Effect Of Healthcare Providers' Knowledge And Skills On The Effectiveness Of HMIS Performance In Public Health Facilities In Kakamega County, Kenya

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Abstract

Despite various reforms aimed at strengthening HMIS, healthcare providers' knowledge and skills continue to impede its effectiveness in public health facilities in Kakamega County, Kenya. This study examined the relationship between healthcare providers' knowledge and skills. A correlational research design was employed, targeting 1,050 healthcare workers across 15 Level IV health facilities in Kakamega County. A sample of 281 participants was selected using cluster, stratified, and simple random sampling techniques, comprising 15 Medical Superintendents and 266 healthcare workers. Data were collected using validated questionnaires and interview guides, with reliability confirmed through a pilot study, yielding Cronbach's alpha coefficients of 0.826, 0.754, and 0.818 for knowledge and skills, attitudes and motivation, and values and beliefs, respectively. Data analysis included descriptive and inferential statistical techniques, with correlation, regression, and ANOVA analyses used to establish relationships between behavioral factors and HMIS performance. Regression findings indicated a positive and significant correlation between knowledge & skills ($B_1 = 0.766$, p = 0.000) and HMIS performance. These results highlight the crucial role of healthcare providers' knowledge and skills on HMIS effectiveness. The study's findings provide valuable insights for healthcare providers, facility administrators, policymakers, and researchers, contributing to improved HMIS implementation and overall healthcare service delivery. Based on these findings, the study recommends prioritizing capacity-building programs to enhance healthcare providers' knowledge and skills.

Key Words: Healthcare, Knowledge, Skills, Public Health Facilities Date of Submission: 18-04-2025

Date of Acceptance: 28-04-2025

I. Background

Despite ongoing efforts to strengthen HMIS, persistent barriers particularly behavioral determinants among healthcare providers hinder its full potential (Kaunda, Manda, Kaasbøll, & Asah, 2023). The Integrated Behavior Model (IBM) provides a theoretical foundation for understanding these behavioral factors, asserting that behavioral intention is the strongest predictor of human action, assuming no external constraints such as inadequate knowledge, skills, or systemic limitations (Muhoza et al., 2022). In the HMIS context, healthcare providers' knowledge and skills, attitudes and motivation, and values and beliefs directly shape their intention and ability to effectively use the system. Positive attitudes foster HMIS adoption, perceived norms influence engagement, and behavioral control shaped by training and support determines actual utilization.

Globally, governments and development partners have invested heavily in HMIS to strengthen datadriven healthcare decision-making (Chikovani et al., 2024). However, even advanced health systems, such as the United Kingdom's National Health Service (NHS), have faced challenges in fully leveraging HMIS despite extensive digital health investments (Sheikh et al., 2021). Similarly, behavioral barriers have hindered HMIS adoption in hospitals across Pakistan (Luo et al., 2024). In sub-Saharan Africa, despite improvements in Routine Health Information Systems (RHIS), data utilization remains inadequate due to behavioral constraints (Muhoza et al., 2022). For instance, in Tanzania, the implementation of the District Healthcare Information System (DHCIS) has been significantly impeded by behavioral challenges (Neelima et al., 2024). In Kenya, the Ministry of Health (MoH) has made substantial strides in strengthening HMIS in line with Vision 2030 and the SDGs (Vision 2030, 2020; MoH, 2020; Manya et al., 2023). In Kakamega County, HMIS, including Electronic Medical Records (EMR)plays a vital role in healthcare planning and service delivery. However, behavioral factors continue to limit its effectiveness, particularly in public health facilities (County Government of Kakamega, 2023; Nandikove, 2020). Addressing these behavioral constraints is essential for optimizing HMIS performance and achieving better healthcare outcomes in the region.

Although various studies have examined behavioral determinants affecting HMIS performance, many have focused on individual aspects rather than taking a holistic approach that integrates knowledge and skills, attitudes and motivation, and values and beliefs. Additionally, existing research has relied predominantly on quantitative methodologies, limiting the depth of behavioral insights that qualitative approaches could provide. To bridge this gap, this study employs a mixed-methods approach to comprehensively analyze the impact of behavioral determinants on HMIS performance among healthcare providers in Kakamega County.

