Behavioral and Technical Factors Associated with Perceived Quality of HIV/AIDS Data Reported in Community Based Health Information System in Homa-Bay County, Kenya

Evans Ogondi[1], George Otieno[2], Isaac Mwanzo2 Gilbert Koome[3]

[1]National AIDS Control Council, Ministry of Health, Nairobi, Kenya
[2]Department of Health Systems Management, Kenyatta University
[2]Department of Community Health, Kenyatta University
[3]School of Clinical Medicine, Mount Kenya University

Abstract- **Introduction:** In Kenya, Community Based Health Information System (CBHIS) plays a pivotal role in ensuring HIV/AIDS data from grass-root and community level is collected and report for evidence-based decision-making. This information is pivotal for evidence-based planning and programming However, quality of data in CBHIS has been persistently reported to be poor. This can adversely hamper achievement of the goal of zero infections rates in the coming years. Therefore, the aim of this study was to determine factors associated with perceived quality of HIV/IDS data reported into the CBHIS in Kenya.

Methods: The study used a cross-sectional study design. One stage cluster sampling was used to randomly select one hundred and thirty eight (138) active Community-Based and Faith-Based HIV/AIDS implementing Organizations representatives in Homa-Bay County. Chi-square statistical techniques were used to establish relationship between study variables and perceived quality of data.

Results: More than half (58%) of the respondents ranked quality of HIV/AIDS data in the CBHIS to be of low quality. Chi-square analysis showed that level of education (p=0.001) was the only behavioural factor associated with perceived quality of data reported in CBHIS. In regards to technical factors, the analysis showed that availability of functional computers (p=0.001), and frequent Data Quality Checks (p=0.001) were statistically significant in explaining the variations in HIV/AIDS data quality.

Conclusion: Perceived quality of HIV/AIDS data in CBHIS is influenced by staff education level, availability of computers and performance of data quality checks. There is need to institutionalizing frequent data quality checks and computerization of information systems to improve quality of data reported in the CBHIS. In addition, data staff recruitment should take into account staff educational qualification.

Index Terms- Data Quality, Community-Based Information Systems, HIV/AIDS Data, Determinants of Data Quality, Behavioural factors, Technical Factors

I. INTRODUCTION

Evidence-based decision-making is a driver of successful programme interventions. One of the advances in improvement of health outcomes has been the adoption of community based health information system (CBHIS) to collect and report data from the community level (1). Supported by this understanding, the Ministry of Health in Kenya advocated for decentralized Community-Based Health Information System (CBHIS) from community level (2). The CBHIS allows continous recording and tapping into the ever dynamic and complex health care phenomena at the grassroot level. It supports gathering of different patterns and records, including mortality and morbidity, which ranges from individual level all the way to the most complex of groups (3). Resultantly, the focus has now shifted into the quality and use of information management, entrenched in CBHIS, in dealing with HIV/AIDS menace (4,5). This requires improvement in quality of data collected from the grass-root level for informed-decision support systems.

Data quality has been cited as a major challenge in use of health information systems (6,7). For instance, the 2014 Kenya National AIDS strategic plan (6) report on strategic planning identified data quality as a hindrance to achieving the numerous initiatives and targets put in place to tackle HIV and AIDS. It is one of the barriers to effective HIV/AIDS programming and intervention. Although the report acknowledges insufficient data provision from CBHIS for decision systems supports; there are limited locally generated efforts geared towards understanding the causes of poor quality of data in the systems.

In developing countries such as Kenya, there are numerous institutional and infrastructural challenges in HIV/AIDS management such as such as lack of sufficiently skilled personnel, limited resources and lack of adequate operational tools (8,9). These counties have higher HIV prevalence compared to developed countries (10). As a result, there are many community-Based Organizations (CBOs) involved in activities related to HIV/AIDS prevention, control and management such as community sensitizations and provision

support networks (5). These CBOs contributes a large proportion of data sets to the CBHIS which is inter-linked to national health information systems.

