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Data Quality Assessment to Improve Tuberculosis Reduction Program Performance in Coast Region, Tanzania

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Abstract

Data quality assessment is central in improving program performance. Reducing TB pandemic transmission is challenging in the global south. The success of interventions to address the pandemic depends upon the availability of sound and reliable data. This study applied a mixed research design to investigate the influence of data quality assessment on the performance of TB reduction program. We interviewed staff of several facilities composed of Directly Observed Treatment (DOT) nurse in-charge, and TB coordinators, among others. We reviewed various TB-related documents and used key informant interviews and observation to collect data from selected health facilities. The findings indicated that the performance of the programs can be determined if the data reported meets the five data quality standards, and present accurately what is done at the facility level. Facilities with accurate, reliable and timely data enable the reduction of TB cases through informing adequate treatment to avoid spreading infection to the wider population unlike those with unreliable data. In this study, most of the health facilities data under-reported the number of TB cases, thus leading to poor program performance. We argue that, to improve program performance, data provided from different facilities should meet the five quality standards. The study recommends regular training of DOT nurses and improvement of monitoring and evaluation systems.

Keywords: *data quality, assessment, performance, tuberculosis reduction*

1. Introduction

Tuberculosis is one of the leading causes of deaths from infectious diseases. According the World Health Organization (WHO) (2019), approximately one-third of the global populations were infected by TB in 2019. The WHO indicated that 10m (range, 9.0–11.1m) people fell ill with TB in 2018. This number has been relatively consistent for almost a century. The TB burden differs from one country to another, but the global average is estimated to be around 130 cases per 100 000 population per year.

A high burden of TB cases is found in African countries, and approximately 80% of TB cases in Sub-Sahara Africa are co-infected with HIV (Majigo et al., 2020). In 2018 there were a total of 1.2m TB deaths among HIV-negative people, and additional 251,000 deaths among HIV positive people. However, reflexive

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case discovery mostly depends on a patient's enthusiasm and knowledge, financial competence, degree of shiftiness of service providers, and the accuracy and efficacy of diagnostic services. Studies in Nigeria disclosed that 83% of patients presented in health facilities after a month or more from the start of their symptoms (Li et al., 2013).

Tanzania is one of the top 30 countries with a high TB burden in the world (WHO, 2018). The incidence rate of TB in Tanzania has increased slightly from 125/100000 population in 2015 to 129/100000 population in 2016. TB also accounted for 5.8% of all deaths in 2014 (NTLP, 2016). TB cases in the country are detected through the reflexive case outcome, whereby patients present themselves to a health facility to seek care. Moreover, a study conducted by WHO (2018) shows that recognition rate is less than 50% in Tanzania. Two studies—one conducted in Tanzania and another in Botswana—showed that patients from rural areas, patients with less advanced understanding levels, site of the first visit, lack of TB information, and female gender were associated with TB recognition delay (Tanzania NTLP, 2016). However, apart from a study conducted in two high TB burden cities of Mwanza and Dar es Salaam, the magnitude and factors responsible for delay in low TB burden regions of Tanzania are unknown (WHO, 2018).

The TB reduction program in Tanzania is implemented in 6 regions: Dar es Salaam, Zanzibar, Coast, Kilimanjaro, Arusha, and Mwanza. The Challenge TB Project, as an implementation organ of the program, builds on foundations laid by previous projects such as the Task Order TB 2015, implemented by PATH and the USAID/Tanzania Country Development Cooperation. Of the mentioned regions, this study intended to focus on assessing the quality of data collected in Kibaha, and Mkuranga districts of the Coast region.

Global governments and development partners are continually funding, and national projects are working, to end the TB disease in Tanzania. The assessment of the progress and status of success of these initiatives depends on systems that can produce data of high quality for decision-making and improve performance. To improve performance, interventions needs to be in place, and an effective data collection system from service delivery points to the highest level to which data are reported, used, and shared with different stakeholders. To enhance the quality of the TB data collected, the Tanzania national AIDS control program, in collaboration with development partners, developed a guideline and data collection tools for the management of TB, HIV, and AIDS data (Affairs & Division, 2012). However, studies have found that in most cases, the developed guidance and tools are not followed or used.

