

Quality and Use of Routine Healthcare Data in Selected Districts of Eastern Province of Rwanda

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Abstract

Strengthening of Health Management Information System (HMIS) is becoming an unavoidable task for most health systems in the World. As part of the strengthening (of HMIS), it is imperative that stakeholders undertake periodic studies on HMIS-data quality so as to gain insight into the level of quality and cause corrective action. This study evaluated the quality of HMIS, factors influencing quality (of HMIS), use of data generated from HMIS and factors influencing use of data in 3 districts of Eastern Province of Rwanda. We employed a descriptive cross-sectional study design focusing on 9 months from 1st July 2012 to 31st March 2013. To achieve this we conducted HMIS data quality assessment through checking of presence of selected registers and client/patients' cards, deviations between reported patient statistics and those in the appropriate registers, reports with at least 95% of the data fields well filled, expected reports received at the receiving hospitals, reports received by due date and evidence of data use from a set of criteria. We further conducted key informants interviews with the health facility managers and records officers on factors influencing the observed data quality; use of data and associated factors. We found that though every 'register of interest' was available in all the health facilities, client/patients' cards experienced severely stock out over the months under study. Low proportion of health facilities attained the a priori for availability of ANC cards (58.0%), Partograms (56.8%), Child Health Cards (59.5%), Family Planning user cards (78.1%) and Outpatient medical forms (57.4%). High proportion of health facilities had good quality of (accurate) health facility reports (73.3%) and those in the electronic data base (70.6%). Similarly, high proportion of health facilities met the quality standard for content completeness (97.6%) in addition to high proportion of expected reports received at the receiving hospitals (97.7%). The overall timeliness of reporting of HMIS monthly reports stood at 93.8%. Data were rarely used in the health facilities and this was majorly enhanced by the top-down approach to setting of targets and planning. We concluded that levels of data accuracy, completeness and timeliness in the situation of Rwanda did not match the rhetoric that data quality in health systems in developing countries is poor. The few lapses identified could have been associated with factors we did not statistically verify. Use of data in our study health facilities was inadequate and the self-reported use (of data) could not be backed by evidence from our observations. The top-down nature of planning greatly prevented the operational-level managers from using data.

Keywords

Quality, Healthcare Data, Routine HMIS, Selected Districts of Eastern Province, Rwanda

1. Introduction

Strengthening of Health Management Information System (HMIS) is a challenging but inevitable task developing

countries continue to face. Healthcare data is of no use unless otherwise, accurate, processed and used to inform decisions on resource allocation (including human resource for health recruitment and distribution), policies, service delivery, cost-recovery, supervision and other components geared

towards generating health actions hence responsive to the local situations [1]. Overtime human and financial resources have been committed to collect data which in most cases are of unknown quality. Periodically, data collection and reporting tools have been devised, improved, re-defined and adopted in seminars and workshops with little progress made on putting into practice proceedings from most of these discussions. If data is not put into information or the generated information is not put to use by policy makers, planners, healthcare managers and/or providers, motivation to collect quality data wanes. Similarly, if data quality is poor, it may not be used (for decision making) unless the user is ill-informed on the quality lapse – in such a case, decisions arising from use (of such poor quality data) are not reliable. It is therefore, implied that poor data quality is both a cause and consequence of non-use of data in many healthcare settings.

With the World becoming a global community, standardization of actions is pushing pressure on ‘data poor’ countries to embrace data quality and use in order to match the data-demands of this post-modern era. United Nations Children’s Fund (UNICEF) argues that, efforts should be made to improve availability and quality of population and health facility data in order to meet the growing demand for healthcare [2]. The United Nations and other agencies have been discussing targets and standards for the post Millennium Development Goals’ era and demand for strict monitoring of progress to the set goals and targets. Accordingly, they recommend annual review of data to assess progress and strongly envisage assessing data quality before the reviews as a practice [3].

