EFFECT OF ELECTRONIC HEALTH MANAGEMENT INFORMATION SYSTEM ON HIV DATA QUALITY AT PRIMARY HEALTH FACILITIES IN DODOMA CITY AND BAHI DISTRICT COUNCIL IN TANZANIA

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation entitled; **"Effect of Electronic Health Management Information System (e-HMIS) on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania"** in partial fulfillment of the requirements for the award of the Master's Degree inMonitoring and Evaluation (MAME).

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Dr. Noel Matemba

(Supervisor)

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Date

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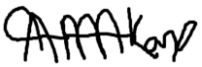
DECLARATION

I, **Ally Yohana Kananika,** do hereby declare that, this dissertation is my own original work. It has never been presented to any other University or Institution. Where other people's works have been used, references have been provided. It is in this regard that I declare this work as originally mine. It is hereby presented in partial fulfilment of the requirements for the Degree of Master in Monitoring and Evaluation (MAME).



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Signature

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Date

DEDICATION

I dedicate this work to my loving wife and children.

ACKNOWLEDGEMENT

I thank the almighty God for all the graces He granted to me, the protection and the guidance throughout this study. I would like to express my sincere gratitude to my supervisor Dr. Noel Matemba for his supervision, assistance, support and encouragement throughout my study.

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ABSTRACT

This study assessed the effect of e-HMIS on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council. Specifically, the study aimed at (i) examining the effect of e-HMIS timeliness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council; (ii) investigating the effect of e-HMIS accuracy attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council; (iii) assessing the effect of e-HMIS completeness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council; and (iv) assessing the effect of eHMIS consistency attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council. Cross sectional research design was employed. The study was guided by the Normalization Process Theory (NPT), the Socio-Technical Theory and Monitoring Evaluation Theory. Both qualitative and quantitative data was collected. The purposive sampling technique was used to secure samples from PHFs. for the study.. Likewise, both interview were employed to collect primary data and secondary data through interview guide and documentary review respectivelyThe study found that the e-HMIS timeliness attribute, e-HMIS accuracy attribute, e-HMIS completeness attribute and e-HMIS consistency attribute had effect on HIV data quality in PHFs in Tanzania. It was therefore concluded that e-HMIS is crucial for enhancing HIV data quality in Tanzania. In this regard, it was recommended that government and relevant health stakeholders should work collaboratively to ensure the e-HMIS is installed in t all Tanzanian PHFs so that HIV data attain aspect of timeliness, completeness, accuracy and consistency.

Keywords: *Data, Quality, Data Quality, Data consistency.*

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LIST OF ABREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CTC	Care and Treatment Clinic
DHIS2	District Health Information Software 2
e-HMIS	Electronic Health Management Information System
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
CT	Information Communication Technology
MoH	Ministry of Health
MTUHA	Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya
PHF	Primary Health Facilities
PO-RALG	Presidents Office Region Administration and Local Government

CHAPTER ONE

INTRODUCTION

1.1 Background to the Research Problem

Determining the impacts of the quality of information systems on the provision of quality health services is important for the future development of any nation. From 2015 to date, Tanzanian researchers have increased interest in evaluating the effect of the Electronic Health Information System (e-HIS) on data quality at Primary Health Facilities (PHF) in Tanzania. Before the imposition of electronic health information system, Tanzania had a manual health system called Health Management Information System-HMIS (Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya -MTUHA) which was characterized by lacking promptness (or timeliness), completeness, reliability, consistency, accuracy and ability to compute (Mwogosi et al., 2021; Wilms et al., 2014). Most HIV systems were not integrated with the HMIS, leading to parallel reporting systems, which undermine data quality and accessibility and limit effective data use (MoH, 2016a, p. 40).

Generally, the paper-based HMIS failed to generate quality data which led to unmatched health decision making which is perilous to the health of the public. Thus, the imposition of e-HMIS aimed at capturing two objectives namely; (i) to ensure that PHFs are adequately monitored with high-quality data that are routinely reported, analyzed and disseminated, and (ii) to strengthen the health sector's capacity to use data for decision making. The Electronic Health Information System (e-HIS) technology has actively been adopted by about 1161 public Public Primary Health Facilities and as such it is imperative to assess the usefulness of the system

with regard to PHFs HIV/ information in consistency, accuracy, completeness and reliability (Mwogosi et al., 2021). This is due to the fact that it is expected that the use of these systems is going to improve the quality of data in terms of consistency, accuracy, completeness and reliability.

Based on the fact that quality of data in Primafy Health Facilities can be improved by using e-HIS, attaining good health decisions, effective policies, services and behaviours which require timely, accurate, and relevant information depends on the existence of these systems. This necessitated the introduction of an electronic health system so as to harness its potential for health. Moreover, there are over 160 software scatted across the country which are not harmonized and do not share data. Most of the software are stand-alone being operated in one health facility while others are program specified for a disease such as HIV use CTC2 and CTC. To address this priority required the government to be keen enough so that the replacement of non- electronic medical records by electronic medical records (eMR) becomes gainful and not otherwise.

Nevertheless, the e-HMIS is challenged by the unreliability of electricity, internet connectivity, inadequate computers and their accessories, ICT illiteracy, choice of appropriate software and client identification codes to avoid double counting (Mboera et al, 2021). Moreover, stand-alone softwares are localized and as a result client information is prone to loss when a patient moves from one health facility to another. Hamad (2022) pointed out the inadequate infrastructure, inadequate ICT literacy and skills, poor governance structure, non-compliance with electronic health standards and systems interoperability perilously affect the performance of electronic

HMIS in Tanzania. Despite those challenges, PO-RALG (2021) claims that data quality in PHFs has increased from 47% to 81% for the period of 2017 to 2020. However, this trend of data quality does not suffice as other diseases such as HIV use information system which is stand alone and are isolated from the entire health system. Getting rid of these challenges requires an effective intervention which has been and is still expensive to the government.

Dodoma City and Bahi District Council are among the 8 councils found in Dodoma Region. Dodoma City has 37, Bahi DC has a total of 46 health facilities under Local Government Authority (Health Facility Report, 2022). Dodoma City and Bahi Council started using e-HMIS since 2016. The purpose of this was to improve the quality of data starting with HIV module. Currently the average of HIV data quality in Dodoma Region is 74.5% while in Bahi DC is 67% and 82% in Dodoma City (POLARG Health Report, 2021). The national target for health data quality is to attain 95%.

Thus, the study sought to establish the extent to which the EHMIS has solved and could potentially solve the future challenges experienced with MTUHA with regard to HIV/AIDS data with a stand-alone health information system such as CTC2 and CTC (Mtebe, 2018). Therefore, the aim of this study was to investigate the effect of e=HMIS on data quality in selected PHFs in Dodoma City with regard to HIV/AIDS information consistency, accuraccy, completeness and timeliness.

1.2 Statement of the Research Problem

Data quality in Primary Health Facilities is the pivot of health decision-making globally. Based on its vitality, government has been and is still devoting deliberate

efforts to ensure that quality data are captured with certainty. The government has largely shifted from paper-based data collection health system to an electronic health management information system (e-HMIS) especially in HIV with expectation of raising the quality of health data collected. Despite these efforts, still the quality of health data is low (74.5%) on average especially in Dodoma CC and Bahi DC (POLARG Health Report, 2021). This implies that in spite of large amount of public funds used to purchase and install the e-HMIS, the government has not attained its goal. Unless this problem is intervened using researched facts and figures, inadequate quality of health data will persistently be produced which will ultimately affect the health decision-making.

The reason for inadequate health data quality was unclear to date especially for HIV which has a longer experience of employing e-HMIS due to limitedness of conclusive and decisive studies in the current study vicinities which are Dodoma CC and Bahi DC e-HMIS. This situation substantiates the urgency of conducting a national comprehensive study on the investigation of the effect of e-HMIS on HIV data quality in-terms of timeliness, accuracy, consistency and completeness in Dodoma City and Bahi District Council.

1.3 Research Objectives

1.3.1 Main Objective

The main objective of this study was to evaluate the effect of e-HMIS on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania.

1.3.2 Specific Objectives

i. To examine the effect of e-HMIS timeliness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania.

ii. To investigate the effect of e-HMIS accuracy attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania.

iii. To assess the effect of e-HMIS completeness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania.

iv. To assess the effect of eHMIS consistency attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania.

1.4 Research Questions

i. What is the effect of e-HIMS's timeliness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania.?

ii. To what extent does e-HIMS's accuracy attribute affect the HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania?

iii. To what extent does e-HIMS's completeness attribute affect the HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania?

iv. To what extent does e-HIMS's consistency attribute affect the HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania?

1.5 Significance of the Study

The study has shed light on the area of electronic health information management system and health care service delivery as a result of quality data. The findings will bring valuable information to the healthcare service providers to improve the e-HMIS. Improving the e-HMIS has improved the quality of data and simplified data-based decision-making for health planning and generally improved the health status of the community as per the findings of this study. This will be be important in advancing guidelines and strategies for improving the health sector. The findings will be used to understand the existing position of electronic health information management system in health care service delivery in terms of data quality at PHFs in Dodoma City and Bahi District Council. The study will form the basis for further studies with regard to electronic health information management system and healthcare service delivery to HIV/AIDS patients.

Besides, these research findings will be crucial to the health policy makers to execute relevant policies in the light of available facts and figures. This will enable the acquisition of the resourceful health policies within the country. Furthermore, such study results will be of great value to the non-government health stakeholders who will make use of such results to plan their programs in the light of existing knowledge brought by this study. Finally, the patients or clients will be able to receive appropriate health services from the PHFs as a result of improved health data

which are the pivot to health decision -making.

1.6 Scope of the Study

The study assessed the effect of electronic health information management system in the selected PHFs in Dodoma City and Bahi District Council with regard to the HIV data. Specifically, the study investigated the effect of eHIMS on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council on the timeliness, accuracy, consistency and completeness variables.

CHAPTER TWO

LITERATURE REVIEW

2.1 An Overview

This chapter presents a review of the literature related to the effect of e-HMIS on data quality with regard to HIV/AIDS among selected PHFs. The chapter presents definitions of key concepts, theoretical and empirical literature review, research gap and conceptual framework.

2.2 Definition of Concepts

2.2.1 Electronic Health Information Management System (e-HMIS)

An electronic health information management system is the systematized collection of patient and population health information electronically stored in a digital format. These records can be shared across different health care settings. Records are shared through network-connected, enterprise-wide information systems or other information networks and exchanges (Tumbo, 2020). The researcher will adopt this definition as it comprehensively covers vital aspects starting with data collection, processing, analysis, sharing and storage.

2.2.2 Data

The word data is the plural form of the Latin noun datum (verbatim “something given”) (ISO 9000:2015). Generally, data entail information, especially facts or numbers, collected to be examined and considered and used to help decision-making, or information in an electronic form that can be stored and used by a computer (Hassenstein and Vanella, 2022). The nature of data may differ depending on the context. For instance, majority of researchers often work with sets of data, which are

data in a structured and accumulated, habitually in tabulated form (Hassenstein and Vanella, 2022). This definition will be adopted in this study as it suffices the purposes of the study since the study is dealing with data quality.

2.2.3 Quality

Based on an ISO 9000:2015 (Hassenstein and Vanella, 2022), quality is viewed as the degree to which a set of inherent characteristics of an object fulfills requirements. Therefore, in our context, quality broadly refers to the extent of the goodness of a thing (in this study the goodness refers to data). Russell et al. (1998) perceived that quality itself has been defined as fundamentally relational. Therefore, quality is the ongoing process of building and sustaining relationships by assessing, anticipating, and fulfilling stated and implied needs.

Juran (1974) provided components of the quality by listing different components by stating quality as (i) fitness for use or purpose; (ii) to do the right thing the first time; (iii) to do the right thing at the right-time (iv) find and know what the consumer wants (v) features that meet consumer needs and give customer satisfaction; (vi) freedom from deficiencies or defects; (vii) Conformance to standards; and (viii) Value or worthiness for money.

2.2.4 Data Quality

Data quality can be defined as the degree to which the data of interest fulfills given requirements (Hassenstein and Vanella, 2022). Similarly, Olson (2003) offers additional interpretations of the data quality concept based on the essence whether the data are fit for (the intended) use and free of flaws or meet the needs and

requirements of their users. Based on this fact, data quality requirements may be forced by stakeholders, legislation, regulations, standards, policies and the associated use (Fürber, 2015).

Haug (2021) asserts that data quality is a measure of the condition of data by relying on factors such as accuracy, completeness, consistency, reliability and whether it is up-to -date. Measuring data quality levels is useful to institutions in order to identify data errors that need to be determined and assess whether the data in their IT systems is fit to serve as intended (Black and van Nederpelt, 2020). Therefore, Partescano et al. (2021) are of the opinion that the importance data quality in enterprise systems has increased due to the fact that data processing has become more tortuously linked with business operations and organizations progressively use data analytics to assist drive business decisions. Data quality management is a core component of the overall data management process, and efforts of data quality improvement are regularly tied to governance programs aiming at ensuring data is configured and used reliably throughout an organization.

2.2.5 Data Accuracy

There are various definitions and concepts of accuracy. However, they are categorized based on their level of abstraction. Theoretical definitions describe the meaning of a concept in an abstract manner. In this case, a theoretical meaning of accuracy could be as follows: the “closeness of the agreement between the result of a measurement and a true value of the measurand (Bureau International des Poids et Mesures 2008, p. 35). This theoretical definition contains the notion of the scale of

an error because it describes data accuracy as the “closeness”. Operational definitions are definitions that clarify the meaning of a concept by stating the processes that are mandatory to measure the concept.

Based on operational basis an accuracy is defined as the ratio between the number of correct values and the total number of values in a database (Cappiello *et al.* 2003, p. 84). The measurement operations that are defined in an operational definition can as well be written in official language. In this regard, the measurement operation is often referred to by the common term metric. Therefore, in metric terms, accuracy is defined as the ratio between the number of correct values and the total number of values in a database (Cappiello *et al.*, 2003, p. 84) as shown in the equation.

Accuracy = (number of fields judged “correct”) / (number of fields tested)

Alternatively, accuracy refers to the extent to which the data reflect the actual/correct information. It defines validity of the data and is achieved by minimizing errors from recording or interviewer bias and transcription (MoH DQA Guideline, 2016). In this study data accuracy is one of the variables for assessing the quality of data.

2.2.6 Data Completeness

Completeness means that an information system from which the results are derived is appropriately inclusive: it represents the complete list of records (eligible persons, facilities, units) and the fields in each record are provided appropriately (MoH DQA Guideline, 2016). In this study data completeness is one of the variables for assessing the quality of data, as the study will assess if all variables and fields are filled in all data collection tools and no blank fields.

