card	15	96	14%
Pharmacy tools	97	14	87%
Electronic register or EMR	43	68	39%

Other:	14	97	13%
Data sources used to validate TX_NEW (PEPFAR method)			
ART register	2	109	2%
ART patient card	1	110	1%
Pharmacy tools	2	109	2%
Electronic register or EMR	2	109	2%
Other:	1	110	1%
Is the site method consistent with the PEPFAR method?	92	19	83%
Are transfers-in excluded?	96	15	86%
Are those restarted after "stopped" excluded?	98	13	88%
Are those restarted after "lost to follow-up" excluded?	97	14	87%

APPENDIX D. CROSS-VALIDATION RESULTS BY FACILITY

Table 15. Cross-validation - matches across data sources - detailed results by facility

							Date of Last ART			Regimen Last ART			Date of Last VL			Result of last VL			Status on Treatment		
No.	Facility	Active on Treatment (DHIS2)	LQAS Sample Size	Decision Rule	Revised Sample Size	Revised Decision Rule	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register / EMR	Medical Record / EMR	Medical Record/ Register	Register / EMR	Medical Record / EMR
1	H NGOZI	719	67	60	68	62	55	60	60	68	68	68	7	9	47	9	9	65	68	67	68
2	H BUYE	302	66	59	66	59	60	64	60	66	66	66	-	-	63	-	-	62	66	65	66
3	H KIREMBA	489	66	59	66	59	65	64	64	66	66	66	-	-	60	-	-	64	66	65	66
4	H CANKUZO	379	66	59	66	59	59	50	43	65	65	64	40	18	8	45	43	38	66	64	65
5	H MURORE	101	47	42	47	42	45	38	37	47	46	46	25	25	25	25	25	25	47	47	47
6	H BUTEZI	110	47	42	47	42	47	32	32	47	47	47	31	29	28	32	31	31	47	47	47
7	SWAA RUYIGI	383	66	59	68	62	67	7	7	67	67	67	18	18	17	18	20	19	68	66	67
8	H KINYINYA	246	58	52	59	54	57	37	37	58	58	58	24	-	-	24	21	21	58	58	58
9	NLLE ESPERENCE BUYENZI	476	66	59	68	62	42	62	44	62	62	66	-	-	-	-	-	61	63	64	66
10	CDS CHUK	224	58	52	68	62	38	55	45	55	54	67	-	-	53	-	-	59	53	54	63
11	NLLE ESPE KANYOSHA	119	47	42	67	60	20	1	6	62	67	62	-	-	14	-	-	32	67	66	67
12	H NTITA	307	66	59	59	54	56	-	-	59	-	-	13	-	-	-	-	-	59	-	-
13	H Mutoyi	257	58	52	58	52	58	-	-	52	-	-	-	-	-	-	-	-	58	-	-
14	H KIBUYE	358	66	59	66	59	-	45	-	66	66	66	-	-	27	-	-	28	66	65	66
15	CDS KIGUTU	456	66	59	65	59	-	47	-	50	65	50	-	-	-	-	-	11	-	65	-
16	H MATANA	225	58	52	55	50	34	30	51	55	55	55	-	-	-	-	-	-	55	55	55

							Date of Last ART			Regimen Last ART			Date of Last VL			Result of last VL			Status on Treatment		
No.	Facility	Active on Treatment (DHIS2)	LQAS Sample Size	Decision Rule	Revised Sample Size	Revised Decision Rule	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register / EMR	Medical Record / EMR	Medical Record/ Register	Register / EMR	Medical Record / EMR
17	H KIGANDA	171	56	50	46	42	24	39	22	46	46	46	10	13	11	14	14	14	45	45	46
18	H MURAMVYA	399	66	59	66	59	34	5	3	50	50	66	-	-	-	-	-	9	39	47	44
19	CDS Marembo	161	56	50	48	44	35	-	-	41	-	-	-	-	-	-	-	-	46	-	-
20	CDS Gasura	235	58	52	58	52	58	-	-	58	-	-	-	-	-	-	-	-	58	-	-
21	H Mukenke	580	67	60	67	60	37	30	28	62	63	65	-	-	35	-	-	57	65	63	64
22	ANSS Kirundo	1,067	68	61	68	61	16	26	17	67	67	66	-	-	12	-	-	58	68	67	68
23	H Nyanza-Lac	261	58	52	66	60	5	-	-	66	66	66	-	-	-	-	-	-	66	65	66
24	ANSS MAKAMBA	616	67	60	68	62	63	38	38	63	52	56	37	32	30	52	52	52	66	65	66
26	CDS RUZO	338	58	52	52	48	21	3	5	42	52	42	-	-	-	-	-	-	44	50	46
27	H MUYINGA	874	67	60	67	60	-	-	25	-	-	28	-	-	18	-	-	20	-	-	35
28	H KIBUMBU	517	67	60	62	57	49	59	50	60	61	60	-	-	5	-	-	40	-	-	62
29	H FOTA	119	47	42	45	41	45	45	45	45	45	45	17	17	17	17	17	17	45	45	45
30	H RUTANA	268	58	52	55	50	55	55	55	55	55	55	35	35	35	35	35	35	55	55	55
31	H GIHOFI	230	58	52	54	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	H KAYANZA	911	67	60	64	58	11	6	57	61	63	62	-	-	-	-	-	-	64	64	64
33	H MUSEMA	239	58	52	57	52	35	38	41	55	57	55	36	35	48	47	47	49	57	57	57
34	CDS MARAMVYA	152	55	49	55	49	23	-	-	55	-	-	-	-	-	-	-	-	54	-	-
35	H Rumonge	592	67	60	63	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	ANSS GITEGA	1,174	68	61	66	60	-	53	-	-	57	-	-	-	-	-	-	-	-	65	-
37	H MUTOYI	257	58	52	58	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