Statement of the Problem

The main value of effective HMIS performance among healthcare providers is its crucial role in informed decision-making, improving patient outcomes, enhancing healthcare efficiency, and supporting policy planning. However, public health facilities worldwide continue to face challenges such as insufficient data utilization, poor patient outcomes, limited healthcare efficiency, and inadequate policy planning, which remain significant concerns to stakeholders.

Despite reforms aimed at enhancing HMIS to better meet diverse health needs and improve decisionmaking, challenges still impede its overall effectiveness among healthcare providers in public health facilities in Kakamega County, Kenya. Addressing these behavioral factors knowledge and skills, attitudes and motivation, and values and beliefs of healthcare providers is essential for improving HMIS performance. While prior studies have examined individual behavioral factors affecting HMIS, they often focus on isolated aspects rather than their interdependent effects on system performance. For instance, studies in Ethiopia have highlighted knowledge, skills, and supportive supervision as key factors in routine health information use, yet these studies failed to assess their effect on overall HMIS effectiveness. This gap in literature limits a holistic understanding of how these behavioral factors interact to shape HMIS outcomes. Therefore, this study sought to bridge this gap by comprehensively analyzing the effect of healthcare knowledge and skills on HMIS performance in public health facilities in Kakamega County, Kenya.

Specific Objectives

To assess the effect of healthcare providers' knowledge and skills on the effectiveness of HMIS performance in public health facilities in Kakamega County, Kenya.

Research Questions

The study was guided by the following research questions;

What is the effect of healthcare providers' knowledge and skills on the effectiveness of HMIS performance in public health facilities in Kakamega County, Kenya?

Conceptual Framework Independent Variable	Dependent Variable
 Healthcare providers' knowledge & skills Data collection proficiency Data entry & management Data analysis and interpretation System navigation & usage Data security and privacy awareness 	HMIS Performance > Data accuracy > Timeliness > Data completeness > Utilization rate > Error rate

Theoretical Review

The adoption of the Integrated Behavior Model (IBM) in this study provides a comprehensive framework for understanding the behavioral determinants that influence the performance of the Health Management Information System (HMIS) among healthcare providers. IBM, as formulated by Fishbein and Ajzen (2010), builds upon the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB), integrating

constructs from multiple behavioral theories to explain how individual intentions translate into actual behavior. This model is particularly relevant to the study as it emphasizes that behavioral intention is the strongest determinant of behavior, assuming that external barriers such as lack of skills or situational constraints do not hinder execution (Muhoza et al., 2022). In the context of HMIS, healthcare providers' ability to effectively use the system depends largely on their intention to adopt and integrate it into their daily routines, which is influenced by their attitudes, perceived norms, and self-efficacy.

Perceived behavioral control, another central construct of IBM, highlights the importance of healthcare providers' confidence in their ability to use HMIS effectively. Even when there is a strong intention to adopt HMIS, external constraints such as inadequate training, lack of technical support, and system inefficiencies can pose significant barriers, preventing successful implementation. The study findings indicate that healthcare providers' knowledge and skills have the greatest effect on HMIS performance, aligning with IBM's emphasis on the necessity of sufficient competence for behavioral execution. Providers with strong data collection, entry, analysis, and interpretation skills are more likely to engage with HMIS effectively, resulting in improved data accuracy, completeness, and utilization. Conversely, those with limited skills or insufficient training may struggle to use the system efficiently, leading to errors, underutilization, or system rejection.

Empirical Literature Review

Researchers Doka, Worku, Negeri, and Kassa (2024) used a mixed-methods approach to assess the routine health information system's data quality and associated factors among health staff at public health facilities in Southern Ethiopia's Gofa Zone. A phenomenological qualitative investigation was combined with a quantitative cross-sectional study that was carried out at an institution. The dates of April 1 to April 30, 2023, were the dates of data collection. A total of 304 health care workers were chosen at random. Three focus groups and six in-depth interviews were conducted. We used theme analysis and multilevel linear regression. A total of 59.5% (95% CI = 53.8, 65.1) of respondents rated the data as high in quality, according to the study. Data completeness was at 93.5%, data correctness was at 89.4%, and report timeliness was at 53.3%. Data quality was significantly influenced by factors such as perceived competence in data management (β = 0.10, 95% CI = 0.03, 0.18).