The CBOs are reported to have weak financing and management structures for data management (11,12). For instance, many of the CBOs are poorly staffed with inadequately skilled volunteers (3), lack proper equipment such as standardized data collection tools (1) and lack sufficient funds to finance their activities (7,13). Despite these challenges, they undertake technical roles of collecting, entering and reporting activity data in these CBHIS. Kenya has a national body, NACC, mandated with coordinating HIV and AIDS activities. Despite of its oversite and accountability role which includes ensuring HIV/AIDS data quality, there has been no data quality assurance (DQA) audits on the community based program reporting system(COBPAR) since adoption of these in 2006 (2,6). Most of the audit focus on national health information systems (6,14). The COBPAR system is a CBHIS used by the community based organization to report on HIV and AIDS intervention programs. Nevertheless, this data is used at the community, county and national level to inform decisions and interventions. It is against this backdrop that this study sought to achieve two main objectives; (1) Determine behavioural factors associated with perceived quality of data in CBHIS at the community level and (ii) Determine technical factors associated with perceived quality of data in CBHIS at the community level

II. Methods

This was a cross-sectional study undertaken in April 2016 among 213 data management representative drawn from community-Based Organizations (CBOs) implementing HIV/AIDS activities in Homa-Bay County, Kenya. Homa-Bay County has eight sub-counties namely Homa-Bay town, Karachuonyo, Dhiwa, Mbita, Rangwe, Suba, Kabondo kasipul and Kasipul. The Estimated population (2013) is 1,053,465 spread all through the sub-counties. In Nyanza region, Homa Bay County leads with HIV prevalence of over 25% causing the county to contribute the largest data sets related to HIV/AIDS (6). The total number of CBOs implementing HIV and AIDS activities in the county is 213.

Homa-Bay County was sampled purposively because it had the highest statistics on HIV prevalence in Kenya (6). One stage cluster sampling was used to sample 138 CBO based on the eight sub- counties. To ensure representativeness of the sampled organizations, a proportional to size formulae was used to select 138 organizations out of the 213 implementing organizations based on their host sub-county. Simple random sampling was then used to select one data management representative from each CBO sampled. A serialized list of all the staff involved in data management activities from the selected organizations was prepared using a continuous numbering system. A table of random numbers was then used to randomly select and recruit one respondent from each of the sampled organization to participate in the study. CBO representatives who had less than twelve months experience in the CBO and those whose roles were not data related were excluded from the study. A pre-tested interviewer administered questionnaire was used to collect data from the respondents. The questionnaire included key questions on behavioural factors, technical factors and quality data reported in the CBHIS.

Collected data was coded, entered, cleaned and analyzed using SPSS version 21 statistical package. Questionnaires with missing, inconsistent and incomplete data were cleaned and data imputation done to ensure the integrity of data used. To determine perceived quality of data in the CBHIS, respondents were asked to rank quality of data in the CBHIS using a 5-likert scale points for the five core quality dimensions used in the study. The five quality dimensions used were completeness, conformity, accuracy, integrity and timeliness of the data. A mean quality index was derived from the five dimensions after which a median value was used to split the index into two categories; low and high quality (15) This was used as measure of data quality in the CBHIS. To analyze the data, cross-tabulation was used to study relationship study variables. This was followed by chi-square analysis which was used to establish association between study variables and perceived quality of data reported in CBHIS. In this study, statistical significance for testing hypothesis was inferred at 5 percent (P-value =0.05).

Ethical clearance to conduct the study was obtained from Kenyatta University Ethical Review Board. Written informed consent forms were used obtain informed consent from study participants. The forms articulated ethical consideration of the study in which the aim and need for the study as well as process of participation or withdrawal from the study.

