Evaluation of Relationship of Sources of Health Information System (HIS) and HIS Feedback in Selected Public Health Facilities in Nairobi City County, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. All the authors participated in the design of the study and data collection tools. Authors DM and GO reviewed the manuscript, while author GGM carried out data collection, analysis and wrote the manuscript. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aim: This study sought to assess the extent to which sources of Health Information System (HIS) is associated with HIS feedback in the public health facilities in Nairobi City County.
Methodology: This study adopted the descriptive survey research design. Independent variable was sources of data and information in HIS while dependent variable was the HIS feedback. Public health facilities in Nairobi City County were chosen as the area of study. The research targeted public health record personnel in the public health facilities and the officials of the National HIS Coordinating Committee. To obtain suitable sample, the study used stratified, random and purposive sampling techniques. The sample size of 130 respondents was chosen in the public health facilities. The research instruments used included questionnaires and interview schedule guides. Collected data were coded and then entered into a secure database for analysis by use of

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Statistical Packages for Social Sciences (SPSS) version 23. Both descriptive as well as inferential statistics were used for analysis. Qualitative data were analyzed with an aim of establishing the themes. Significance was assessed at p = 0.05.

Results: The sources of data had a negative association with HIS feedback with a correlation coefficient of -0.753. The relationship between sources of data and HIS feedback was significant (p = 0.0476).

Conclusion: Based on the findings, it was concluded that many sources of data negatively influences HIS feedback. Thus, with more sources of data, there is less HIS feedback.

1. INTRODUCTION

Health is one important sector in the economy of any country. A country that has poor health systems and policies is bound to experience poor economic growth as productivity of citizens might be greatly affected when they fall sick or die from curable cases. Despite the important role played by health sector, serious problems continue to be experienced [1]. In the early 1970's, Kenya's Ministry of Health (MOH) recognized the need to establish the Health Information System (HIS) which is a system for collection and processing of data from various sources and using the information for policy making and management of health services [2]. The HIS was made up of several data sources. Data collected is intended for Ministry of Health headquarter needs. The information generated is expected to assist in the formulation of health policies, setting of priorities and evaluation of health care programs [3].

Health workers collect and report data routinely on all their activities. However, several studies show that very little of this vast amount of data is used by those who are collecting the data and by local health management at health facility or Sub-County levels. Ideally, local data should be collected, analyzed and used to support local health management and local health service delivery [4]. At the centre of data collection, processing and reporting is feedback from recipients of information on the information shared. Ordinarily, feedback is part of key factors in continuous improvement strategies [5]. This indicates that feedback cannot be ignored in implementation of any programme.

In the health sector, feedback in health management information systems supports evaluation of the health programs. Significance of the information systems in the health sector has been attributed to monitoring and evaluation of health services that is critical to quality improvement in the delivery of health-care services [6,7]. In this regard, health information recipients providing feedback support determination on whether programme outcomes are achieved or not. However, this has been a challenge as some health information recipients do not provide feedback which makes it difficult to determine the extent to which health programs are performing.

With advancement in technology, there are increasing reforms in the health sector as a means of improving performance of health sector programs. Part of the reforms is the uptake and usage of information systems. As part of health sector reforms, many developing countries embarked on developing and implementing free and open-source web-based Sub County Health Information Software (DHIS2). For example, in Sierra Leone, South Africa, Zanzibar, Malawi, Tanzania, Ethiopia, Mozambique and Kenya introduced information systems such as DHIS2. The implementation of DHIS2 in these countries facilitated integration of information from various departments in health facilities across large geographical areas [6]. Other benefits included capacity building of the health sector and provision of timely information for decision making.

In Kenya, Health Information System (HIS) is robust and supports collection of data on different health indicators from different sources. The most important component in the HIS is the recipients of the health information who are expected to provide feedback. Despite the robustness and importance of HIS, Karuri et al. [6] argue that information systems in current health services do not meet the expectations of the health sector in Kenya. There are challenges in HIS attributed to disjointed flow of information which limits clear provision of feedback. According to Karuri et al. [6], the recipients and users of health information often get confused on where to provide feedback. In addition, the health information exchange platforms do not clearly

keep track of sources of data which also limits provision of feedback [8]. Further analysis shows that poor collection, collation, compilation, analysis and reporting of health data limit provision of feedback on context [6].