Many countries spend great deal of time and money on the activities and systems involved in collecting and analysing data, yet there remains a lack of confidence in some of the information produced from these data. As reliance is placed on increasing ‘performance information’ in performance management and assessment regimes, the need to demonstrate that the underlying data are reliable has become more critical. The National Health Service of England among others places accuracy and timeliness of data as one of the pre-requisites for contracts [4]. Reference [5] notes that availability of high quality information does not guarantee its appropriate use in the decision making process and adds that health information systems are ‘data-driven’ (systems) that tend to measure success basing on the quantity of data produced. They (data-driven systems) should instead be both ‘data and action-driven’ and measure success basing on the quantity and quality of data produced for decisions and actions to succeed. This sentiment underpins the need for high quality local monitoring and evaluation data since it is the main source of preferred evidence for health policy by local health authorities. Data requirements are frequently chosen without taking into account the technical skills of the health workers collecting the data in the peripheral health facilities [6]. A qualitative study that evaluated policy-stakeholders’ views regarding the kind of evidence required to inform policy reports different level of evidence required at different levels – the national Ministry of Health and the district health managers demand

local evidence from routine monitoring and evaluation data; and reports from service providers [7]. Despite the desire for use of local evidence to inform policy in many low-income countries: especially based on data locally generated from monitoring and evaluation systems (like HMIS), quality of such data remain widely questionable unless otherwise, reviewed and acted upon. The World Health Organization reports insufficient monitoring and evaluation, inadequate quality, incomplete and late submission of data produced through the routine health recording and reporting mechanisms. It (World Health Organization) proposes that: data should primarily be used at service-level and reporting to higher-levels should come after satisfying local data needs; health data should be used to analyze and solve important health and service problems; and that priority attention should be given to improving data generation and use at the local level.

This study was a response to the sentiments raised herein. We aimed to assess data quality in a systems perspective. Specifically, we looked at availability of HMIS inputs, accuracy, timeliness, completeness and use of HMIS data/information and factors influencing use of data.

2. Methodology

2.1. Study Setting

We conducted this study in three districts (Bugesera, Kayonza and Rwamagana) of the Eastern province of Rwanda. The other districts that make up the province include; Gatsibo, Kirehe, Ngoma, Nyagatare and Rwamagana. Eastern province has 106 health centres and 9 district hospitals. Of the 106 health centres, 14 are private not for profit while 3 of the 9 district hospitals are the same. Each health facility has a data manager responsible for data collection and processing. All the health centres offer minimum health care package (‘Packet Minimum d’activité’) while all the district hospitals offer the complementary health package (packet complementaired’activité) of Rwanda.

2.2. Study Design, Population and Sampling

This was a descriptive cross-sectional study that adopted the triangulation mixed-methods approach of data collection and analysis. The objectives of the study were to assess; availability of inputs required for generation of healthcare data, accuracy of healthcare data, completeness of healthcare data, timeliness of healthcare data, factors influencing quality of data, use and factors influencing healthcare data use. For the source documents, we specifically looked for physical presence of print copies of the nationally-recommended out patients register; family planning client card and register; delivery register and partograph; antenatal care register and antenatal care cards; and child health cards and immunization register. We noted the presence (or absence) of the registers and client/patients’ cards during the nine months preceding this study (1st July 2012 to 31st March 2013). For the same duration and period, we computed count of client/patient

records from the registers that served as the 'gold standards'. We then counted the same statistics from the health facilities' hard copy reports and electronic data bases on monthly basis. We referred to comparison of count of client records from registers and hard copies of health facility reports as accuracy 1 and those of registers and electronic data base as accuracy 2. We evaluated both content completeness (level to which expected data sets/indicators on the reporting forms are completed) and proportion of expected reports received at the district hospital (coverage with reporting). Data collection focussed on the 9 months preceding this study. At health facility level, a complete report meant that with up to at least 95% of all the relevant data sets filled in while completeness at district level meant receipt of at least 95% of all the expected reports for the district for a given period/month. Timeliness meant a report received at the district level by the due date for the prescribed period. A district was said to be practicing quality reporting if at least 95% of the health facilities reported timely. For data use, we employed presence of health facility-level population stratification (per service) and display of trend charts for key national health indicators and observed for 'mention' of specific data sources in minutes of management and planning meetings. We qualitatively obtained factors influencing data quality and use through in-depth interviews with health facility and district healthcare managers: including with members of the management of committees of the health facilities. In order to compute the sample size for the health facilities, we employed the Kish-Leslie formula for infinite population at 95% level of confidence, +/5% desired precision and 50% prevalence to arrive at 384.16 health facilities before adjusting for a total of 40 health facilities to arrive at minimum sample size of 37 using the Cochran's formula. From each district, we selected a proportionate number of health facilities using simple random sampling in order to attain the required sample size – initially per district then on, merged. Managers and data collectors were purposively selected for in-depth (key informant) interview due to their wealth of knowledge and experience related to management of HMIS. In addition, we included members of health unit management committees or boards for in-depth interviews for similar reasons.