In Tanzania, regular data quality assessments (DQAs) are mandatory for most non-government organizations (NGOs), but are very uncommon in the public health sector. This implies that managers in the public sector, such as in health centres, are making decisions based on data of unknown quality. This has a negative

repercussion on the current and long-term performance of many health programs, including TB programs. Therefore, there is a need for integrating routine DQA in long-term programs such as TB testing services. The use of quality data is important to ensure that decisions involved in adaptive management are realistic and reliable. Thus, there is a need for a continuous assessment of the quality of data from the different TB programs to ascertain the extent to which they can be trusted for decision-making. This paper assesses the influence of data quality assessment in improving the performance of TB reduction programs in Kibaha and Mkuranga districts. Such an understanding is critical to making policy and strategic improvements towards ensuring the reduction of TB cases in Tanzania.

2. Literature Review

2.1 Data Quality Assessment and TB Reduction Theories

Several theories explain factors affecting the quality of data that hinder the reduction of TB cases. This study merged several of these theories, including the stakeholder, organizational change, and the meta-evaluation theories. Freeman (1984) developed the stakeholder theory in 1984 to explain key factors of solving managerial problems associated with changing environment and uncertainty in businesses or projects. He suggested that individuals who are associated with a program should be treated as part and parcel of the project implementation. As far as this study is concerned, the stakeholder theory was used to explain the necessity of incorporating regional health management teams (RCHMTs), council health management teams (CHMTs), and other non-government stakeholders to improve data quality (Measure Evaluation, 2007). All these stakeholders have the right to know the weaknesses and strengths of data quality and the performance of their programs. Moreover, stakeholders can lead to the failure of a project if they are not involved throughout the project implementation. Therefore, before the onset of a project, stakeholders need to be involved in project planning, execution, monitoring, and evaluation. Their participation creates project ownership and improves the quality of data because of their monitoring activities. Experience has shown that a lack of stakeholders' involvement has created chaos and poor data along national systems.

Organizational change is both the process in which an organization changes its structure, strategies, operational methods, technologies, or organizational culture to affect change within an organization, and the effects of these changes on an organization. Organizational change can be continuous or occur for distinct periods (Cummings & Worley, 2015). Using the concept of organizational change theory, the findings of the study encouraged the adoption, implementation, and sustainability of health facilities in the improvements of data quality. This is because DQA is a participatory exercise that involve record reviews and interviews with health workers. Moreover, a DQA exercise is an action-oriented activity that includes diagnosis, action planning, and some follow-ups when

deemed necessary. DQA feedback normally leads to significant improvements in terms of collecting and reporting quality data (Xiao et al., 2017). As such, the organizational change theory is complemented with meta-evaluation.

In early 1969 Michael Scriven introduced the meta-evaluation theory as a process that is systematic, managed, and controlled; and which assesses the quality of processes and results of carried-out evaluations. The theory is guided by a data quality standards criterion. The essence is to ensure quality, validity, and accuracy of primary evaluation, thus answering the question of whether key standards have been met in the evaluation; and whether the results can, therefore, be judged as relevant, valid enough, and reliable. Indeed, meta-evaluation fits into DQA. Criteria for data quality that can be assessed by meta-evaluation have been modified by Remr (2009: 4) from the previous source—Eurostat 2003—which explains the importance of data quality assessment in a project or program, and if adopted, how it can improve the performance management of the ascertained program. In this case, this study looked at some criteria to assess the fitness of data for use in ascertaining the performance of the TB reduction program.

2.2 Empirical Studies on DQA on TB Reduction Programs

An assessment of Tanzania's health system by Musau et al. (2011) shows that inadequate number of staff to collect and report data from health facilities is still a problem in many health facilities. It revealed a limited staff dedicated to M&E responsibilities in most of health facilities; and found that there was no evidence to prove that health facilities conduct regular meetings or any other informal gathering to discuss data quality issues. Feedback is critical in improving program performance, data quality, and good governance. However, this study pointed out that there was no feedback provided to health facilities on the quality of their reporting (i.e., accuracy, completeness, and timeliness). All health facilities visited never received supportive supervision from higher reporting levels to check the quality of the data collected. Generally, there was no system in place describing how data moved from health facility along the data chain, and no independent data review due to a shortage of health workers. Musau et al. (ibid.) recommended that the Ministry responsible for health recruit and train staff on data management process; and conducts regular supervision and on-the-job-training to ensure that data collected and reported are of good quality.