The performance of HIS in Kenya remains largely under-utilized yet the players in the Health Sector heavily rely on the HIS for improvements in provision of health services. The interaction of the stakeholders or players in the Health sector is mainly done through provision of feedback to health information. However, in the current HIS it is difficult to determine the extent to which source of HIS data sources support feedback mechanism. In this situation, the level of feedback from health dispensaries, county hospitals and national hospitals remains unknown yet the facilities contribute data that supports health policies and performance of health programmes. In addition, there is no clarity on who the sources of data and recipients of information should provide their feedback to. This situation limits the effectiveness of feedback system. In essence, HIS was designed to solve problems related to demand of health information by key stakeholders such as donors. However, there are challenges in provision of feedback related to sources of data and information. The challenges indicate that there is unresponsive feedback mechanism. It is against this backdrop that this study seeks to investigate extent to which sources of data affects feedback in Health Information System.

Provision of timely and accurate data or information is one of the factors required in improving Universal Health Coverage (UHC). The coordination among partners involved in the generation of health data is therefore important in supporting the implementation of UHC. In many cases, Ministry of Health collaborates with development partners and donors in implementing programmes which require feedback as part of performance measures. The sources of data and recipients of information often come across situations where some reports are authored by Ministry of Health in collaboration with development partners or donors. The dispensaries are sources of health data at County level and national level hospitals while county level hospitals are sources of data at National hospitals. Also, all different levels of health facilities are sources of data for the Ministry of Health and development or donor partners.

Data collection is the first step of the information process within the Health Information System, and so these systems are often classified according to data collection method. Studies show that there are two basic ways in which to collect data: routinely and periodically (non-routine) [9]. Many Health Information Systems in developing countries, for example, Mozambique and Tanzania deal with routine data collection at the health facility level, which are the main sources of data in healthcare information systems. According to Karuri et al. [6] operations of the Health Information Systems involves collection, collation, compilation, analysis and reporting of health data. This demonstrates how data are collected, processed and disseminated. In addition, the World Health Organization (WHO) [10] considers operations of HIS to include inputs, process and outputs of health data. The WHO [10] proposed that inputs of HIS include personnel, finance and infrastructure. This implies that health records are collected through the facilitation of the health officers by provision of finance and facilities such as computers. Based on the system proposed by the WHO, it is evident that there is interaction between the components of the system. This implies that there is back and forth relationship between inputs and process as well as between processes and outputs and eventually outputs and inputs. This is what is known as a complete system in which Robert [11] asserts that a complete system has interdependent parts working in harmony to achieve intended goals.

The backward interaction between the components of the system is basically feedback of the forward interaction [5,7]. In their argument, Hahn, Wanjala and Marx [5] explain that feedback interaction between components of HIS are intended for improving service delivery of the health sector. The Health Metrics Network (HMN) [12] articulates how service delivery of health sector is dependent on the feedback mechanism between components of the HIS.

The data sources in the Health Information Systems may be population-based and health facility based. The main population-based sources of data are census, household surveys and vital registration systems. The main health facility-related data sources are public health surveillance, health services data also sometimes known as health management information system or routine health information system [13]. According to HMN [13], sources of health records include censuses, household

surveys and assessment of health facilities. The information obtained in the health facilities forms sub-system of the national HIS known as the Routine Health Information Systems (RHIS) at the local health facilities such as the dispensaries. The RHIS at the local level becomes input for the RHIS at the Sub County level. Therefore, efficient RHIS at the local level becomes important at the Sub County level. Lippeveld, Sauerborn and Bodart [14] argued that health systems strengthening strategies at the Sub County and facility levels require robust RHIS for evidence-based decision making. In this case, inefficiencies in RHIS at the local level require corrective measures such as proper implementation of quality assessment and assurance strategies. This implies that there should be a response from the Sub County level to ensure adherence to service delivery guidelines, to minimize medical errors, and to ensure that commodities are available.

In their findings, Karuri et al. [6] observed that DHIS2 system implemented in Kenya does not incorporate requirements of the stakeholders. In this case, it demonstrates deficiency of points of interactions with other health sector stakeholders. The underlying factors to determining empirical evidence on poor implementation of the health information system based on stakeholder participation are not comprehensive based on the ever-emerging needs in the health sector. For example, the health information system in Kenya is designed to facilitate more movement of information or data from local level to national level. There is limited flow of information from national level to local level for decision making. Notably, information is not easily and timely disseminated from national level to local level for further action or internalization of such information suitable to the local context.

In the framework of information flow in the health sector, this policy indicates that mutual relationship should be between different levels of the HIS. The policy establishes standard procedures and processes for data collection, analysis and reporting. It also allocates responsibilities of stakeholders in the management of HIS. The scope of levels of health sector is clearly defined. This provides for the expectation of efficient working of the DHIS. To support the efficient working of the DHIS, this policy provides guidelines and legal framework for reporting and feedback. For example, the policy provides for regular submission of reports to the next level of service for timely feedback to submitting facilities or levels. In addition, the policy provides for mandatory requirement to report and give feedback on health information by all. Finally, there is alignment of multiple stakeholders towards a common reporting mechanism and objective. In this policy, it is clear that feedback mechanism is fully created to enhance two-way communication flows between levels of health facilities.