2.3. Data Analysis

We analyzed quantitative data using Microsoft office excel in majorly proportions. We computed median/mean availability of the source documents and employed at least 98% median/mean availability as a measure of availability, hence good quality of inputs. Accuracy was measured using percentage deviation (+ or -) of the related data in the data base from each source document with +/- 5% deviation as our benchmark for accuracy. For completeness at the health facility, we assumed a complete report whenever at least 95% of all the data points were entered in that report. For each of the above indicators, a district had quality only if at least 95% of the health facilities met our a priori benchmark. At district/hospital level, completeness referred to proportion of health facilities that submitted a given report and a

district/hospital had complete report if at least 95% of its health facilities reported for the given period. We employed proportion of health facilities with the observed charts and/or minutes as measure of data use. A given district was reporting as using data of at least 95% of the health facilities met the data use criteria for the study. Qualitative data were analyzed using content analysis for factors influencing use of data. Whereas quantitative methods formed the basis for assessing quality and use of data, qualitative aspects were later employed to assess factors influencing the observed level of quality hence explanatory mixed methods approach for design and analysis for use of data; and associated factors.

2.4. Quality Control

We trained the research assistants for two days to get a harmonized understanding of the data collection tools. The data collection instruments were pre-tested in one health centre not sampled for this study (Nyarugenge health center) in Bugesera district. In order to prevent data manipulation, the health facility staff only availed the data sources but did not participate in collection since they would be biased. Data entry took place each day a given data set was collected and for any observed unusual pattern, we communicated to the health facility staff to get clarification.

2.5. Ethical Consideration

The faculty board of Faculty of Health Sciences, Uganda Martyrs University offered ethical clearance for this study. While in the field, we sought written consent of all relevant authorities and informed consent of the respondents (verbal) before continuing to collect data. In this report, we have made no reference to individuals in order to take care of confidentiality of the respondents. In addition, the data we generated was used only for this study.

3. Results

3.1. Availability of Source Documents

For the purpose of this study source documents refer to the Outpatient prescription cards and registers for (outpatients' data), client cards and register (for family planning data), delivery registers and partographs (for intra-partum care data), ANC registers and ANC cards (for antenatal care data) and child health cards and immunization registers (for immunization data). Our report is based on the observations for the period 1st July 2012 to 31st March 2013.

We measured monthly availability of source documents and a health facility had source documents available if it had them available for at least 98% of the months under study. The districts health facility-months for our study were 99 health facility months (11 health facilities by 9 months of data collection) for Bugesera district; while Kayonza and Rwamagana districts each had 117 health facility months of observation (13 health facilities each by 9 months). During our study reference period, none of health facilities experienced stock out of any of the registers under study. However, there

were variations in availability of client/patient cards (table 1) – majority of the health facilities had each of the cards. Family planning user cards were most available while partographs were least available in the region. On average, 61.9% of the months had the client/patients' cards available (lowest: 49.1% [Bugesera] and highest: 73.5% [Rwamagana]).

3.2. Accuracy of Data

Accurate data were seen in a report with percentage deviation of +/- 5% (count in report minus count in register divided by count in report times 100). Any deviation of more than 5% was regarded inaccurate data and the inaccuracies we found were associated with over-reporting hence the reason for the positive deviations documented herein (table 2). The recount of data in the clinical/client registers for the nine months compared with the reports in the health facility HMIS-hard copies during the same period (what we refer to as

accuracy₁ of reporting) showed variations in levels of accuracy among districts – Kayonza with least proportion (65.0%) of health facilities with accuracy₁ while Rwamagana had the highest proportion (82.1%) of facilities with same. A similar trend of accuracy was observed comparing clinical data from the registers with the monthly reports entered into the electronic data base (what we refer to as accuracy 2) – this time round, Bugesera district had the least proportion (68.7%) of health facilities with accurate data while Kayonza rose to district with highest proportion of facilities with accuracy (71.8%).