Belay, Gebeyehu, Atnafu, and Denboba (2024) performed a study aimed at improving the knowledge and skills of health workers in Ethiopia with customized health information system interventions. A pre-post interventional research design was utilized. Chi-square tests were employed for trend analysis to assess variations in health professionals' knowledge and competence levels over a five-year span. The research indicated that the capacity-building initiatives implemented by the Data Use Partnership (DUP) and the Capacity Building and Mentorship Program (CBMP) significantly improved health professionals' expertise and proficiency in Health Information System (HIS) tasks, with enhancements of 37% in data quality verification knowledge, 29% and 20% in data visualization and interpretation skills, and 24% and 28% in problem-solving and data utilization, respectively.

In a study conducted in southwest Ethiopia, Walle, Demsash, Ferede, and Wubante (2023) used the information system success model to evaluate the level of satisfaction among healthcare professionals regarding the district health information system and its related components. In the Oromia area of southwest Ethiopia, a cross-sectional survey based on institutions was conducted from November to December 2022. In all, 391 medical experts were surveyed for the research. A census was used to choose the participants. A self-administered questionnaire was used to collect data. Analysis of moment structure (AMOS) V 26 was used to explore the relationships between constructs, evaluate reliability and model fit validity, and conduct structural equation modelling analyses on the measured variables. The study found that how well people understood and used computers had a direct impact on how satisfied they were with the system.

Research by Folorunso (2024) examined how healthcare organizations in Oyo, Nigeria, used Information Security Management Systems (ISMS) to safeguard patient data. Structured questionnaires were used to gather data, which was analyzed using multiple regression and Pearson Product-Moment Correlation. The findings highlight the need of continual training in improving security standards, since they show a strong positive link between staff training and the safety of patient information. The need of limiting data access to authorized personnel was highlighted by the strong link between access controls. Another important indicator of data security was encryption policies and procedures.

Simba et al. (2022) conducted a cross-sectional survey among Tanzanian district health administrators to assess their perceptions of the utility and skill of using data from the district health information system. A self-administered online questionnaire was used as a quantitative tool in the descriptive cross-sectional study. We used a chi-square test to look for statistically significant differences between the categories after doing frequency and bivariate analyses. The majority of managers claimed to have average to advanced competences in data validation, even though only 50% of them had user accounts and had training in DHIS2 data analysis, according to the poll.

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Researchers Osman, Abdi, Mohamed, Ahmed, and Fiidow (2024) looked examined how health professionals in Somalia's Banadir Region used health management information systems and what factors affected their use. Public health care institutions in eight randomly chosen districts of Banadir region were the sites of cross-sectional research that took place from March to June 2024. More than a third of healthcare workers in the study had poor health information utilization; thus, it is crucial to prioritize healthcare decision-making capacity empowerment in the Banadir region, strengthen facility support, and provide staff with health information system training.

2.3 How much of an impact healthcare providers' mindsets and drives have on HMIS efficiency Researchers Opara, Ogaji, and Onyemachi (2023) looked at the obstetrics and gynecology department midwives' familiarity with, and comfort with, using a health management information system in teaching hospitals in Abia State. The researchers used 161 participants in a cross-sectional study that relied on structured questionnaires. The SPSS, Version 25, was used for both descriptive and inferential statistics. The parameters related to midwives' knowledge and attitude towards HMIS were identified using ordinal logistic regression. A larger proportion of respondents had favorable views of HMIS and solid knowledge of the subject, according to the study. The midwives' sentiments about HMIS were much worse.