Based on the source of data and information, it is difficult to determine the extent to which each component of HIS contributes to responsive feedback. Under such situations, there is a threat to achieving good performance in overall provision of health services in Kenya. Unless the level of feedback is determined in the HIS, the feedback mechanism will remain unresponsive. It is against this background that this study sought to examine the extent to which source of data and information affects the level of HIS feedback in selected public health facilities in Nairobi City County.

This study was guided by the following conceptual framework:
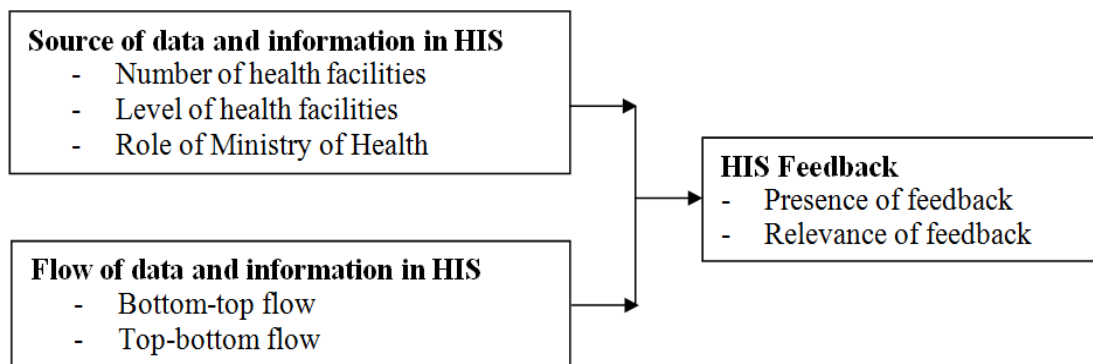
2. MATERIALS AND METHODS

2.1 Research Design

This study adopted the descriptive cross-sectional research design as it is a type of observational study that analyzes data collected from a population, or a representative subset, at a specific point in time. Similarly, it involved collection of data from large area by use of questionnaires to determine characteristics within the population [15,16]. It often uses visual aids such as graphs and charts to aid the reader in understanding the data distribution and is very important in reducing the data to manageable form.

2.2 Variables of the Study

The study had two categories of variables; independent and dependent variables. These variables are shown in Table 1.

2.3 Location of the Study

The study's location was Nairobi City County. The area was chosen because it has all levels of health facility; dispensaries, Sub County hospitals, County and national level hospital. It has also the headquarters of National HIS Coordinating Committee tasked with coordinating HIS in the country.

2.4 Target and Study Population

The study population included public health record personnel from local, Sub County, County and national health facilities. The research also targeted members of the National HIS Coordinating Committee. The health record personnel provided information at their respective dispensaries, sub-county, county and national level health facilities. National HIS Coordinating Committee members provided information on coordination of HIS policy in Nairobi. The size and composition of the target population are indicated in Table 2.

2.5 Sampling Techniques and Sample Size Determination

To obtain suitable sample, stratified, simple random and purposive sampling techniques were used. Stratified sampling helped in grouping health facilities into levels of service. From each stratum, suitable sample were obtained, and random sampling used to obtain health facilities and employees whose tasks included health records. Finally, purposive sampling technique was used to obtain specific employees of HIS Coordinating Committee whose tasks include policy implementation of Health Information Systems.

Table 1. Study variables

Independent Variable	Indicators	Scale
Sources of data and information	- Number of health facilities - Level of health facilities - Role of Ministry of Health	Ordinal
Flow of data and information	- Bottom-Top flow - Top-Bottom flow	Ordinal
Dependent Variable	**Indicators**	**Scale**
HIS Feedback	- Presence of feedback - Relevance of feedback	Ordinal

Table 2. Target population

Hospitals	Total Number of hospitals	Total population of health information officers
National Hospitals	2	38
County Hospitals	3	15
Health Centers / Dispensaries	50	145
Total	55	198

The sample size was determined using Fisher et al 1998 as follows:

$$n = \frac{Z^2 pq}{d^2}$$

Where:

n = the desired sample size;
p = the proportion in target population: since p was not known, standardized estimate of 0.5 was applied;
q = (1-p) standardized (1-p =0.5);
Z = Standard normal deviation usually at 1.96;
d = the degree of accuracy required = 0.05.