Majority of the health facilities in all the districts accurately transmitted data from registers to health facility monthly reports and electronic data bases – the regional proportions of health facilities with accuracy₁ and accuracy₂ stood at 73.3% and 70.6% respectively (table 2)

Table 1. Availability of client/patients' cards/forms.

Document	Bugesera (n _B = 99)		Kayonza (n _K = 117)		Rwamagana (n _R = 117)		Total (n _T = 333)	
	98-100%	<98%	98-100%	<98%	98-100%	<98%	98-100%	<98%
Antenatal cards	56 (56.6%)	43 (43.4%)	53(45.3%)	64(54.7%)	84 (71.8%)	33 (28.2%)	193 (58.0%)	140 (42.0%)
Partograms	57 (57.6%)	42 (42.4%)	60 (51.3%)	57(48.7%)	72(61.5%)	45(38.5%)	189 (56.8%)	144 (43.2)
Child health cards	35 (35.4%)	64(64.6%)	72(61.5%)	45(38.5%)	91 (77.8%)	26 (22.2%)	198 (59.5%)	135 (40.5%)
Family planning users cards	59 (59.6%)	40 (40.4%)	102(87.2%)	15(12.8%)	99(84.6%)	18(15.4%)	260 (78.1%)	73(21.9%)
OPD medical forms	36 (36.4%)	63 (63.6%)	71(60.7%)	46(39.3%)	84(71.8%)	33(28.2%)	191 (57.4%)	142 (42.6%)
Total months (n=1,665)	243 (49.1%)	252 (50.9%)	358 (61.2%)	227 (38.8%)	430 (73.5%)	155 (26.5%)	1,031 (61.9%)	634 (38.1%)

Note: 98-100% means facilities with good quality/adequate inputs while those with <98% have poor quality/inadequate inputs

3.3. Completeness of Reports

We looked at the health facility monthly reports with the a priori assumption that if 95% or more of the data points in the HMIS monthly report were filled, it was taken as complete reporting (content-completeness) while the reverse is true for incomplete reporting. The median proportions of months with content-completeness were 98% (Bugesera), 96.6% (Kayonza) and 98.3% (Rwamagana) – all reflective of high level of completeness. Since district hospitals in each of the districts were the data centres for receiving the health facility reports, reference to completeness of reporting is made to hospitals (not the districts). The hospitals include Nyamata hospital (Bugesera district), Rwinkwavu hospital (Kayonza district) and Rwamagana hospital (Rwamagana district). Coverage with completeness of the reporting health facilities was equally high in all the hospitals. Nyamata hospital (Bugesera district) received all the reports for each of the months under study. Rwinkwavu hospital (Kayonza district) missed 1 report each in July and December 2012 and 2 reports in February 2013. Rwamagana hospital (Rwamagana district) missed 1 report each in September, October and December 2012 and 2 reports in November 2012. The median regional months of complete reporting (for content completeness) stood at 44.4% (district range: 55.6% to 100.0%). The regional average for proportion of expected reports received at

the hospitals stood at 97.7%.

3.4. Timeliness of Reporting

We assumed 80% of reports required to be timely in order to address information needs of the district timely as such; any district with 80% of the monthly reports received on time were categorized as having good quality in terms of timeliness. Generally the region met the cut off for timeliness for all the months aggregated though only 69.2% of the health facilities in Rwamagana had early reporting in December 2012 (average 94.0%). The proportion of facilities with timely reports (for all the months) ranged from 90.9% (in Nyamata hospital) to 96.6% (in Rwinkwavu hospital). The overall timeliness of reporting of HMIS monthly reports stood at 93.8%.

3.5. Factors That May Influence Data Quality

We explored factors that may influence data quality focusing on; functions and capabilities of the managers, location of the health facilities, availability of job aides, data management processes, internal controls (e.g. to prevent double counting). All the (37) health centres had data managers' positions filled, 17 of whom had ordinary diploma in Nursing, 11 had ordinary diploma in social sciences and 9 had ordinary diploma in information technology. Nineteen of

data managers had received training on data management process and tools and all data managers received refresher training within 3 years preceding this study. All the in-charges of the health centres were nurses. Twenty three of the 37 managers had ordinary diploma while 14 had higher diploma. Thirty-three in-charges reported reviewing reports prior to submission whereas 4 did not.