Wilms et al. (2014) conducted an in-depth, exploratory assessment of the implementation of the National Health Information System at a district level hospital in Tanzania. They found that all staff members acknowledged data collection as part of their job responsibilities. However, all had concerns about the accuracy of the *Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya* (MTUHA) data. Access to training was limited, mathematical capabilities were often low, dissemination of MTUHA knowledge within the hospital was poor, and a broad understanding of the full capabilities of the Health Management Information

System (HMIS) was lacking. While data collection for routine services functioned reasonably well, filling of the secondary data tools was unsatisfactory. Also, internal inconsistencies between the different types of data tools were found. These included duplications, and the collection of data that was no longer useful. Sixteen of the total 72 forms (22.2%) that make up one of the key secondary data books (Hospital data/MTUHA book 2) could not be completed with the information collected in the primary data books. Moreover, the hospital made no use of any of the secondary data. The hospital's main planning document was its development plan. Only 3 of the 22 indicators in this plan were the same as indicators in the MTUHA; and while the information for 9 more was collected by the MTUHA system, figures had to be extracted and recalculated to fit; while for the remaining 10 indicators no use could be made of the MTUHA at all.

Of the foregoing existing studies, none were specific on the influence of data quality assessment on TB reduction; thus, calling for research.

3. Methods and Materials

This study used an exploratory case study design with quantitative and qualitative approaches at the core of data collection and analysis (Creswell, 2014). The study was carried out in Kibaha and Mkuranga districts (Figure 1).