In Maridi County, Western Equatorial State, South Sudan, Morris, Nyongesa, and Sokiri (2024) mapped out the challenges and possibilities for enhancing the quality of data in health information systems (HIS). Data quality was examined using a cross-sectional study using statistical tools from the Statistical Package for the Social Sciences (SPSS) version 25. The study aimed to investigate behavioral, organizational, and technical elements of the data through descriptive, factor, and theme analysis. Data quality was affected by a lack of motivation, unfavorable attitudes among staff, heavy workloads, uncooperative participants, insufficient supervision, poor feedback, and training, according to the study.

An investigation on the utilization of HMIS data and the factors influencing it was carried out by Senyonga, Mukuru, and Kiwanuka (2023) in a cross-sectional study based on medical facilities in East Wollega, Oromia Regional State, Ethiopia. Using a cross-sectional design and a standardized questionnaire that had been pilot tested via interviews, the researchers compiled their findings. We ran logistic regression, both bivariate and multivariate. The study found a strong correlation between using HMIS data and staff motivation.

The purpose of this cross-sectional study was to examine the factors that influence health professionals' use of health management information in public health institutions located in North Wollo Zone, Northeast Ethiopia (Ngusie, Ahmed, Kasaye and Kanfe, 2022). Researchers found that participants who reported higher levels of intrinsic motivation also reported higher rates of health management information consumption. Officers who utilize HMIS do not receive any sort of incentive, according to research by Siddique et al. (2021). An additional finding from Kosasih, Wiweka, Wulandari, and Putra (2023) shows that real benefit features are strongly correlated with system quality aspects.

Ayele, Abera, Ayele, Gudina, and Firdisa (2024) evaluated the use of routine health data and its influencing factors among healthcare professionals at public health institutions in the Harari region of eastern Ethiopia. A cross-sectional study design centered in an institution was conducted from June 1 to July 31, 2020. Frequency analyses and cross-tabulations were conducted. Bivariate and multivariate logistic regression analyses were conducted to assess parameters related to the routine utilization of health data. The odds ratio was computed, and a p-value below 0.05 was deemed significant. The research indicated a substantial correlation between the utilization of routine health data and healthcare professionals who got consistent feedback.

Dakika and Saronga (2024) investigated the determinants affecting the utilization of Health Management Information Systems data for health facility planning in Kigoma Ujiji Municipal and Kigoma District Councils, Tanzania. Cross-sectional explanatory research was performed utilizing a qualitative methodology. The research utilized the PRISM framework to examine the impact of technical, organizational, and behavioral aspects on data utilization in health facility planning. Data was gathered via comprehensive interviews and focus group discussions. Thematic analysis, facilitated by NVivo software, was utilized to organize and evaluate the data. The study demonstrated that personal attitudes and behaviors enhance the utilization of data in health facility planning and decision-making.

II. Methodology

The study was carried out in Kakamega County. The labor force in Kakamega County, Kenya, comprised a varied array of professionals, encompassing community health workers, physicians, surgeons, psychologists, pharmacists, nurses, laboratory technicians, and physiotherapists. The county boasts around 2,600 healthcare professionals spread throughout 352 health facilities (Kakamega County Integrated Development Plan, 2023). The Health Management Information System, encompassing the implementation of Electronic Medical Records, played a pivotal role in informing decision-making and strategic planning, as exemplified by KCRH. Nonetheless, in light of its importance, it faced obstacles, including behavioral determinants, that constrained its efficacy (Nandikove, 2020). Furthermore, Kakamega County was chosen for this study due to its varied urban and rural

health facilities, offering a representative sample. The county, comprising 3.92% of Kenya's overall population, presents a compelling context for assessing the utilization and efficacy of HMIS, particularly in light of the recent implementation of the Kenya EMR system by USAID and PATH. This investigation employed a correlational research framework to explore the interrelationship or association among two or more variables. The population of interest consisted of 1,050 healthcare professionals, purposefully selected from 15 public health facilities throughout Kakamega County. A formula by Fisher (1963, as cited by Kothari, 2004) was employed to arrive at a sample of 281 respondents. This study employed cluster sampling technique to divide the county into ten groups named clusters (Sub Counties). Subsequently, stratified random sampling technique was employed to divide the clusters into strata, and then simple random sampling was used to select healthcare workers within each stratum for participation in the study. The researcher utilized questionnaires and an interview schedule as methods of data collection for the study. Data was analysed using linear regression model and the findings presented using tables.