							Date of Last ART			Regimen Last ART			Date of Last VL			Result of last VL			Status on Treatment		
No.	Facility	Active on Treatment (DHIS2)	LQAS Sample Size	Decision Rule	Revised Sample Size	Revised Decision Rule	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register/ EMR	Medical Record/ EMR	Medical Record/ Register	Register / EMR	Medical Record / EMR	Medical Record/ Register	Register / EMR	Medical Record / EMR
38	H BUHIGA	402	67	60	63	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	H GIHANGA	283	58	52	58	52	44	-	-	57	-	-	-	-	-	-	-	-	57	-	-
40	H CIBITOKE	524	67	60	65	59	33	62	33	63	63	63	-	-	-	-	-	-	61	63	61
41	Kabezi	149	55	49	55	49	54	14	14	55	55	55	-	-	-	-	-	-	55	55	55
42	Apecos	468	66	59	66	59	66	62	62	66	66	66	-	-	-	-	-	-	66	66	66
43	Kinama	806	67	60	67	60	59	-	-	63	63	65	-	-	-	-	-	-	67	67	66
44	Jenda	204	58	52	58	52	41	17	20	52	50	49	-	-	-	-	-	-	54	53	53
45	Rama	563	67	60	67	60	44	-	-	64	65	63	-	-	-	-	-	-	65	67	65

APPENDIX E. CROSS-VALIDATION COMPARISON TO EXHAUSTIVE REVIEW DETAILED RESULTS

Table 16. Cross-validation comparison to exhaustive review (Status on Treatment)

					Status on Treatment								VF Exhaustive Review
					SIDA Info		Medical Record		Register		Decision Rule	Standard Met	
Survey ID No.	Region	District	PEFPAR Site	Facility Name	No. Active	%	No. Active	%	No. Active	%			TX_CURR
10	Ngozi	DS Ngozi	Yes	H NGOZI	68	100%	68	100%	68	100%	62	yes	100%
5	Ngozi	DS Buye	Yes	H BUYE	66	100%	66	100%	66	100%	59	yes	93%
7	Ngozi	DS Kiremba	Yes	H KIREMBA	66	100%	66	100%	66	100%	59	yes	98%
55	Cankuzo	DS Cankuzo	No	H CANKUZO	65	98%	66	100%	66	100%	59	yes	100%
56	Cankuzo	DS Murore	No	H MURORE	47	100%	47	100%	47	100%	42	yes	101%
54	Ruyigi	DS Butezi	No	H BUTEZI	47	100%	47	100%	47	100%	42	yes	54%
50	Ruyigi	DS Ruyigi	No	SWAA RUYIGI	68	100%	67	99%	67	99%	62	yes	100%
52	Ruyigi	DS Kinyinya	No	H KINYINYA	58	98%	58	100%	58	100%	54	yes	98%
69	Bujumbura Mairie	DS Bujumbura centre	Yes	NLLE ESPERENCE BUYENZI	67	99%	65	96%	64	96%	62	yes	99%
94	Bujumbura Mairie	DS Bujumbura nord	Yes	CDS CHUK	68	100%	63	93%	55	96%	62	yes	99%
99	Bujumbura Mairie	DS Bujumbura sud	Yes	NLLE ESPE KANYOSHA	67	100%	67	100%	67	100%	60	yes	95%
116	Gitega	DS Ryansoro	No	H NTITA	0		59	100%	59	100%	54	yes	100%
114	Gitega	DS Mutaho	Yes	H Mutoyi	0		58	100%	58	100%	52	yes	96%
113	Gitega	DS Kibuye	No	H KIBUYE	66	100%	66	100%	66	100%	59	yes	193%
37	Bururi	DS Bururi	No	CDS KIGUTU	66	100%	0	0%	66	100%	59	yes	98%
40	Bururi	DS Matana	No	H MATANA	55	100%	55	100%	55	100%	50	yes	101%
26	Muramvya	DS Kiganda	No	H KIGANDA	45	100%	45	100%	46	100%	42	yes	50%
24	Muramvya	DS Muramvya	No	H MURAMVYA	66	100%	44	86%	48	100%	59	yes	100%
123	Kirundo	DS Busoni	Yes	CDS Marembo	0		47	98%	47	100%	44	yes	63%

