

# Factors Influencing Data Utilization and Performance of Health Management Information Systems: A Case Study

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**Abstract** - The Healthcare Management Information System (HCMIS) is a comprehensive collection of data systematically gathered at healthcare institutions to fulfill the requirements for statistical information on medical services. This research aimed to assess the use of HCMIS information and identify the elements that impact the efficiency of the medical system at the district and primary medical institution levels in Tanzania as a case study. This research was conducted in 11 districts in Tanzania and included 115 healthcare institutions. It was cross-sectional research. The data were gathered via a semi-structured survey given to healthcare professionals at the institution and district stages. The information was then recorded utilizing an observational checklist. The researchers used an analytical technique for thematic content to combine and validate the replies and findings and gather essential data. 93 healthcare institution personnel and 13 district authorities were surveyed. Approximately 61% of the facility participants said they utilized the HCMIS information, but only 39% of the district participants acknowledged consistently analyzing HCMIS information. Out of the participants from nine districts, 68% said that they regularly get feedback on the quality of their work from authority figures monthly and quarterly. The patient workload was often shown to significantly impact the efficiency of staff members in data collection and administration. Insufficient analysis and subpar use of information were prevalent in most districts and healthcare institutions in Tanzania. Inadequate human and financial resources, absence of rewards and monitoring, and lack of standard processes for data handling significantly hindered the HCMIS efficiency in Tanzania.

**Keywords:** Healthcare, Health Management System, Case study, Data Utilization

## I. INTRODUCTION TO HEALTHCARE

Healthcare information systems play a crucial role in obtaining universal healthcare globally. Accurate and essential data is critical in making informed public healthcare decisions, conducting healthcare sector assessments, planning, allocating resources, and monitoring and evaluating programs (Berdik et al., 2021). Organizations must make intricate decisions amid ambiguity, trade-offs, and significant repercussions. The ability of individual decision-makers to react rationally to such circumstances might be hindered by their cognitive limitations (Melović et al., 2022). High-quality information is essential for making advances in healthcare systems.

Healthcare programs often need help to use data for decision-making effectively. Data remains stagnant in reports and databases without being used to inform the enhancement of programs, the creation of policies, the formulation of strategic plans, or the promotion of causes. The failure in the process is partly due to the dispersed and complicated nature of Healthcare Management Information Systems (HCMIS), which must adequately meet information requirements. Decision-makers sometimes need help accessing the necessary facts to inform their forthcoming choices (Kozioł-Nadolna & Beyer, 2021).

The HCMIS is Tanzania's central data system, built in the early 1990s (Sukums et al., 2021). The data consists of healthcare records for managing regular healthcare services. These records include information on morbidity, mortality, healthcare infrastructure, and service availability (Yashir

Ahamed et al., 2023). To enhance the effectiveness of the HCMIS in Tanzania, the Government implemented the District Healthcare Information System (DHCIS), a web-based application package designed for collecting, verifying, evaluating, and appearing aggregated statistics, specifically for integrated healthcare data managing operations (Mboera et al., 2021). The implementation of DHCIS was intended to streamline data accessibility and promote use. The efficacy of a DHCIS relies on the accurate collection, analysis, interpretation, and use of information at every level (Shim & Jo, 2020). In most cases, incapacitated systems undermine optimum functioning and system efficiency.

In several Sub-Saharan African nations, the use of data in healthcare systems is generally minimal (Batani & Maharaj, 2022). Existing research indicates that, while there have been some remarkable achievements, the influence of HCMIS on the decision-making procedure within African healthcare systems is still restricted (Madhavi et al., 2023). Multiple obstacles have been documented as hindrances to the HCMIS's realization of its maximum capabilities in Africa (Masele & Kagoma, 2023). The effective deployment and utilization of data produced by the HCMIS is influenced by several elements, including institutional, technical, human, and logistical capabilities. These capacities can either facilitate or hinder the process. According to reports, the HCMIS provides chances to educate healthcare decision-making at all stages of medical systems. However, its utility is only realized when it enables the conversion of collected data into relevant information and knowledge for action.