III. Results

Perceived data quality

A total of 138 CBO representatives participated in the study. Overall, more than half (58%) of the respondents ranked quality of data in the CBHIS as low while 42% ranked the data quality as high.
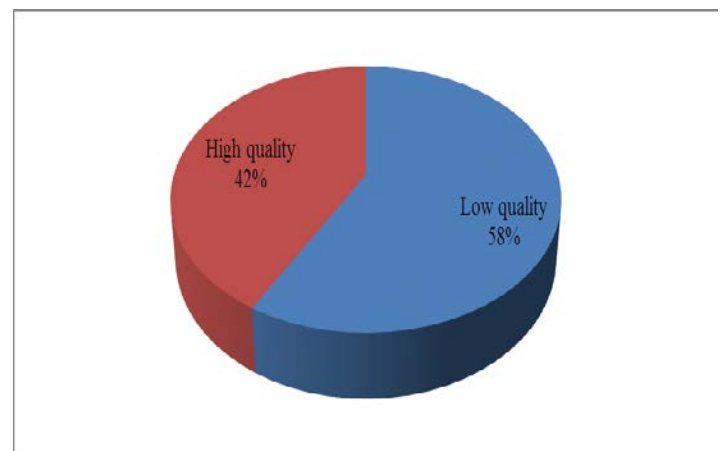

***Figure* 1: Perceived Quality of HIV/AIDS Data in CBHIS**

Behavioral Factors and their Association with Quality of HIV/AIDS Data in CBHIS

In regards to males, 59% were males. Males tendered to rank data quality high (70.4%) compared to females (29.6%). Gender of staff, (χ^2 (1) = 2.643, p = 0.144), had no statistically significant relationship with perceived data quality reported in

the CBHIS. In terms of age, 72% were aged 21-44 years. There was minimal difference on perceived data quality ranking across the different age groups. The proportion of younger staff (21-44 years) ranking data quality as high (80%) compared almost equally with those who ranked the data quality as low (81.9%). The trend was the same for older staff. Age of staff, (χ^2 (3) = 2.746, p = 0.453), had no statistically significant relationship with perceived data quality reported in the CBHIS.

In regards to highest education level, 59% had middle level college education. Staff who had college education and above tended to rank quality of data in the CBHIS high (100.0%) compared to those who had secondary education level and below

(0.0%). There was a statistically significant relationship between education level and data quality (χ^2 (3) = 44.895, p = 0.001). In regards to experience, 38% had 2-4 years of experience in their organization. Staff who had at least two years of professional experience and above tended to rank data quality high (82.7%) compared to those who had less than two years of experience (17.3%). There was no statistically significant relationship between work experience, (χ^2 (4) = 6.509, p = 0.169), had no statistically significant relationship with perceived data quality reported in the CBHIS.

Table 1. Influence of Behavioural Factors on Perceived Data Quality

Variable		Quality Perception		Total (n=138)	Chi-square statistics
		Low	High		
Age	21-34 years	43(59.7%)	23(46.0%)	66 (48%)	χ^2=2.746, df=3,
	35-44 years	16(22.2%)	17(34.0%)	33 (42%)	
	45-54 years	11(15.3%)	9(18.0%)	20 (14%)	
	55+ years	2(2.8%)	1(2.0%)	3 (2%)	
	No Response			16 (12%)	
Gender	Male	44(56.4%)	38(70.4%)	82 (59%)	χ^2=2.643, df=1, p=.144
	Female	34(43.6%)	16(29.6%)	50 (36%)	
	No Response			6 (4%)	
Education Level	Primary	2(2.7%)	0(0.0%)	2 (1%)	χ^2=44.895, df=3, p=.001
	Secondary	37(50.7%)	0(0.0%)	37 (27%)	
	College	29(39.7%)	53(91.4%)	82 (59%)	
	University	5(6.8%)	5(8.6%)	10 (7%)	
	No Response			7 (5%)	
Professional Experience	<2 years	6(8.2%)	9(17.3%)	15 (11%)	χ^2=6.509, df=4, p=.169
	2-4 years	37(50.7%)	16(30.8%)	53 (38%)	
	5-7 years	16(21.9%)	13(25.0%)	29 (21%)	
	8-10 years	8(11.0%)	10(19.2%)	18 (13%)	
	Over 10 years	6(8.2%)	4(7.7%)	10 (7%)	
	No Response			13 (9%)	

Technical Factors and their Association with Quality of HIV/AIDS Data in CBHIS

In regards to availability of computers, 60% reported availability of functional computers for data storage and management. Staff who had functional computers for data management tendered to rank data quality in CBHIS high (100.0%) compared to those who had no computers tendered to

rank quality (0.00%). There was a statistically significant relationship between availability of functional computers (χ^2 (1) =61.888, p = 0.001) and perceived data quality.