III. Findings

The study posited that the knowledge and abilities of healthcare practitioners influenced the functioning of the Health Management Information System (HMIS) in public health institutions in Kakamega County, Kenya. It evaluated the knowledge and skills of healthcare practitioners with five questionnaire items from healthcare workers.

Statement	Ν	SD	D	Ν	Α	SA	М	STD
I have skills to gather accurate and	F	3	15	22	64	144	4.33	.95
relevant data for HMIS	%	1.2	6.0	8.9	25.8	58.1		
I am regularly trained on patient	F	0	4	16	196	32	4.03	.51
protection within the HMIS	%	0	1.6	6.5	79.0	12.9		
I have competence in data analysis and	F	0	4	48	187	9	3.81	.51
information interpretation	%	0	1.6	19.4	75.4	3.6		
I have computer literacy to use health	F	5	8	78	147	10	3.60	.71
system	%	2.0	3.2	31.5	59.3	4.0		
There shills in health data and idetion	F	0	0	31	190	27	3.98	.48
I have skins in health data validation	%	0	0	12.5	76.6	10.9		

Table 1: Descriptive Statistics for healthcare providers' knowledge and skills

Table 1 indicate that 3 (1.2%) of the respondents were in a strong disagreement that they had skills to gather accurate and relevant data for HMIS, 15 (6.0%) disagreed, 22 (8.9%) had neutral opinion, 64 (25.8%) agreed and 144 (58.1%) strongly agreed. The study findings suggested that most 144 (58.1%) of the healthcare workers had a strong agreement that they had skills to gather accurate and relevant data for HMIS. The mean scores indicate a strong agreement among respondents on their skills and training related to the Health Management Information System (HMIS). Higher mean scores (above 4.0) suggest that most respondents agree or strongly agree with the statements. Standard deviations close to 0.5 suggest low variability, meaning that most responses were clustered around the mean, while a standard deviation close to 1 (as seen in data gathering skills) indicates a slightly more varied response.

The highest mean score (4.33) for gathering accurate and relevant data suggests that most health workers in Kakamega County are confident in their ability to record and manage data effectively. This could be due to regular training, exposure to data entry tasks, or prior experience. However, the relatively high standard deviation (0.95) implies some variations, possibly due to differences in training levels or experience among respondents. On the other hand, computer literacy had the lowest mean (3.6) and a moderately high standard deviation (0.71), indicating that while many respondents feel comfortable using digital health systems, there may be a subset that struggles with technology. This highlights a potential gap where additional training or resources could improve efficiency and data quality. Overall, the findings suggest that healthcare workers in Kakamega County generally possess the necessary HMIS skills, but there are some areas, such as computer literacy and data interpretation, where further training could enhance competency and system utilization.

This was supported by an interviewee who had the following to say;

... There was a consistent correct entry of patient demographic and clinical data into the system, which was crucial for tracking patient outcomes and resource allocation. This improved decision-making processes within the hospital... (Male Participant, 51 years, Medical Superintendents.)

This implies that healthcare workers have strong skills to gather accurate and relevant data for HMIS. This is in line with the findings of Doka, Worku, Negeri and Kassa (2024) that enhancing data management skills ensure data quality in health institutions.

Additionally, none of the respondents were in a strong disagreement that they were regularly trained on patient protection within the HMIS, 4 (1.6%) disagreed, 16 (6.5%) had neutral opinion, 196 (79.0%) agreed and 32 (12.9%) strongly agreed. The study findings revealed that most 196 (79.0%) of the healthcare workers had an

agreement that they were regularly trained on patient protection within the HMIS. This was supported by an interviewee who had the following to say;

... We trained our healthcare workers to properly handle sensitive patient information, using encrypted systems to store records and adhering to protocols for sharing data only with authorized personnel. This collective understanding of data protection principles demonstrated their commitment to maintaining privacy and complying with legal and ethical standards in healthcare data management (Female Participant, 57 years, Medical Superintendents).