We asked the key informants about distance of the health facility from the nearest hospital to which it sends routine reports. Majority (67.6%) of the health facilities lay beyond 10 km from the receiving hospitals. The mean distance between the district hospitals and the health centres were 20.7 km, 24.2 km and 18.6km for Bugesera, Kayonza and Rwamagana districts respectively. Indicator definition manuals were available in 21 of 37 health centres. Thirty four (of the 37) data managers demonstrated knowledge of the definition of selected indicators while 32 (of 37) data managers knew where the reports should be submitted. All the health facilities had guidelines on the formats in which the reports should be submitted.

There were no quality controls in place when data from paper-based HMIS were entered into the computer (e.g. double entry, post-data entry verification) in all the 37 health centres. The staff in all the health centres reported having received feedback on the quality of their reporting during integrated supervision but this was only verbal and there was no written note to back it. There was no documented and actively implemented database administration procedure in place in all the 37 health centres. In all the health centres, within each point of service clients receiving the same service twice in a reporting period were being registered as new cases or old cases to avoid double counting. Clients receiving the same service in two different locations were tracked in registers and tally sheets to avoid double counting in 35 of 37 health centres. The relevant National forms/tools were being used in data collection and reporting in most of the health centres: only a few health centres were using ink-ruled papers adapted for the same purpose. Data were being reported through multiple channels; to the National information system and vertical program donors. Reporting deadlines were not harmonized with the relevant timeline of the National program

and donors. This caused anxiety and fatigue to the data managers. There was a unique identification number that follows a national design for all health centres.

3.6. Use of Data and Associated Factors

Of the 68 health centre in-charges and data managers interviewed, 28 (41.2%) knew their catchment population. Only 17 (25%) health centre in-charges and data managers determined the targets for key healthcare services utilized. Displayed and documented graphs showing among others service coverage, disease trends, medicine consumption, vaccine wastage, monthly revenue and monthly expenditure was observed and verified in 9 of 37(24.3%) health centres. All the health centres had strategic and operational plans but these plans were not based on evidence as baseline was not set using HMIS and none of the health facilities had a quarterly plan. In all the 37 health centres, annual work plan (July 2012/June 2013) were documented but only 14 of 68 (20.6%) in-charges/data managers knew how to calculate the baseline information. Quarterly/semester evaluation of annual work plan (July 2012/June 2013) were documented but only 29 of 68 (42.6%) in-charges/data managers knew how to conduct evaluation of the set targets. Thirty (44.1%) of the in-charges/data managers reported using HMIS data. Of these, 9(30%) said they used HMIS data for procurement of drugs, 3 (10%) said they used HMIS data for ordering mosquito nets, 10 (33.3%) said they used HMIS data for requesting for funds from the district administration authorities and 8 (26.6%) reported using HMIS data for assigning tasks and payment of community health workers.

We further asked the respondents to mention any one decision informed by evidence from HMIS a month preceding this study. Sixteen of 30 (53.3%) respondents used HMIS data to take decision on amount of vaccines to be ordered, 7 (23.3%) said they used HMIS data to take decision on hiring more staff and 7 (23.3%) said they did not recall using HMIS data when taking decisions. On the question of who were the primary stakeholders in the use of health information, most of the respondents mentioned Ministry of Health and none mentioned the health facilities.

Table 2. Accuracy of reporting.

% deviation	Bugesera (n=99)	Kayonza (n=117)	Rwamagana (n=117)	Total (n=333)
Accuracy 1 (deviation of hard copy reports from registers)				
0-5 (accurate)	72 (72.7%)	76 (65.0%)	96 (82.1%)	244 (73.3%)
>5 (inaccurate)	27 (27.3%)	41 (35.0%)	21 (17.9%)	89 (26.7%)
Total health facility months	99 (100.0%)	117 (100.0%)	117 (100.0%)	333 (100.0%)
Accuracy 2 (deviation of reports in electronic data base from registers)				
0-5 (accurate)	68 (68.7%)	84 (71.8%)	83 (70.9%)	235 (70.6%)
>5 (inaccurate)	31(31.3%)	33 (28.2%)	34 (29.1%)	98 (29.4%)
Total health facility months	99 (100.0%)	117 (100.0%)	117 (100.0%)	333 (100.0%)

Table 3. Content completeness at health facilities.