139	Kirundo	DS Vumbi	Yes	CDS Gasura	0		58	100%	58	100%	52	yes	101%
134	Kirundo	DS Mukenke	Yes	H Mukenke	63	94%	65	98%	65	100%	60	yes	101%
128	Kirundo	DS Kirundo	Yes	ANSS Kirundo	68	100%	68	100%	68	100%	61	yes	95%
58	Makamba	DS Nyanza-Lac	No	H Nyanza-Lac	66	100%	66	100%	66	100%	60	yes	87%
57	Makamba	DS Makamba	No	ANSS MAKAMBA	66	100%	66	100%	66	100%	62	yes	101%
145	Muyinga	DS Giteranyi	No	CDS RUZO	44	85%	44	85%	42	81%	48	no	92%
1	Muyinga	DS Muyinga	No	H MUYINGA	59	88%	33	94%	0		60	no	41%
28	Mwaro	DS Kibumbu	No	H KIBUMBU	62	100%	62	100%	0		57	yes	100%
29	Mwaro	DS Fota	No	H FOTA	45	100%	45	100%	45	100%	41	yes	100%
46	Rutana	DS Rutana	No	H RUTANA	55	100%	55	100%	55	100%	50	yes	68%
62	Kayanza	DS Kayanza	Yes	H KAYANZA	64	100%	64	100%	64	100%	58	yes	101%
47	Rutana	DS Gihofi	No	H Gifhofi			54	100%			49	yes	-
65	Kayanza	DS Musema	Yes	H MUSEMA	57	100%	57	100%	57	100%	52	yes	100%
64	Kayanza	DS Gahombo	Yes	CDS MARAMVYA	0		55	100%	54	100%	49	yes	96%
43	Rumonge	DS Rumonge	No	H Rumonge	0		63	100%	0		57	yes	99%
106	Gitega	DS Gitega	Yes	ANSS GITEGA	64	97%	0		64	97%	60	yes	101%
114	Gitega	DS Mutaho	Yes	H MUTOYI	58	100%	0		0		52	yes	96%
119	Karusi	DS Buhiga	No	H BUHIGA	0		0		0		57	no	96%
18	Bubanza	DS Mpanda	No	H GIHANGA	0		51	88%	50	88%	52	no	95%
21	Cibitoke	DS Cibitoke	No	H CIBITOKE	60	95%	63	98%	60	95%	59	yes	86%
33	Bujumbura	DS Kabezi	Yes	H KABEZI	55	100%	55	100%	55	100%	49	yes	100%
100	Bujumbura Mairie	DS Bujumbura centre	Yes	APECOS	66	100%	66	100%	66	100%	59	yes	100%
88	Bujumbura Mairie	DS Bujumbura centre	Yes	CDS Kinama	68	100%	66	97%	66	97%	60	yes	100%
31	Bujumbura	DS Rwibaga	Yes	H Jenda	54	100%	53	96%	53	100%	52	yes	95%
73	Bujumbura Mairie	DS Bujumbura centre	Yes	CDS Rama	67	100%	65	97%	67	100%	60	yes	100%
				Average percentage active on tx		**99%**		**96%**		**99%**		40	**95%**
												44	

Percentage of facilities meeting the standard	**91%**	

Table 17. Cross-validation comparison to exhaustive review (Viral Load Done and Suppressed)

					VL Suppression								VF Exhaustive Review
					SIDA Info		Medical Record		Register		Decision Rule	Standard Met	
Survey ID No.	Region	District	PEFPAR Site	Facility Name	No. Active	%	No. Active	%	No. Active	%			TX_PVLS
10	Ngozi	DS Ngozi	Yes	H NGOZI	61	92%	61	91%	8	89%	62	no	96%
5	Ngozi	DS Buye	Yes	H BUYE	62	98%	61	98%	0		59	yes	97%
7	Ngozi	DS Kiremba	Yes	H KIREMBA	63	98%	64	98%	0		59	yes	96%
55	Cankuzo	DS Cankuzo	No	H CANKUZO	41	85%	40	85%	43	84%	59	no	94%
56	Cankuzo	DS Murore	No	H MURORE	24	96%	24	96%	24	96%	42	no	96%
54	Ruyigi	DS Butezi	No	H BUTEZI	31	89%	28	88%	28	88%	42	no	88%
50	Ruyigi	DS Ruyigi	No	SWAA RUYIGI	20	95%	18	95%	19	95%	62	no	86%
52	Ruyigi	DS Kinyinya	No	H KINYINYA	22	92%	22	92%	22	92%	54	no	95%
69	Bujumbura Mairie	DS Bujumbura centre	Yes	NLLE ESPERENCE BUYENZI	59	91%	59	91%	0		62	no	94%
94	Bujumbura Mairie	DS Bujumbura nord	Yes	CDS CHUK	56	92%	57	92%	0		62	no	94%
99	Bujumbura Mairie	DS Bujumbura sud	Yes	NLLE ESPE KANYOSHA	34	89%	57	97%	0		60	no	86%
116	Gitega	DS Ryansoro	No	H NTITA	0		27	96%	0		54	no	91%
114	Gitega	DS Mutaho	Yes	H Mutoyi	0		45	85%	0		52	no	88%
113	Gitega	DS Kibuye	No	H KIBUYE	25	89%	25	89%	0		59	no	88%
37	Bururi	DS Bururi	No	CDS KIGUTU	52	100%	11	92%	0		59	no	83%
40	Bururi	DS Matana	No	H MATANA	0	0%	0		0		50	no	77%
26	Muramvya	DS Kiganda	No	H KIGANDA	11	79%	11	79%	11	79%	42	no	84%
24	Muramvya	DS Muramvya	No	H MURAMVYA	11	100%	16	89%	0		59	no	87%
123	Kirundo	DS Busoni	Yes	CDS Marembo	0		0		0		44	no	
139	Kirundo	DS Vumbi	Yes	CDS Gasura	0		9	100%	0		52	no	100%