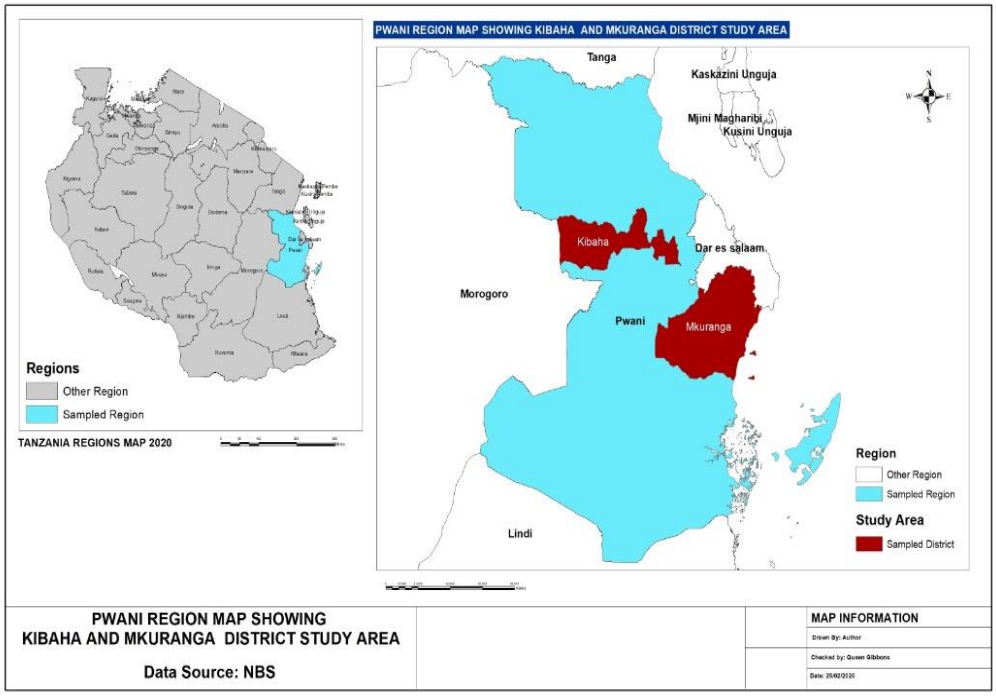


Figure 1: ***The Study Area (Kibaha and Mkuranga Districts)***

This study targeted the data of tuberculosis cases in Kibaha and Mkuranga health facilities in 2019 to assess the five data quality standards: validity, reliability, timeliness, precision, and integrity. The data that was accessed from the office of the Regional TB/Leprosy coordinator and health facilities were selected basing on the high and low volume of TB cases presented. One key informant at each health facility was interviewed. Participants in the study were purposively selected based on their position and experience (Kothari, 2004; Kumar, 2014). A total of 10 facilities were selected for investigation. Key informants were interviewed to triangulate data from document review. Purposively, the study selected the Regional TB/Leprosy coordinator, 2 District TB/Leprosy coordinators, and 10 Direct Observant Treatment (DOT) nurses, one from each health facility. It is these informants who provided information on the data quality of TB. Document review and observation was used to cross-check the information provided by these key informants. Participation in the study adhered to the consent of the interviewees. Data analysis followed content analysis with the use of adapted Measure Evaluation Excel tools (Global Fund, 2011).

4. Results and Discussion

4.1 Verification Indicators for Health Facilities Performance

The findings in Table 1 show the availability of quality controls, but there were fewer spot-checks conducted. Of the 10 health facilities assessed, only St. Vincent Health Center and Tumbi Hospital scored perfect verification.

Table 1: Data Verification for Each Indicator per Health Facilities

Facility Name	Indicator	Recounted	Reported	Verification Factor
Misugusugu Health Centre	TB_ART	2	2	100%
	TB_STAT	1	2	200%
Mkoani Health Centre	TB_ART	6	9	150%
	TB_STAT	49	48	98%
Kongowe Health Centre	TB_ART	1	1	100%
	TB_STAT	9	7	78%
Tumbi Hospital	TB_ART	15	15	100%
	TB_STAT	31	31	100%
Nyumbu Health Centre	TB_ART	1	1	100%
	TB_STAT	5	6	120%
Uzima Mission Dispensary	TB_ART	9	6	67%
	TB_STAT	16	13	77%
Mkurunga Hospital	TB_ART	8	6	75%
	TB_STAT	35	13	37%
St. Vincent Health Centre	TB_ART	7	7	100%
	TB_STAT	13	13	100%
Kisiju Health Center	TB_ART	1	1	100%
	TB_STAT	2	3	150%
Mkamba Dispensary	TB_ART	0	0	100%
	TB_STAT	8	4	50%
Overall performance		**219**	**188**	**85%**

Source: Field data (2020)

This means that the reported and recounted values matched. The remaining health facilities were either under-reported or over-reported on their indicators' data. The overall verification factor was 85%. The minimum percentage allowed for under- or over-reporting is 5% due to human error. However, according to the overall findings there was a divergence of 15%. Hence, it shows that most of the data under-reported the number of TB cases. These results demonstrate poor performance of most of the health facilities with the exception of St. Vincent and Tumbi Hospital. The identified deviations from the reported and the recounted values was mainly due to various reasons, including: source documents, supportive supervision and feedback mechanism, e-files and paper-based file storages, staff knowledge of data elements (indicators), and training.

4.1.1 Performance of the Reporting and M&E System

Accurate reporting and M&E system influences program performance. We relate the availability and completeness of data to explain performance of a program. Figure 2 shows the percentage data availability and completeness for the 10 health facilities studied in the Coast Region.