% completeness	Bugesera (n=99)	Kayonza (n=117)	Rwamagana (n=117)	Total (n=333)
95-100	97 (98.0%)	113 (96.6%)	115 (98.3%)	325 (97.6%)
<95	2 (2.0%)	4 (3.4%)	2 (2.7%)	8 (2.4%)
Total months	99 (100.0%)	117 (100.0%)	117 (100.0%)	333 (100.0%)

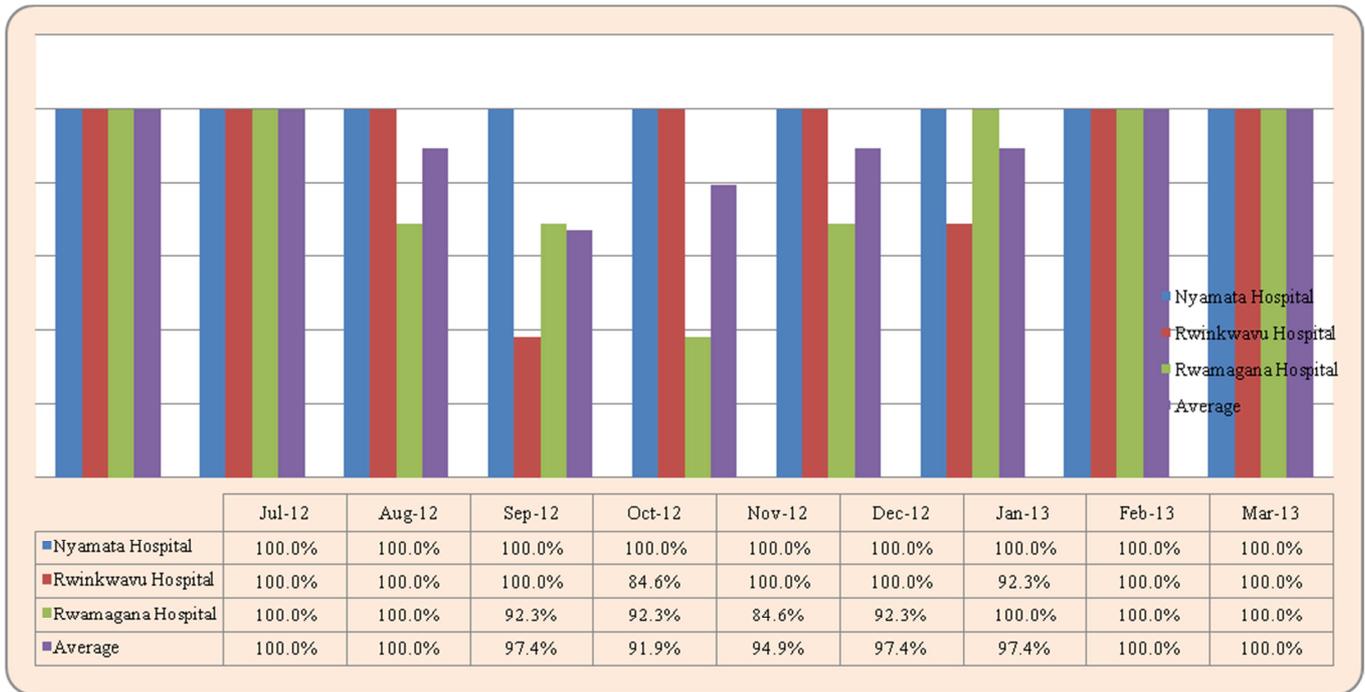


Figure 1. Expected reports received at the district hospital (coverage with reporting).

On whose interests are most served by health information data, 38 of 68 (55.9%) respondents mentioned Ministry of Health and the district administration while 11(16.2%) respondents mentioned Ministry of Health and only 19 (27.9%) respondents mentioned the health centres and the district administration.

All the respondents reported submitting HMIS monthly reports to the district hospital. Twenty seven (39.7%) of the respondents reported having received feedback on HMIS monthly reports they submitted. On the number of times the respondents received feedback in the preceding nine months, 14 of 27 (51.9%) respondents answered four times, 7 (25.9%) said three times while 6 (22.2%) mentioned two times. Twenty-three of 37 (62.3%) health managers reported having held staff meetings once or twice in the quarter preceding this study and that HMIS data were discussed. Unfortunately, there was no indication that HMIS data were discussed in the documented previous staff meeting minutes to confirm this assertion. The majority (90%) of the Health Unit Management Committee members reported holding meetings: officially quarterly and any other time the president deemed necessary. They generally perceive their role as overseeing financial management and not data use. One of them said,

We are not nurses to have interest in the number of patients treated. We are only interested in the amount of money spent and how it was used.