134	Kirundo	DS Mukenke	Yes	H Mukenke	58	98%	59	98%	0		60	no	92%
128	Kirundo	DS Kirundo	Yes	ANSS Kirundo	58	97%	62	93%	0		61	yes	
58	Makamba	DS Nyanza-Lac	No	H Nyanza-Lac	0		0		0		60	no	
57	Makamba	DS Makamba	No	ANSS MAKAMBA	62	94%	50	94%	50	93%	62	yes	90%
145	Muyinga	DS Giteranyi	No	CDS RUZO	0	0%	14	93%	0	0%	48	no	80%
1	Muyinga	DS Muyinga	No	H MUYINGA	45	87%	17	77%	0		60	no	88%
28	Mwaro	DS Kibumbu	No	H KIBUMBU	38	93%	43	93%	0		57	no	92%
29	Mwaro	DS Fota	No	H FOTA	16	94%	16	94%	16	94%	41	no	100%
46	Rutana	DS Rutana	No	H RUTANA	33	94%	33	94%	33	94%	50	no	100%
62	Kayanza	DS Kayanza	Yes	H KAYANZA	51	98%	0		0		58	no	97%
47	Rutana	DS Gihofi	No	H Gifhofi									
65	Kayanza	DS Musema	Yes	H MUSEMA	45	92%	45	92%	43	91%	52	no	97%
64	Kayanza	DS Gahombo	Yes	CDS MARAMVYA	0		25	89%	0		49	no	92%
43	Rumonge	DS Rumonge	No	H Rumonge	0		18	100%	0		57	no	91%
106	Gitega	DS Gitega	Yes	ANSS GITEGA	45	92%	0		0		60	no	97%
114	Gitega	DS Mutaho	Yes	H MUTOYI	46	85%	0		0		52	no	88%
119	Karusi	DS Buhiga	No	H BUHIGA	0		0		0		57	no	87%
18	Bubanza	DS Mpanda	No	H GIHANGA	0		16	80%	0		52	no	85%
21	Cibitoke	DS Cibitoke	No	H CIBITOKE	0		16	89%	0		59	no	90%
				Average percent VL done and suppressed		**86%**		**92%**		**83%**		4	**91%**
												37	
							Percent of facilities meeting the standard					**11%**	

APPENDIX F. LIST OF SITES WITH EXTREME VALUES FOR VF AND MISSING DOCUMENTATION, BY INDICATOR

Table 18. List of sites with extreme values for VF (TX_CURR)

Source	VF Extreme	Region	District	Facility	PEPFAR Total	Recount Total	PEFPAR VF
PEPFAR Reporting	VF Under-reported	Kirundo	DS Busoni	CDS Bunyari	100	128	128%
		Kirundo	DS Mukenke	CDS Buhoro	99	117	118%
	VF Over-reported	Kirundo	DS Mukenke	CDS Shore	108	83	77%
		Bujumbura Mairie	DS Bujumbura sud	CDS Kinindo (Croix rouge)	193	141	73%
		Kirundo	DS Kirundo	CDS Rutare	110	76	69%
		Kirundo	DS Busoni	CDS Marembo	174	109	63%
Source	**VF Extreme**	**Region**	**District**	**Facility**	**DHIS2 Total**	**Recount Total**	**DHIS2 VF**
DHIS2 Reporting	VF Under-reported	Gitega	DS Kibuye	H KIBUYE	355	576	162%
		Bubanza	DS Bubanza	H Bubanza	187	221	118%
		Rumonge	DS Rumonge	CDS ABUBEF RUMONGE	134	149	111%
	VF Over-reported	Kirundo	DS Mukenke	CDS Shore	108	83	77%
		Muyinga	DS Muyinga	CDS Muramba	157	117	75%
		Rutana	DS Rutana	H Rutana	272	192	71%
		Makamba	DS Makamba	CDS Kayogoro I	143	100	70%
		Kirundo	DS Kirundo	CDS Rutare	110	76	69%
		Kirundo	DS Busoni	CDS Marembo	174	109	63%
		Bujumbura Mairie	DS Bujumbura sud	CDS Kinindo (Croix rouge)	226	141	62%
		Bubanza	DS Mpanda	CDS Muzinda	143	77	54%
		Muyinga	DS Gashoho	CDS Gisanze	97	51	53%
		Gitega	DS Ryansoro	CDS Nyabiraba	195	79	41%
		Muyinga	DS Gashoho	H Gashoho	296	67	23%
Source	**VF Extreme**	**Region**	**District**	**Facility**	**Monthly Report Total**	**Recount Total**	**MR VF**
Reporting on Monthly Reports	VF Under-reported	Gitega	DS Kibuye	H KIBUYE	355	576	162%
		Bubanza	DS Bubanza	H Bubanza	187	221	118%
		Ruyigi	DS Ruyigi	SWAA Ruyigi	331	389	118%
		Rumonge	DS Rumonge	CDS ABUBEF RUMONGE	134	149	111%
	VF Over-reported	Muyinga	DS Muyinga	CDS Muramba	157	117	75%
		Bujumbura Mairie	DS Bujumbura sud	CDS Rukundo	129	96	74%
		Kirundo	DS Kirundo	CDS Rutare	110	76	69%
		Rutana	DS Rutana	H Rutana	283	192	68%

