Data Quality, Supply Chains, and the Distribution of Vital Medicines: Antiretroviral Drugs Availability in Nasarawa State, Nigeria

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ABSTRACT: *Regular availability of antiretroviral (ARV) medicines at health facility (HF)-level has been a challenge in effective HIV management in Nigeria. Despite a stabilised flow of ARV medicines in axial warehouses, there are documented reports of regular stockouts of HIV medicines in HFs. Existing research suggests there are identifiable and avoidable factors responsible for stockout of ARVs at service delivery sites. These factors include needed data to support ARV distribution. This article explored the relationship between ARV availability and logistics data quality in HFs in Nigeria's Nasarawa State. Data from the Logistics Management Coordination Unit (LMCU) in the State Ministry of Health was used to perform the research analysis. Cross-sectional study design was used to analyze data from 71 HFs that provided comprehensive HIV management services between the period of November 2014 to October 2015. In each of the six reporting cycles analyzed, some HFs experienced stockout of ARVs and there were records of incomplete bimonthly reports submitted to LMCU. There was a statistically significant association between data quality and ARV stockout at HF-level. These HFs may be central in ensuring regular availability of ARVs for patients. Their capability to control data quality is then a key enabler in their ability to control pull commands in the ARV supply chain.*

KEYWORDS: Stockout, data quality, anti-retroviral therapy, supply chain, availability, HIV

INTRODUCTION

The continual availability of HIV medicines, called antiretroviral therapy (ART) after their operative mechanism, is key in the management of the disease. Yet universal availability is new. About 20 years ago, these medicines were completely unaffordable for most of those who needed them. Then the treatment cost was between $5,000 - $15,000 (Bendavid et al., 2010). However, the Doha Declaration became a watershed in improving access to the antiretrovirals. The Declaration by the World Trade Organization on the Agreement on Trade-Related Aspects of Intellectual Property Rights and Public Health brought many changes to patent rights that vastly reduced the cost of the medicines (Hoen et al., 2011). Today, there are many HIV management HFs that provide ARVs free to over 2.75 million people living with the virus (Ahmed, 2021; Kharsany & Karim, 2016).

There are three global health initiatives that fund most of the HIV services in Nigeria. These are the U.S. President's Emergency Plan for AIDS Relief;, the Global Fund to Fight AIDS, Tuberculosis, Malaria;, and the World Bank Multi-Country HIV/AIDS Program (Chima & Homedes, 2015; Wong & Wehbe, 2011). Before 2012, more than 12 parallel and typically redundant supply chains were led by different implementing partners (IPs) distributing ARVs through Nigeria's treatment centers (JSI Research & Training Institute, Inc. 2014). As a result, there were many value-destroying duplications and deficiencies, such as delayed re-supplies and stockout (JSI Research & Training Institute, Inc. 2014). Stockout brings supply interruption, which may imperil health. Disappointed patients may default on treatment plans. These problems necessitated unifying the national distribution of HIV/AIDS into a single supply chain through an integrated (unified) warehouse and distribution network, under the USAID project called Supply Chain Management System (SCMS) (JSI Research & Training Institute, Inc. 2014). The Unification was done under the auspices of the Joint Executive Committee of the HIV/AIDS Procurement and Supply Chain Management Technical Working Group (PSM TWG) (JSI Research & Training Institute, Inc. 2014). The Unification was meant to achieve commodity security, ensuring a resilient, dependable, and stabilised stock availability and supply of ARVs. However, Itiola *et al.* (2019) reported continuing stockout of ARVs in some Nigerian HIV treatment centers two years after the unification project had commenced.