Regular medical data is crucial for making informed decisions at every healthcare system level, in day-to-day operations and long-term planning. Efficient and trustworthy HCMIS are essential for investment in healthcare (Adane et al., 2021). Given the heightened investment in disease control programs in Tanzania, it is imperative to establish a robust healthcare information system that can effectively facilitate decision-making at all levels and vice versa. Enhanced HCMIS is expected to improve evidence-based decision-making and policy formulation, increasing accountability and effectiveness across all healthcare system levels (Chanyalew et al., 2023). The Global Summit on Measurement and Responsibility for Healthcare has urged all countries to take action to promote the use of information and evidence-based decision-making (Malathi et al., 2024). They have called for establishing medical information flows that involve the local utilization of data to enhance the efficiency of disease programs. This research aimed to assess the use of HCMIS information and identify the elements that affect the effectiveness of the entire system at the district and primary medical institution levels in Tanzania.

## II. BACKGROUND AND ANALYSIS

Environmental concerns are external variables that impact an organization's operations. External variables that influence an organization include the marketplace it works in, the

economy, government regulation, and consumers' response to the firm's goods and services regarding the adoption of DHCIS (Buhalis et al., 2020). Research has been carried out in Tanzania to evaluate the effectiveness of HCMIS, and specific measures have been taken to enhance their efficiency. Despite significant investments in HCMIS, the Government of Tanzania needs help delivering high-quality and timely healthcare data for decision-making purposes (Sukums et al., 2023). This problem is most noticeable at the regional levels, where a system deficiency enhances data availability, combination, transmission, and understanding. These deficiencies prevent districts from making informed choices about important service delivery matters. Nguyen et al. state that a review of the HCMIS from 2006 to 2007 characterized the current routine HCMIS as fragmented and vertical, consisting of independent systems at the national level (Nguyen, 2023). Using paper-based, vertical systems led to a significant need for more access to data for efficient management, evaluation, and planning of the healthcare system at all stages (Arora, 2024). The National HCMIS found other areas for improvement about the inadequate use of data in making decisions. The healthcare information strategy aimed to meet these demands by proposing removing the conventional HCMIS's hierarchical structure and consolidating current data sources into a single data warehouse (Birhanu et al., 2022). The DHCIS, an open-source web-based healthcare information system, was recognized as a crucial answer to the healthcare information approach and was put into operation starting in 2010. The implementation of DHCIS was expected to enhance data use across all tiers of the healthcare system.

Organizational culture and managers' attitudes toward change are significant factors. This is because managers' impression of the organization's capacity for change will likely influence the acceptance of innovation. For innovation to occur and provide positive results, managers and other users must perceive that the organization can adapt to and execute new procedures. The framework posits that by fostering an environment that values information, businesses enhance their proficiency in doing duties, hence bolstering their self-assurance in executing such jobs (Smeplass, 2023). With a conducive work environment that fosters essential behaviors and principles, healthcare professionals internalize the necessary values to create, sustain, and enhance information systems (Srimulyani & Hermanto, 2022).

More integration is needed with disconnected and widely spread agencies (Venegas et al., 2021). There is no effective centralized coordination to guarantee that the data contained in these systems is easily accessible to other networks (Aliyari, 2024). The Tanzania Healthcare Sector Strategic and Investment Plan identifies several issues from July 2013 to June 2023 (Moturi et al., 2023). These include a need for more complete structures to guarantee and oversee evidence-based policymaking, systems to generate requests for statistics and manage knowledge, and the limited utilization of data on significant incidents for guiding decision-making.

One further problem expressed by HCMIS specialists is that most poor nations need a culture of data that prioritizes enhancing the oversight, feedback, and support elements of the HCMIS (Yohannes et al., 2022). Feedback is a crucial part of the healthcare information cycle because it helps maintain open lines of communication to address and fix issues in the system, resulting in improvements in the whole healthcare system. Medical professionals in poor countries who collect and send healthcare data usually await a response. And when feedback is given, it tends to be unfavorable, characterized by significant delays and lacking constructive criticism (Uyan, 2022).

A research investigation was carried out in South Africa to examine and elucidate staff members' experiences handling information and data using DHCIS to enhance data quality. This study aimed to identify the advantages and disadvantages of the existing data management procedures (Yaqoob et al., 2022). The results elucidated the staff's strengths, limitations, and obstacles. The emphasized positives are the presence of data capturers and the use of DHCIS technology in most, if not all, institutions.

The primary focus is to enhance maternal, neonatal, and child healthcare measures. The lack of policy implementation and inadequate healthcare systems have impeded progress since they fail to address and meet the population's requirements. This leads to limited availability and underutilization of preventative and therapeutic healthcare services. The investigators aimed to identify the organizational factors that impact the utilization of the DHCIS2 in hospitals in Uasin Gishu County. The objective was to propose more effective strategies for utilizing the data contained in DHCIS to enhance decision-making and healthcare outcomes.