In this case 95% confidence level has 5% error or 0.05 errors

Therefore 0.05 is the level of significance

$$n = \frac{(1.96)^2 0.5 x 0.5}{0.05^2}$$

n=384.16

Since the target population was less than 10,000; therefore, the final sample was calculated by using the adjusted formula i.e.

$$nf = \frac{n}{1 + (\frac{n}{N})}$$

Where:

nf = Desired sample size when the population is less than 10,000.
n = The estimated population size; where n= 384
N = Estimated population; (N= 198, Approximate population of health record officers in all the public hospital in Nairobi).

Therefore,

$$nf = \frac{384}{1 + (\frac{384}{198})}$$

nf = 130

However, some of these are prone to be on study leave, and annual leave so that at any one given time the accessible population was approximated to 130, which was distributed proportionately to the population size in all the levels of the hospitals.

2.6 Research Instruments

Primary data were collected using semi-structured questionnaires and interview schedule guides. The questionnaires were also used to collect data from health record officers within the public health facilities in Nairobi City County. Key informant interviews schedule guides were used to gather information or opinions on specific topics on the informed consent which involved the Health information system feedback from the health record officers on all levels of the public healthcare.

Pretesting of the questionnaire was done in order to validate them and this involved selecting a pretest group of 10 individuals from public hospitals outside the sampling frame which were not included in the actual study. This was done in Kiambu level V Hospital in Kiambu County. The clarity of the instrument items to the respondents was established, as well as familiarization with research and its administration procedures. Items that required modification were identified. Finally, the results helped in correcting inconsistencies arising from the instruments, which ensured that they measure what is intended. The inconsistencies included measurement indicators and scale for some questions.

The validity of the instruments was checked in terms of how the questionnaire is constructed and the content of the questionnaire. This ensured the questions were structured in an understandable way clear to all and respondents able to interpret all questions in the same way without any bias and the responses finally helped answer the research questions.

Table 1. Sample size

Hospitals	Total Number of hospitals	Total population of health information officers	Sampled population of the health information officers
National Hospitals	2	38	25
County Hospitals	3	15	10
Health Centers / Dispensaries	50	145	95
Total	55	198	130

To establish reliability of instruments, pilot-testing of the instruments was done. Test and retest for the same respondents who were no part of the study was done. The results of the test and retest were analyzed by use of Cronbach Alpha yielding a reliability coefficient of 0.76, which was considered acceptable for data collection.

2.7 Data Collection Procedures

To get information effectively, questionnaires and interview schedule guide were used to collect data. Questionnaires were administered with the help of assistants trained and sent to the sampled public hospitals within Nairobi City County. Questionnaires were dropped and picked after one week. The use of questionnaires limits the interviews chance of being biased. It is therefore efficient in terms of time and its anonymous nature allows respondents to give information freely. Further, one on one interviews were conducted using schedule guides. Interviews are good method data collection instruments since they allow the researchers to seek clarification in case they do not understand a given concept, something one cannot do in the case of a questionnaire. The interview guides had both structured and unstructured questions. The data collection was done for a period of one month.

2.8 Data Analysis and Presentation

Both descriptive as well as inferential statistics were analyzed with the help of Statistical Package for Social Sciences (SPSS) version 23. All quantitative data were converted to continuous data to achieve a normal distribution. The responses provided in binary form of "Yes" and "No" were coded and converted to ordinal scale of "0-1" where "0" represented "No" while "1" represented "Yes". For each of the variables, descriptive statistics such as the measures of central tendencies dispersion and frequency distribution were used to summarize the data and to describe the distribution of the sample.

Similarly, for each variable, the inferential statistics through Pearson Correlation and logistic regression were used to infer the sample results to the population. Pearson Correlation was used to test strength of relationship between sources of data or information and HIS feedback and flow of data or information and HIS feedback. Regression analysis was used to test the variations between independent variables (sources of data and information and information flows) and dependent variable (HIS feedback). For each of the variable, qualitative data were analyzed with an aim of establishing the themes which corroborated the quantitative data. Analyzed quantitative data were presented using tables and charts whereas the qualitative data were presented in terms of narrations.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Response rate

A total of 130 questionnaires were administered to health information officers and 114 were filled and returned. The response rate therefore was 88% as illustrated in Table 4. Health centres/dispensaries had the highest response rate while national hospital had the lowest rate (Table 4).

3.1.2 Demographic characteristics of the respondents

3.1.2.1 Gender of respondents

Information on gender of the respondents was obtained. Majority of health information officers are male (58.8%) (Fig. 1). Gender distribution across the hospitals indicated that National Hospitals had the highest percentage of male to female at 83.3% while the Health centres/dispensaries had the least percentage of male to females at 52.3% (Fig.1).