This implies that healthcare workers are regularly trained on patient protection within the HMIS. This supports the finding of Folorunso (2024) that there is a significant positive correlation between regular staff training and patient information protection.

Similarly, none of the respondents were in a strong disagreement that they had competence in data analysis and information interpretation, 4 (1.6%) disagreed, 48 (19.4%) had neutral opinion, 187 (75.4%) agreed and 9 (3.6%) strongly agreed. The study findings suggested that most 187 (75.4%) of the healthcare workers had an agreement that competence in data analysis and information interpretation. This was supported by an interviewee who had the following to say;

...Healthcare workers routinely examined patient admission data, which allowed them to identify emerging disease trends, such as an increase in respiratory infections during seasonal changes (Male Participant, 47 years, Medical Superintendents).

This implies that healthcare workers have competence in data analysis and information interpretation. This is in line with the findings of Belay, Gebeyehu, Atnafu and Denboba (2024) that the capacity building interventions by the Data Use Partnership and the Capacity Building and Mentorship Program enhanced health professionals' competence in HIS tasks like skills in data visualization and interpretation skills. On whether respondents had computer literacy to use the health system, 5 (2.0%) had a strong disagreement, 8 (3.2%) disagreed, 78 (31.5%) had neutral opinion, 147 (59.3%) agreed and 10 (4.0%) strongly agreed. The study findings revealed that most 147 (59.3%) of the healthcare workers had an agreement that they had computer literacy to use the health system.

Further analysis was carried out using Pearson product moment correlation. This section examines the relationship between healthcare providers' knowledge and skills and the effectiveness of HMIS performance in public health facilities in Kakamega County, Kenya. Spearman's rank correlation analysis was conducted to determine the strength and direction of this relationship. Based on the first specific objective, "To assess the effect of healthcare providers' knowledge and skills on the effectiveness of HMIS performance in public health facilities in Kakamega County, Kenya," the correlation matrix below was analyzed. The table illustrates the Pearson correlation coefficients between five components of healthcare providers' knowledge and skills namely, data collection proficiency, data entry & management, data analysis & interpretation, system navigation & usage, and data security & privacy awareness and the five dimensions of HMIS performance, including data accuracy, timeliness, data completeness, utilization rate, and error rate. The strength and direction of each relationship were examined alongside their respective significance levels.

"Correlations											
		Data	Data entry	Data analysis	System	Data	Data	Timeliness	Data	Utilization	Error
		collection	&	and	navigation	security	accuracy		completeness	rate	rate
		proficiency	management	interpretation	& usage	and					
						privacy					
	P					awareness					
Data collection proficiency	Pearson Correlation	1	.131*	.057	.145*	035	.436**	.112	.161*	079	.153*
	Sig. (2- tailed)		.039	.372	.022	.581	.000	.077	.011	.213	.016
	N	248	248	248	248	248	248	248	248	248	248
Data entry & management	Pearson Correlation	.131*	1	.293**	.156*	.089	.349**	.170**	.276**	.178**	.313**
	Sig. (2- tailed)	.039		.000	.014	.162	.000	.007	.000	.005	.000
	Ν	248	248	248	248	248	248	248	248	248	248
Data analysis and interpretation	Pearson Correlation	.057	.293**	1	.003	011	.315**	.128*	.277**	.322**	.112
	Sig. (2- tailed)	.372	.000		.963	.868	.000	.044	.000	.000	.078
	N	248	248	248	248	248	248	248	248	248	248
System navigation & usage	Pearson Correlation	.145*	.156*	.003	1	.071	.291**	.201**	.194**	.180**	.030
	Sig. (2- tailed)	.022	.014	.963		.263	.000	.001	.002	.004	.643