### III. MATERIALS AND METHODS

#### 3.1. Study Sites and Design

This survey included 11 districts in Tanzania. The study included gathering primary information at the healthcare institution and district sectors. In this research, the nation was divided into eight geographical areas. They utilized a multiple-phase sampling methodology to choose the research areas and districts inside the regions. Areas 1–3 were selected within specified zones, and within every region, a district was randomly assigned using a random generator function in Microsoft Excel. A separate source has provided information on choosing the research site.

#### 3.2. Sample Size and Data Collection

The research used a combination of qualitative and quantitative methodologies to collect the necessary data. The data were gathered via a standard survey and a checklist for observation that was created in collaboration with field specialists to ensure the quality of their content. Guidelines with a semi-structured format were developed in English and then translated into Tanzania to conduct comprehensive interviews with hospitals and district office workers. Before

being used in the research, the translation tools underwent pre-testing to evaluate their dependability. The survey gathered data on information administration, including assessment and use, current deficiencies, and obstacles. The respondents were queried about the methods used to analyze and utilize the information at their levels, as well as the feedback received from various levels. During this phase, effective methods of managing, analyzing, and using data, including the many displays seen at healthcare facilities or district offices, were observed and recorded. Conference recordings were also examined to see if data use is included in their regular talks. The presence of specialized personnel in charge of overseeing material and medical information systems, training programs for staff on HCMIS, and accessibility of organizational and behavioral assessments were recorded.

#### 3.3. Data Management and Analysis

The in-depth interviews were analyzed using thematic content evaluation. The researchers transcribed the conversations into English. The manual review was conducted by creating a code list based on several readings of recordings. After the assessment, open coding was conducted to identify significant themes and sub-themes from the data. These findings were then connected to the purpose of the research. A summary was made of the reported practices regarding data analysis and employment. The results acquired from both approaches were cross-referenced to ensure accurate interpretation. When there was a need to quantify the outcomes, the data was condensed into percentages.

The main informants identified what follows as the primary determinants of data consumption inside the company:

- The utilization of the DHCIS system was impacted by the need for information, which was identified as one of the organizational determinants. The responders emphasized the need to make the information accessible to everyone, particularly healthcare professionals. Respondent 1 articulated this issue: "One of the key requirements is the universal availability of information to ensure that there is an ongoing need for it" (personal interaction, respondent 1, male, district clinical director).
- Respondent 1 emphasized the significance of collaboration, stating that it is no longer limited and now involves several individuals working together instead of one person being the only contributor. At the same time, it requires and generates data. Users cannot bring this food inside the hotel; however, they can get it.
- The use of information inside the DHCIS system is impacted by its hierarchical architecture, which restricts top executives' access to the platform. The explanation was clear and concise: "The application of information from DHCIS varies among different levels of management, with top-level sub-county and county executives utilizing the information

more than lower-level employees" (personal interaction, respondent 5, male, regional director of healthcare).

- Participant 5 emphasized the need for robust policies to influence the use of the DHCIS platform. Data utilization in DHCIS is also influenced by policies, as stated by the county secretary of medical services (personal interaction, respondent 5, male).
- Participants also said that upper management's interest might impact the consumption of DHIS2 data. Hence, if there is genuine interest from the rest of the system, DHCIS will undoubtedly be embraced: "... if the top administration shows interest in our information, it is evident that this will enhance data utilization" (personal interaction, respondent 5, male, regional director of healthcare).
- Staff expertise, support from management, and supply of appropriate servers were claimed to have affected the usage of DHCIS data. Respondent 5 articulated this idea by stating that external and internal elements, such as staff expertise and managerial backing, together with the supply of sufficient servers to the personnel, are influential.

(source: private conversation, respondent 5, male, regional director of healthcare).

- Participants also said political intervention tends to impact how reports are generated from the DHCIS information. The respondent, a male regional director of healthcare, communicated the following: "Political factors have a significant impact on legal matters, such as demand for reports."

#### IV. RESULTS AND DISCUSSION

##### 4.1. Demographic Characteristics

This research included a total of 115 healthcare institutions located in 11 districts. Ninety-three healthcare institution staff were surveyed. Approximately 60.215% of individuals had a Diploma. Most of those who participated were clinical officers, accounting for 40.860%, nurses at 17.204%, and homemakers at 10.753%. Most (55.914%) participants have more than ten years of professional experience (Table I). Thirteen Council Medical Management Committee members were questioned in the district headquarters. The individuals who formed the group were the District Medical Directors, District HCMIS, and the Reproductive Healthcare Focal Individuals.