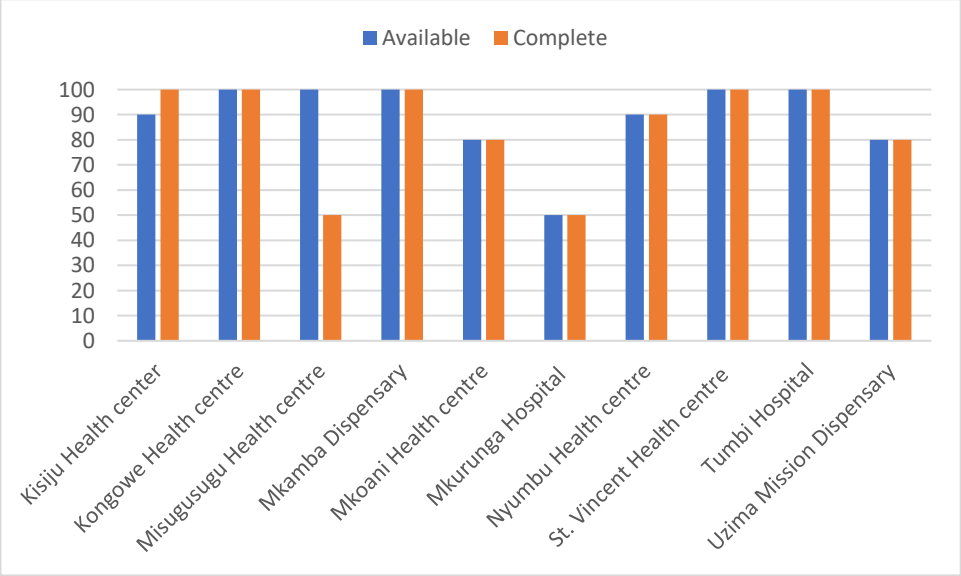


Figure 2: ***Percentage Availability and Completeness for 10 Health Facilities***

Source: Field data (2020)

The findings show that out of the 10 hospitals, only 5 (Kisiju, Kongowe, Mkamba, St Vicent, and Tumbi Hospital) had available data, and filled in the source document. The rest were not fully filled. A complete filling of source documents helps improve the performance of a reporting system, and makes

data more trustworthy for decision-making. Furthermore, of the 10 health facilities assessed, it was hard to find all source documents (registers). Also, in some cases, HIV status and client identification numbers were not recorded, which led to difficulties in recording indicator data. In general, excellent performance was observed in 4 (40%) out of the 10 health facilities assessed: St. Vicent Health Centre, Tumbi Hospital, Mkamba Dispensary, and Kongowe Health Centre. The rest of the health facilities relatively revealed bad performance. Worst performance was particularly observed in Mkuranga Hospital. The poor performance in Mkuranga Hospital was due to transcription error from the database at the hospital, and at the district offices. There were also discrepancies of data because it was not submitted timely to the district level.

Hence, the data presented above shows that the program is not performing well mostly in Mkuranga Hospital, Mkoani Health Center, Uzima Mission dispensary, and Misugusugu in part because of registers being incomplete. It is also shown that facilities with high TB cases are the ones with challenges in reporting. TB reduction programs needs more emphasis on such hospitals to improve their performance, especially when they encounter challenges in reporting, which makes the programs look like they are not performing well on such hospitals. As Majigo et al. (2020) noted elsewhere in Tanzania, as an integral part of the TB reduction program, delivery of care and treatment needs improvement, particularly in Mkurunga, to ensure that effective monitoring and evaluation takes place.

4.2 Factors Influencing Data Quality of TB Reduction Programs

Study participants identified source document, supervision, file storage, staff knowledge and training as factors that influenced the data quality of the TB reduction program.

4.2.1 Source Documents

Ensuring the availability of the data sources is critical in improving the quality of data. The validity, reliability, and precision of the quality of data depend mostly on the availability of source documents. In seven hospitals studied, most of the source documents were found. This implied that the staff were knowledgeable on the importance of source document for quality checks. Missing source documents in the following health facilities compromised the quality of the data: Kisiju Health Center, Nyumbu Health Center, and Mkurunga Health Center. A service provider in one of these health centres said:

> *"We keep past information and data in boxes and send them to stores after they are all integrated in the system, [and] that is why it is hard to get the information now."*

This indicated that the assessed health facilities had major data quality issues. It is difficult for decision- and policy-makers to make decisions if the required information is missing. As a result of the missing source documents, policy-makers can underestimate the magnitude of health problems. Results indicated that 11% of the health facility registers were missing while data quality assessment was conducted. A study conducted in Manila, Philippines, in 2013, found a similar problem of missing source documents (Office of Inspector General, 2013). This study found that 40% of the health facility registers and 20% of the monthly summary report were missing. This means that for accurate decision-making all the data should be available for better implementation and resource-tracking.