2.2.7 Data Timeliness

Data are timely when they are up-to-date (current), and when the information is available on time (MoH DQA Guideline, 2016). Timeliness is affected by: (i) the rate at which the programme's information system is updated; (ii) the rate of change of actual programme activities; and (iii) when the information is actually used or required. In this study, data timeliness is one of the variables for assessing the quality of data. The data is said to be submitted timely when the submission of a monthly report is done before or on 15^{th} of the following month (MoH DQA Guideline, 2016).

2.2.8 Data consistency

Data consistency is a crucial aspect that ensures the accuracy and reliability of data. Data consistency is the accuracy, completeness, and correctness of data stored in a database (Zhu and Wang, 2010). The same data across all related systems, applications, and databases is when we say that data is consistent. Inconsistent data can lead to incorrect analysis, decision-making, and outcomes. Gao *et al*. (2017) provides the key metrics of data consistency such as accuracy, completeness, timeliness, and relevance which are used to analyze or measure data consistency. Data consistency is critical for any organization that has data as an asset and relies on data to make business decisions, serve customers, or comply with regulations.

Furthermore, Chihoub (2013) contends that data consistency is also important for maintaining data quality and integrity. Organizations are more confident when data is consistent in its accuracy. Taking better decisions, improving customer satisfaction, and better business outcomes becomes easy with data consistency.

Based on Liu *et al*. (2016) common causes of data inconsistency include:

(i) *Incomplete data entry*: This occurs when some data is missing and can happen due to human error or system issues;

(ii) *Human error in data entry*: Human error is another common cause of data inconsistency. This can include typos, incorrect data formatting, or incorrect data entry due to a lack of knowledge or training.

(iii) *Outdated or incorrect data sources*: When data is pulled from outdated or incorrect sources, it can lead to inconsistencies. This happens when data is not up-to-date or when data from multiple sources is not integrated correctly and does not make sense.

(iv) *Lack of data integration across systems*: Data stored in multiple systems or databases can lead to inconsistencies if the data is not integrated correctly. This can happen when data is stored in silos, or integration tools are incorrectly used.

It is essential not only to understand where your data is coming from or the source but also where it is going or the databases and everything that happens in between or the integration; only then will you be able to achieve data consistency.

Therefore, data consistency refers to the correct and complete logical relationship between related data in relational databases (Shi et al., 2019). When users access the same database at the same time and operate on the same data, four things can happen: lost update, undetermined correlations, inconsistent analysis, and read fantasy (Gao *et al*., 2017). Similarly, consistency refers to whether the same data kept at different places do or do not match (MoH DQA Guideline, 2016). In this

study the data consistency will be assessed through into different used in collecting data in HMIS so as to measure the level of data quality in terms of consistency. And this definition was adopted for this study.

2.2.9 Primary Health Facilities

Primary Health Facilities (PHFs) is the vital care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost they and the country can afford to maintain in the spirit of self-reliance and self-determination (WHO, 1978). Furthermore, PHC is essential health care based on practical, scientifically sound and socially acceptable methods and technology, made universally accessible to individuals and families in the community through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination.

Primary Health Facilities (PHFs) is therefore understood as an approach to health care that promotes the attainment by all people of a level of health that will permit them to live socially and economically productive lives (Tangcharoensathien et al., 2015). PHF is health care that is essential, scientifically sound (evidence-based), ethical, accessible, equitable, affordable, and accountable to the community. Figure 1 illustrates the meaning of the primary health facility.

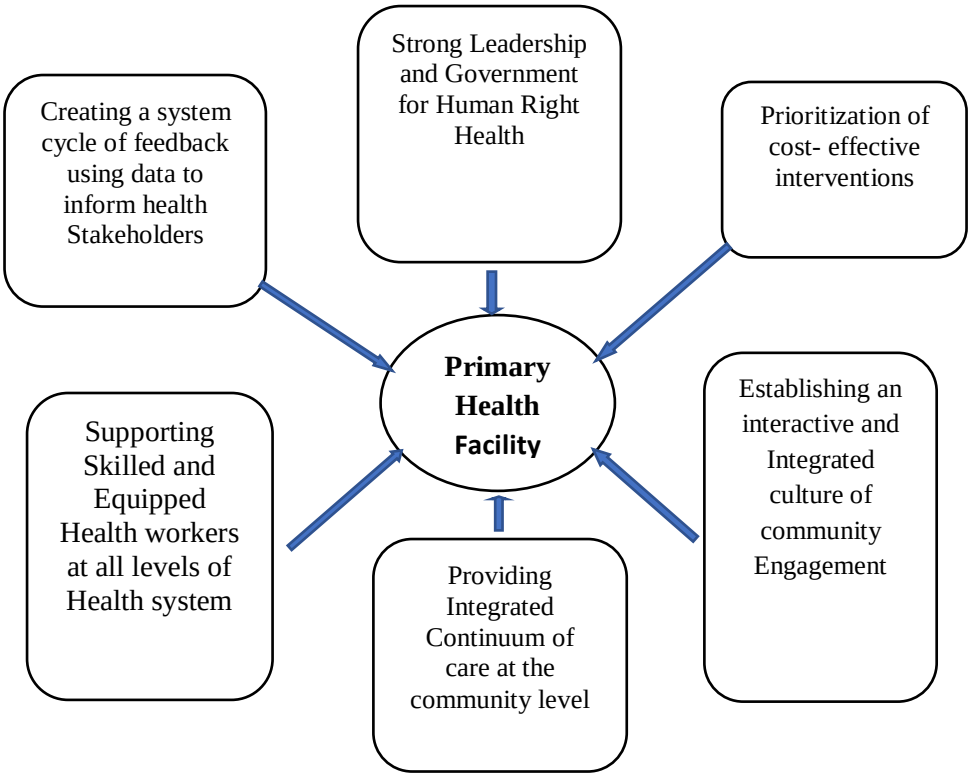

Figure 21: Definition of Primary Health Facility

Additionally, Hone, *et al., (*2018) view PHFs as a broad range of health services provided by medical professionals in the community. This means universal health care is accessible to all individuals and families in a community. Basically, the PHF service is the process and practice of immediate health services, including diagnosis and treatment of a health condition, support in managing long-term health care, including chronic conditions such as diabetes (Tangcharoensathien et al., 2015). PHF also includes regular health checks, health advice when an unhealthy person seeks support for ongoing care.

Additionally, SDG 3 targets to successfully implement and achieve universal health coverage, which acts as a means for equitable access of health care services to all people so as to end the preventable death of newborns, infants, and children under the age group of 5 years (WHO, 2018). PHF is essential to a person for leading a life of sound health throughout which includes physical, mental, and social well-being of

all people at all times (Starfield, 2011). It should cover health promotion, disease prevention, treatment, rehabilitation, and palliative care.

The best way to approach the people for PHF is to meet their health needs throughout their lives (WHO, 2018). In order to bring awareness on broader determinants of health through the multispectral policy, it is necessary to convince the population at individual, family, and community levels to take responsibility for their own. Primary health facilities in Tanzania refers to health facilities that provide basic health services rather than specialized services. These include dispensaries, health centres, and district hospitals.

2.3 Theoretical Literature Review

Theories are established to enlighten, forecast, and comprehend phenomena and to challenge and extend existing knowledge within the same sphere of critical assumptions. This study will be guided by Socio Technical Theory, Monitoring and Evaluation Theory and the Normalization Process Theory (NPT) as presented in Sections 2.3.1 and 2.3.2.

2.3.1 The Socio-Technical Theory

The theoretical background for this study was the Socio -Technical Theory. This theory was chosen for this study as it focuses on the implementation of technology in the organization. The Socio-Technical Theory focuses on the implementation of technology in an organization. There are social and technical elements found in organizations that influence the success or failure of technology implementation (Trist, 1981). The technical subsystem consists of the tools, devices and techniques

necessary for transforming inputs into outputs in ways that make the organization more efficient (Adebayo, 2015). The social subsystem consists of employees, needs, attitudes, skills, values and the knowledge they bring to the work environment, together with the reward system and structures of authority in the organization.

2.3.2 Normalization Process Theory (NPT)

This theory is a sociological theory in the field of science and technology studies. May et al. (2015) states that NPT deals with the adoption of both technological and organizational innovations to improve quality of data especially HIV/AIDS data. Innovation promises data quality in terms of data accuracy, promptness and completeness. This is of paramount importance in advancing of the clinical and cost-effectiveness of services, and reductions in the burdens of illness to the community - especially chronic illness like HIV/AIDS.

The theory is relevant to the study as it addresses the manner a new technology ought to change and bring innovations to the old ways of systems by generating more qualified output. The application of this theory stays at the fact that the imposition of eHIMS has revolutionized data quality on decision-making on health services such as HIV/AIDS counselling and testing in Dodoma City and Bahi District Council, as it is known that adopting eHMIS like GOTHOMIS in these Councils is the new technology, so the study is going to assess how the new technology has improved the quality of HIV data.

2.3.3 Monitoring and Evaluation Theory

The theory evolved in the USA in the late 1960s and 1970s where it was rooted in the perception of public sector failures (Cameron, 1993). Some projects

underperformed (failed) which led to the creation of an independent M & E unit with responsibilities ranging from collecting data, processing and analyzing the same (Cameron, 1993). The M&E departments' responsibilities also included reporting on project performance against original targets to ministries and international agencies.

M&E has been around for a while and has been featured in many disciplines of study and practice. These include finance, governance, agriculture, development projects and health. M&E for accountability and systematic social enquiry has been the focus of evaluation research (Alkin & Christie, 2004). Notwithstanding the long-standing profession and availability of literature on the subject matter, the ultimate object and impact in project delivery can be questioned since projects do not conform to quality standards, cost overruns and completed beyond schedule and general dissatisfaction by project stakeholders.

M&E as a project management function is a key driving factor for achieving project success. As noted by Kamau and Mohamed (2015), M&E is a critical success factor (CSF) in project delivery. Achieving project success (PS) is nearly impossible without the constant M&E which has been found consistent with literature and practice (Ika et al., 2012; Kamau & Mohamed, 2015). Also Kibebe and Mwirigi, (2014) ranked ineffective M & E as the number one management factor that contributed to project failure. This theory is relevant to this study as it provided the role of M&E in the provision of proper information for organization sustenance.

2.4 Empirical Literature Review

Health Management Information System (HMIS) has been studied by many researchers using varied methods in various countries. These studies have looked at

HMIS in different angles with regard to health services delivery especially in the digital era where such system has shifted from HMIS to eHMIS. Al-Otaibi et al. (2022) in Kuwait studied effect of eHMIS on health service satisfaction using cross-sectional design while applying questionnaire in data collection. The study findings revealed that ease of use, education level and gender were significantly affecting the degree of physician satisfaction with the e-HR system.

This study did not link the usage of eHMIS with data quality with regard to HIV/AIDS disease. Similarly. Alnashmi et al. (2022) in Kuwait explored the health information management system of between 2019 to July 2020 using questionnaire noted that paper-based medical records had many flaws compared to the eHIMS. However, this study neither showed performance with regard to data quality nor conducted at PHFs in Dodoma City.

Moreover, Thuraisingam et al. (2021) in Australia assessed the suitability of general practice of electronic health records for clinical prediction model development based on completeness, credibility and accuracy of data for the period of 2014–2015. The study noted that there was a substantial missing data of weight gain between early adulthood and middle age. This study was relevant to the current study by having similar variables, but it also ignored the specificity of effect of eHIMS on data quality regarding HIV/AIDS in selected PHFS in Dodoma City.

Similarly, Almaghrabi and Bugis (2022) in Saudi Arabia reviewed patient confidentiality of electronic health records. It was found that the health care sector was flawed with several security risks that may corrupt the integrity of patient data.

However, this study was not confined to effect of eHIMS on the data quality in selected PHFs in Dodoma City in Tanzania regarding HIV/AIDS data. The researcher recommended the provision of appropriate skills in handling eHRs for health actors.

Daneshkohan, et al., (2022) explored the perception of primary health care workers on data quality and data use in a northern Iranian city using a cross-sectional study and questionnaire. The study noted that the volume of the data collected, training program frequency about HIS, supervision, feedback provision, and incentivization were associated with data quality and data use. Daneshkohan et al. (2022) resembled the work of Alnashmi et al. (2022) in Kuwait in that both did not expressly deal with eHIMS and did not work in Tanzania. Several questions arise from this study such as: What kind of data are referred to? Would these study findings apply in Dodoma City selected PHFs? In what aspects were data quality measured? What was its accuracy, completeness or promptness?

Similarly, Katurura and Cilliers (2018) in South Africa reviewed the electronic health records (eHRs) system in the public health care sector using a systematic literature review between 2006 and 2017. The study found that adoption of eHIMS was hindered by technical, social and environmental factors. Despite its contemporary, Katurura and Cilliers (2018) did not investigate the effect of e-HIMS with regard to HIV/AIDS congruent to the current study. Likewise, Botha et al. (2014) identified data quality challenges in eHIMS in South Africa based on mixed study using data users from eHIMS as the unit of analysis applying both interviews and questionnaires method. The study found that the most powerful challenge to

eHIMS adoption was inadequate training to users. This was, however, not the aim of the current study as it has ignored the effect of the eHIMS on data quality nor carried out in Dodoma Tanzania.

Equally, in South Africa, Radebe et al. (2022) evaluated patient data quality based on laboratory data warehouse for the period of 2017-2020 employing both descriptive statistics and Chi-square univariate tests based on infants and children. The findings revealed that poor data failed to capture the patient demographics. Despite being too old Botha et al. (2014) studies the eHIMS while Radebe et al. (2022) confined on data quality with respect to infants and children. Thus, Radebe et al. (2022) was based on public laboratory data warehouse and did not associate data quality with HIV/AIDS at PHFs congruent to the current study.

Noureldin et al. (2014) in Egypt assessed the quality of documentation of electronic medical information systems at primary health care units. It was found that culture acted as physician's feedback on barriers. The study was too old however, it studied eHIMS. Mursi et al. (2022) supported the Noureldin et al. (2014) by investigating the security of eHIMS for public healthcare sector in Egypt using HL7. The study findings revealed that eHIMS especially HL7 improved data quality with regard to complete privacy and utmost security of patients' data. However, this study associated HL7 software with Covid-19 incongruent with current study which aims at linking eHIMS with data quality with regard to HIV/AIDS data. Would the findings of this study be applicable to Tanzania? Would the use of different research design apart from cross-section yield different study results? Failure to fully address these queries proves existence of knowledge gap.