Through the unification initiative between 2012 and 2016, the SCMS project was charged with co-ordinating the efforts of several stakeholders, including the Federal and State Ministry of Health (MOH) and several HIV/AIDS IPs. John Snow Inc. a US public health research and consulting firm was mandated, through the SCMS project, with ensuring ARV availability in over 1000 HFs in Nigeria (JSI Research & Training Institute, Inc. 2014) – an ambitious co-ordination project involving distributed large numbers of actors (Bar-Yam, 2006). The supply chain's simplified process was designed so that all treatment centers needed to transmit reports on consumption bimonthly to their respective Central Medical Stores. In turn, these central medical stores were tasked to re-supply treatment centers with ARVs based on their consumption data as contained in the transmitted report (JSI Research & Training Institute, Inc. 2014). These reports were information engines driving dispersed supply chain (SC) actions; they were catalytical and seminal**.** The report transmission was also supposed to occur within an agreed review period, and the process was under the guidance of the SCMS (JSI Research & Training Institute, Inc. 2014). This system design is an example of a "pull system." That term implies a logistics and supply management system wherein a lower facility in an inter-organizational hierarchy determines what commodities it receives (Yadav, Lega Tata, and Bababley, 2011; Leung *et al.*, 2016). With an adequate supply of ARVs in the in-country axial warehouse as a necessary condition, timely, accurate, and complete transmission of consumption reports was expected to trigger re-supply on-time, thereby minimizing stockout rates (JSI Research & Training Institute, Inc. 2014).

UNAIDS, a key system investor, looked to achieve the ambitious goal of 90 – 90 - 90 - 90% of people with HIV are diagnosed, 90% of those diagnosed receive ARV drugs, while 90% of those individuals have their viral load effectively suppressed (UNAIDS (Joint United Nations Programme on HIV/AIDS), 2014). Given this goal, it is vital that ARV supply security is attained. Besides, the Nigerian government is expected to take ownership of the supply chain management of ARVs in the country in a progressive nationalization of responsibility (Vogus & Graff, 2015). In this emerging and dispersed supply chain, the availability and accessibility of ARVs in designated health centers are critical aspects in managing and treating HIV/AIDS (Himakalasa et al., 2013). One of the crucial determinants in patients' consumption of ARVs has been their consistent availability in designated HFs where clients could refill their prescriptions when required without hitches (Wasti et al., 2012). Conversely, glitches in supply generate inconsistency and imperil health (Ahmed, 2021).

The ART, with ARVs at its heart, is free for all patients in Nigeria, with support from the US Government and other foreign agencies (Okoli & Cleary, 2011). The availability of these ARVs in various designated hospitals is, in turn, dependent on the hospitals fulfilling their end of the supply chain management multi-agency design. Delivering this design has proven difficult. In Nigeria, researchers have documented inherent problems with HIV/AIDS commodity supply chain management at the hospital level. Two key problems present. There is first, low data quality concerning ARV consumption (for example, fewer reports transmitted to central medical stores versus number expected). Second, these reports contain poor quality reporting, with missed variables (Itiola et al., 2019). *Some of the data quality attributes include accuracy, completeness, reliability, and data timeliness (Cai & Zhu, 2015). Since the re-supply of commodities to HFs is usually based on data generated from the HFs, such data needs to be of high quality*. Where data is of poor quality, SC consequences ensue. The researchers hypothesised that there is a relationship between data quality and hospital-level stockout (unavailability) of ARVs.

METHODOLOGY

Study Design, Settings, and Sample Size

The study was retrospective and cross-sectional, using data from secondary and tertiary institutions. We were seeking to examine the prevalence of a phenomenon, problem, or issue by taking a snapshot of a networked population. The cross sectional approach was therefore, appropriate for the study (Wang & Cheng, 2020). The researchers used secondary LCMU data held in Nasarawa State Ministry of Health for the analysis. The data was freely and knowingly shared with us. Reflecting this, ethical approval was obtained from the Health Research Ethics Committee in Nasarawa State Ministry of Health.