4.2.2 Supportive Supervision and Feedback Mechanism

Feedback is critical in improving data quality and good governance. In this study, the feedback on data quality-related issues was provided regularly to TB/leprosy coordinators so as to be updated on any changes in the provision and maintenance of data. One of the DOT nurse reported:

> *"…when we go for supervision we write and leave reports for service providers to know what they have done. If they come here, we sit on the table and discuss ongoing issues face-to-face.''*

The quote above reveals the presence of supportive supervision and feedback. However, from observation we noted that inadequate feedback was provided to DOT nurses in health facilities on the quality of their reporting as accuracy, completeness, and timeliness of the data were unknown to key informants. Evidence from other studies complements these findings: that feedback needs to improve data quality and be provided regularly after data have been received and checked for correctness, accuracy, and completeness (Mphatswe et al., 2012; MOH, 2012; Glèlè Ahanhanzo et al., 2014). In the present study, one DOT nurse noted the inconsistency in the provided supportive supervision thus:

> *"We are provided with supportive supervision when we are first employed. After that the only thing that we are receiving is feedback on the quarterly meetings conducted."*

In addition, the assessed health facilities received less supportive supervision consistently from higher reporting levels to check the quality of collected data. As such, health facility service providers fail to improve data quality since they are not notified about the quality of their submitted data. Abdelhak and Hankin (2001) also found inadequate data communication among data producers and users as an issue undermining program performance. According to Mutemwa (2006) supportive supervision is one of the factors enabling data producers and users to improve the quality of data. It helps them address all data obstacles existing in the health information management system. Since regular feedback and supportive supervision improve the quality of data (Ledikwe et al., 2014), Stakeholders in the Coast Region TB reduction program should improve in this aspect.

4.2.3 E-files and Paper-based Files Storage

There were well-stipulated confidentiality protocols on the storage of personal information at the health facility level, where primary source documents are kept. Moreover, registers require clients to be registered using identification numbers only to maintain confidentiality. Also, the databases (electronic TB/Leprosy database) and project computers at the regional and district levels had a password to prevent any data manipulation from unauthorized personnel. Some health facilities stored their paper-based files in boxes. This practice causes data loss and difficulties in retrieving information. So far, health facilities lack documented guidance on filing system storage. One of the key informant noted the storage of paper-based files as a challenge:

> *"There is a lot of paper work in health facilities. A DOT nurse has tones of papers, registers for patients, and sometimes has to enter data into the computer. I would suggest if there could be help from a data clerk who deals with data … it will improve storage and accuracy of data".*

However, results indicated that 4 health facilities had no proper way of keeping their registers, and anyone/unauthorized person could access the client information data easily. In this case, the paper-based data lacked integrity. Data quality assessment report findings came up with similar findings where the government of Botswana had no written confidentiality protocol that can be adhered to (Ledikwe et al., 2014). In addition, to identify numbers, other means to safeguard personal information, especially at the lower reporting levels, is highly recommended (Mphatswe et al., 2012, MoH, 2012).

4.2.4 Staff Knowledge of Data Elements (Indicators)

Seven of the staff had knowledge and understanding of what to be counted and reported; which source documents to use; to whom a report should be submitted; and when a report is due to increase data validity, reliability and timeliness. The findings also revealed that this knowledge is very high at the higher reporting levels than at the lower reporting levels (health facility). Limited knowledge at the lower reporting levels was attributed to less regular training provided on occasional basis as the project phases out. One service provider said:

> *"People from KNCV foundation used to train us on how to report the indicators and fill in the registers, but since the project has ended, refresher training disappeared and the COVID 19 happened: hence we couldn't plan for any further training."*

Some service providers at health facility levels used irrelevant monthly summary reports, some of which included clients with no TB status under the indicators used for this study. Moreover, service provides across most of the health facilities were not sufficiently trained in the data management process. This shows how important staff training on data elements and data collection tools is needed to increase the performance of the TB reduction program. One participant voiced this by saying:

"Training has helped me a lot. There were things I didn't know at first, but now I know them. I just hope the training that different programs used to provide could come back and continue updating us."