Furthermore, Sanjuluca, et al., (2022) in Angola assessed the use of hospital information systems (HIS) to support decision-making using a cross-sectional study in public hospitals. Upon using descriptive method, the study found that two thirds of the participants reported that they were unsatisfied with HIS for decision-making. This study did not correlate the eHIMS with data quality in PHFs in Dodoma City but in Angola. Similarly, Sanjuluca et al. (2022) did not concur with current study intention by failure to concentrate with effect of eHIMS on data quality regarding HIV/AIDS in selected PHFS in Dodoma City and Bahi District Council.

Adedeji, et al., (2022) in Nigeria worked on implementing electronic health records in primary care using the theory of change. The study found that head of nursing and health information officers showed significant commitment to adopting the e-HIMS. However, some physicians and midwives had no willingness to use the EHR before being persuaded and incentivized by the management. Adedeji, et al., (2022) neither stated the effect of eHIMS to the data quality nor confined on HIV/AIDS data. This observation was different from that of Elikwu, et al., (2020) in Nigeria who confined on effect of eHIMS on medical records management in public health care institutions.

Elikwu, et al., (2020) noted that adoption of eHMIS reduces risk of treatment errors, decreases patient waiting time, enhances timely communication among practitioners, protects patient information from unapproved employees and enhances health care service delivery. However, this study was neither conducted in Tanzania nor biased to HIV/AIDS data quality as such its findings loosely apply to Tanzania context. Rumisha, et al., (2022) in Tanzania studied the data quality of the routine health

management information system at the primary health care facility and district levels in Tanzania using cross-sectional research design. It was noted that the routine HMIS was weak where data at district level inaccurately reflects what is available at the source. The researcher highlighted the urgency to design tailored and inter-service strategies for improving data quality. Similarly, Rumisha et al. (2022) dealt with routine HIMS instead of eHIMS which is the focal area in the current study.

On the other hand, Lwoga et al. (2020) studied the predictors of eHIMS for improving the quality of care for women and people with disabilities. The study revealed that majority literate health workers have adopted eHIMS due to its ability to improve data quality. However, this study was conducted at one health facility named CCBRT and it was based on women and people with disabilities. Similarly, the study did not highlight the data regarding HIV/AIDS victims in Dodoma City who experience different situation from Dar es-Salaam.

2.5 Research Gap

The prudent decision-making pertaining health issues demands sound data (facts and figures). Most studies in the field of HMIS have only focused on factors affecting its adoption in their country (Adedeji et al., 2022; Daneshkohan et al., 2022; Elikwu et al., 2020). However, studies were hardly reported in Tanzania. Rumisha et al. (2022) was done in Tanzania but it only assessed the routine HMIS without incorporating electronic aspect with regard to HIV/AIDS data in Dodoma. Similarly, Lwoga et al. (2020) studied the predictors of e-HMIS with regard to quality of care improvement of women and people with disabilities at CCRBT in Dar es Salaam.

Despite being done in Tanzania, it opted for only one health centre (CCBRT) and HIV/AIDS information at Dodoma City and Bahi DC PHFs were not considered. Meanwhile, Tumbo assessed the impact of e-HMIS on health care services delivery at Mount Meru Hospital in Arusha City only. Therefore it is unknown the manner e-HMIS affects on the data quality in the selected PHFs in Dodoma City and Bahi DC with regard to HIV/AIDS data. Practically due to adoption of e-HMIS in Dodoma and Bahi Council it was expected the quality of data to reach the national target which is 95%; unfortunately it is 74%.

2.6 Conceptual Framework

The conceptual framework delienates the variables of this research and the associations between each variable in a precise manner. The researcher used the conceptual frames to define the objectives of the research undoubtedly (Kumar, 2019). A conceptual framework is an analytical tool with several variations and contexts which the researcher believes can best explain the natural progression of the phenomenon to be studied (Kumar, 2019). Alternatively, a conceptual framework is an analytical tool with several variations and contexts, which the researcher believes can best explain the natural progression of the phenomenon to be studied (Kothari, 2014).

It links various variables derived from concepts, empirical research, and important theories used in systemizing the knowledge adopted by the researcher. It shows conceptual distinctions and organizes ideas to be captured in a way that is simple to memorize and apply (Kothari, 2014). It is the researcher's explanation of how the research problem would be explored by unfolding variables of the study topic

relationship. Mensah et al. (2020) propose that a good conceptual framework must be logical in structure to provide a picture or visual display of how concepts relate to one another in the topic of choice.

This conceptual framework was scientifically designed based on the research topic, findings of the reviewed literature (Chapter Two), research objectives, and research questions. The researcher has used a 5-step process to develop the conceptual framework:

i) The research topic was selected and in-depth review of the literature was conducted;
ii) Research objectives and research questions were identified;
iii) Variables of the conceptual framework were identified;
iv) Relationships between variables were identified and
v) The conceptual framework was generated.

Based on extensive reviews on literature the researcher has identified the following variables. The conceptual framework consists of two types of variables namely independent variable which is the e-HIMS (attributes of accuracy, consistency, completeness and timeliness) and dependent variable namely HIV/AIDS data quality (in terms validity and reliability and relevance) of PHFs. The researcher assumes that e-HIMS has capability to affect the HIV/AIDS data quality of PHFs (in terms of validity, reliability and relevance) in Tanzania focusing on the Dodoma City Council and Bahi District Council as pictorially presented in Figure 2:

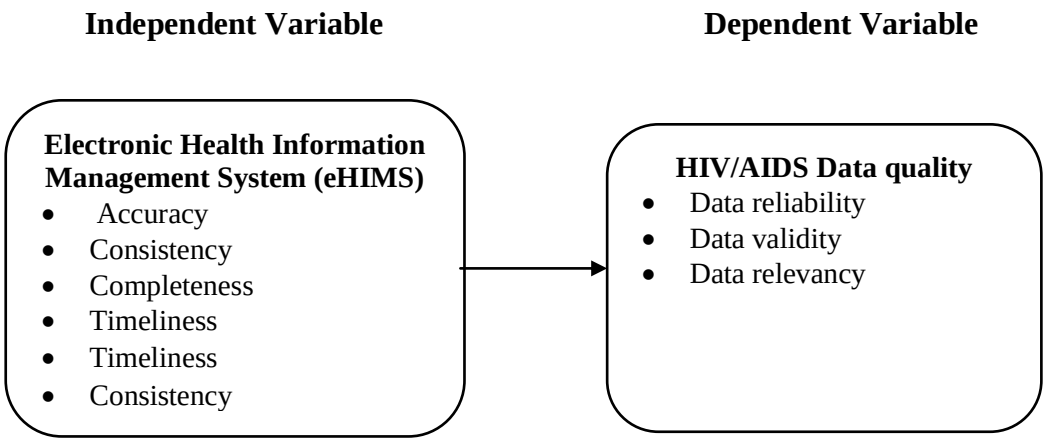

Figure 2.2: Conceptual Framework

Source: Researcher's Construct (2023)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 An Overview

This chapter describes the research methodology which includes: research design, area of study, research approach, population, sample, sampling techniques, sample size, data collection methods, primary data, secondary data, data analysis technique, reliability and validity of the instruments and ethical considerations.

3.2 Research Philosophy

A research philosophy refers to an idea or belief of a researcher. It is concerned with the collection, investigation and interpretation of collected data (Kumar, 2019). Research philosophy covers the assumption or principle that was adopted or procedure followed by the researcher in conducting the study (Creswell, 2014). This study was built on the positivism paradigm which aimed at generating knowledge to explain the relationship between variables. Based on Kumar (2019), positivists believe that there is a single reality that is possible to measure and understand. Because of this, they are most likely to use quantitative method in their research.

Typically, positivists propose a hypothesis that can be proved or disproved using statistical data analysis. Positivism tends to investigate the existence of a relationship between two variables rather than the reason behind it. In this philosophy, the researcher is assumed to be independent in the sense of not being affected by the research subject and giving room to a researcher to describe the facts and information obtained from the population.

3.3 Research Approach

Research approaches are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. This plan involves several decisions, and they need not be taken in the order in which they make sense to me and the order of their presentation here. The overall decision involves which approach should be used to study a topic. Informing this decision should be the philosophical assumptions the researcher brings to the study; procedures of inquiry (called research designs); and specific research methods of data collection, analysis, and interpretation.

The selection of a research approach is also based on the nature of the research problem or issue being addressed, the researchers' personal experiences, and the audiences for the study. Thus, in this study, research approaches, research design, and research methods are three key terms that represent a perspective about research that presents information in a successive way from broad constructions of research to the narrow procedures of methods.

A mixed methods research design is a procedure for collecting, analyzing, and "mixing" both quantitative and qualitative research and methods in a single study to understand a research problem. A mixed methods approach is one in which the researcher tends to base knowledge claims on pragmatic grounds (e.g., consequence-oriented, problem-centered, and pluralistic). It employs strategies of inquiry that involve collecting data either simultaneously or sequentially to best understand research problems. The data collection also involves gathering both numeric information (e.g., on instruments) as well as text information (e.g., on interviews) so

that the final database represents both quantitative and qualitative information.

Johnson and Onwuegbuzie (2004) hoped that the mixed methods approach to research provided researchers with an alternative to believing that the quantitative and qualitative research approaches are incompatible and, in turn, their associated methods "cannot and should not be mixed." With the mixed methods approach to research, researchers incorporate methods of collecting or analyzing data from the quantitative and qualitative research approaches in a single research study. Both quantitative and qualitative approaches use data that will be numerical and non-numerical in nature (Kothari, 2014). The study employed a quantitative and qualitative research approach as the study collected data in form of numerals regarding data of patients with regard to PHFs of choice while at the same time key informants were to provide qualitative information.

3.4 Research Design

Pandey (2015) defined a research design as simply the framework or plan for a study that is used as a guide in collecting and analyzing the data. It is a blueprint that is followed in completing a study. In this study the cross-sectional research design was adopted as it fits well with a large number of respondents (Creswell, 2014). A research design (a research strategy) is a plan to answer a set of questions (McCombes, 2019). It is a framework that includes the methods and procedures to collect, analyze, and interpret data.

In other words, the research design describes how the researcher will investigate the central problem of the research and is, therefore, part of the research proposal. The characteristics of research design influence the type of data to be gathered and,

consequently, its results. Depending on the type, which we will explain below, research design also defines all other constituent parts of a study, such as variables, hypotheses, experiments, methodology, and statistical analysis (Creswell *et al*., 2018). Thus, the research design employed in this study was cross-sectional research design.

Cross-sectional study design is a type of observational study design. In a cross-sectional study, the investigator measures the outcome and the exposures in the study participants at the same time (the defining feature of a cross-sectional study is that it can compare different population groups at a single point in time (Pandey and Pandey, 2018). Based on Creswell and Poth (2018), research design has various advantages namely:

i) Relatively quick and easy to conduct (no long periods of follow-up);
ii) Data on all variables is only collected once;
iii) Able to measure prevalence for all factors under investigation;
iv) Multiple outcomes and exposures can be studied;
v) It can handle prevalence of the disease or other health-related characteristics which are crucial in public health for assessing the burden of disease in a specified population and in planning and allocating health resources and
vi) Good for descriptive analyses and for generating hypotheses.

While the research design is advantageous, Kumar (2019) asserts that one needs to be cautious in using this research design as it has several weaknesses such as:

i) Difficult to determine whether the outcome followed exposure in time or exposure resulted from the outcome;

ii) Not suitable for studying rare diseases or diseases with a short duration;

iii) As cross-sectional studies measure prevalent rather than incident cases, the data will always reflect determinants of survival as well as aetiology;

iv) Unable to measure incidence;

v) Associations identified may be difficult to interpret;

vi) Susceptible to bias due to low response and misclassification due to recall bias, and (vii) Non-response is a particular problem affecting cross-sectional studies and can result in bias of the measures of outcome.

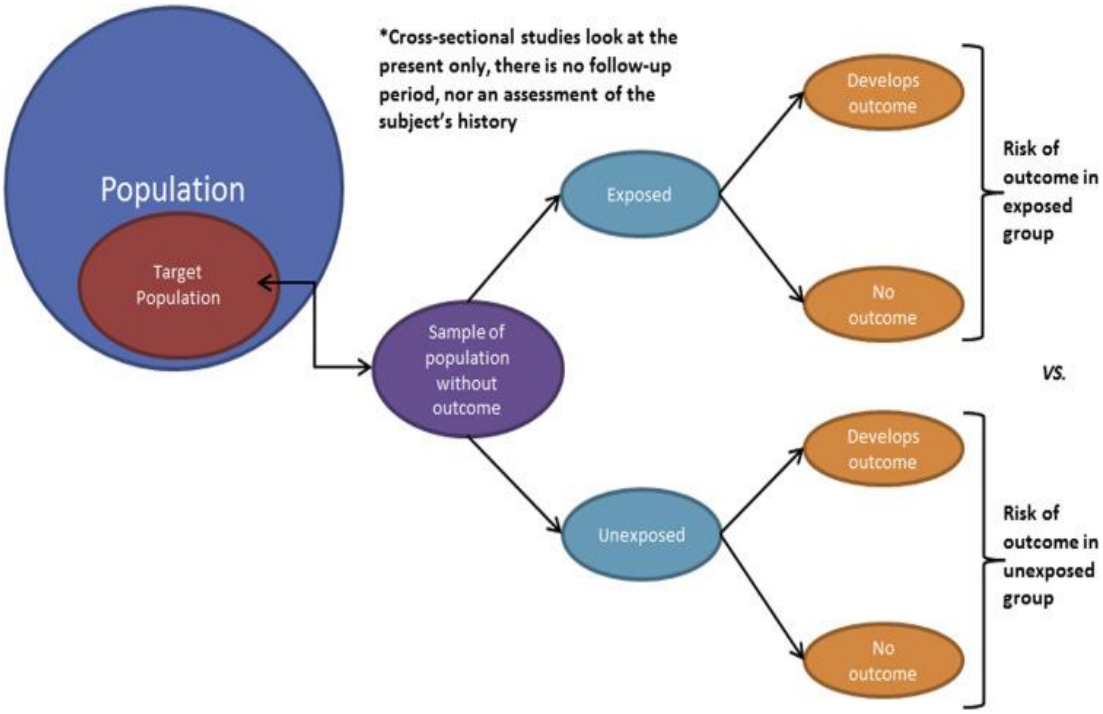

Figure 3.1: Example of A Cross-Sectional Study

3.5 Area of Study

The study was conducted in Dodoma City and Bahi District Council, where a total of 12 health facilities with e-HMIS and six (6) health facilities from each study vicinity were involved. The two selected districts are due to the fact that they have long experience of using e-HMIS in Dodoma Region.