Table 4. Response rate of health workers included in the study

Hospitals	Sample Size	Questionnaires administered	Questionnaires filled and returned	Response rate
National Hospitals	25	25	18	72%
County Hospitals	10	10	8	80%
Health Centers / Dispensaries	95	95	88	93%
Total	130	130	114	88%

3.1.3 Working experience of respondents

Information on working experience of the respondents was obtained. This study revealed that majority of respondents (43.0%) have working experience of between 6.1 years and 9.0 years. The highest number of this cadre of officers is in County Hospitals while the least is in National Hospitals (Fig. 2). Respondents with less than 3 years and above 10 years were very low.

3.1.4 Health information system feedback

Health information system feedback findings were obtained and presented based on health facilities (Fig. 3) and working experience of health officers (Table 5). Overall findings on the level of feedback was also obtained and presented as presented in Table 3.

3.1.4.1 Health information system feedback based on health facilities

Findings on presence and relevance of feedback were obtained. The findings indicated that 67% of the health officers at dispensaries acknowledged to have received feedback compared to 62.5% and 66.7% at County hospitals and National hospitals, respectively (Fig. 3). The feedback was in form of referrals, disease prevalence rates and policy implementation. In terms of relevance, the highest numbers of health officers (88.6%) of were in dispensaries who considered that feedback was relevant compared to 87.5% and 66.7% in County and National hospitals, respectively (Fig. 3). The findings further showed that at dispensary level, 86.4% of the health officers considered feedback from Ministry of Health to dispensaries relevant compared to 87.5% at County hospital level and 72.2% at National Hospital level (Fig. 3). The feedback was beneficial in terms of helping the health facilities improve data collection, information processing and general implementation of the Health policies.

3.1.4.2 Health information system feedback based on working experience

Findings on HIS feedback based on working experience were obtained. The findings showed that health officers with a higher work experience (more than 6 years) at Dispensary and County health facilities confirmed that there was feedback which was also relevant (Table 5). However, health officers with lower work experience (less than 6 years) at National health facilities confirmed that there was feedback which was also relevant (Table 5). The findings imply that with experience, the health officers are able to participate in the HIS through transfer of data and information as well as receiving feedback.
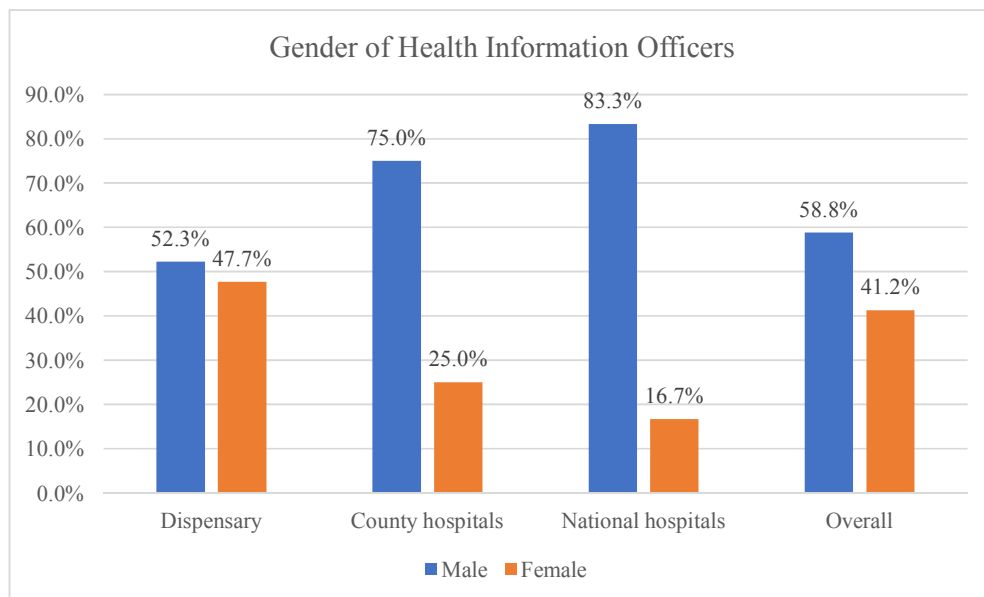