A cross-sectional design was pursued because the researchers only intended to explore the relationship between data quality and stockout of ARVs and not to establish a causal relationship (Creswell, 2009; Frankfort-Nachmias & Nachmias, 2015). Therefore, the descriptive design was appropriate to explore the relationship between the study variables. To determine the sample size, the Taro Yamane formula (Adam, 2020) was used:

$n = N/ (1+Ne^2)$
n= The required sample size
N= Population, (74 in the study); e = Margin of error which is set at 0.05
1= A theoretical constant.
Substitution gives = $74/ (1 + 74 \times 0.05^2)$
≈ 63
Therefore, the minimum sample size required was 63.

Sampling technique

74 HFs were approved to provide comprehensive ART services in Nasarawa state during the study period. These were eligible for the study. The sample size calculation implied that 63 were required. Therefore, total population was used (Thygese & Ersbøll, 2014). Three HFs with significantly missing data were excluded and the remaining 71 HFs were all included in the study.

Method of data collection

Data from LMCU was selected for the study because it was the only repository of the Logistics Management Information System (LMIS) that contains the data on ARV supplies across the state for the period under the study. Comprehensive ART services include prophylaxes targeted at diagnosis, viral load control and transmission of the disease. However, analysis of viral load (CD4) was done only in 19 of the HFs. The data used in the cross-sectional study were collected between November 2014 – October 2015 from the HFs designated to treat and manage HIV/AIDS. The Nasarawa State Ministry of Health through the state Logistics Management Coordinating Unit, was responsible for collation and management of the logistics information. The participating public and private HFs comprised of secondary and tertiary health institutions that provided varying health care levels under the ART program.

The LMIS data was collected at HFs designated for HIV/AIIDS management and transmitted by respective HF focal persons to the office of LMCU in Lafia, Nasarawa State. The LMIS template used by LMCU for data collection purposes had a provision to capture ending balance (from previous month) and opening balance of all drugs, including quantities of ARVs received in the previous supply cycle. The template captured dispensed ARV volumes over the review period, losses, and adjustments, ending balance, and quantity to order (QTO). It was based on the QTO that the LMCU determined the quantity of drugs to re-supply each HF in the state. In each reporting cycle, the stock status was assessed to see if the facility experienced stock-out incidence for any of the ARV commodities considered as tracer products in anti-retroviral therapy. A tracer product acts as an indicator of the status of an object of concern. Data for the study was, therefore, retrieved from the LMCU data repository after due approval from the Nasarawa State Ministry of Health.

Data analysis

A total of 74 HFs from the 13 Local Government Areas comprising Nasarawa State were included in the analysis. The data was obtained for six reporting cycles namely January 2015, March 2015, May 2015, July 2015, September 2015, and November

2015. Each reporting cycle was a report of the preceding two months. For example, the January 2015 report analysed the data for November – December 2014 tracking commodity utilization at the HF level. The data was obtained and cleaned to ensure missing data that could unnecessarily skew the results was eliminated. Therefore, three HFs with significantly missing data were excluded from the analysis. The names of the HFs were coded, and data aggregated. Thereafter, the data was imported into SPSS version 26 for data management and analysis.

RESULTS

Descriptive Statistics Analysis per Reporting Cycle

Data quality: The descriptive statistics for data quality for the six reporting cycles were obtained as follows: For January 2015 report, 55 (77.5%) HFs had complete reports compared to 16 (22.5%) that transmitted an incomplete report. In March 2015, 56 (78.9%) had a complete report compared to 15 (21.1%) who had incomplete reports. Complete reports were tabled from 44 (62.0%) HFs compared to 27 (38.0%) that submitted only an incomplete report in May 2015 report. The complete reports for the 6 reporting cycles are displayed in table 1.