Table 4.1: PHFs Understudy With Their Type

FACILITIES WITH E-HMIS			FACILITIES WITHOUT E-HMIS		
Facility Name	**Facility Type**	**Council**	**Facility Name**	**Facility Type**	**Council**
Bahi	Health Center	Bahi DC	Babayu	Dispensary	Bahi DC
Chibelela	Dispensary	Bahi DC	Chali Isangha	Dispensary	Bahi DC
Hombolo	Health Center	Dodoma CC	Chipanga	Health Center	Bahi DC
Kigwe	Health Center	Bahi DC	Ihumwa	Dispensary	Dodoma CC
Makole	Health Center	Dodoma CC	Kikuyu	Dispensary	Dodoma CC
Mpunguzi	Dispensary	Dodoma CC	Mkonze	Health Center	Dodoma CC

Source: Research Data, (2023).

3.6 Population, Sample and Sampling Techniques

3.6.1 Population

Population of the study refers to the people, items years and so forth which a researcher is interested in to generalize results of the study (Kumar, 2019). In this study, the targeted population will be the health care providers from PHFs of choice in Dodoma City and Bahi District Council. The total population of health care providers engaging with health data from PHFs of choice congruent to PO-RALG Report of 2021. Table 2 portrays the distribution of population based on the Primary Health Facilities understudy by indicating those with and without e-HMIS and their respective type.

Table 4.2: Distribution of Population of Health Data dealers by PHFs and their Types

S/N	PH Facility Name	Facility Type	Population	S/N	PH Facility Name	Facility Type	Population
1	Bahi	Health Center	5	7	Babayu	Dispensary	3
2	Chibelela	Dispensary	3	8	Chali Isangha	Dispensary	3
3	Hombolo	Health Center	5	9	Chipanga	Health Center	5
4	Kigwe	Health Center	3	10	Ihumwa	Dispensary	3
5	Makole	Health Center	7	11	Kikuyu	Dispensary	3
6	Mpunguzi	Dispensary	4	12	Mkonze	Health Center	6
	SUB TOTAL 1	**27**			**Sub Total 2**	23	
	GRAND TOTAL	**50**					

Source: Research Data, (2023).

3.6.2 Unit of Analysis

Based on this study the unit of analysis is the health care providers dealing with the health facility's data management. In this regard, unit of analysis is individual persons and the health facility's relevant health data documents.

3.6.3 Sampling Technique

This study adopted the purposive sampling technique. In this technique, respondents are selected from the population based on their merits of furnishing the researcher with vital information (Pandey, 2018). Impliedly, the researcher considered health care providers who deal with health facility data management at PHFs as their role synchronizes with the health information demanded.

3.6.4 Sample Size

A sample is a small proportion of a population selected for observation and analysis (Saunders et al. (2009). The sample size for the health care providers from selected PHFs was drawn using a model proposed by Yamane, (1967), which shows the following relationship:

$n = N/ (1+Ne2)$

Where

N = population size health data dealers 50

n = sample size e = confidence interval (0.05)

From $n = N/ (1+Ne2)$

$n = 50/ [1+50 (0.1)^2] = 44$

Therefore, the sample size for this study was 44 participants who are health care providers. Meanwhile 4 participants came from Council Health Management Team

and 2 participants from Regional Health Management Team. Table 3 below shows the sample distribution based on PHFs and their type:

Table 4.3: Sample based on PHFs and their Types

PH FACILITIES WITH E-HMIS				PH FACILITIES WITHOUT E-HMIS			
S/N	**PHFacility Name**	**Facility Type**	**Population**	**S/N**	**PH Facility Name**	**Facility Type**	**Population**
1	Bahi	Health Center	4	7	Babayu	Dispensary	3
2	Chibelela	Dispensary	3	8	Chali Isangha	Dispensary	3
3	Hombolo	Health Center	4	9	Chipanga	Health Center	5
4	Kigwe	Health Center	3	10	Ihumwa	Dispensary	3
5	Makole	Health Center	6	11	Kikuyu	Dispensary	3
6	Mpunguzi	Dispensary	3	12	Mkonze	Health Center	4
SUB TOTAL 1			**23**	**Sub Total 2**			**21**
GRAND TOTAL			**44**				

Source: Research data, (2023).

3.6.4 Data Collection Methods

In this study both primary and secondary sources of data were used. Primary data was collected by interview based on 36 interviewees. On the other hand, document checklist was used to capture secondary data from data quality reports. According to Kothari (2014) interview gives the avenue for the elaboration of issues whereas secondary data are cheap as they already exist.

3.7 Data Analysis Technique

Data analysis is the process of inspecting, rearranging, modifying and transforming data to extract useful information from it (Kumar, 2019). Alternatively, data analysis is simply the process of converting the gathered data to meaningful information. Different techniques such as modeling to reach trends, relationships, and therefore conclusions to address the decision-making process are employed in this process (Taherdoost, 2020). However, the data needs to be prepared before being used in the data analysis process. Data preparation is the process in which data is converted to

the numerical format which is machine - readable to be used in specific analyzing programs such as SAS or SPSS. The steps to follow for the data preparation process are data coding, data entry, missing values, and data transformation.

3.7.1 Data Coding

Converting data to numerical values happens during the data coding process. It uses a codebook which is a document including different information such as an explanation of the variables, measures, and format of variables, the response, and finally coding them. In this process response means determining the types of scales for instance, whether the scale is chosen as nominal, ratio, ordinal, or interval; whether the scale is five-point, seven-point, etc. For example, to code the industry type, we can use a numerical form, and the coding scheme can be considered as 1 for healthcare, 2 for manufacturing, 3 for retailing, and 4 for financial.

3.7.2 Data Entry

In this process, the coded data from the previous step is entered into text files or spreadsheets. It also can be directly added to the statistical program. Missing data: As some respondents may not answer all the questions because of different reasons, a method should be used to face these missed values. For example, you need to add the value -1 or 999 in some programs; some of them automatically address the missed values, and others use a list-wise deletion technique facing the missing values which drop all the answers even with a single missed value.

3.7.3 Data Transformation

Transforming data is needed before interpreting them in some cases. Reverse coded items can be considered as an example that should be transformed before comparing

or combining with not reversed ones. This concept is used where the meaning of the item is opposite to their underlying construct (Bhattacherjee, 2012). The study used content analysis which is used to test the objectives by answering the research questions. Content analysis may be briefly defined as the systematic, objective, quantitative analysis of message characteristics. It includes both human-coded analyses and Computer-Aided Text Analysis (CATA).

Its applications can include the careful examination of face-to-face human interactions; the analysis of character portrayals in media venues ranging from novels to online videos; the computer-driven analysis of word usage in news media and political speeches, advertising, and blogs; the examination of interactive content such as video gaming and social media exchanges; and so much more. Content analysis has been applied in many areas of inquiry. Despite the fact that this method was selected based on the nature of data, the method is suitable as it has the following benefits:

i) Directly examines communication using text;

ii) Allows for both qualitative and quantitative analysis;

iii) Provides valuable historical and cultural insights over time;

iv) Allows a closeness to data;

v) Coded form of the text can be statistically analysed;

vi) Unobtrusive means of analyzing interactions.

Likewise, the study employed a descriptive analysis. The descriptive statistics was used in analyzing the participants' characteristics while objective one to four were analysed using binary logistic regression with the help of SPSS version 23. Binary

logistic regression (LR) is a regression model where the target variable appears in two i.e success (1) or failure (0) (Kumar, 2019). The choice of these analytical methods was based on simplicity in presentation and ability to establish variable correction respectively (Kothari, 2014). In this study the binary logistic regression equation was as follows:

$$\frac{Pi}{(1-Pi)} = \beta 0 + X1\beta 1 + X2\beta 2 + X3\beta 3 + X4\beta 4 + \varepsilon$$

Pi = Y= data quality

X_1 = Timeliness aspect, X_2 = Completeness aspect, X_3 = Consistency aspect, X_4 = Accuracy aspect and Ɛ= marginal error.

3.8 Reliability and Validity

3.8.1 Reliability

Reliability means consistency and stability of information and that if research is conducted under the same circumstances findings will be replicated (Kothari, 2015). To be sure about the reliability, the researcher compared each significant information obtained from documentary review and interviews against another source. In addition to that, the researcher used more than one data collection instrument in order to enable collecting more information suitable and credible for the study.

Elo, *et al.* (2014) and Lewis (2015) agreed that for the results of the qualitative case study research to be reliable, the qualitative researcher should accurately collect, transcribe, categorize and code the vast amount of data before assigning the appropriate themes. Morse (2015) posited that the examination of trustworthiness of the study is important for qualitative research to be considered as reliable. Achieving accuracy or consistency in qualitative studies is critical to establishing credibility and

transferability of the findings, which is necessary to prove reliability (Kumar, 2019). Reliability in qualitative studies also requires dependability on study findings over a sustained period (Elo et al., 2014).

Member checking is an appropriate method to validate the accuracy of the interpretation of the data collected from the participants (Creswell, 2014). Member checking allows the participants of the study to provide meaningful feedback regarding the identified themes, the methods used to arrive at the findings, and to discuss the findings of the study (Andrasik *et al*., 2014; Harvey, 2015). Member checking is an effective means to address accuracy and dependability on the results of qualitative research (English, 2015; Lincoln & Guba, 1985; Tong & Dew, 2016). Dependability of this study was achieved by ensuring that the process by which the participants were selected was clearly and accurately described, as well as the characteristics of the participants.

Dependability was further achieved by ensuring the accuracy of the interpretation of the understanding of the phenomenon as described by the participants. The participants confirmed the accuracy of the interpretation of the research interview findings by cross-checking with the interviewees. In this study, the researcher shared the research findings through various media to the participants and requested for feedback in relation to the accuracy of the summarized interview in order to arrive at the conclusions of the findings.

3.8.2 Validity

The validity of the study entails the quality and instruments of the study which are correct, accurate, truly meaningful and right (Creswell and Poth, 2018). Elo *et al.*

(2014) are of the opinion that validity tests the extent to which a research instrument measures what it is intended to measure. Therefore, validity of a research instrument assesses the extent to which the instrument measures aspect(s) intended to be measured (Robson, 2018). It is the degree to which the results are straightforward and that will be used certainly by other users. Similarly, validity of qualitative studies entails the researcher's transparency regarding the manner results were attained from the point of collection of data to the conclusion point (Noble & Smith, 2015). Validity in a qualitative study compels a researcher to adhere to all research principles to ensure that collection of data is neatly done (Robson, 2018).

Credibility in a qualitative study means the ability of a researcher to definitely harmonise the findings of the research to the research questions (Robson, 2018). Basically Robson (2018) classifies validity into internal validity and external validity. The internal validity is the ability of the researcher to fruitfully protect the credibility of the inferences drawn from the study (Morse, 2015). Likewise, the external validity of the researcher is the ability to spread the study beyond the researched organization to other organizations (Saunders et al. 2016). The conclusions reached by a researcher should be simply identified by the interviewees of the research because of their experience of the phenomenon. The research is required to be widely accepted due to consideration of various aspects.

Denzin (1978) identified four types of triangulation: methodological, data, investigative, and theoretical. The researcher in this study used two approaches to ensure the credibility of the findings of the study; these were the methodological triangulation and member checking. Methodological triangulation is a technique that

involves the use of more than one data source to validate the findings of the study (Robson, 2018; Denzin, 1978). Congruent to this study, both interview data collection method and documentary review were used in collecting data with regard to the manner electricity regulatory environment has promoted off-grid investment in Tanzania. Been, *et al*. (2015) recognized methodological triangulation as a useful technique to validate the results of a qualitative case study. Scholars identified several sources that could be used for triangulation evidence, such as documents, business reports, policies, regulations, laws and procedures, archival records, and organizational charts (Robson, 2018).

In this study the researcher reviewed documents in both the facilities with e-HMIS and those without. Based on the timeliness, submission time was of interest as the researcher wanted to know whether monthly reports were submitted on or before the fifth day of the next month pursuant to health information system (HIS) guideline of 2019. Meanwhile, with respect to the data consistency, appearance of similar data in all tools (clients' register, tally sheet, monthly report summary and district health system 2, DHS2) was of great interest. Similarly, the study regarded data to be complete if the flow of information of individuals were complete. Such individual information included name, sex, age, place etc. Lastly, the accuracy measured the level of erroneousness of the data collected due to human error or equipment.

All these aspects of data were measured against standard of the health performance whose threshold is 80%. Scores below 80% is deemed failure whereas scores above 80% implied well performed. On the other hand, member checking is used by researchers to establish credibility by allowing respondents to review the

researcher's interpretations of the transcripts for accuracy (Robson, 2018; Harvey, 2015). In this study, the research gave the opportunity to the participants to verify the researcher's interpretations via smartphone social media communication. This enabled the researcher to share the interpretations of the transcripts to the participants from the selected mini grid operators in Tanzania so as to enhance the credibility of the study.

Similarly, to ensure validity of the study, the researcher compared the research findings resulting from analysis of data obtained from the interviews with the research results obtained from data analysis from documentary review. Transcripts from semi structured interviews were recorded, interpreted and the interpretations shared with the participants for feedback on the accuracy of the interpretations. Robson (2018) defines confirmability as the ability of more than one independent researcher to agree on the credibility and interpretation of the study findings. Confirmability of the study could be achieved by describing the consistency with which the study was conducted with the participants and the applicability of the findings (Robson. 2018; Noble & Smith, 2015).

Confirmability was established by an audit trail that outlines the process of data collection and analysis for readers to understand the research process and the basis for the conclusions. Confirmability of a study refers to a researcher's ability to establish the accuracy of the data and provide other researchers and readers with reassurance (Robson 2018). Apart from confirmability, the research findings should be able to be transferred and applied to another context different from the vicinity of origin where the study was conducted.

Transferability refers to the ability of the researcher to provide the readers of the study with evidence that the findings could apply to other contexts or populations (Anney, 2014; Elo *et al.,* 2014). Robson (2018) proposes that a researcher could establish transferability in a qualitative study by providing readers with an extensive presentation of the conclusions drawn from the study. Transferability of the findings would be further strengthened if accompanied by quotations from the participants' interviews that support the findings (Robson, 2018; Houghton, et al., 2013).

The researcher ensured transferability of the study by including rich details in the description of the process, data analysis and findings in the final report to assist the readers with the application of the findings. The researcher ensured that the final report entails portions of the raw data, direct quotes, observation notes, and a description of how the themes were derived. The researcher stopped considering more data after attaining the data saturation point.

Data saturation is achieved when the researcher is no longer able to acquire new information regarding the research question, and no new emergent theme can be identified from the available information (Fusch & Ness, 2015). Data saturation is achieved when the researcher has exhausted the ability to do further coding of themes from the available data (Fusch & Ness, 2015; Morse, 2015). In this study, after the researcher had gathered primary data from the interviewees sourced from PHC of choice and secondary data from documentary review, the data collected credibly showed that no more data could be coded for analysis congruent to Pandey and Pandey (2015) and on the theory of data saturation. In this regard, the data collected were analysed to yield the study findings.