This suggests that HUMC members did not know their role in planning and evaluation and this could have a negative effect on data use.

The 84% of key informants reported multiple data sources as an impediment to data use. They added that data sent to the Ministry of Health were computerized while data requested by the donors were paper-based. Furthermore they were not sure

of the quality of the data from the community health workers. With these factors, they saw it impossible to confidently make use of data. Low technical capacity, especially in computerized data analysis further hindered use of data. This was associated with high staff turnover implying that, mostly inexperienced staffs are left to work and move on after gaining experience. All these were made worse by manual analysis of data that is prone to error hence reliability question. A male key informant had this to say,... can you imagine analysing twelve HMIS monthly reports manually prior to planning period.

Top-down approach to target-setting prevented health facilities from using data for planning their local health needs. The targets were most of the time set at the national and district levels and this dissuaded them (health facility managers) from using their own data. Similarly indicative planning figures for the following fiscal year were rarely communicated to the health centres as such, the managers saw it as waste of time to plan for nothing or what they did not understand.

Some of our funders release money which we have not budgeted for and more so towards the end of the financial year to escape the blame of under utilization of the budget.

4. Discussion

While all the registers were available in the study health facilities, low proportion of health facilities met the 98% standard for availability of any of the studied client cards that include; antenatal client cards, partograms, child health cards, new family planning acceptor cards and outpatient client cards. An assessment of functionality of HMIS in Uganda reports variability in availability of registers and HMIS forms

across health facilities – the private not for profit health facilities had printed registers and photocopied HMIS forms whereas public health facilities majorly used counter books [9]. Such occurrences are not uncommon in Eastern Africa since inadequacy of data collection and reporting tools have been echoed in Kenya [10] though this finding only compares with inadequacy of pre-primary tools (patient/client cards) in our study. The data that goes through the hierarchy of reporting is got from these source documents hence their lack results into improvising of the missing cards and this can be associated with errors of capturing less of the required or more of the un-wanted variables. Errors made in filling the source documents are likely to affect accuracy and content completeness and the general data quality. The same errors could be transcribed to the health facility database through the hierarchy of reporting to the national level. Rwamagana district had the cards most available and equally recorded the most accurate health facility reports among our study districts though we did not observe a definitive relationship between availability of the clients cards and accuracy of health facility HMIS between Bugesera and Kayonza districts. Generally, slightly less than three quarters of the health facilities had accurate health facility reports. Rwamagana and Kayonza districts had close to average (70.6%) proportion of health facilities with accurate reports in the health facility database. The region met the quality standard for timeliness of report though this was not the case in Rwamagana district. This finding is surprising given that Rwamagana district had most available client cards and averaged as the best of the districts in accuracy¹ and accuracy². Similarly, the average distance from the reporting health facilities was least in Rwamagana and this implies that factors other than distance do influence timeliness of reporting. Close to all the health facilities in the region had good quality of ‘content-completeness’ of HMIS. These findings are surprising given that several studies [11], [12], [13] document poor quality of data in several African countries. Proportion of reports received at the district hospitals were equally high with at least 90% of reports received at the district hospitals each month. On average, 97.7% of all the reports for the region were received. This could have been as a result of the presence of electronic reporting system that has been (reportedly) associated with improved proportion of health facilities reporting on outpatient and in-patient services elsewhere in Uganda [12]. An earlier study that assessed completeness and internal consistency of data over a period of five years in Rwanda documents progressive improvement in Rwanda’s data quality. In that study, completeness grew from 88% in 2008 to 95% in 2012 [14]– a finding consistent with ours that perfectly fits within the trend of continuous improvement. The low (44.4%) median regional months of complete reporting is suggestive of recurrent months with missing reports. Such recurrence is a pointer to a systems problem that is not responding to lapses in report received at the hospitals. For a fully functional and responsive reporting system, we would expect most of the months with full reports in and specific months overridden by cross-cutting events that should have