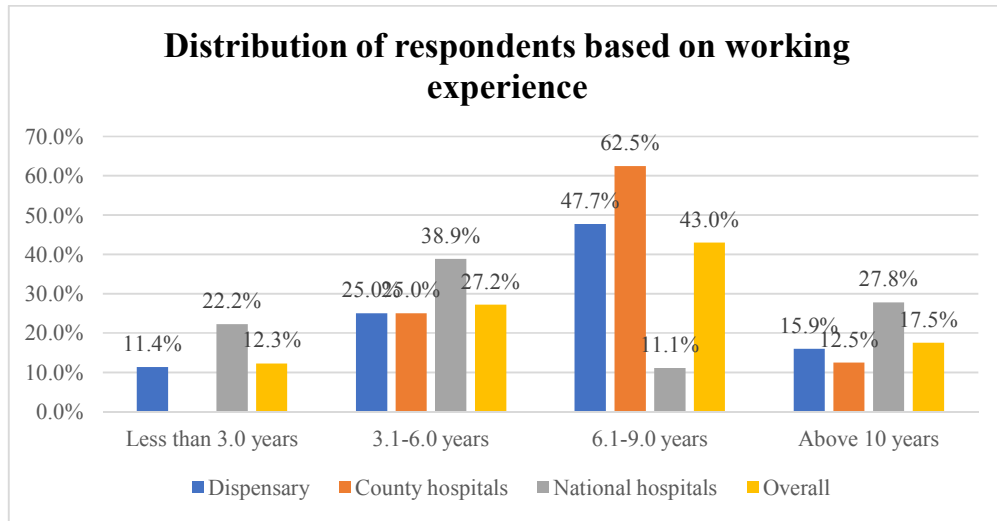**Fig. 1. Distribution of respondents based on gender**

Distribution of respondents based on working experience

Fig. 2. Distribution of respondents based on working experience

Table 5. Health information system feedback based on working experience of health officers

Presence and relevance of HIS feedback	Less than 3.0 years	3.1-6.0 years	6.1-9.0 years	Above 9.0 years
There is feedback to all data from dispensaries	13.6%	27.1%	44.1%	15.3%
There is feedback to all data from county hospitals	-	40%	40%	20%
There is feedback to all data from national hospitals	16.7%	33.3%	8.3%	41.7%
Feedback from dispensaries is always relevant in HIS	12.8%	23.1%	50.0%	14.1%
Feedback from county hospitals is always relevant in HIS	-	14.3%	71.4%	14.3%
Feedback from national hospitals is always relevant in HIS	25%	33.3%	8.3%	33.3%
Feedback from Ministry of Health is always relevant in HIS	12.5%	22.9%	46.9%	17.7%

Scale: No=0, Yes=1 Dispensaries (n=88); County hospitals (n=8); National hospitals (n=18); Min. of Health (n=114)

Table 6. Health information system feedback

Presence and relevance of HIS feedback	N	Mean
There is feedback to all data from dispensaries	88	.67
There is feedback to all data from county hospitals	8	.63
There is feedback to all data from national hospitals	18	.67
Feedback from dispensaries is always relevant in HIS	88	.89
Feedback from county hospitals is always relevant in HIS	8	.88
Feedback from national hospitals is always relevant in HIS	18	.67
Feedback from Ministry of Health is always relevant in HIS	114	.84
Overall		**.75**

Scale: No=0.0-0.49; Yes=0.50-1.00

3.1.4.3 Overall health information system feedback

The overall HIS feedback was obtained. The findings indicated that dispensaries and national hospitals had a higher mean on presence of feedback in the HIS to all data than the county hospitals (Table 6). Also, the findings indicated a highest mean on feedback in the HIS being relevant in dispensaries while National hospital had the lowest mean (Table 6). The Ministry of Health mean on feedback in the HIS being relevant was 0.84. The overall mean on presence and relevant of HIS feedback was 0.75 indicating that the feedback was present and relevant.
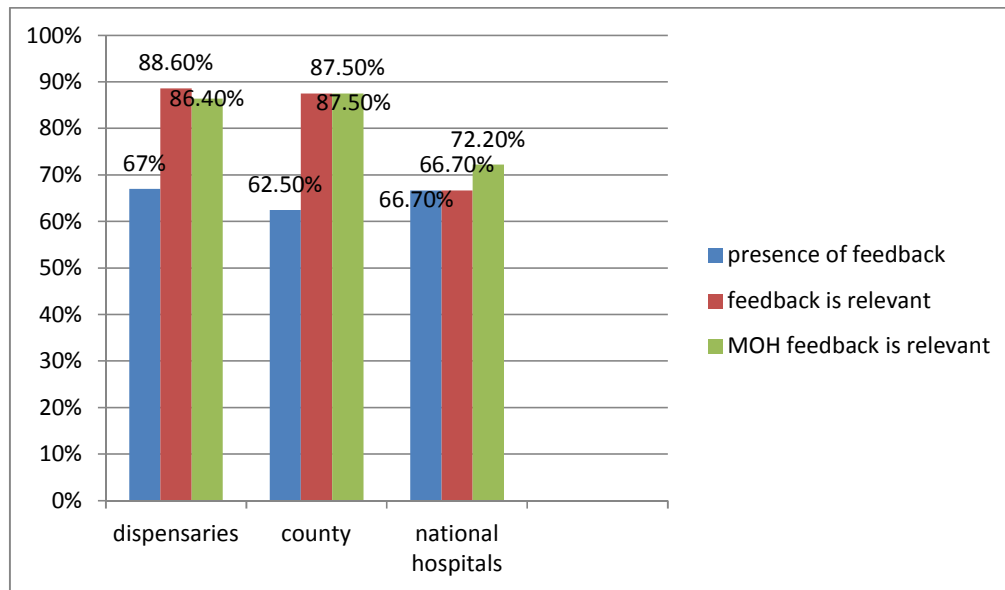
Fig. 3. Health information system feedback based on health facilities