3.9 Ethical Considerations

Research ethics provide guidelines governing the conduct of the research to ensure high standards of ethics are adhered to in all activities. The study complied to the rules and regulations of the Open University of Tanzania as well as agreed principles of the research conduction provided by global reputable education institutions. This was very crucial as laxity in this aspect would deprive the reliability and validity of the study.

To adhere to ethical standards, the written ethical permits were obtained from the Open University of Tanzania for introduction of the researcher to the responsible authorities so as to access vital data for the study. The approved letter was submitted to the respective PHCs and relevant regional and district offices for seeking assistance, consideration and cooperation regarding the research task at stake. The main aspects for consideration included: Informed consent, privacy and confidentiality, anonymity, statement of harm, data protection, authorship and publication issues and voluntary participation.

3.9.1. Informed Consent

Using an information sheet, the purpose of this study was thoroughly shared to the administration of the day public secondary schools and any relevant authorities. The information regarding the role of researcher was included. Then, the participants' informed consent was sought. Only then participants signed a consent form indicating their acceptance to participate as well as the freedom to withdraw participation at any point in the study was considered. No unauthorized individual was permitted to access the data so as to omit loopholes for study interference and

biasness.

3.9.2. Privacy and Confidentiality

Data from the investigation were stored securely, and privacy was assured all the time during and after the data collection processes. Printed versions of relevant documents such as interview guides and documents checklists were locked in a cabinet and soft copies were stored using a computer-ensured password so that no any unauthorised person got access to them.

3.9.3. Anonymity

Nowhere in the report were participants of the study allowed to be identifiable by name. Instead pseudonyms were employed to represent names of the staff. Meanwhile personal information concerning research participants was treated with high standards of confidentiality so as to adhere to the research principles. This was so important so as to ensure that the study neither became invalid and unreliable nor fatal to the participants of the study.

3.9.4. Protecting Participants from Harm

In this study the researcher was responsible to protect the participants so that all the time of study participants were protected from all sorts of harm such as social, physical, psychological, and legal harm. Consequently, participants were not despised, terrified or maltreated by compelling them to answer questions forcefully as leaving such situations to happen would have resulted into psychological and social harm to the study participants.

3.9.5. Data Protection

The integrity of the data collected was protected so that no opportunity for impairing them by falsification, omission, and distortion of the truth was accessed. To ensure data protection, a key was applied without any alteration. Since some data were in form of soft copies, such data were keenly protected using digitalised devices using multiple servers so as to ensure that they remain original and not distorted at all.

3.9 .6 Authorship and Publication Issues

The final research results were published as a way of communicating to the scholarly world about the findings and secondly this is the requirement for many East African universities. The reported data were comprehensive enough to ensure stability from replication. Publications are academically important as they provide academic credit to all authors for upscaling academic career development status.

3.9 .7 Voluntary Participation

The researcher stated vividly to the participants regarding their freedom to dissociate from the research activities if they so wished. It was well stated that there would be no repercussions for those who wished to cease their participation in the study. It is the ethical practice to allow participants to participate in the study by their free will without any kind of coercion so as to secure vital and unimpaired data for reliable and valid study findings.

CHAPTER FOUR

FINDINGS

4.1 Introduction

This chapter presents the results upon data analysis from the respondents' characteristics and data regarding the study specific objectives. The objective of the study was to evaluate the effect of e-HMIS on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council. Specifically, the study aimed at:

i) examining the effect of e-HMIS timeliness attribute on HIV data quality at Primary Health Facilities;
ii) investigating the effect of e-HMIS accuracy attribute on HIV data quality at Primary Health Facilities;
iii) assessing the effect of e-HMIS completeness attribute on HIV data quality at Primary Health Facilities; and
iv) assessing the effect of eHMIS consistency attribute on HIV data quality at Primary Health Facilities

4.1 Response Rate

44 interviewees were planned to participate in this study. However, a total of thirty (30) participants were obtained for interview and fully participated in the interview. This amounted to an overall successful response rate of 68.2% as shown in Table 4. According to Kothari (2014) a response rate of above 50% is adequate for a descriptive study. Babbie (2004) also asserted that response rates of above 50% are acceptable to analyze and publish, 60% is good and 70% is very good. Based on

these assertions from renowned scholars, 83.3% response rate was very good for the study to be undertaken. Table 4.1 presents this information.

Table 4.1: Response Rate of Interviewees

Response Rate	Frequency	Percent
Interviewees Participated	30	68.2%
Interviewees missed	14	31.8%
Total	**44**	**100%**

Source: Research data (2023).

4.2 Demographic Characteristics of Participants

The study examined the demographic characteristics of participants where items such as sex, age, education level and work experience were considered.

4.2.1 Respondents Distribution by Sex

Table 4.2 shows that male were 18 (56.7%) of the entire interviewees while 14(43.3%) were female.

Table 5.2: Respondents Distribution by Gender

Sex	Frequency	Percent %
Male	18	56.7.0
Female	14	43.3.0
Total	**32**	**100.0**

Source: Research data (2023).

4.2 .2 Respondents Distribution by Age Group

Results from Table 4.3 indicate respondents had varying ages such that 10 (31.3%) participants were aged between 38-47 years, meanwhile 9 (28.1%) participants ranged between 28-37 years. On the other hand, 7 (21.8%) participants were in the age category of 48 years and above while 6 (18.7%) participants were aged between 18-27.

Table 6.3: Respondents Distribution by Age Group

Age Group in Years	Frequency	Percent %
18-27	6	18.7
28 -37	9	28.1
38 – 47	10	31.4
48 and above	7	21.8
Total	**32**	**100.0**

Source: Research data (2023).

4.2 .3 Respondents distribution by Education Level

Table 4.4 results reveal that 8 (25%) participants had a Bachelor's degree level while 15 (46.8%) had Diploma level, 4 (12.5%) participants had Master's degree meanwhile 5 (15.7%) participants held Certificate qualifications.

Table 7.4: Respondents Distribution by Education Level

Education level	Frequency	Percent %
Master's degree	4	12.5
Batchelor's degree	8	25
Diploma	15	46.8
Certificate	5	15.7
Total	**32**	**100.0**

Source: Research data (2023).

4.2 .4 Respondents Distribution by Work Experience

Table 4.5 shows that respondents were distributed by work experience. 11 (36.7%) had work experience of between 11-15 years while 7(21.8%) participants had work experience of between 6-10 years. Meanwhile, 7(21.8%) had work experience of 16 years and above whereas 5(15.6%) participants had work experience of between 1 - 5 years.

Table 8.5: Respondents Distribution by Work Experience

Work Experience in Years	Frequency	Percent %
1-5	5	15.6
6 -10	7	21.8
11-15	11	34.4
16 and above	7	21.8
Total	**32**	**100.0**

Source: Research data (2023).

4.3 Codification of Participants

This section presents results related to research objectives attained through data analysis. The following specific objectives guided this study:

i) to examine the effect of e-HMIS timeliness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

ii) to investigate the effect of e-HMIS accuracy attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania;

iii) to assess the effect of e-HMIS completeness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania; and

iv) to assess the effect of eHMIS consistency attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania. To simplify the sorting of participants interviewed, codification was used for easy and ethical reporting whereas the data from the interview were organised and summarized. Table 5 provides the participants' codification where HP1, HP2, HP3, HP4, HP5, HP6, HP7 HP8, HP9, HP10, HP11 and HP12 represented the health care providers from the primary health centres which were also coded as PH1, PH2, PH3, PH4, PH5 PH6, PH7, PH8, PH9, PH10, PH11 and PH12. Meanwhile, the council health and regional health management team were coded X1, X2 and X3 as shown in Table 4.9.

Table 9.6: Codification of Participants (Health Care Providers & Management Team)

S/N	Health Care Providers	CH & RH Mgt Team	Primary Health Facilities
1	HP1	X1	PH1
2	HP2		PH2
3	HP3		PH3
4	HP4		PH4
5	HP5	X2	PH5
6	HP6		PH6
7	HP7		PH7
8	HP8		PH8
9	HP9	X3	PH9
10	HP10		PH10
11	HP11		PH11
12	HP12		PH12

Source: Research data (2023).

4.4 Level of Data quality at the Primary Health Facilities

4.4.1 Performance of PHFs without e-HMIS in Dodoma City Council and Bahi District Council

Table 4.7 presents performance of PHFs without e-HMIS as shown.

Table 10.7: Results of PHFs without e-HMIS Installation

PHFS	DATA TIMELINESS	DATA COMPLETENESS	DATA ACCURACY	DATA CONSISTENCY	AVERAGE PERFORMANCE (%)
PH1	68	74	76	65	**70.75**
PH2	76	75	75	76	**75.5**
PH3	67	72	71	67	**69.25**
PH4	78	68	61	76	**70.75**
PH5	69	64	73	69	**68.75**
PH6	71	73	72	80	**74**

Source: Research data (2023).

4.4.2 Performance of PHFs with e-HMIS in Dodoma City Council and Bahi District Council

Under this aspect Table 4.8 provides the performance of PHFs with e-HMIS as indicated.

Table 11.8: Results of PHFs with e-HMIS Installation

PHFS	DATA TIMELINESS	DATA COMPLETENESS	DATA ACCURACY	DATA CONSISTENCY	AVERAGE PERFORMANCE (%)
PH7	88	99	85	97	**92.25**
PH8	90	86	92	99	**91.75**
PH9	93	97	88	89	**91.75**
PH10	85	88	87	91	**87.75**
PH11	87	91	84	98	**90**
PH12	92	93	95	96	**94**

Source: Research data (2023).

4.4.3. Effect of e-HMIS Timeliness Attribute on Health Data Quality of Primary Health Facilities

Based on each specific aspect of e-HMIS Table 4.9 shows the statistical information of aspect of health data quality with regard to the independent variable which is e-HMIS.

Table 12.9: Descriptive statistics of e-HMIS Attributes (n = 32)

Statistics

		eHMIS Timeliness	eHMIS Accuracy	eHMIS Completeness	eHMIS Cosistency
N	Valid	32	32	32	32
	Missing	0	0	0	0
Mean		1.16	1.13	1.16	1.13
Std. Deviation		.369	.336	.369	.336
Minimum		1	1	1	1
Maximum		2	2	2	2

Source: Research data (2023)

4.4.4 Effect of e- Timeliness Attribute on Health Data Quality of Primary Health Facilities

Table 13.10: e- HMIS Timeliness Attribute (n = 32)

eHMIS Timeliness

		Frequency	Percent
Valid	Yes (good quality)	27	84.4
	No (poor quality)	5	15.6
	Total	32	100.0

Source: Research data (2023).

4.4.5 Effect of e-HMIS Accuracy Attribute on Health Data Quality of Primary Health Facilities

Table 14.11: e- HMIS Accuracy Attribute (n = 32)

eHMIS Accuracy

		Frequency	Percent
Valid	Yes (good quality)	28	87.5
	No (poor quality)	4	12.5
	Total	32	100.0

Source: Research data (2023).

4.4.6 Effect of e-HMIS Completeness Attribute on Health Data Quality of Primary Health Facilities

Table 15.12: e-HMIS Completeness Attribute (n = 32)

eHMIS Completeness

		Frequency	Percent
Valid	Yes (good quality)	27	84.4
	No (poor quality)	5	15.6
	Total	32	100.0

Source: Research data (2023).

4.4.7 Effect of e-HMIS Consistency Attribute on Health Data Quality of Primary Health Facilities

Table 16.13: e-HMIS Accuracy Attribute (n = 32)

eHMIS Cosistency

		Frequency	Percent
Valid	Yes (good quality)	28	87.5
	No (poor quality)	4	12.5
	Total	32	100.0

Source: Research data (2023).

4.5 Binary Logistic Regression Results

4.5.1 The Effect of e-HMIS Attribute on Health Data Quality of Primary Health Facilities

From Table 4.15 of binary logistic regression results, it is evident that the Chi-square was 80.134 at a point where *p*-value = 0.000. This indicates that e-HMIS predicts the health data quality with regard to HIV/AIDS strongly. Similarly, Cox & Snell R Square and Nagelkerke R Square were 0.537 and 0.847 respectively have shown that independent variables significantly predict the change in dependent variable. This implies that 54.3% and 83.3% of the total variance in health data quality with regard to HIV/AIDS are accounted for by the e-HMIS aspect.

Table 17.15: Binary Logistic Results (n = 32)

Variables	*B-Coefficient*	SE	Sig	EXP(B)
e-HMIS Timeliness	2.232	3.350	.000	**2.203**
e-HMIS Accuracy	1.712	1.935	.000	**1.014**
e-HMIS Completeness	2.795	2.969	.000	**2.530**
e-HMIS Consistency	3.761	3.969	.000	**1.301**
Constant	3.864	.749		
Chi Square		**80.134, P = 0.000**		
Cox & Snell R^2	.543			
Nagelkerke R Square	**.833**			

Source: Research data (2023).

CHAPTER FIVE

DISCUSSION OF THE RESULTS

5.1 Introduction

This chapter presents the results discussion so as to understand the implication of the results in the light of the previous empirical studies and the theoretical literature review. This chapter discusses the results presented in Chapter Four.

5.2 Demographic Characteristics of Participants

The study examined the demographic characteristics of participants where items such as age, sex, work experience and education level were considered.

5.2 .1 Respondents Distribution by Gender

The sex of the participants was analyzed in that both male and female respondents were considered. The participants were composed of eighteen (18) male participants equivalent to 56.7% and fourteen (14) female participants equivalent to (43.3%) (Table 5). These statistics show that male participants were slightly larger in number than female participants. Furthermore, there was no sex biasness as the respondents' gender was almost equitably distributed such that male participants outnumbered the female by just four (4) participants which is equivalent to 13.3% only, which statistically cannot affect the study result reliability and validity as shown in Table 5. The study finding is supported by the suggestions of Creswell (2014) on the importance of getting rid of any sort of sample biasness including the sex or gender biasness.

5.2 .2 Respondents Distribution by Age Group

The age of the participants was analysed and the results were tabulated in Table 6

showed that 10 (31.3%) participants were aged between 38-47 years; 9 (28.1%) participants' age ranged between 28-37 years. On the other hand, 7 (21.8%) participants were in the age category of 48 years and above while 6 (18.7%) participants were aged between 18-27 as shown in Table 6. This implies that about 17 (53.1%) participants had attained the age of 38 and above which means that majority of the participants were mature enough to provide vital information as contended by Saunders et al. (2016).

Furthermore, this age group constituted prudent and sound minds who were able to react to various questions posed to them through interview as they were matured enough to understand and make analysis of issues. The study observations are supported by those in the study of Creswell and Poth (2018) which affirmed that biasness in terms of age, level of education, income level and experience be avoided in favour of valid and reliable study findings.