Reporting period	Outcome	Frequency	Percent (%)	Valid %	Cumulative %
January 2015	Complete	55.0	77.5	77.5	77.5
	Incomplete	16.0	22.5	22.5	100.0
	Total	71.0	100.0	100.0	
March 2015	Complete	56.0	78.9	78.9	78.9
	Incomplete	15.0	21.1	21.2	100.0
	Total	71.0	100.0	100.0	
May 2015	Complete	44	62.0	62.0	62.0
	Incomplete	27	38.0	38.0	100.0
	Total	71.0	100.0	100.0	
July 2015	Complete	69.0	97.2	97.2	97.2
	Incomplete	2.0	2.8	2.8	100.0
	Total	71.0	100.0	100.0	
Sept 2015	Complete	61.0	85.9	85.9	85.9
	Incomplete	10.0	14.1	14.1	14.1
	Total	71.0	100.0	100.0	
Nov 2015	Complete	60.0	84.5	84.5	84.5
	Incomplete	11.0	15.5	15.5	100
	Total	71.0	100.0	100.0	

Table 1. Descriptive statistics of reporting cycles

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Stock Availability: The status of ARV availability for the tracer ARV products is set out in table 2.

Report Cycle	Stock Status	Number
Jan-15	Number of HF that experienced stockout	16
	Number of HF that did not experience stockout	53
	Total	71
Mar-15	Number of HF that experienced stockout	16
	Number of HF that did not experience stockout	53
	Total	71
May-15	Number of HF that experienced stockout	26
	Number of HF that did not experience stockout	45
	Total	71
Jul-15	Number of HF that experienced stockout	4
	Number of HF that did not experience stockout	67
	Total	71
Sep-15	Number of HF that experienced stockout	10
	Number of HF that did not experience stockout	61
	Total	71
Nov-15	Number of HF that experienced stockout	12
	Number of HF that did not experience stockout	59
	Total	71

Table 2. HFs and Stock Status

Inferential Statistics Analysis for Each Reporting Cycle

The two variables labelled stockout and data quality were coded as categorical and tested for a bivariate relationship. The statistical significance value was set at 5% and at a given degree of freedom. For all the tests, the researchers failed to reject the null hypothesis if a p-value was more than 0.05 and conversely, the null hypothesis was rejected for any p-value that was less than 0.05 (Field, 2013).

January 2015 Report: From the SPSS data output, the assumption for the use of Chi-Square is violated as one of the cells has a value less than 5. Therefore, Fisher's Exact Test was used to interpret the result. The analysis shows there is a statistically significant relationship between stockout rate and data quality ($P < 0.00$ by Fisher's exact test). Therefore, the null hypothesis was rejected for the January 2015 report. The output has a Cramer's V of 1.00. The relationship between stockout rate and data quality for the January 2015 report was, therefore, very strong.

March 2015 Report: The SPSS data output shows a violation of one of the assumptions of Chi-Square. Therefore, Fisher’s Exact Test was again used to interpret the result. The analysis shows there is a statistically significant relationship between stockout rate and data quality (P < 0.00 by Fisher's exact test). Therefore, the null hypothesis was rejected for the March 2015 report. The output has a Cramer’s V of 0.794. The relationship between stockout rate and data quality for the March 2015 report was very strong.

May 2015 Report: The analysis shows there is a statistically significant relationship between stockout rate and data quality (x^2 = 66.851, p = 0.00). Therefore, the null hypothesis was rejected. The output has a Cramer’s V of 0.970. The relationship between stockout rate and data quality for the May 2015 report was once again very strong.

July 2015 report: The analysis shows there is a statistically significant relationship between stockout rate and data quality (x^2 = 34.47, p = 0.00). Therefore, the null hypothesis was rejected. The output has a Cramer’s V of 0.697. The relationship between stockout rate and data quality for the July 2015 report was only moderate.

September 2015 report: The analysis finds a statistically significant relationship between stockout rate and data quality (P < 0.00 by Fisher's exact test). Therefore, the null hypothesis was rejected for the Sept 2015 report. The output has a Cramer’s V of 1.00. The relationship between stockout rate and data quality for the Sept 2015 report was perfectly strong.