Staff training on what to be counted, and on other reporting guidelines, increases data validity, reliability, and timelines (Chisinau, 2011). This is corroborated by a study conducted by Judice et al. (2011), which concluded that staff knowledge improves the quality of data. In Tanzania, Simba et al. (2006) concluded that HMIS knowledge is very crucial for staff to ensure that all data quality issues are addressed on a daily basis. Recording data to register per indicator requirements needs staff or service providers who are knowledgeable on data management processes. Moreover, service providers need to know how to generate and analyse information per indicator definition requirements (Simba et al., 2006).

4.2.5 Quality of Training Provided

The findings revealed that training on the methods and use of data collection and reporting tools are being conducted annually to update new staff on the TB cases platform, and refresh those who are already in. A TB coordinator put it thus:

"Every one of us needs to attend an annual training, which is done in different batches, at least one training a year… [and] coordinators keep updating DOT nurses."

During the assessment—especially during the desk review of health facility registers—the researchers noticed that some of the data elements were not completed as per instructions on how to fill in registers. It was noted that service providers had inadequate knowledge on what information to fill in the registers. Also, some health facilities had incomplete registers as the number of HIV-positive clients were neither indicated new nor relapse. Inadequate neatness in filling data collection tools creates data suspicion during the data verification exercise. In a few health centres, the HIV status of TB treatment cards was not filled for some patients. All these data quality issues raised questions and doubts about the training provided to the data personnel. Hence, it is advised to provide refresher courses regularly—instead of annually—to enable DOT nurses fill in registers properly. In this regard, two service providers said:

"There is no stability or retention of staff. I have trained them and tomorrow they are gone so I have to train another one: it is a challenge, especially in health facilities."

"I think there should be a 'must-course' included in all health universities on data management and HMIS as one of the courses a doctor or nurse should study. Data is not collected only by the data-focal persons: if other workers do not know about it, I cannot get accurate data."

Literature indicates that insufficient training impedes the quality of data. A study conducted in Uganda came up with a similar findings: that training on data management was not provided (Mandelli & Giusti, 2005) adequately and regularly. Training should be provided adequately and regularly because it has a great impact on knowledge and skills to health service providers. In the

effectiveness of data management, training tends to reduce the cost for on-the-job-training and mentorships. Similarly, quality training should go hand in hand with the improvement of the M&E system.

5. Conclusion and Recommendations

The paper has revealed that DQA is central in improving programs performance in terms of meeting quality standards and tackling factors affecting data quality in TB reduction programs. Also, it has shown that health facilities with limited resources perform poorly with inadequate or misleading information and are unlikely to reduce cases of TB infections. Some facilities' data management processes assessed in this paper were not well structured due to low quality and knowledge of staff, particularly DOT nurses, on evaluation expertise, which has led to poor program performance. Thus, enhancing the training of DOT nurses, and data management and reporting systems is recommended to improve the performance of the TB reduction program.

The stakeholder theory, meta-evaluation and organizational change were applied to determine programs performance. The theories enabled us to understand how stakeholders -- including Governments and NGOs -- are collaborating in conducting data quality assessment to improve the performance of the TB reduction program. The findings revealed that data management, M&E, and reporting systems should be in place to ensure good program performance. However, in some facilities data management processes were not well structured due to low evaluation expertise and quantity of staffs, which has led to poor program performance.

Based on the findings and conclusion, we recommend the following. First, there is a need for the government, particularly the ministry responsible for health, to support health facilities maintain proper filing of all original source documents through appropriate training and routine support supervision visits. Among others, staff at health facility levels should be exposed to the national data retention policy. The retention policy requires that source documents (government data) be kept for more than 3 years before being discarded. Second, health facilities management/authorities should conduct on-the-job training, mentoring, and coaching on the proper filling of client cards and unit registers. Moreover, there is a need to observe that clients' information is kept in confidential-client files/cards and unit registers. These should be stored in locked cabinets or in places where they cannot be accessed by unauthorized personnel.

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