Table 4. 1: Relationship between HMIS Performance and Knowledge and Skills

DOI: 10.9790/0837-3004092432

	Ν	248	248	248	248	248	248	248	248	248	248
Data security and privacy awareness	Pearson Correlation	035	.089	011	.071	1	.144*	.165**	.104	.026	.241**
	Sig. (2- tailed)	.581	.162	.868	.263		.023	.009	.103	.683	.000
	N	248	248	248	248	248	248	248	248	248	248
Data accuracy	Pearson Correlation	.436**	.349**	.315**	.291**	.144*	1	.417**	.513**	.258**	.561**
	Sig. (2- tailed)	.000	.000	.000	.000	.023		.000	.000	.000	.000
	N	248	248	248	248	248	248	248	248	248	248
Timeliness	Pearson Correlation	.112	.170**	.128*	.201**	.165**	.417**	1	.813**	.516**	.575**
	Sig. (2- tailed)	.077	.007	.044	.001	.009	.000		.000	.000	.000
	N	248	248	248	248	248	248	248	248	248	248
Data completeness	Pearson Correlation	.161*	.276**	.277**	.194**	.104	.513**	.813**	1	.640**	.527**
	Sig. (2- tailed)	.011	.000	.000	.002	.103	.000	.000		.000	.000
	N	248	248	248	248	248	248	248	248	248	248
Utilization rate	Pearson Correlation	079	.178**	.322**	.180**	.026	.258**	.516**	.640**	1	.089
	Sig. (2- tailed)	.213	.005	.000	.004	.683	.000	.000	.000		.164
	N	248	248	248	248	248	248	248	248	248	248
Error rate	Pearson Correlation	.153*	.313**	.112	.030	.241**	.561**	.575**	.527**	.089	1
	Sig. (2- tailed)	.016	.000	.078	.643	.000	.000	.000	.000	.164	
	N	248	248	248	248	248	248	248	248	248	248
*. Correlation is significant at the 0.05 level (2-tailed).											
**. Correlation is significant at the 0.01 level (2-tailed)."											

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The table 4.3 findings show that data collection proficiency is positively and significantly correlated with data accuracy (r = .436, p < .01), indicating that healthcare providers with strong data collection skills are more likely to produce accurate data within the HMIS. This positive relationship underscores the importance of accurate data collection processes in achieving HMIS goals. Additionally, data collection proficiency is significantly associated with data completeness (r = .161, p < .05) and error rate (r = .153, p < .05). The negative correlation with error rate suggests that higher data collection proficiency may help reduce errors in HMIS. Although not significant, the weak negative correlation with utilization rate (r = .079, p = .213) might indicate a possible area of further inquiry.

In terms of data entry and management, the results reveal statistically significant and positive correlations with all key HMIS performance indicators. It has strong relationships with data accuracy (r = .349, p < .01), data completeness (r = .276, p < .01), and error rate (r = .313, p < .01), suggesting that effective data entry practices are critical for enhancing HMIS performance. Moreover, timeliness (r = .170, p < .01) and utilization rate (r = .178, p < .01) also demonstrate significant positive relationships, indicating that efficient data management can enhance not only the accuracy and completeness of information but also its timely and practical use in healthcare decision-making.

With regard to data analysis and interpretation, the variable is significantly and positively associated with data accuracy (r = .315, p < .01), timeliness (r = .128, p < .05), data completeness (r = .277, p < .01), and utilization rate (r = .322, p < .01). These findings suggest that when healthcare providers possess strong analytical skills, they are more likely to utilize HMIS data effectively and contribute to its completeness and timeliness. The relationship with error rate is not significant (r = .112, p = .078), but the direction is positive, which may warrant further investigation in larger samples or qualitative inquiries.

System navigation and usage also significantly correlate with several dimensions of HMIS performance. It is positively associated with data accuracy (r = .291, p < .01), timeliness (r = .201, p < .01), data completeness (r = .194, p < .01), and utilization rate (r = .180, p < .01), confirming that healthcare providers' ease in navigating and using the HMIS platform enhances system efficiency. These findings align with literature emphasizing the need for technical usability and digital literacy in improving health information systems. Although the correlation with error rate is minimal and not statistically significant (r = .030, p = .643), it may indicate that navigation skill alone does not directly affect the error rate.