November 2015: The analysis shows there to be a statistically significant relationship between stockout rate and data quality (P < 0.00 by Fisher's Exact test). Therefore, the null hypothesis was rejected for the Nov 2015 report. The output has a Cramer’s V of 0.949. The relationship between stockout rate and data quality for the Nov 2015 report was therefore very strong. Table 3 summarises these findings.

Month/Test	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
January 2015					
Pearson Chi-Square	71.000[a]	1	.000		
Continuity Correction[b]	65.387	1	.000		
Likelihood Ratio	75.771	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	70.000	1	.000		
Cramer’s V	1.00				
N of Valid Cases	71				
March 2015					
Pearson Chi-Square	44.806[a]	1	.000		
Continuity Correction[b]	40.269	1	.000		
Likelihood Ratio	40.594	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	44.175	1	.000		
Cramer’s V	0.794				
N of Valid Cases	71				
May 2015					

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Pearson Chi-Square	66.851[a]	1	.000		
Continuity Correction[b]	62.766	1	.000		
Likelihood Ratio	84.726	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	65.909	1	.000		
Cramer's V	0.970				
N of Valid Cases	71				
July 2015					
Pearson Chi-Square	34.471[a]	1	.000		
Continuity Correction[b]	18.626	1	.000		
Likelihood Ratio	12.676	1	.000		
Fisher's Exact Test				.002	.002
Linear-by-Linear Association	33.986	1	.000		
Cramer's V	0.697				
N of Valid Cases	71				
Sept 2015					
Pearson Chi-Square	71.000[a]	1	.000		
Continuity Correction[b]	62.977	1	.000		
Likelihood Ratio	57.722	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	70.000	1	.000		
Cramer's V	1.00				
N of Valid Cases	71				
Nov 2015					
Pearson Chi-Square	63.999[a]	1	.000		
Continuity Correction[b]	57.189	1	.000		
Likelihood Ratio	54.341	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	63.097	1	.000		
Cramer's V	0.949				
N of Valid Cases	71				

Table 3. Summary of inferential statistics.

In all the six discrete report data for Year 2015 in table 3, there was a moderate to strong relationship between data quality and stockout rate. The policy implications of this finding are discussed below.

DISCUSSION

The analysis set out above raises several interconnected concerns. These relate to data quality, assurance, mutuality and conduct of SC members. To understand these interactions, a whole-system perspective on the SC is provisionally adopted. One of the common frameworks used in understanding the relationship between logistics activities in supply chain management for health products is the logistics cycle (USAID Deliver, 2011). See figure 1.

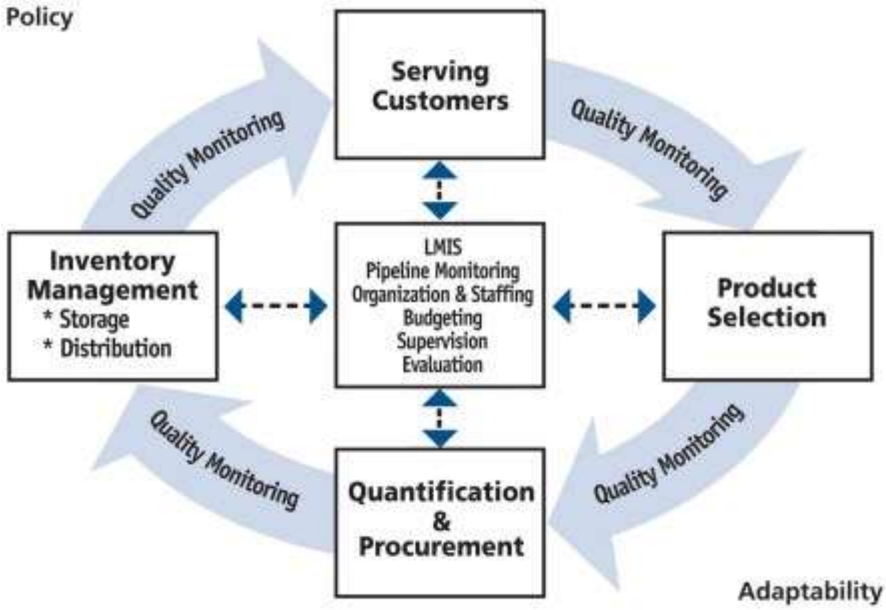

Figure 1. The Logistics Cycle (Adapted from USAID Deliver, 2011, p.4)