5.2.3 Respondents Distribution by Education Level

Furthermore, the study in Table 7 revealed that 8 (25%) participants had a Bachelor's degree level of education while 15 (46.8%) held Diploma level of education, 4 (12.5%) participants had Master's degree while 5 (15.7%) participants held Certificate qualifications. The study findings imply that the level of education of the majority of participants was adequate to give them confidence and exposure to sufficiently respond to the interviews. This was of paramount importance to ensure that the study is not biased by skewedness of sampling of participants in terms of level of education. The study findings were in harmony with the proposition of Kumar (2019) on emphasis on the consideration of biasness in research.

5.2.4 Respondents Distribution by Work Experience

Moreover, the study in Table 8 revealed that 11 (36.7%) participants had work experience of between 11-15 years while 7 (21.8%) participants had work experience of between 6-10 years. Meanwhile, 7 (21.8%) participants had work experience of 16 years and above whereas 5 (15.6%) participants had work experience of between 1 - 5 years. The study findings show that 18 (60%) participants had work experience of above 10 years in the health sector.

These observations imply that participants had sufficient experience in work hence they were able to furnish the researchers with vital information on the study by responding clearly in face to face interview. This is of paramount importance to ensure that biasness is not committed through considering participants who are newly employed as such lack the work experience which is of value to the research or considering only older participants who are not aware of the new technology such as e-HMIS and its application in the health sector. The study findings were in harmony with suggestions of Kumar (2019) on emphasis on the consideration of biasness in research.

5.3 Codification of Participants

This section presents results related to research objectives attained through data analysis. The following specific objectives guided this study: - (i) to examine the effect of e-HMIS timeliness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania (ii) to investigate the effect of e-HMIS accuracy attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in tanzania; (iii) to assess the

effect of e-HMIS completeness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania; and (iv) to assess the effect of eHMIS consistency attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania.

To simplify the sorting of participants interviewed, codification was used for easy and ethical reporting whereas the data from the interview were organised and summarized. Table 5 provides the participants' codification where HP1, HP2, HP3, HP4, HP5, HP6, HP7 HP8, HP9, HP10, HP11 and HP12 represented the health care providers from the primary health centres which were also coded as PH1, PH2, PH3, PH4, PH5 PH6, PH7, PH8, PH9, PH10, PH11 and PH12. Meanwhile, the council health and regional health management teams were coded X1, X2 and X3 as shown in Table 4.6.

5.4 Level of Data quality at the Primary Health Facilities

5.4.1 Performance of PHFs without e-HMIS in Dodoma City Council and Bahi District Council

The performance of PHFs with data quality dimensions such as data timeliness, data completeness, data accuracy and data consistency was measured (Table 4.7). The results in Table 4.7 shows that despite the varying performance across PHFs with respect to health data quality dimensions, all PHFs had inadequate performance as they failed to attain the 80% and above which is the threshold for the performance.

5.4.2 Performance of PHFs with e-HMIS in Dodoma City Council and Bahi District Council

The performance of PHFs with data quality dimensions such as data timeliness, data

completeness, data accuracy and data consistency was measured (Table 4.8). The results in Table 4.8 show that despite the varying performance across PHFs with respect to health data quality dimensions, all PHFs had adequate performance as they attained the 80% and above which is the threshold for the performance.

5.4.3 Effect of e-HMIS Timeliness Attribute on Health Data Quality of Primary Health Facilities

Table 4.9 shows that the mean and standard deviation of participants' responses on whether or not e-HMIS timeliness affect the health data quality of HIV/AIDS was 1.16 and 0.369 respectively. Meanwhile maximum and minimum values were 2 and 1 respectively. This shows that the majority of participants had a belief that adoption and use of e-HMIS affect the health data quality.

This has been proved by a mean of 1.16 which is very close to 1 which implies that in this sentiment participants agreed that e-HMIS timeliness attribute had effect on the health data quality. Similarly, this conclusion has been also evidenced by the smaller size of standard deviation which showed very little dispersion (0.369) from the mean. The overall mean of the health data quality was 1.135 as calculated from individual means as presented in Table 4.10. This implies that majority of participants were of the opinion that e-HMIS timeliness aspect affects the health data quality of HIV/AIDS in Tanzania.

Likewise, Table 4.10 shows that 27 (84.4%) participants agreed that the e-HMIS usage fostered the health timeliness to 84.4%. This acceptable performance was based on the District Health System 2 (DHS2) guideline of 2019. This observation

is congruent to the observation of Alnashmi, *et al.,* (2022) in Kuwait who studied the health information management system of between 2019 to July 2020 and found that manual-based medical records had many flaws in data timeliness compared to the e-HIMS. These observations concurred with secondary data in terms of Data Quality Assessment (DQA) reports which categorically showed that among other aspects PHFs had inadequate performance in terms of timeliness as on average the score was 67%.

Additionally, Thuraisingam, *et al.,* (2021) in Australia got resembling study results on the similar topic for the 2014–2015 period. Thuraisingam *et al.* (2021) found that e-HMIS usage ensured data timeliness, data completeness, credibility and accuracy with regard to weight gain between early adulthood and middle age of the patients. These results concur with the postulation of the Normalization Process Theory (NPT) which solely describes the essence of the technological adoption for enhanced innovation. Thus, the results are well supported by the NPT such that one can conclude that NPT shows concurrence to the study findings.

Table 4.9 shows that the mean and standard deviation of participants' responses on whether or not e-HMIS accuracy affects health data quality of HIV/AIDS was 1.06 and 0.243 respectively. Meanwhile maximum and minimum values were 2 and 1 respectively. This shows that the majority of participants had a belief that adoption and use of e-HMIS affects the health data quality. This has been proved by a mean of 1.06 which is very close to 1 which implies that in this sentiment participants agreed that e-HMIS accuracy attribute had effect on the health data quality. Similarly, this conclusion has been also evidenced by the smaller size of standard deviation which

showed very little dispersion (0.243) from the mean. The overall mean of the health data quality was 1.135 as calculated from individual means (Table 4.9). This implies that majority of participants were of the opinion that e-HMIS accuracy aspect affects the health data quality of HIV/AIDS in Tanzania.

Likewise, Table 4.11 shows that 28 (87.5%) participants agreed that the e-HMIS usage fostered the health data accuracy to 87.5%. This is acceptable performance based on the District Health System 2 (DHS2) guideline of 2019. These study findings are in harmony with the findings of Adedeji et al. (2022) of Nigeria who noted implementing electronic health records in primary care using the theory of change enhanced health data quality. Furthermore, these study findings were congruent to the findings of Elikwu, *et al.*, (2020) in Nigeria who revealed that adoption of eHMIS reduces risk of treatment errors, decreases patient waiting time, enhances timely communication among practitioners, protects patient information from unapproved employees and enhances health care service delivery.

5.4.4 Effect of e-HMIS Completeness Attribute on Health Data Quality of Primary Health Facilities

Table 4.9 shows that the mean and standard deviation of participants' responses on whether or not e-HMIS completeness affects the health data quality of HIV/AIDS was 1.12 and 0.332 respectively. Meanwhile maximum and minimum values were 2 and 1 respectively. This shows that the majority of participants had a belief that adoption and use of e-HMIS affects the health data quality. This has been proved by a mean of 1.06 which is very close to 1 which implies that in this sentiment participants agreed that e-HMIS completeness attribute had effect on the health data

quality. Similarly, this conclusion has been also evidenced by the smaller size of standard deviation which showed very little dispersion (0.243) from the mean. The overall mean of the health data quality was 1.135 as calculated from individual means. This implies that majority of participants were of the opinion that e-HMIS Completeness aspect affects the health data quality of HIV/AIDS in Tanzania.

Likewise, Table 4.12 shows that 27 (84.4%) participants agreed that the e-HMIS usage fostered the health data accuracy to 84.4%. This is acceptable performance based on the District Health System 2 (DHS2) guideline of 2019. These study findings are consistent with the findings of Radebe *et al.* (2022) in South Africa who evaluated patient data quality and found that e-HMIS had effect on the health data quality of infants and children for the period of 2017-2020. Additionally, Noureldin, *et al*., (2014) in Egypt noted that the use of e-HMIS has significant effect on the the quality of documentation of electronic medical information systems at primary health care units.

5.4.5 Effect of e-HMIS Consistency Attribute on Health Data Quality of Primary Health Facilities

Table 4.9 shows that the mean and standard deviation of participants' responses on whether or not e-HMIS consistency affects the health data quality of HIV/AIDS was 1.12 and 0.332 respectively. Meanwhile maximum and minimum values were 2 and 1 respectively. This shows that the majority of participants had a belief that adoption and use of e-HMIS affects the health data quality. This has been proved by a mean of 1.06 which is very close to 1 which implies that in this sentiment participants agreed that e-HMIS completeness attribute had effect on the health data quality. Similarly,

this conclusion has also been evidenced by the smaller size of standard deviation which showed very little dispersion (0.243) from the mean. The overall mean of the health data quality was 1.135 as calculated from individual means. This implies that majority of participants were of the opinion that e-HMIS accuracy aspect affects the health data quality of HIV/AIDS in Tanzania.

Likewise, Table 4.13 shows that 28 (87.5%) participants agreed that the e-HMIS usage fostered the health data accuracy to 87.5%. This is acceptable performance based on the District Health System 2 (DHS2) guideline of 2019. These study findings are consistent with the findings of Radebe, *et al.* (2022) in South Africa who evaluated patient data quality and found that e-HMIS had effect on the health data quality of infants and children for the period of 2017-2020. Additionally, Noureldin, *et al*., (2014) in Egypt noted that the use of e-HMIS has significant effect on the quality of documentation of electronic medical information systems at primary health care units. Ironically, study findings were in harmony with Data Quality Assessment (DQA) reports which showed vivid matching of data between e-HMIS and DHIS2. This confirmed the improved data quality by imposition of e-HMIS.

5.5 Binary Logistic Regression Results

5.5.1 The Effect of e-HMIS Attribute on Health Data Quality of Primary Health Facilities

From Table 4.14 of binary logistic regression results it is evident that the Chi-square was **80.134** at a point where *p*-value = 0.000. This indicates that e-HMIS predicts the health data quality with regard to HIV/AIDS strongly. Similarly, Cox & Snell R

Square and Nagelkerke R Square were 0.537 and 0.847 respectively have shown that independent variables significantly predict the change in dependent variable. This implies that 54.3% and 83.3% of the total variance in health data quality with regard to HIV/AIDS are accounted for by the e-HMIS aspect.

5.5.2 Effect of e-HMIS Timeliness Attribute on Health Data Quality of PHFs

From Table 4.8, it is shown that e-HMIS timeliness attribute had a coefficient (β) of 2.232 which was significant as p = 0.000. This finding implies that a unit change of e-HMIS timeliness attribute results in a 223.2% change in the health data quality. Furthermore, findings for e-HMIS timeliness attribute show an odds ratio of 2.203 which implies the contribution of e-HMIS timeliness attribute to the health data quality with regard to HIV/AIDS in Tanzania was 2.2 times as portrayed in Table 11 of the Binary Logistic Results. This study results mirror-imaged the findings of Thuraisingam *et al.* (2021) in Australia who in the period of 2014–2015 found that the adoption of e-HMIS fosters the health data quality in Tanzania.

Similarly, Almaghrabi and Bugis (2022) in Saudi Arabia reviewed the patient confidentiality of electronic health records and noted that non- usage of e-HMIS led to poor health data quality. It was found that the health care sector was flawed with several security risks that may corrupt the integrity of patient data. Moreover, this observation from this study was similar to the findings from Daneshkohan, et al. (2022) in Iran who explored the perception of primary health care workers on data quality and data use in a northern Iranian city using a cross-sectional study and questionnaire. The study noted that the volume of the data collected, training program frequency about HIS, supervision, feedback provision, and incentivization

were associated with data quality and data use.

Likewise, these study findings are in line with Normalization Process Theory (NPT) which states that the adoption of both technological and organizational innovations leads into improvement of quality of data especially HIV/AIDS data (May, *et al.*, 2015). Innovation promises data quality in terms of data accuracy, promptness and completeness. This is of paramount importance in advancing of the clinical and cost-effectiveness of services, and reductions in the burdens of illness to the community - especially chronic illnesses like HIV/AIDS. This observation provides the manner the theory synchronises with the findings of this study by linking the e-HMIS and health data quality.

Moreover, as it was for NPT, the socio-technical theory is found to relate closely to the study findings of this study. This theory focuses on if the manner of implementation of technology in the organization influences the performance of that organisation by processing the inputs into outputs by proper employment of both devices and human resources. This process resembles the way entered data into software or e-HMIS by people transforms such data in terms of data timeliness, data completeness, data reliability, data consistency, data accuracy and data validity. Therefore, the socio and technical elements found in organizations influence either the success or failure of technology implementation (Trist, 1981). The technical subsystem consists of the tools, devices and techniques necessary for transforming inputs into outputs in ways that make the organization more efficient (Adebayo, 2015).

This observation was tallying with the claims of the respondents when interviewed on the effect of e-HMIS aspect on health data quality of primary health centre from Dodoma City Council. It was thus stated that:

> *".....Although e-HMIS has been newly installed with all challenges, e-HMIS has simplified a lot of cumbersome and boredom activities which used to consume alot of time....as of now, the task is not only no longer hard but also it is done timely and meets the demand of reporting schedule as provided in the guideline of District Health System 2 which compels PHCs to have submitted health reports to the relevant authority by or before 5th day of the next month....."* (**Health Provider HP3/Primary Health Centre, PH3/Interview/ 2023**).

This implies that health care provider admitted the manner e-HMIS has revolutionised the health performance in terms of data quality especially regarding HIV/AIDS data as such data were unconsolidated by manual registers. As of now these data have been well computed, sorted and timely produced ready for the consumption. With this in mind, it has been noted that e-HMIS timeliness attribute strongly affects the health data quality as seen in the confession of the health care providers.

Furthermore, upon interview with a participant on whether e-HMIS had any positive effect on the reporting schedule (timeliness) it was stated that:

> *Monthly manual computation was really tedious as much time was required to complete the task. This amounted to the delaying of monthly report and DHS2 contrary to the government directives provided within the health information system (HIS) guideline of 2019 which demands that a report should be furnished to the responsible office by or before 5th day of the next month... While in previous settings one among health providers had to move physically to submit or use system with a lot of weaknesses, nonetheless, as of now, e-HMIS generates report automatically where all computations are done precisely and promptly for better health decision making....."*(**Health Provider HP5/Primary Health Centre, PH2/Interview/ 2023**).

This health provider claims is congruent to the real situation experienced as a result of adoption of e-HMIS in the selected primary health centres in Tanzania. The e-HMIS has revolutionized the health decision making hence the data quality which has led to improved health sector. The adoption of the e-HMIS removed health providers' reliance of human working in data production and processes which was erroneously produced leading to poor decision making with regard to health matters.