TABLE I DEMOGRAPHIC CHARACTERISTICS ANALYSIS

Parameter	Category	Rate	Percentage (%)
Gender	Men	53	56.989
	Women	40	43.011
Education	School level	21	22.581
	Diploma	56	60.215
	Bachelor / Master	16	17.204
Experience (years)	Less than 5	26	27.957
	5 to 10 years	15	16.129
	10 years and above	52	55.914
Designation	Nurse	16	17.204
	Home maker	10	10.753
	Clinical operator	38	40.860
	Healthcare assistant	4	4.301
	Laboratory attendant	5	5.376
	Healthcare executive	9	9.677

##### 4.2. HCMIS Data at Facility and District Levels

Only 11 institutions, less than 11% of the total, were seen to do accurate analysis and present data by creating graphs depicting the disease burden. Approximately 61% of the institutions reported using the HCMIS data they get. The statistics were utilized to compare their achievements in terms of service acceptance (54%), analyze the trends in death and morbidity over time (51%), deliver public healthcare information and outreach in their respective regions of service (53%), and assess the facility needs for drugs and other healthcare equipment (35%). The predominant forms of data shown at health institutions were the top 10 illnesses, accounting for 56% of the total. Most

establishments (54%) had shown current data analysis outcomes during the prior three months.

Most of the data shown needed dates, making determining the corresponding reporting period difficult. Most facilities provided a list of the top 10 illnesses but did not provide any statistical data to compare the levels of these diseases/conditions. Differences in information processing and presentations were noted across divisions in healthcare institutions. Most lectures focused on reproductive and child health trends and statistics relating to deadly diseases.

The majority of participants said that the quality of data collected by their facilities had an impact on its use in evidence-based decision-making. They believed that choices

are made according to the facts or genuine requirements at the plant and district stages. These factors included the service populace's authentic requirements and considered the institution's expenses or financial capability. It was discovered that in several cases, judgments at healthcare institutions were influenced by instructions from higher-ups. Managers were said to have overlooked some effective practices regarding information utilization, while around two-thirds of individuals noted that staff members needed to be acknowledged for their outstanding work but were held accountable for their subpar performance. Regarding the significance of gathering information about health and medical care facilities, employees were 100% certain that they comprehended why they had to assemble and complete data for suitable departments and officials. Most individuals concurred that collecting data that serves no purpose in guiding decisions demotivates them.

Almost all (97%) health institutions have regular meetings to discuss and assess management and administrative issues. Most health institutions (47%) said discussions were conducted monthly, and almost all (93%) kept formal documentation of these sessions. In addition, a minimum of 56% of the facilities distributed copies of the minutes from their prior meetings throughout the corresponding quarters. Upon examination of the proceedings, it was found that the majority (61%) should have included statistics as a topic for discussion. The issues noted in the talks were the administration of HCMIS, namely data quality and reports, which accounted for 54% of the concerns.

There was a debate regarding commodities stock-out, which accounted for 63% of the concerns. Most (71%) had made choices according to their conversation. During the last three months, only 48% of the workplace reported attending meetings organized by the region's office to review HCMIS information.

4.3. Factors Influencing HCMIS Results

- *Inadequate Human and Financial Resources*

The number of staff members particularly assigned to HCMIS operations varied across different districts. All of the responders from the facility claimed that there was a lack of sufficient human resources for managing data. Most individuals in charge of HCMIS operations said they had received brief training in handling data, which mainly included accurate capturing, data collecting, and generating reports, with less emphasis on fundamental analysis or analysis. A few individuals said they had not received any specialized instruction other than the training they received while doing their duties. Approximately 42% of the facility's staff had not received instruction in handling information about HCMIS in the 12 months leading up to this study. The average number of staff active in HCMIS operations per facility was five, namely in collecting and compiling reports HCMIS data analysis shown in Table II.