		Makamba	DS Makamba	CDS Kayogoro I	155	100	65%
		Bujumbura Mairie	DS Bujumbura sud	CDS Kinindo (Croix rouge)	224	141	63%
		Kirundo	DS Busoni	CDS Marembo	174	109	63%
		Bubanza	DS Mpanda	CDS Muzinda	142	77	54%
		Muyinga	DS Gashoho	CDS Gisanze	97	51	53%
		Gitega	DS Ryansoro	CDS Nyabiraba	195	79	41%
		Muyinga	DS Gashoho	H Gashoho	295	67	23%

Table 19. List of sites with extreme values for VF (TX_NEW)

Source	VF Extreme	Region	District	Facility	PEPFAR Total	Recount Total	PEFPAR VF
PEPFAR Reporting	VF Under-reported	Kirundo	DS Mukenke	CDS Kimeza	16	24	150%
	VF Over-reported	Bujumbura Mairie	DS Bujumbura nord	H Roi Khaled	26	18	69%
		Ngozi	DS Ngozi	CDS Swaa	16	11	69%
		Kayanza	DS Kayanza	H KAYANZA	19	10	53%
Source	**VF Extreme**	**Region**	**District**	**Facility**	**DHIS2 Total**	**Recount Total**	**DHIS2 VF**
DHIS2 Reporting	VF Under-reported	Kirundo	DS Vumbi	CDS Muramba	8	35	438%
		Kirundo	DS Kirundo	H KIRUNDO	4	12	300%
		Bujumbura Mairie	DS Bujumbura sud	Nouvelle Espérance	6	17	283%
		Kirundo	DS Kirundo	ANSS Kirundo	12	25	208%
		Kirundo	DS Busoni	CDS Marembo	5	10	200%
		Rumonge	DS Rumonge	H Rumonge	7	13	186%
		Bujumbura Mairie	DS Bujumbura sud	CDS Kanyosha	8	13	163%
		Kirundo	DS Mukenke	CDS Kimeza	16	24	150%
		Ngozi	DS Ngozi	CDS ACVS	16	24	150%
	VF Over-reported	Bujumbura Mairie	DS Bujumbura nord	H Roi Khaled	26	18	69%
		Ngozi	DS Ngozi	CDS Swaa	16	11	69%
		Muyinga	DS Gashoho	H Gashoho	12	7	58%
		Ruyigi	DS Ruyigi	SWAA Ruyigi	10	5	50%
		Gitega	DS Mutaho	H MUTAHO	12	6	50%
		Gitega	DS Gitega	CDS Mushasha	9	4	44%
		Makamba	DS Makamba	ANSS Makamba	15	3	20%
		Muyinga	DS Giteranyi	H Giteranyi	22	3	14%
		Gitega	DS Ryansoro	CDS Nyabiraba	290	4	1%

		Karusi	DS Buhiga	CDS Gitaramuka	101	1	1%
Source	**VF Extreme**	**Region**	**District**	**Facility**	**Monthly Report Total**	**Recount Total**	**MR VF**
Reporting on Monthly Reports	VF Under-reported	Kirundo	DS Mukenke	CDS Shore	1	7	700%
		Rumonge	DS Rumonge	H Rumonge	6	13	217%
		Kirundo	DS Vumbi	CDS Muramba	17	35	206%
		Kirundo	DS Busoni	CDS Marembo	5	10	200%
		Kayanza	DS Kayanza	H KAYANZA	5	10	200%
		Kirundo	DS Mukenke	CDS Kimeza	16	24	150%
	VF Over-reported	Muyinga	DS Muyinga	SWAA Muyinga	18	13	72%
		Muyinga	DS Giteranyi	H Giteranyi	10	3	30%
		Makamba	DS Makamba	ANSS Makamba	12	3	25%
		Mwaro	DS Fota	H FOTA	7	1	14%

APPENDIX G. LIST OF SAMPLED SITES WITH MISSING SOURCE DOCUMENTS

Table 20. List of sites with missing documentation for verification factor, by indicator