led to lack of reports in such months. Long distance from the receiving health facilities may be responsible for this recurrent lapse since absence of transport may worsen this situation. Tagging support supervision to the most distant health facilities towards the deadline for reporting and integrating pick-up of the missing reports by the receiving hospitals could address this challenge. Timeliness of reporting ranked high on average though one district had less than three quarters of the health facilities reporting timely. This high timeliness of reporting contradicts the rhetoric that good quality data is hard to come by in developing countries [13]. Stakeholders need to understand that with computerization of HMIS in the District Health Management Information System² software hope is growing up regarding data quality. Uganda clearly demonstrated that this electronic software can make tremendous contribution to improving data quality – the Ugandan study having looked at completeness and timeliness of data [12]. The observed lapses in Rwanda’s data quality could have been associated with long distance from the receiving hospitals, inadequate checks of reliability of paper-based and electronic data entries. However, staffing with qualified data managers, knowledgeable in-charges and data managers on HMIS, review of reports by in-charges, checks to prevent multiple entries on patients were strengths of Rwanda’s HMIS and probably the secrets behind the upward and consistent trend in quality of HMIS. A study in Zambia has shown that filling of the available posts of data managers is not enough unless with persons formally trained in data management [15]. The World Health Organization recommends countries to keep the detail of HMIS data at source and that data forwarded to higher level should be maintained at minimum [16]. Reference [16] further highlights that countries need to specify data elements to be reported, recipients of data/data elements, frequency of reporting and the form in which to report during HMIS development process. In this study, different channels of sending data to the national level, including to vertical programs and some donors with variable timelines is a strain to the data managers at the health facilities. It is imperative that, all reports follow specified channels and where possible, partners be given access to electronic data bases to access facility-level data so as to reduce additional work load on the health facility staff.

Use of data for decision making at points of generation was limited in all the study districts. Of the avalanche of decisions made at the health facilities, only on ordering of vaccines that more than half of the managers made use of data. This could be as a result of high national interest in immunization activities and the associated frequent support provided by the district, regional and/or national immunization programs (to the health facilities). The poor culture of data use, top-down approach to target-setting, lack of awareness of planning role (of health unit management committees) and concentration of health unit management committees on only financial management are inter alia, contributors to poor use of data at the health facilities in the study districts. Consistent with our findings, earlier authors document progressive improvement

in quality of HMIS data [14], [17] though there remains a big challenge of demonstrating use of data to inform decision at district, sub-district and health facility levels [17] and other developing countries. The Health Information Systems Knowledge Hub, School of Population Health, University of Queensland [18] add that in addition to inadequate resources required to produce quality HMIS, lack of support from supply perspective and lack of incentive to correct crude data collected prevent decision makers from using data they deem poor quality. As a consequence, those who generate data pay little attention to improving quality of data since no one will use the data [19]. Reference [18] recommends that central health information systems should make their subjects disseminate data on clear schedule in order to address the status quo though the recommendation may not be enough to stimulate maximum gain in quality. The health centre managers felt it was not worth using data to plan for amount of funds that they were not aware of since some of them did not have knowledge of their indicative planning figures. It is imperative that planners of the health system establish a mechanism to communicate indicative planning figures in order to prevent such excuses since they(indicative planning figures) are just 'a negligible' piece of data compared to that at the disposal of the health facility managers.

5. Conclusions

This study has highlighted the status of data capture inputs, data quality and associated factors. The same study brings to light the extent of data use at operational levels and the factors underlying the observed level of use. Save for client/patients' cards (pre-primary data tools), the registers (primary data capture tools) were readily available in all the health facilities. The levels of data accuracy, completeness and timeliness in Rwanda's situation did not match the rhetoric that data quality in health systems in developing countries is poor. The few lapses identified could have been associated with factors we did not statistically verify.

Use of data in our study health facilities was inadequate and the self-reported use (of data) could not be backed by evidence from our observations. The top-down nature of planning greatly de-motivated the operational level managers from using data. On the side of the health unit management committees, data use was obliterated by the belief that their work was nothing beyond monitoring finances of the health facilities. The government of Rwanda and development partners should consider empowering the members of the health unit management committees to undertake roles that incorporate planning, implementation, monitoring and evaluation of health care delivery. In so doing, they may be empowered to use data for making various management decisions, including in monitoring so that they may be able to link between resources and results.

Abbreviation

HMIS: Health Management Information System.

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