Table 2. Influence of Technical Factors on Perceived Data Quality

Variable		Quality Perception		Total (n=138)	Chi-square Statistics
		Low	High		
Availability of computers for data storage	Yes	16(33.3%)	67(100.0%)	83 (60%)	χ^2=61.888, df=1, p=.001
	No	32(66.7%)	0(0.0%)	32 (23%)	
	No Response			23 (17%)	
Availability of internet connection	Yes	20(29.9%)	10(20.8%)	30 (22%)	χ^2=1.179, df=1, p=.293
	No	47(70.1%)	38(79.2%)	85 (62%)	
	No Response			23 (17%)	
Performance of Data Quality Audit	Yes	55(71.4%)	45(83.3%)	101 (73%)	χ^2=12.037, df=2, p=.001
	No	22(28.6%)	9(16.7%)	31 (22%)	
	No Response			8 (8%)	

In regards to access to internet connection, 62% reported lack of access to internet Staff who had no access to internet connection tended to rank data quality in CBHIS high (79.2%) compared to those who had internet connection (20.8%). There was no significant association between availability of internet connection (χ^2 (1) =1.179, p = 0.293) and perceived data quality reported in the CBHIS.

In regards to performance of data quality audits, 73% had conducted at least one data quality checks in the last 12 months preceding the study. Staff who reported performing data quality audit tended to rank quality of data high (83.3%) compared to those who reported to have no data quality audit (16.7%).   There was a statistically significant relationship between performance of data quality audit (χ^2 (2) =12.037, p = 0.001) and perceived data quality.

IV. DISCUSSION

Level of education was shown to influence quality of data in CBHIS. Education level of staff handling data at various stages of data management is an important qualification requirement. Higher educational attainment has been linked to increase the ability of an individual to articulate complex data quality problems and formulating practical solutions to address them (3,16). Data handled by staff with lower education level was reported to be of lesser quality. Staff with low education levels were reported to pre-requisite knowledge for handling complex data and skills required to transform data to suitable reporting formats. This was similarly reported in a study by Ahanhanzo et al. (16) in which education attainment was shonwn to correlate positively with possession of data management skills and abilities.

Age and gender of data staff didn't have any significant association with quality of data. To a plarge extent, data staff performance depends on individual motivation to work for a healthier community and passion for dealing with data irrespective of the age of the data handler (9). The perceived quality of data in the CBHIS didn't differ with gender roles assigned to the staff. In formal institutions, job-match is based on

individual skills and abilities to manipulate and manage data sets rather than their sexual orientation rendering the gender of the role holder inconsequential (16)(8). This means that equipping staff with relevant skills and knowledge has a greater effect in influencing data quality as opposed to their ages and gender orientation. However, the underlying assumptions in these relationships was not extensively explored and investigated hence no conclusive finding can be made.

Experience in data management provides an important exposure and learning opportunities which can translate into high performance and improved data quality outcomes (17). However, this study found no significant association between experience in data related activities and perceived quality of data in the CBHIS. This could be parlty explained by the high number of volunteer staff who lack pre-requisite technical skills in data management. In the context of skilled staff, experience has been reported to affect data quality perceptions. The technical staff have superior abilities in identification of errors, mistakes and data issues compared to the non-experienced ones (13)(7).The relationship between experience and data quality perceptions needs further investigation to explain and validate these findings. Functional computers comprise essential tools in management data entry, storage and processing (18)(6). Due to financing challenges, many CBOs lack adequate functional computers to aid in these roles. Where available, many staff, especialy those of low education attainment, lack pre-requisite computer skills which are critical in data management activities. Lack of computerized systems is linked to higher probability of data loss, poor record keeping and poor data quality outcomes (1). Improved data quality require equipping the organizations with adequate resources such as networked computers and well-skilled staff, to enhance their capacity to collect and manage the data.