Lastly, data security and privacy awareness have a significant positive correlation with data accuracy (r = .144, p < .05), timeliness (r = .165, p < .01), and error rate (r = .241, p < .01), implying that providers who are conscious of data protection are more cautious and deliberate, leading to fewer mistakes and more timely, accurate

submissions. Interestingly, the variable does not show a significant relationship with data completeness (r = .104, p = .103) or utilization rate (r = .026, p = .683), possibly suggesting that while security awareness improves precision and timing, it might not directly influence the use or completeness of data in practice.

The correlation analysis supports existence of positive influence of healthcare providers' knowledge and skills significantly on HMIS performance. Notably, all five knowledge-related variables showed significant associations with at least one performance dimension. These findings highlight the importance of continuous training and capacity building in areas such as data handling, analytics, and system navigation to enhance HMIS effectiveness. Future interventions should focus on strengthening these competencies among healthcare workers to ensure reliable, complete, timely, and well-utilized health data across public health facilities in Kakamega County, Kenya. An interviewee provided the following insights in support of this notion;

... There was regular utilization of the system's features, such as accessing patient histories, scheduling appointments, and generating medical reports, with ease and confidence. This safeguarded patient information ... Male Participant, 44 years, Medical Superintendents.

This implies that healthcare workers have computer literacy to use the health system. This supports the finding of Walle, Demsash, Ferede and Wubante (2023) that computer literacy directly influenced the respondent's system use and satisfaction.

Finally, the study indicates that none of the respondents disagreed that they had skills in data validation, 31 (12.5%) had neutral opinion, 190 (76.6%) agreed and 27 (10.9%) strongly agreed. The study findings suggested that majority 190 (76.6%) of the healthcare workers had an agreement that they had skills in data validation. This indicates that healthcare professionals possess competencies in data validation. This aligns with the findings of Simba et al. (2022), which indicate that while only half of the managers possessed user accounts and received training in DHIS2 data processing, the majority asserted they had average to advanced abilities in data validation.

IV. Summary Of Findings, Conclusions And Recommendations

The study findings indicated that a majority of healthcare workers strongly agreed that they possessed the necessary skills to gather accurate and relevant data for the Health Management Information System (HMIS). Additionally, most healthcare workers agreed that they were proficient in correctly inputting and updating information within the HMIS. Similarly, there was a consensus among healthcare workers regarding their competence in analyzing data trends and interpreting information. Furthermore, the findings revealed that most respondents were familiar with using HMIS software tools and had a strong understanding of data protection principles. Despite these positive perceptions, statistical analysis using a t-test revealed that healthcare providers' knowledge and skills did not have a statistically significant effect on HMIS performance (p = .000). The regression analysis results showed that the coefficient for healthcare providers' knowledge and skills was $\beta = 0.315$, t = 1.86, p = .000, indicating that although the effect was not statistically significant, knowledge and skills had the greatest influence on HMIS performance compared to other factors. These findings suggest that while healthcare workers acknowledge the importance of HMIS-related competencies, other variables may play a more significant role in determining overall system performance in public health facilities in Kakamega County, Kenya.

The findings revealed a significant effect of healthcare providers' knowledge and skills on the effectiveness of HMIS performance. The findings indicate that healthcare providers' knowledge and skills have the greatest effect on HMIS performance, reinforcing the key principles of the Integrated Behavior Model (IBM). According to IBM, behavioral intention is influenced by an individual's perceived ability to perform a task, which aligns with the study's results showing that providers with higher competency in data collection, entry, analysis, and system navigation contribute significantly to HMIS effectiveness. When healthcare providers possess proficiency in handling HMIS-related tasks, they are better positioned to minimize errors, enhance data accuracy, and support evidence-based decision-making. These competencies not only improve system efficiency but also ensure that healthcare facilities operate with reliable and timely data, ultimately leading to improved patient care and overall health system performance. The IBM framework suggests that behavioral execution is contingent on sufficient knowledge and skills, and these findings validate the importance of technical proficiency in maximizing HMIS utilization.

From the aforementioned findings, it is recommended that health institutions should improve healthcare workers' skills in gathering accurate and relevant data for HMIS, enhance their ability to correctly input and update information within the HMIS, ensure that they are familiar with using HMIS software tools and understand data protection principles.

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