Indicator	Region	District	Health Facility	DHIS2	Monthly Report	Recount	Notes
TX_CURR	Kirundo	DS Vumbi	CDS Gasura	X			
	Bujumbura Mairie	DS Bujumbura sud	CDS Musaga	X			
	Kirundo	DS Vumbi	CDS Muramba	X			
	Bubanza	DS Mpanda	H Gihanga	X			
	Cibitoke	DS Mabayi	H Mabayi	X			
	Rutana	DS Rutana	CDS SOS	X			
	Ruyigi	DS Butezi	H BUTEZI	X			
	Muyinga	DS Gashoho	CDS Kagari	X			
	Rutana	DS Gihofi	H Gihofi	X	X	X	Missing all data for TX_CURR
	Kirundo	DS Mukenke	CDS Shore		X		
	Makamba	DS Makamba	ANSS Makamba		X		
TX_NEW	Muramvya	DS Muramvya	RAMA BUKEYE		X	X	
	Makamba	DS Nyanza-Lac	H NYANZA-LAC		X		
	Makamba	DS Nyanza-Lac	FVS Mabanda		X		
	Gitega	DS Ryansoro	H NTITA		X		
	Muyinga	DS Giteranyi	CDS Ruzo			X	5 cases in DHIS2; 3 on monthly report

APPENDIX H. LIST OF SAMPLED SITES

Table 21. List of DQA sampled sites

Facility ID	Region	District Sanitaire	Facility	PEPFAR Site (Y/N)	Assessed (Y/N)	Active File (March 2019)
1	Muyinga	DS Muyinga	H Muyinga	No	Yes	879
2	Muyinga	DS Muyinga	SWAA Muyinga	No	Yes	386
3	Muyinga	DS Muyinga	CDS Muramba	No	Yes	157
4	Muyinga	DS Muyinga	CDS Rugari	No	Yes	151
5	Ngozi	DS Buye	H Buye	Yes	Yes	308
6	Ngozi	DS Buye	CDS Gashikanwa	Yes	Yes	101
7	Ngozi	DS Kiremba	H Kiremba	Yes	Yes	484
8	Ngozi	DS Kiremba	CDS Musasa	Yes	No	135
9	Ngozi	DS Kiremba	CDS Musenyi Etat	Yes	Yes	128
10	Ngozi	DS Ngozi	H Ngozi	Yes	Yes	726
11	Ngozi	DS Ngozi	CDS Swaa	Yes	Yes	551
12	Ngozi	DS Ngozi	CDS CMSR	Yes	Yes	374
13	Ngozi	DS Ngozi	CDS ACVS	Yes	Yes	369
14	Ngozi	DS Ngozi	H Mivo	Yes	Yes	192
15	Ngozi	DS Ngozi	CDS Abcmav	Yes	No	183
16	Ngozi	DS Ngozi	CDS Burasira	No	Yes	99
17	Bubanza	DS Bubanza	H Bubanza	No	Yes	187
18	Bubanza	DS Mpanda	H Gihanga	No	Yes	287
19	Bubanza	DS Mpanda	CDS Muzinda	No	Yes	143
20	Bubanza	DS Mpanda	H Mpanda	No	Yes	115
21	Cibitoke	DS Cibitoke	H Cibitoke	No	Yes	521
22	Cibitoke	DS Cibitoke	CDS Kaburantwa	No	Yes	308
23	Cibitoke	DS Mabayi	H Mabayi	No	Yes	130
24	Muramvya	DS Muramvya	H Muramvya	No	Yes	403
25	Muramvya	DS Muramvya	RAMA BUKEYE	No	Yes	228
26	Muramvya	DS Kiganda	H Kiganda	No	Yes	172
27	Muramvya	DS Muramvya	CDS Bukeye	No	Yes	98
28	Mwaro	DS Kibumbu	H KIBUMBU	No	Yes	513
29	Mwaro	DS Fota	H FOTA	No	Yes	114
30	Bujumbura	DS Isale	CDS Gatumba	Yes	Yes	300
31	Bujumbura	DS Rwibaga	H JENDA	Yes	Yes	204
32	Bujumbura	DS Isale	CDS Maramvya (DS Isale)	Yes	No	163
33	Bujumbura	DS Kabezi	H KABEZI	Yes	Yes	143
34	Bujumbura	DS Isale	CDS Rukaramu	Yes	No	120
35	Bujumbura	DS Isale	CDS Mubimbi	Yes	No	96