Many of the data representatives in the implementing organizations reported inadequate technical skills to support execution of their roles as data support staff which included computer skills. There is consensus that technical skills for computer use and data management and manipulation are important elements for achieving high data quality. Studies

indicate that quality of data gathered is highly dependent on the technical skills and resources available in an organization (13)(19)(9)(3). Thus, provision of computers should be accompanied by customized capacity building or training opportunities to equip staff with skills for use. This ensures optimal use of the resources and reduction in quality problems emanating from lack of staff technical capacity. This requires organization management and programme stakeholders to take responsibility for poor data in the CBHIs.

The study found no significant relationship between perceived data quality and internet connection. This contradicts findings of a study by Macharia and Maroa(8) in which internet connection was reported to improve efficiency and ease of data collection and reporting. Internet is perceived to be a useful resource in validating data and communicating outcomes. This difference in result is mainly due to difference in study context; Small organizations such as CBOs don't handle big and complex data which may require complex and well-coordinated information management systems including internet-based communication and networking. However, access to internet is a useful tool in sharing of reports especially where reporting timeliness and cost-effectives of operations is a key priority (1,16). With advancement of technology, evidence points to increasing need for system automation and hence the need/demand for reliable internet access among implementing organizations at the local and grassroot level (1,17). Performance of data quality audits is an important aspect of data quality assurance and control (6,9). Few CBOs performs any regular data quality checks which was linked to increase in potential for quality gaps in the data collected, achieved and reported. Data quality audits allows organization to identify quality deviations and institute correction measures in a timely manner (16). Regular and well-coordinated quality audits are required to strengthen quality standards in community systems(8). Many of the CBOs don't have the necessary expertise and capacity including resources to perform comprehensive and effective quality audits. Supporting and guiding grassroots organizations in ensuring implementation and maintenance of simple but effective quality assurance programmes can be the solution for improving of the data collected and reported.

V. CONCLUSIONS

Staff educational attainment is an important behavioural determinant of data quality. Higher Level of education attainment increases ability of a motivated individual to handle complex data quality-related problems and provide solutions to address them compared to those with lower educational attainment. Availability of functional computers and performance of data quality audits comprise essential technical determinants of quality of data reported in the CBHIS. Providing CBOs with relevant technical skills/capacity building opportunities for HIV/AIDS data management is essential in boosting their ability to collect and report quality data in the CBHIS.

To achieve high data quality, the study recommends: (i) Implementing organizations (CBOs) management to recruit and hire educated and skilled data staff (who should have at least college education) responsible for data handling and management. However, recruitment and selection of the staff should take into account individual motivation and interest in not only the position but also data-related disciplines to ensure sustained commitment in data quality assurance and improvement; and (ii) HIV/AIDS program partners, governments and other relevant stakeholders should strengthen CBHIS by taking responsibility for equipping the CBOs with enough functional computers and institutionalize regular but frequent data quality checks as key synergetic measures for data quality improvement.

Achieving these milestones requires implementing organizations and stakeholders to adopt holistic but complementary CBHIS data quality improvement initiatives including staff training programs on data collection, processing and reporting, increasing data collection frequency and use of competent staff to collect data.

REFERENCES

[1] Chen H, Hailey D, Wang N, Yu P. A review of data quality assessment methods for public health information systems. Int J Environ Res Public Health. 2014;11(5):5170–207.

[2] Ministry of Health. Ministry of Health. He Korowai Oranga [Internet]. 2017; Available from: http://www.health.govt.nz/our-work/populations/maori-health/he-korowai-oranga

[3] Adejumo NA. An Assessment of Data Quality in Routine Health Information Systems in Oyo State, A mini-thesis submitted in partial fulfillment of the requirements for the degree of. 2017;(January):1–90. Available from: https://etd.uwc.ac.za/bitstream/handle/11394/5497/Adejumo_a_mph_chs_2017.pdf?sequence=1&isAllowed=y

[4] Kedar S Mate, Brandon Bennett, Wendy Mphatswe, Pierre Barker NR. Challenges for routine health system data management in a large public programme to prevent mother-to-child HIV transmission in South Africa. Vol. 4, PloS one. 2009. p. e5483.