3.1.5 Sources of data and information in health information systems

In the HIS, source of data and information is important in determining the level of contribution or participation of the health facilities. The findings were obtained and presented in Tables 7, 8, 9, 10 and 11.

3.1.5.1 Sources of data and information

Findings on sources of data and information in HIS were obtained. It was established that Dispensaries, County and National health facilities are main sources of data information in the HIS. The facilities provided data and information in the HIS on patient records, patient referrals, health surveys and policies or regulations. The study revealed that Dispensaries provided most patient records while National hospitals had highest number of referral records (Table 5). Dispensaries also provided higher RHIS records while County hospitals provided most of the information on health policies and regulations (Table 5). Overall, majority of data were on patient records while referrals had the least records (Table 5).

3.1.5.2 Sources of data and information based on health facilities

Findings on sources of data and information based in health facilities were obtained and cross tabulated as shown Table 6. Findings indicated that National hospitals provided most data and

information (88.9%) into the HIS, followed by County hospitals and dispensaries. The findings also indicated that National hospitals received most data and information from Ministry of Health followed by County hospitals and dispensaries (Table 6).

3.1.5.3 Sources of data and information based on experience of health officers

Findings on sources of data and information as observed by health officers with different working experience were obtained. The findings indicated that health officers with high working experience (above 6 years) confirmed that health facilities provided and received data or information in the HIS (Table 9).

3.1.6 Overall sources of data and information in the health information system

The overall findings on sources of data and information in the HIS were obtained and are shown in Table 10. The findings showed that all health facilities provided regular data to HIS. The findings also revealed that National hospitals had the highest mean in receiving regular information from Ministry of Health while dispensaries had the least mean (Table 10). The findings imply that all health facilities participate in providing data into HIS but feedback was regularly provided to only County and National hospitals and rarely to dispensaries.

Table 7. Sources of data and information in health information systems

Health facility	Patient records	Referrals	Health surveys	RHIS	Policies and regulations
Dispensary	67.0%		9.1%	13.6%	10.2%
County hospitals	37.5%	25.0%	12.5%	12.5%	12.5%
National hospitals	33.3%	38.9%	11.1%	11.1%	5.6%
Overall	**59.6%**	**7.9%**	**9.6%**	**13.2%**	**9.6%**

Scale: No=0, Yes=1

Table 8. Sources of data and information based on health facilities

Provision and Acquisition	Dispensary (n=88)	County hospitals (n=8)	National hospitals (n=18)
Health facility providing regular data to the HIS	62.5%	87.5%	88.9%
Health facility receiving regular information from Ministry of Health in HIS	43.2%	62.5%	66.7%

Scale: No=0, Yes=1

Table 9. Sources of data and information based on experience of health officers

Provision and Acquisition	Less than 3.0 years	3.1-6.0 years	6.1-9.0 years	Above 9.0 years
Dispensaries providing regular data to the HIS	12.7%	23.6%	49.1%	14.5%
County hospitals providing regular data to the HIS	-	28.6%	57.1%	14.3%
National hospitals providing regular data to the HIS	12.5%	43.8%	12.5%	31.3%
Dispensaries receiving regular information from Ministry of Health in HIS	10.50%	21.10%	57.90%	10.50%
County hospitals receiving regular information from Ministry of Health in HIS	-	40.0%	40.0%	20.0%
National hospitals receiving regular information from Ministry of Health in HIS	8.3%	8.3%	50.0%	33.3%

Scale: No=0, Yes=1

Table 10. Overall sources of data and information in HIS

Provision and Acquisition	N	Mean
Dispensaries providing regular data to the HIS	88	.63
County hospitals providing regular data to the HIS	8	.88
National hospitals providing regular data to the HIS	18	.89
Dispensaries receiving regular information from Ministry of Health in HIS	88	.43
County hospitals receiving regular information from Ministry of Health in HIS	8	.63
National hospitals receiving regular information from Ministry of Health in HIS	18	.67