> *Following the lack of flow of information from the clients' information registered in the register, tally sheet, monthly report summary and district health system 2, DHS2), it is of great urgency that the e HMIS be installed so that we get rid of such mess so that data collected should not mislead the medical decision making with regard to clients under primary health centres* (**Minutes from a health care providers meeting reviewed in primary health facilities PH2/ 2023).**

5.5.3 Effect of e-HMIS Accuracy Attribute on Health Data Quality of PHF's

From Table 4.8, the study findings have undeniably revealed that e-HMIS accuracy had a coefficient (β) of 1.712 which was significant. This finding implies that a unit change of e-HMIS accuracy attribute results into a 171.2% change in the health data quality. Furthermore, findings for e-HMIS accuracy attribute show an odd ratio of 1.014 which implies the contribution of e-HMIS accuracy attribute to the health data quality with regard to HIV/AIDS in Tanzania was 1.01 times as portrayed in Table 4.8 of the Binary Logistic Results.

This study results mirror-imaged the findings of Thuraisingam, *et al.*, (2021) in Australia who in the period of 2014–2015 found that the adoption of e-HMIS accuracy boosts the health data quality in Tanzania. Likewise, the study findings are in accordance with study findings of Lwoga, *et al.*, (2020) who upon studying the predictors of eHIMS for improving the quality of care for women and people with

disabilities revealed that majority literate health workers have adopted eHIMS due to its ability to improve data quality. Therefore, literate health care providers opted to use e-HMIS due to its ability to improve data quality of health sector including the HIV/AIDS data.

Similarly, apart from previous studies' findings resemblance to the current study results, these study findings are in line with Normalization Process Theory (NPT) which links the adoption of technological and organizational innovations to the improvement of quality of data especially HIV/AIDS data (May, *et al.,* 2015). Therefore, innovation promises data quality in terms of data accuracy, promptness and completeness. The technology employment in health sector is of paramount importance in health data quality like HIV/AIDS. This observation provides the manner the theory harmonises with the study findings by linking the e-HMIS and health data quality. It was also noted that one of the participants from the regional health management team (RHMT) described the importance of e-HMIS with the following words:

> "..... *doctors are not using the manual system currently, because of difficulty of preparing monthly reports, since the similar data that is entered in the health management information system (HMIS) should then be reentered manually in the MTUHA physical* books *as per the Government requirements*.....So it seems like causing double work which in such scenario the task becomes tiresome **(Key informants X3/Interview/2023).**

This concern is really of paramount importance. It implies that the tedious task was time consuming and prone to human errors and is replaced by the computerised system which provides accurate information. This enriches health data with accuracy aspect contrary to previous health data in the era of manual system. This was

confirmed by RHMT meeting minutes which stated that:

> *It was agreed that e-HMIS should be installed in other primary health centres as it has improved the data quality of the patients. Therefore, in the near future, primary health centres should provide people who will be capacitated on how to use the system and the budget should be allocated so as to facilitate this exercise.* Apart *from this the meeting resolved that* since the system works based on the computerised system then health work at primary health centres with already installed system (e-HMIS) should ensure that the initial data entry should be keenly done as "garbage in garbage out" principle is obeyed.

5.5.4 Effect of e-HMIS Completeness Attribute on Health Data Quality of PHF's

With regard to e-HMIS completeness attribute of data aspect, findings reveal that e-HMIS completeness had a coefficient (β) of 2.795 which was significant. This finding suggests that a unit change of e-HMIS completeness attribute results into a 279.5 % change in the health data quality. Furthermore, findings for e-HMIS accuracy show an odd ratio of 2.530 which implies the contribution of e-HMIS accuracy to the health data quality with regard to HIV/AIDS in Tanzania was 2.5 times as portrayed in Table 4.8 of the Binary Logistic Results.

This study results mirror-imaged the findings of Almaghrabi and Bugis (2022) in Saudi Arabia who noted that e-HMIS had positively and significantly influenced the health data quality. It was further resembling the study findings by linking its absence with several security risks that would corrupt the integrity of patient data in the primary health centres. Additionally, Daneshkohan *et al.* (2022) in Iran who noted that the volume of the data collected, training program frequency about HIS, supervision, feedback provision, and incentivization which were associated with data quality and data use similar to the findings of this study where e-HMIS accuracy was

found to boost the health data quality in Tanzanian selected primary health centres. Moreover, the study results tallied with the health provider from the primary health centres who upon interview on whether e-HMIS had added any improvement towards the health data quality dimensions stated that:

> *".....I strongly commend for the continuous use of e-HMIS as it has really contributed to great improvement of health data quality which is the key to health decision.....with this system (e-HMIS) it has been easy to get health data which is complete in the sense that nowadays health data carries all client information with complete flow of information such as age, sex, place and name. This aspect of completeness of data with respect to the health data is crucial as it provides the health providers with clues on health decision making for the improved health services...."(Health provider, HP4 /Primary health center, PH3 /Interview/2023).*

This implies that e-HMIS has really brought revolution on the health data quality with regard to HIV/AIDS as formerly there were many unconsolidated systems which dealt with HIV/AIDS in Tanzania. Hence, the adoption of this system has now solved the challenges of missing the right flow of data pertaining to client's information which are important in health decision making.

This fact as yielded by the study findings are congruent to the study findings of Katurura and Cilliers (2018) in South Africa who commended the use of the e-HMIS despite its challenges such as technical, social and environmental factors. Likewise, Botha et al. (2014) who also appraised the suitability of the e-HMIS although it was faced with challenges such as inadequate training to users of the e-HMIS. Equally, Radebe et al. (2022) in South Africa evaluated patient data quality with regard to the e-HMIS for the period of 2017-2020 employing both descriptive statistics and Chi-square univariate tests revealed that poor data failed to capture the patient's

demographics.

5.5.5 Effect of e-HMIS Consistency Attribute on Health Data Quality of PHF's

Likewise, findings show that e-HMIS consistency had a coefficient (β) of 3.761 which was significant. This finding implies that a unit change of e-HMIS consistency attribute results into a 171.2% change in the health data quality. Furthermore, findings for e-HMIS accuracy show an odd ratio of 1.301 which implies the contribution of e-HMIS consistency attribute to the health data quality with regard to HIV/AIDS in Tanzania was 1.3 times as portrayed in Table 11 of the Binary Logistic Results. This study results resembled the findings of Thuraisingam *et al.* (2021) in Australia who in 2014–2015 found that the adoption of e-HMIS consistency attribute boosts the health data quality in Tanzania.

This study finding was also in line with secondary data obtained from the primary health centres in the districts of choice. It was noted from one of the primary health centre meeting minutes that:

> *Following the lack of flow of information from the clients' information registered in the register, tally sheet, monthly report summary and district health system 2, DHS2), it is of great urgency that the e HMIS be installed so that we get rid of such mess so that data collected should not mislead the medical decision making with regard to clients under primary health centres (***Minutes from a health care providers meeting reviewed in primary health centre PH2/ 2023).**

This implies that primary health centres with e-HMIS acknowledged the deficit of using manual system in data collection and they were wishing to install the e-HMIS in their Primary Health Centres. This clearly proves that e-HMIS was found to be

more consistent than the manual system. Therefore, it is worthwhile to conclude that e-HMIS consistency attribute had significant effect on the HIV/AIDS data quality in the primary health centres of choice in Tanzania.

These study results are harmonious to the postulation of the Normalization Process Theory (NPT) which deals with sociological issues in the field of science and technology studies. It is supported by May et al. (2015) who state that NPT is concerned with the adoption of both technological and organizational innovations to improve quality of data especially HIV/AIDS data. Innovation promises data quality in terms of data accuracy, promptness and completeness. These observations were similar to the concern of the respondents who claimed that:

> *"..... I am always happy with the use of e-HMIS as once data is entered in the system remains the same till the end.....in this regard, data are automatic tallying from the physical patients register, tally sheet, monthly report summary and the DHS2.....This makes it easy for health providers to make decision on treatment but also to make budgeting as all health decisions are the function of the data quality with the country. For this account, I strongly commend for the suitability and functionality of e-HMIS and suggests that installation of e-HMIS be done to all PHCs in Tanzania so that the country gets quality data for right and correct health decision making and improved community health .....***(Health provider, HP3 /Primary health center, PH5 /Interview/2023).**

This implies that health providers have realized that e-HMIS has automatized health systems by auto data propagation so that tallying of data across various health report stages is guaranteed. The data consistency created this way ensures the correct and precise health decision making process by the health practitioners. When this happens, it becomes easy even to have precise allocation of medicines and work force to various parts of the country. This sentiment suitably tallies with the findings

of Al-Otaibi et al. (2022) in Kuwait who upon studying effect of eHMIS on health service satisfaction using cross-sectional design while applying questionnaire in data collection affected the degree of physician satisfaction with the EHR system. Similarly, the results of the current study are supported by Alnashmi et al. (2022) in Kuwait who noted that paper-based medical records had many flaws compared to the e-HIMS.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The chapter presents the summary, conclusion and recommendations regarding findings found in this study. The conclusion of the study has been drawn in relation to the specific objectives of the study. Similarly, the chapter also has provided specific recommendations based on the specific objectives provided in Section 1.3.2. for best practice.

6.2 Summary of Key Findings

The study assessed the effect of e-HMIS on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council. Specifically, the study aimed at (i) examining the effect of e-HMIS timeliness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council; (ii) investigating the effect of e-HMIS accuracy attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council; (iii) assessing the effect of e-HMIS completeness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council; and (iv) assessing the effect of eHMIS consistency attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council.

A specific consideration was given to four independent variables namely e-HMIS timeliness attribute, e-HMIS accuracy attribute, e-HMIS completeness attribute and e-HMIS consistency attribute. The study was based on Normalization Process Theory (NPT), the Socio-Technical Theory and Monitoring Evaluation Theory.

Meanwhile the mixed approach was employed where the interview and documentary review were employed to collect primary data and secondary data through interview guide and document checklist tools respectively. The stratified random sampling technique was used to secure samples from PHCs. Descriptive statistics was used in the analysis of respondents' characteristics while binary logistic regression was used to analyze the data based on the study objectives.

The study found that the e-HMIS timeliness attribute, e-HMIS accuracy attribute, e-HMIS completeness attribute and e-HMIS consistency attribute had effect on the health data quality in PHCs with respect to HIV/AIDS in Tanzania.

6.3 Conclusion

Based on the study results with regard to the effect of the e-HMIS on the data health quality in the selected PHCs in Dodoma City and Bahi District Councils in Tanzania, the study noted various facts described based on the specific objectives as provided under Sections 5.2.1, 5.2.2, 5.2.3 and 5.2.4 respectively.

6.3.1 The effect of e-HMIS timeliness attribute on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

The study discovered that e-HMIS timeliness attributed to improvement of health data of HIV/AIDS in Tanzania in terms of health data reliability, relevance and validity. This implies that the adoption of e-HMIS revolutionized the health data quality of the PHCs in Tanzania through timely and accurate health data generation faster than human beings could in the era of manual systems. Therefore, e-HMIS as it is a computerised system has improved health data quality in that it has become

possible for the data to be submitted on or prior to the 5th day of the next month congruent to the demand of the health information system (HIS) guideline of 2019 which is used as the yardstick or reference for the performance of data quality aspects. Therefore, the e-HMIS attributed to the performance of the PHCs in terms of data quality with respect to the data timeliness as performance was above 80% as itemised in the health information system (HIS) guideline of 2019.

6.3.2 The effect of e-HMIS accuracy Attribute on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

Based on the data analysis and findings yielded thereafter, the study discovered that e-HMIS accuracy attributed to improvement of health data of HIV/AIDS in Tanzania in terms of health data reliability, relevance and validity. This implies that the adoption of e-HMIS revolutionized the health data quality of the PHCs in Tanzania by making error free health data compared to those data produced by human beings which was largely affected by errors in the era of usage of manual systems. This is very important for the correct health decision making regarding the patients.

Therefore, e-HMIS as it is computerized system has improved health data quality in that it has become possible for the data to be submitted timely and accurately congruent to the demand of the health information system (HIS) guideline of 2019 which is used as the yardstick or reference for the performance of data quality aspects. Hence, the e-HMIS attributed to the performance of the PHCs in terms of data quality with respect to the data accuracy as performance was above 80% as demanded in the health information system (HIS) guideline of 2019.

6.3.3 The Effect of e-HMIS Completeness attribute on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

Based on the data analysis and findings generated, the study discovered that e-HMIS completeness brought improvement of health data of HIV/AIDS in Tanzania in terms of health data reliability, relevance and validity. This implies that the adoption of e-HMIS transformed the health data quality of the PHCs in Tanzania by producing sensible health data flow compared to those data produced by human beings based on health manual systems. This is very important for the correct health decision making regarding the patients as aspects such as name, age, sex, place of domicile became synchronised.

Therefore, e-HMIS as it is digitalised system has improved health data quality in that it has become possible for the data to be timely submitted in the complete manner harmonious to the demand of the health information system (HIS) guideline of 2019 which is used as the yardstick or reference for the performance of data quality aspects. Hence, the e-HMIS completeness affects the data quality of the PHCs with respect to the data completeness as performance was above 80% as demanded in the health information system (HIS) guideline of 2019.

6.4.3. The Effect of e-HMIS Consistency Attribute on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

From study findings generated, the study discovered that e-HMIS consistency affected the health data of HIV/AIDS in Tanzania in terms of health data reliability,

relevance and validity. This implies that the adoption of e-HMIS influenced the health data quality of the PHCs in Tanzania by producing similar health data from the register at the PHC, tally sheet, monthly summary report and district health system 2 (DHS2). This was really highly challenging when the data were generated manually by human beings. It was thus difficult to make feasible decisions as data were confusing.

Therefore, e-HMIS as it is digitalised system has improved health data quality in that it has become possible for the data to not only be timely submitted but also similar data produced across various levels from the primary health centres to the district level. This attribute is in line with the demand of the health information system (HIS) guideline of 2019 which is used as the yardstick for the performance of data quality aspects. Hence, the e-HMIS consistency affected the data quality of the PHCs such that performance in terms of consistency was above 80% as demanded in the health information system (HIS) guideline of 2019.

6.5 Recommendations

Based on the research conclusions the researcher drew on the study objectives to provide the study recommendations: -

6.5.1 The Effect of e-HMIS Timeliness Attribute on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

It is known that the adoption of e-HMIS revolutionized the health data quality of the PHCs in Tanzania. Therefore, e-HMIS as it is a computerized system has improved health data quality in that it has become possible for the data to be submitted on or

prior to the 5th day of the next month congruent to the demand of the health information system (HIS) guideline of 2019 which is used as the yardstick. Pursuant to the conclusion drawn, the researcher recommends that installation of e-HMIS should be done in as many PHCs as possible so as to benefit from speed of data generation by ensuring that all conditions necessary for this to happen are fully addressed.