[5] Karamouzian M, Madani N, Doroudi F, Haghdoost AA. Improving the quality and quantity of HIV data in the middle east and North Africa: Key challenges and ways forward. Vol. 6, International Journal of Health Policy and Management. 2017.

[6] NACC. Kenya AIDS Strategic Framework 2014/2015 - 2018/2019. Natl AIDS Control Counc [Internet]. 2014;1–84. Available from: http://www.nacc.or.ke/attachments/article/181/KNASP III.pdf

[7] Yakob B, Ncama BP. Perceived quality of HIV treatment and care services in Wolaita Zone of southern Ethiopia: A cross-sectional study. Vol. 5, BMJ Open. 2015.

[8] Macharia J, Maroa C. Health Management Information Systems (HMIS) Implementation Characteristics that Influence the Quality of Healthcare in Private Hospitals in Kenya. 2014 Ist-Africa Conf Proc. 2014;1–12.

[9] Shivaji T, Cortes Martins H. Improving data management practices in the Portuguese HIV/AIDS surveillance system during a time of public sector austerity [Internet]. Vol. 4, BMJ Quality Improvement Reports. 2015. p.

u209037.w3663. Available from: http://qir.bmj.com/lookup/doi/10.1136/bmjquality.u209037.w3663

[10] Centers for Disease Control and Prevention. Estimated rates of diagnoses of HIV infection among adults and adolescents , by sex and race / ethnicity , 2008 — 37 states with confidential name-based HIV infection reporting. Aids [Internet]. 2008;20. Available from: http://www.cdc.gov/hiv/surveillance/resources/reports/2008report/

[11] Burua A, Nuwaha F, Waiswa P. Adherence to standards of quality HIV/AIDS care and antiretroviral therapy in the West Nile Region of Uganda. Vol. 14, BMC Health Services Research. 2014.

[12] Vold K. Prevalence , predictors and outcomes of HIV serostatus disclosure among HIV positive women in Moshi , Tanzania. 2015;

[13] Matsuyama Y, Hashimoto S, Ichikawa S, Nakamura Y, Kidokoro T, Umeda T, et al. Trends in HIV and AIDS based on HIV/AIDS surveillance data in Japan. Int J Epidemiol. 1999;28(6):1149–55.

[14] Green THE, Hotel H. Ministry Of Health Chs Annual Stakeholders Meeting. 2014;(CDC).

[15] Larson-Hall J. Finding Group Differences with Chi-Square when All Your Variables Are Categorical : The Effects of Interaction Feedback on Question Formation and the Choice of Copular Verb in Spanish. 1999;1–114.

[16] Ahanhanzo YG, Ouedraogo LT, Kpoz?houen A, Coppieters Y, Makoutod? M, Wilmet-Dramaix M. Factors associated with data quality in the routine health information system of Benin. Vol. 72, Archives of Public Health. 2014.

[17] Granato SA, International HA. Quality of health facility data in the PMTCT cascade in Côte d ' Ivoire. 2015;(February).

[18] Sekaran U. eBook Collection. 2003. 1-602 p.

[19] Donaldson MS. Quality of Health. 1999.

AUTHORS

First Author – Evans Ogondi, National AIDS Control Council, Ministry of Health, Nairobi, Kenya
Second Author – George Otieno, Department of Health Systems Management, Kenyatta University
Third Author – Isaac Mwanzo, Department of Community Health, Kenyatta University
Fourth Author – Gilbert Koome, School of Clinical Medicine, Mount Kenya University

Corresponding Author: Gilbert Koome, School of Clinical Medicine, Mount Kenya University, Phone: +254 728 509 038, Email: rithaag@gmail.com, Nairobi, Kenya