Facility ID	Region	District Sanitaire	Facility	PEPFAR Site (Y/N)	Assessed (Y/N)	Active File (March 2019)
36	Bujumbura	DS Isale	H RUSHUBI	Yes	No	95
37	Bururi	DS Bururi	CDS Kigutu	No	Yes	443
38	Bururi	DS Bururi	CDS Centre socio Médical/FVS	No	Yes	305
39	Bururi	DS Bururi	H Bururi	No	Yes	252
40	Bururi	DS Matana	H Matana	No	Yes	231
41	Bururi	DS Matana	H Rutovu	No	Yes	166
42	Bururi	DS Matana	Association RAMA	No	Yes	122
43	Rumonge	DS Rumonge	H Rumonge	No	Yes	588
44	Rumonge	DS Rumonge	Clinique Saint David	No	Yes	277
45	Rumonge	DS Rumonge	CDS ABUBEF RUMONGE	No	Yes	134
46	Rutana	DS Rutana	H Rutana	No	Yes	272
47	Rutana	DS Gihofi	H Gihofi	No	No	233
48	Rutana	DS Rutana	H MUSONGATI	No	Yes	203
49	Rutana	DS Rutana	CDS SOS (DS Rutana)	No	Yes	115
50	Ruyigi	DS Ruyigi	SWAA Ruyigi	No	Yes	390
51	Ruyigi	DS Ruyigi	H RUYIGI	No	Yes	237
52	Ruyigi	DS Kinyinya	H KINYINYA	No	Yes	234
53	Ruyigi	DS Kinyinya	H GISURU	No	Yes	138
54	Ruyigi	DS Butezi	H BUTEZI	No	Yes	108
55	Cankuzo	DS Cankuzo	H CANKUZO	No	Yes	378
56	Cankuzo	DS Murore	H MURORE	No	Yes	101
57	Makamba	DS Makamba	ANSS Makamba	No	Yes	630
58	Makamba	DS Nyanza-Lac	H NYANZA-LAC	No	Yes	411
59	Makamba	DS Nyanza-Lac	FVS Mabanda	No	Yes	263
60	Makamba	DS Makamba	H MAKAMBA	No	Yes	177
61	Makamba	DS Makamba	CDS Kayogoro I	No	Yes	143
62	Kayanza	DS Kayanza	H KAYANZA	Yes	Yes	910
63	Kayanza	DS Kayanza	CDS Swaa	Yes	Yes	329
64	Kayanza	DS Gahombo	CDS Maramvya	Yes	Yes	279
65	Kayanza	DS Musema	H MUSEMA	Yes	Yes	237
66	Kayanza	DS Gahombo	CDS Muhanga I	Yes	Yes	125
67	Kayanza	DS Kayanza	CDS Rubura	Yes	Yes	106
68	Kayanza	DS Musema	CDS Gasenyi I	Yes	Yes	98
69	Bujumbura Mairie	DS Bujumbura centre	Nouvelle Espérance	Yes	Yes	1804
70	Bujumbura Mairie	DS Bujumbura centre	HPRC	Yes	No	1551
71	Bujumbura Mairie	DS Bujumbura centre	Services Yezu Mwiza	Yes	Yes	992

Facility ID	Region	District Sanitaire	Facility	PEPFAR Site (Y/N)	Assessed (Y/N)	Active File (March 2019)
72	Bujumbura Mairie	DS Bujumbura centre	CDS Abubef-jabe	Yes	No	776
73	Bujumbura Mairie	DS Bujumbura centre	CDS Rama	Yes	Yes	567
74	Bujumbura Mairie	DS Bujumbura centre	ACVS/ARM	Yes	No	520
75	Bujumbura Mairie	DS Bujumbura centre	CDS Abubef-Buyenzi	Yes	No	500
76	Bujumbura Mairie	DS Bujumbura centre	CDS SOS	Yes	No	460
77	Bujumbura Mairie	DS Bujumbura centre	CDS Abcmav	Yes	No	325
78	Bujumbura Mairie	DS Bujumbura centre	H CPLR	Yes	No	308
79	Bujumbura Mairie	DS Bujumbura centre	CDS CMC Buyenzi	Yes	No	208
80	Bujumbura Mairie	DS Bujumbura centre	CDS Saint Michel	Yes	No	179
81	Bujumbura Mairie	DS Bujumbura centre	Polyceb	No	No	167
82	Bujumbura Mairie	DS Bujumbura centre	CDS CATB	No	No	165
83	Bujumbura Mairie	DS Bujumbura centre	CDS UP and UP HUMURA	No	No	111
84	Bujumbura Mairie	DS Bujumbura nord	ANSS Bujumbura	Yes	Yes	2,970
85	Bujumbura Mairie	DS Bujumbura nord	H Roi Khaled	Yes	Yes	2,514
86	Bujumbura Mairie	DS Bujumbura nord	SWAA Bujumbura	Yes	Yes	1,817
87	Bujumbura Mairie	DS Bujumbura nord	Hop Militaire	No	No	800
88	Bujumbura Mairie	DS Bujumbura nord	CDS Kinama	Yes	Yes	755
89	Bujumbura Mairie	DS Bujumbura nord	CDS Life Clinic Cibitoke	Yes	No	498
90	Bujumbura Mairie	DS Bujumbura nord	CDS Buterere	Yes	No	375
91	Bujumbura Mairie	DS Bujumbura nord	CDS Mirango I	Yes	No	301
92	Bujumbura Mairie	DS Bujumbura nord	CDS Kamenge	Yes	No	255
93	Bujumbura Mairie	DS Bujumbura nord	CDS Ntaseka	No	No	220
94	Bujumbura Mairie	DS Bujumbura nord	CDS CHUK	Yes	Yes	213
95	Bujumbura Mairie	DS Bujumbura nord	H CNPK	Yes	No	183
96	Bujumbura Mairie	DS Bujumbura nord	CDS Ngagara	Yes	No	140
97	Bujumbura Mairie	DS Bujumbura nord	CDS Mutakura	Yes	No	98
98	Bujumbura Mairie	DS Bujumbura sud	Centre Akabanga	No	No	1,132
99	Bujumbura Mairie	DS Bujumbura sud	Nouvelle Espérance	Yes	Yes	713
100	Bujumbura Mairie	DS Bujumbura sud	APECOS	Yes	Yes	470
101	Bujumbura Mairie	DS Bujumbura sud	CDS Kinindo (Croix rouge)	Yes	Yes	226