The circular nature of the cycle underscores the repetitive and continuous nature of many logistics activities. Each activity is connected to, and reliant on the preceding activity, and any undue information 'noise' or abrupt truncation in one activity will affect the status and performance of the next activity. These links in the Logistics Cycle are captured in the notion of quality monitoring practice, where both terms (quality and monitoring) in this compound noun are significant, though in differing ways. The measurement of quality is required at all four points in the framework connecting critical components of the logistics cycle (Biwott et al., 2017). Thus, quality is important not just to the final product, but in every stage of the effort that is inputted into that final product. This embedded and distributed approach to the gauging of quality also suggests that checking and monitoring will not be solely summative or after-the-event in nature. It must be done to get the cycle into a state of initial readiness – formatively – and then to test and check integrity throughout.

The Logistics Cycle is thus integrated as much by quality as by monitoring. Poor quality data will variously impact on supply chain management. Impacts might include precautionary oversupply with avoidable inventory holding cost, artificial (misinformation-based) drug shortages in a supply system, and increased expiry of drugs. These consequences reflect the translation of an information issue into anomalous behaviours that jeopardises the effectiveness of the SC itself, undermining its legitimacy. One of the six rights of a logistics licence to trade is to have a commodity supplied to a designated place in the right quantity. Getting the right quantity is dependent on getting the right data. The two rights are therefore linked. The finding confirms the relevance of quality in the logistics cycle model, where quality mediates each of the four sections in the heart of that model (USAID Deliver, 2011) (see figure 1). Data quality is, therefore, key, and it helps to avert fraud, generate good project management, and appropriate delivery of efficient services. In the logistics cycle model, 'quantification' is considered to be instrumental in deciding what volume of a commodity will be procured and the accuracy of the quantification process is a function of broader data quality (USAID/Deliver project, 2009).

The significance of effective information in networked environments like the distributed ARV SC evaluated here is increasingly recognised. Thus, in Ghana, Kuupiel et al. (2019) found poor inventory level at service delivery points to be responsible for stockout of point-of-care diagnostic tests. The strong association between quality data and medicine stockout in HFs is a recurring research theme. In a study of medicine stockouts in Gauteng Province, South Africa, poor data quality was the paramount cause of medicine shortage in the province (Modisakeng et al., 2020). It may be that this cause was more significant than the aggregate supply volumes of the medicines concerned. Bateman (2013) also corroborated the relationship between stockout and data quality in finding that stockout of ARVs was an issue in most South African states, due to a shortage of staff to prepare a quality report. According to the National Health Department in 2013, stockout of ARVs was an issue in eight provinces out of nine due to a shortage of staff, as reports were prepared by health workers who were not qualified for the information processing task (Bateman, 2013). In a related review of the correlation between quality information and drug availability in hospitals, Bohmer et al.(2020) observed that while quality data itself does not eliminate stockout of medicines, poor data certainly worsens shortages. A poor-quality report affects logistics decisions which could cause either under-supply or over-supply of ARVs.