Scale: No=0.0-0.49; Yes=0.50-1.00

Table 11. Correlation between sources of data and health information system feedback

Correlations		Feedback of HIS	Source of data and information in HIS
Feedback of HIS	Pearson Correlation	1	-.753
	Sig. (2-tailed)		.084
	N	7	6
Source of data and information in HIS	Pearson Correlation	-.753	1
	Sig. (2-tailed)	.084	
	N	6	6

3.1.7 Relationship between sources of data and health information system feedback

Correlation between sources of data and HIS was done and presented in Table 11. The findings showed that with correlation coefficient of -0.753, source of information negatively influenced HIS feedback. The findings imply that feedback is less provided with increase in number of sources of the data and information. In this case, feedback is likely to be provided when sources of data are less.

3.1.8 Hypothesis testing

Hypothesis was tested at significance level of 0.05. With a $p = 0.0476$, the null hypothesis that there is no significant relationship between source of information and the Health Information Systems feedback in selected public health facilities in Nairobi City County, was rejected.

3.2 Discussion

3.2.1 Health information systems feedback

This study established that there was feedback at all levels in the HIS. The feedback was on referrals, disease prevalence rates and policy implementation. The feedback was beneficial in terms of helping the health facilities improve data collection, information processing and general implementation of the Health policies. According to Karuri et al. [6] feedback is important for smooth running of any system. In this study, feedback provided was relevant especially from the Ministry of Health. This was due to the role of Ministry of Health in formulating policies and coordination of all health services activities. In this regard, Ministry of Health provided feedback inform of policy documents, policy statements and general health services guides following the data that was obtained, transferred, processed and analysed. However, to every data or information shared in HIS, feedback was not fully provided. Thus, HIS feedback varies by 3.5% while 96.5% remaining is explained by other variables or factors not included in the model and represented by the error term.

3.2.2 Sources of information and health information systems feedback

The findings indicated that there are two major sources of data in the HIS which are important in provision of data in the HIS. The major sources are health facilities and Ministry of Health. Health facilities included dispensaries, County hospitals and National hospitals. The findings also indicated that National hospitals provided regular data more than County hospitals and dispensaries. The data shared was mainly patient statistics, prevalence of diseases and monitoring and evaluation data for policies and programmes. In response, National hospitals received most data and information from Ministry of Health followed by County hospitals and dispensaries. However, in terms of frequency of receiving the information, County and National hospitals received information regularly from Ministry of Health, dispensaries did not.

The findings imply that all health facilities participated in providing data into HIS but feedback was regularly provided to only County and National hospitals and not dispensaries. In this regard, correlation between sources of data and HIS revealed that with correlation coefficient of -0.753, source of information negatively influenced HIS feedback. The findings indicate that feedback is less provided with increase in number of sources of the data and information. In this case, feedback is likely provided when sources of data are less.

The findings agree with HMN [13] that the sources of information (include patient records, surveys, RHIS and policies or regulations) form input of the HIS. The negative influence of sources of information on feedback is also supported by findings Karuri et al. [6] that interaction between sources of information is very limited. In this regard, the findings implied that source of data and information is not a major determinant in the HIS.

In testing the hypothesis stating that there is no significant relationship between source of information and the Health Information Systems feedback in selected public health facilities in Nairobi City County, the findings indicate that there is significant relationship. With the $p = 0.0476$, this study rejects the hypothesis that there is no significant relationship between sources of data and information and the Health Information Systems feedback in selected public health facilities in Nairobi City County.

4. CONCLUSION

This study was designed to assess the Health information system feedback in selected public health facilities in Nairobi City County. The study sought to answer question about the extent to which sources information is associated with

Health Information Systems feedback in selected public health facilities in Nairobi City County, Kenya. The study has demonstrated that the source of data and health information has a negative but insignificant association with HIS feedback. In view of the findings, the study concludes that source of information or data is a cause of unresponsive HIS. In this regard, source of data or information do not significantly matter in the provision of feedback.

CONSENT AND ETHICAL APPROVAL

Authority to conduct research was sought from Kenyatta University ethical board, NACOSTI, Ministry of Health (MOH) and the Nairobi City County government to conduct research in this county. Respondents consent was sought and only those willing were enlisted in the study. Those unwilling were not coerced to participate. Questionnaires were coded to protect the identity of the respondents. The identity of respondents was not disclosed and was treated with utmost confidentiality. Besides these basic research ethics requirements, the study upheld the highest ethical standards.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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