Facility ID	Region	District Sanitaire	Facility	PEPFAR Site (Y/N)	Assessed (Y/N)	Active File (March 2019)
102	Bujumbura Mairie	DS Bujumbura sud	CDS Musaga	Yes	Yes	193
103	Bujumbura Mairie	DS Bujumbura sud	CDS Kanyosha	Yes	Yes	123
104	Bujumbura Mairie	DS Bujumbura sud	CDS Rukundo	Yes	Yes	115
105	Bujumbura Mairie	DS Bujumbura sud	CDS Mpimba	No	No	100
106	Gitega	DS Gitega	ANSS Gitega	Yes	Yes	1,180
107	Gitega	DS Gitega	SWAA Gitega	Yes	Yes	1,172
108	Gitega	DS Gitega	H GITEGA	Yes	Yes	469
109	Gitega	DS Gitega	H KIBIMBA	Yes	Yes	261
110	Gitega	DS Gitega	CDS Mushasha	Yes	Yes	239
111	Gitega	DS Gitega	CDS SOS	No	Yes	145
112	Gitega	DS Gitega	Clinique Ste Thérèse de Songa	Yes	Yes	105
113	Gitega	DS Kibuye	H KIBUYE	No	Yes	355
114	Gitega	DS Mutaho	H MUTOYI	Yes	Yes	269
115	Gitega	DS Mutaho	H MUTAHO	Yes	Yes	182
116	Gitega	DS Ryansoro	H NTITA	No	Yes	292
117	Gitega	DS Ryansoro	CDS Nyabiraba	No	Yes	195
118	Gitega	DS Ryansoro	CDS Nyangwa	No	No	137
119	Karusi	DS Buhiga	H BUHIGA	No	Yes	396
120	Karusi	DS Buhiga	CDS Bugenyuzi	No	Yes	225
121	Karusi	DS Buhiga	CDS Karusi	No	Yes	136
122	Karusi	DS Buhiga	CDS Gitaramuka	No	Yes	95
123	Kirundo	DS Busoni	CDS Marembo	Yes	Yes	174
124	Kirundo	DS Busoni	CDS Bunyari	Yes	Yes	131
125	Kirundo	DS Busoni	CDS Murore	Yes	Yes	120
126	Kirundo	DS Busoni	CDS Kabanga	Yes	Yes	105
127	Kirundo	DS Busoni	CDS Vyanzo	Yes	Yes	96
128	Kirundo	DS Kirundo	ANSS Kirundo	Yes	Yes	1,082
129	Kirundo	DS Kirundo	H KIRUNDO	Yes	Yes	600
130	Kirundo	DS Kirundo	CDS Abubef	Yes	Yes	356
131	Kirundo	DS Kirundo	CDS Izere	Yes	Yes	199
132	Kirundo	DS Kirundo	CDS Rutare	Yes	Yes	110
133	Kirundo	DS Kirundo	CDS Kigozi	Yes	Yes	100
134	Kirundo	DS Mukenke	H MUKENKE	Yes	Yes	515
135	Kirundo	DS Mukenke	CDS Mukenke	Yes	Yes	218
136	Kirundo	DS Mukenke	CDS Kimeza	Yes	Yes	146
137	Kirundo	DS Mukenke	CDS Buhoro	Yes	Yes	118

Facility ID	Region	District Sanitaire	Facility	PEPFAR Site (Y/N)	Assessed (Y/N)	Active File (March 2019)
138	Kirundo	DS Mukenke	CDS Shore	Yes	Yes	108
139	Kirundo	DS Vumbi	CDS Gasura	Yes	Yes	232
140	Kirundo	DS Vumbi	CDS Ntega	Yes	Yes	191
141	Kirundo	DS Vumbi	CDS Muramba	Yes	Yes	160
142	Muyinga	DS Gashoho	H Gashoho	No	Yes	296
143	Muyinga	DS Gashoho	CDS Kagari	No	Yes	115
144	Muyinga	DS Gashoho	CDS Gisanze	No	Yes	97
145	Muyinga	DS Giteranyi	CDS Ruzo	No	Yes	291
146	Muyinga	DS Giteranyi	H Giteranyi	No	Yes	245
147	Muyinga	DS Giteranyi	CDS Kamaramagambo	No	Yes	151
Total Active Files Assessed:						**42,317**
Total Active Files as of end of March 2019:						**65,560**
% of Active Files Assessed:						**65%**

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