This linkage was evident in the ART SC in the period under study. In each of the six-reporting cycles, there was a relationship between stockout rate and data quality. The findings suggest that the stockout rate in an individual HF is strongly associated with the quality of the reports that inform decisions on the supply of medicines to that HF. Poor data quality is, therefore, most likely to reflect in decisions that are based on that poor data quality. Misinformation then produces erroneous decisions that may generate further misinformation as those decisions are hidden from scrutiny. Consequently, when critical decisions are taken based on poor data quality and are then likely to prove inept, the outcomes could damage the medicines supply chain. The pull system, in which a lower facility in an inter-organizational hierarchy determines what commodities it receives, means that a poor quality report from that lower facility would impact stock availability and pull availability in untoward or value destroying directions (Yadav et al., 2011). This finding corroborates Damtie et al. (2020) who reported that poor data records were one of the causes of stockout of HIV medicines in HFs in Ethiopia.

The existing research tends, though, to explore dyadic or small-group information processes linking higher and lower network members (Reimers et al., 2010). This largely tacit ontological assumption could understate wider processes of network (dis-) integration in which information may again play a central part. There are then suggestive research propositions that relate to network-building and disintegration. For instance, fiefdoms and siloes may erect barriers to transparent and accessible shared data. Undue or artificial claims to professionalism may also function as a boundary blocking the flow of data – may indeed be used deliberately to erect localised monopolies (Huvila et al., 2017). Such boundary objects may include human individuals who are assigned to represent data as champions or speakers What results is a disintegration process that may lead to the localisation of information, the nurturing of parochial attitudes and the Balkanisation of the network. What our evidence base cannot inform is the nature of the mechanism through which (dis-) integration occurs. We have already highlighted the cognitive and behavioural challenges posed by network-level information sharing. There is also an obvious ethical transmission mechanism that could fracture a national network. Where the SC membership operates differing norms and observes distinct ethical conventions (Ponte, 2009) , pressures to disintegrate may gather momentum.

This is doubly important because, as noted above, the information deficit that generates potentially compounding error may lead to a diverging path that destroys value and has no necessary means of correcting itself. Data corruption then becomes embedded in value-destroying (corrupted in a second sense) physical supply practices. Exactly where in this ART supply chain these translations of corrupt data into corrupted logistics supply practice occur is an important consideration. This reflection also points towards a dynamic understanding of paths of information flow, decision, and action in complex supply chains. This dynamic understanding will have complex feedforward and feedback loops occurring in (in this case) vicious circles of complex causality. Mapping decision paths in dynamic SCs is a relatively new field of study, but it is one that may hold considerable promise in seeking to understand how distributed SC networks evolve over time.

CONCLUSION

The researchers found a strong association between quality of the reports transmitted from the HFs to the LMCU, and the linked availability of (here, ARV) health commodities. This finding agrees with Chindove and Mdege (2012). Working with data perceived as poor quality could result in supply chain mismanagement. In the supply of the ARV medicinal commodity to HFs, a stockout that happens before routine re-supply would be consequential. It might mean a patient not getting their medicines or extra cost of using a courier service for urgent re-supply from a higher facility. Poor data quality could equally lead to mistrust, especially when it involves drugs that are donated and are supposed to be free for the patient. This supports both Marinagi et al (2015) and Handfield and Yacura (2019). It underscores how recurring logistical issues can generate behavioral anomalies like hoarding or obscure workarounds. Drug thefts by hospital employees have been documented in both developed and developing nations (Culbertson, 2020; Ferrinho et al., 2004). Indeed, one of the causes of medicines stockout in hospitals in Anglophone West Africa is theft of drugs by hospital workers (Onwujekwe et al., 2019). Right data promotes efficient materials logistics which minimises the behavioural temptations that can produce misconduct.

Generating quality data is important as decisions in the supply chain are largely informed by that data (Siponen, 2004). In pragmatic terms, information quality may shape both decisions and actions. Therefore, the information-owning IPs, in conjunction with the Logistics Management Coordination Unit in NSMoH should focus on improving data quality through training of all staff members on data documentation and management – including probity and ethics. Because of routine staff transfer and attrition rates for staff, all new staff must receive training or refresher orientation on data management at facility level.

Declaration of conflicting interests

The Authors declare that they have no conflict of interest, and no support was received from any funding agencies, public or private.

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