TABLE II HCMIS DATA ANALYSIS

District	Number of participants used in HCMIS	Number of participants trained
Kinondoni	6	5
Temeke	5	54
Ilala	3	3
Kigamboni	4	7
Arusha Urban	6	4
Dodoma Urban	10	8
Mbeya Urban	5	25
Moshi Urban	4	41
Tabora Urban	8	26
Tanga Urban	6	25
Mwanza Urban	7	48
Morogoro Urban	5	24
Zanzibar Urban/West	3	18
Average	5.538	22.154

Additionally, 21 staff members received training in the last 12 months. The five personnel who were found to be actively involved in HCMIS were also required to participate in other tasks. Due to the limited number of workers engaged in the HCMIS operations, the handling of data was found to be degraded. A primary obstacle highlighted by reliable district sources was the need for more expertise inside the HCMIS to effectively use analytical instruments and processes to consolidate information for decision-making purposes. This inefficiency was ascribed to inadequate training. Only a minority (3 out of 11) claimed to have district plans for training. The ineffective provision of cash resources was identified as the cause of insufficient in-service training for workers in handling data. All HCMIS focal individuals in the district indicated they received instruction and were given HCMIS training documents to refer to while doing HCMIS-related duties. Most district participants (n = 7) said that the individuals in charge of HCMIS operations also had responsibilities for various other tasks.

- *Supervision*

Only 42% of the health institutions reported receiving supportive inspections from district office personnel three months before this evaluation. Most (53%) said the regional supervision team needed a supervisory checklist throughout their visit. 73% of the facility participants noted that the regional team had assessed their information's integrity. The majority (65%) of the participants from the healthcare institutions pointed out that the regional team addressed the facility's efficiency using the given data. In contrast, a small percentage (8%) of the healthcare institutions stated they had a specific timetable for district supervisory inspections. A significant portion of the participants (34%) said that regional teams often conduct unannounced inspections of the institutions. Only 42% of the participants submitted the

district supervising states, as shown in Table III. In contrast to the facility study, 9 out of 11 regions said they had criteria and visit timetables, while 10 out of 11 areas had supervision inspections.

TABLE III HEALTHCARE WORKER’S RESPONSE ANALYSIS

Category	Response	Number of participants	Percentage (%)
Super visor checklist	Positive	49	52.688
	Negative	44	47.312
	Total	93	100
Scheduled visits	Positive	13	13.978
	Negative	80	86.022
	Total	93	100
Supervisor report	Positive	40	43.011
	Negative	53	56.989
	Total	93	100

• *Standard Protocols and HCMIS*

The use of diverse protocols and records for the reception of reports was customary and correlated with the misplacement of sent reports from subordinate levels. Certain districts needed an adequate system for obtaining information from medical centers. Whenever a report is presented in these districts, anyone at the district’s office might only accept it by checking its correct completion or even recording or acknowledging that it was received. Only 54% of participants indicated that they provided feedback on the submission and quality of findings from the regional office to health facility staff, primarily through verbal input. Such procedures and interaction gaps allowed for the reception of inaccurately or inadequately completed reports from the building level to the district. According to conversations with district leaders, nearly all districts (91%) stated they did not have written protocols to handle late, incorrect, and lacking reports. This includes the need for more procedures to address data quality problems within the building. A participant from Tanzania mentioned that there were no formal processes and that conversations were only provided verbally, sometimes through telephone calls.

Unidentified medical centers or time frames were often seen in registers, tally sheets, or reporting forms. Only six sites had logbooks that were accessible for recording and submitting reports. It was seen that just two districts had affixed their stamps on all the facility forms to mark the date of receipt. Just 50% of the regions said they have implemented quality assurance measures for transferring information from paper-based to electronic DHCIS. HCMIS tools were implemented at multiple facilities across numerous districts, each using a distinct version. Specific versions lacked the variables of interest.

**V. CONCLUSION AND FINDINGS**

This research aimed to determine the variables that influence the implementation of the HCMIS in Tanzania. Based on the factors recognized in this study, the effectiveness of medical professionals in using HCMIS is enhanced. The HCMIS

requires skilled user assistance, system features, managerial support, and enough organizational enablers. In Tanzania, adequate data utilization is needed in most districts and health institutions. Monitoring and feedback, sufficient funding, adequate capacity development, and poor data administration abilities were identified as problems contributing to the poor performance of the healthcare information system for management in Tanzania. The research suggests that sufficient people must be educated in HCMIS activities and well-defined governance mechanisms to disseminate the structure to all medical professionals. It is essential to monitor HCMIS operations' support, use creative methods to incentivize staff to fulfill HCMIS responsibilities and utilize data from regular health records to inform decision-making.

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