6.5.2 The Effect of e-HMIS Accuracy Attribute on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

As evidenced by study findings, the adoption of e-HMIS accuracy revolutionizes the health data quality of the PHCs in Tanzania. Therefore, e-HMIS as it is a computerized system has improved health data quality in that it has become possible for the accurate data to be submitted on or prior to the 5th day of the next month harmonious to the demand of the health information system (HIS) guideline of 2019 which is used as the yardstick. Based on this conclusion drawn, the researcher recommends that installation of e-HMIS should be done in as many PHCs as possible so as to benefit from data accuracy hence enriching decision making on the HIV/AIDS patients in the country. This calls for the government to ensure that all conditions necessary for this to happen are fully addressed.

6.5.3 The effect of e-HMIS Completeness Attribute on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

Findings show that adoption of e-HMIS completeness aspect affects the health data

quality of the PHCs in Tanzania. Therefore, e-HMIS as it is a computerized system has improved health data quality in that it has become possible for the complete flow of data based on essential aspects such as patient's name, age, sex and domicile place to be produced and be submitted on or prior to the 5th day of the next month in line with the demand of the health information system (HIS) guideline of 2019 which is used as the performance reference which calls for harmony in data flow. Based on this conclusion drawn, the researcher recommends that installation of e-HMIS should be done in as many PHCs as possible so as to benefit from data completeness for enriching decision making on the HIV/AIDS patients in the country. This calls for the government to ensure that all conditions necessary for this to happen are fully addressed.

6.5.4 The Effect of e-HMIS Consistency Attribute on HIV Data Quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania

While study findings show that adoption of e-HMIS accuracy revolutionizes the health data quality of the PHCs in Tanzania, the study with respect to this variable concluded that e-HMIS as it is a computerized system has improved health data quality in that it has become possible for the consistent data to be submitted on or prior to the 5th day of the next month harmonious to the demand of the health information system (HIS) guideline of 2019 which is used as the yardstick.

This guideline demands that similar data should be flowing from the register, tally sheet, monthly summary report and DHS2. Based on this conclusion drawn, the researcher recommends that installation of e-HMIS should be done in as many PHCs

as possible so as to benefit from data consistency for enriching decision making on the HIV/AIDS patients in the country. This calls for the government to ensure that all conditions necessary for this to happen are fully addressed.

6.6 Areas for Further Study

The study assessed the effect of the e-HMIS on the HIV/AIDS health data quality of selected PHCs in Dodoma City and Bahi District Council in Tanzania.However, other districts, cities such as Dar es Salaam, Mbeya, Tanga and Mwanza were ignored. This calls for the researchers in future to study a similar topic by focusing on the regions which were not considered in the current study. Likewise, the current study used descriptive statistics and binary logistic regression method as analytical methods, while there are many other methods that were not opted for. It is highly recommended that the future scholars should re-do the topic by utilising alternative analytical methods such as multiple regression, Chi-square method and cointegration method just to mention a few.

Furthermore, in practice, this study ignored crucial intermediate and moderating variables which principally their effect on the health data quality could not be ignored. Yet, the researcher ignored all as if they do not have influence on the dependent variable. The researcher is of the opinion that future study in a similar topic should consider various intermediate and moderating variables like government health policy, level of ICT among health providers, power accessibility and social factors.

Moreover, the study used interview and documentary review only. The researcher would have opted to use survey method, observational method, focused group

method just to mention a few. The neglect of some data collection methods has provided a narrow picture of the effectiveness and efficiency of the data collection process. It is from this context, the researcher strongly suggests that future studies should consider the methods which were ignored.

Finally, the study assessed the effect of e-HMIS on HIV data quality at Primary Health Facilities in Dodoma City and Bahi District Council in Tanzania. However, in practice there are several diseases a researcher would have opted. Therefore, the decision considered deprived the study from understanding the topic in the light of many other diseases. The study recommends that similar study conducted in future should incorporate other diseases which were not considered at this moment such as malaria, typhoid, TB, and Hepatitis.

6.7 The Study Contribution

6.7.1 Theoretical Contribution

The first contribution is seen in the theoretical gap at the beginning of this study dissertation. Absence of a study like this means e-HMIS literature would remain disjointed and with no conceptualised framework for incorporating study results. The research highlights e-HMIS influence on the health data quality based on three theories which are Normalization Process Theory (NPT), the Socio-Technical Theory and Monitoring Evaluation Theory. These theories were crucial to test e-HMIS to integrate, combine, reconfigure and review resources during the situations where needs of requiring health data quality to be gained arise.

6.7.2 Knowledge Contribution

Findings from the current study fills the knowledge gap by linking the e-HMIS and

health data quality at the selected PHCs. This has led to cancelations of some former inferences, which found insignificant relationships existing between e-HMIS and health data quality at the selected PHCs with regard to the HIV/AIDS disease. The study results have established that e-HMIS has a positive and significant correlation with health data quality at the selected PHCs in Tanzania.

6.8 Research Implication

6.8.1 Policy Implication

The results from this research is vital to health system policy-makers for the formulation and improvement of the existing country health policies. Firstly, the study has established evidence based on the empirical literature that e-HMIS has a potential influence on health data quality in terms of data reliability, validity and relevancy. Henceforth, the study stresses that the government should consider the importance of e-HMIS. Based on this implication, the government via the Ministry of Health should execute and improve the existing policies regarding the e-HMIS and health data quality in terms of data reliability, validity and relevancy in the country's health sector.

Secondly, the research provides a foundation on which policy makers may use to formulate relevant health information systems policies good enough to exploit all unleashed potentials captured in the e-HMIS as noted in this study. From this study it implies that from policy point of view, the government via the Ministry of Health should formulate health policies which compel PHCs to adopt and install e-HMIS. Specifically, the policy should emphasise on the functionality of e-HMIS to the PHCs data quality.

6.8.2 Practical Implications

The findings of the present research have a significant practical contribution to the health sector in Tanzania. Lack of research into the health sector has created gaps in understanding how e-HMIS influences health data quality problem and how to optimise e-HMIS efficiencies with regard to HIV/AIDS. Due to a lack of studies into e-HMIS and PHCs health data quality in Tanzania, health sector management is uninformed of what is the influence of e-HMIS on PHCs health data quality. At the same time, policy makers in Tanzania have inadequate information on how to develop good policies that contribute to higher performance of PHCs in terms of health data quality. The present research study sheds light on this subject matter. By understanding the findings of the present research health sector management can optimise the usage of e-HMIS in operationalization of the PHCs and get high quality data.

REFERENCES

Adebayo, E. F, Uthman O. A, Wiysonge, C. S. Stern, E. A, Lamont, K. T. Ataguba, J. E. (2015). A systematic review of factors that affect uptake of community-based health insurance in low-income and middle-income countries. *BMC Health Serv Res.*, 15(1), 543.

Adedeji, T. Fraser, H. & Scott, P. (2022). Implementing Electronic Health Records in Primary Care Using the Theory of Change: Nigerian Case Study. *JMIR Med Inform,* 10(8), |e33491, 1-17.

Almaghrabi, N. S. and Bugis, B. A. (2022). Patient Confidentiality of Electronic Health Records: A Recent Review of the Saudi Literature.Dr. Sulaiman Al Habib Medical Journal, 4, 126–135.

Alnashmi, M.; Salman, A AlHumaidi, H.; Yunis, M.; Al-Enezi, N. Exploring the Health Information Management System of Kuwait: Lessons and Opportunities. *Appl. Syst. Innov.,* 5(25), 1-13.

Al-Otaibi, J. Tolma, E. Alali, W. Alhuwail, D. & Aljunid, S. M. (2022). The Factors Contributing to Physicians' Current Use of and Satisfaction With Electronic Health Records in Kuwait's Public Health Care: Cross-sectional Questionnaire Study. *JMIR Med Inform,* 10(10):e36313.

Black, A. & Nederpelt, P. (2020). *How to Select the Right Dimensions of Data Quality. Includes 60 Dimensions of Data Quality and Their Standardized Definitions.* Herveld: DAMA NL Foundation.

Botha, M. Botha, A. & Herselma, M. (2014). On the prioritization of data quality challenges in e-health systems in South Africa.

Chihoub, H. E. (2013). Managing Consistency for Big Data Applications: Tradeoffs

and Self-Adaptiveness; Databases [cs.DB]; École Normale Supérieure de Cachan-ENS Cachan: Paris, France.

Creswell, J. W. & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches,* 5th Ed., Thousand Oaks, CA: Sage.

Creswell, J. W. (2015). *An Introduction to Mixed Methods Research.* Thousand Oaks, CA: Sage.

Daneshkohan, A. Alimoradi, M. Ahmadi, M. J. & Alipour, J. (2022). Data quality and data use in primary health care: A case study from Iran. *Informatics in Medicine Unlocked* 28, 55, 1-7.

Denzin, N. K. (1978). The Research Act: A theoretical introduction to sociological methods. New York: McGraw-Hill.

Elikwu, I. M. Igbokwe, A. A. C. & Emokhare, G. (2020). Effect of electronic health information system on medical records management in public healthcare institutions. *Unizik Journal of Business,* 3(1), 43-56.

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative Content Analysis. *SAGE Open,* 4, 1-10.

Fürber, C. (2015). *Data Quality Management with Semantic Technologies,* 1st ed.; Springer Gabler: Wiesbaden, Germany.

Gao, H., Duan, Y., Miao, H. & Yin, Y. (2017). An Approach to Data Consistency Checking for the Dynamic Replacement of Service Process. IEEE Access 2017, 5, 11700–11711.

Hamad, W. B. (2022). Current Position and Challenges of E-health in Tanzania: A review of literature. *Global Scientific Journal,* 7(9), 364-378.

Hamed Taherdoost, H. (2020). Different Types of Data Analysis; Data Analysis Methods and Techniques in Research Projects Authors. *International Journal of Academic Research in Management (IJARM),* 9(1), 1-9.

Hassenstain, M. J. Data Quality—Concepts and Problems. *Encyclopedia*, (2022), 2, 498–510.

Hassenstein, M. J. & Vanella, P. (2022). Data Quality—Concepts and Problems. *Encyclopedia*, 2, 498–510.

Haug, A. (2021). Understanding the differences across data quality classifications: A literature review and guidelines for future research. *Ind. Manag. Data Syst.* 121, 2651–2671.

Hazazi, A. & Wilson, A, (2021). Leveraging electronic health records to improve management of non-communicable diseases at primary healthcare centers in Saudi Arabia: a qualitative study. *BMC Family Practice*, 22(106), 1-6.

Hone, T. Macinko, J. Millett, C. (2018). Revisiting Alma-Ata: What is the role of primary health care in achieving the sustainable development goals? *Lancet*, 392(10156),1461–72.

International Organization for Standardization, (2015). *Quality Management Systems - Fundamentals and Vocabulary,* 5th Ed., Geneva: International Organization for Standardization.

Juran, J. M. (1974). *Quality Control Handbook.* New York: McGraw-Hill.

Katurura MC, Cilliers L. (2018). Electronic health record system in the public health care sector of South Africa: A systematic literature review. *African Journal of Primary Health Care & Family Medicine*,10(1), 1746, 1-8.

Lexico English Dictionary, (2021). Data. Oxford University Press.

Liu, J.; Li, J.; Li, W.; Wu, J. (2016). Rethinking big data: A review on the data quality and usage issues. *ISPRS J. Photogramm. Remote Sens.*, 115, 134–142.

Lwoga, E. T., Sangeda, R. Z. & Mushi, R. (2020). Predictors of electronic health management information system for improving the quality of care for women and people with disabilities. *Information Development,* 37(1), 1-27.

Mboera, L. E. G., Rumisha, S. F., Mbata, D, Mremi, I. R. Lyimo, E. P. & Joachim, C. (2021). Data utilisation and factors influencing the performance of the health management information system in Tanzania. *BMC Health Services Research,* (55)21, 498.

Morse, J. M. (2015). Critical analysis of strategies for determining rigor in qualitative inquiry. *Qualitative Health Research,* 25, 1212-1222.

Mursi, M. F. M. Salama, M. A. and Galal, S.E. (2021). Towards A Secure E-Health System for Public Healthcare Sector in Egypt Using HL7. *Mansoura engineering journal (MEJ),* 46(2), 11-22.

Mwogosi, A., Kibusi, S. & Shao, D. (2021). Tools and Techniques for Decision Making in Healthcare Facilities in Tanzania: Usage, Challenges and Resolutions. *Journal of Health Informatics in Developing Countries*, 16(1), 122-135.

Noureldin, M. Mosallam, R. and Hassan, S. Z. (2014). Quality of documentation of electronic medical information systems at primary health care units in Alexandria, Egypt. *Eastern Mediterranean Health Journal*, 20(2), 105-111.

Ojasalo, J. (2006). Quality for the individual and for the company in the business-to-business market: Concepts and empirical findings on trade-offs. *The*

International J. of Quality & Reliability Management, 23(2/3), 162-178.

Olson, J. E. (2003). *Data Quality: The Accuracy Dimension.* Morgan Kaufmann: San Francisco, CA, USA.

Pandey I. M. (2015). *Principles of Financial Management.* 8th Edition. Delhi: University of Delhi Press.

Partescano, E., Jack, M. E. M., Vinci, M.; Cociancich, A.; Altenburger, A.; Giorgetti, A.; Galgani, F. (2021). Data quality and FAIR principles applied to marine litter data in Europe. *Mar. Pollut. Bull.* 173, 112965.

Radebe, L. Mazanderani, A. H. & Sherman, G. G. (2022). Evaluating patient data quality in South Africa's National Health Laboratory Service Data Warehouse, 2017-2020: implications for monitoring child health programmes. *BMC Public Health,* 22, 1266.

Robson, C. (2018). Real World Research: A Resource for Users of Social Research Methods in Applied Settings, (2nd Ed.). Sussex, A. John Wiley and Sons Ltd.

Roy, K., Zvonkovic, A., Goldberg, A., Sharp, E. & LaRossa, R. (2015). Sampling richness and qualitative integrity: Challenges for research with families. *Journal of Marriage and Family,* 77, 243-260.

Rumisha, S. F. Lyimo, E. P. Mremi, I. R. Tungu, P.K. Mwingira, V.S. Mbata, D. Malekia, S.E. Joachim, C. and Mboera, L.E. G. (2022). Data quality of the routine health management information system at the primary healthcare facility and district levels in Tanzania. *BMC Med Inform Decis Mak,* 20, 340.

Russell, G. R. & Miles, M. P. (1998). The definition and perception of quality in ISO-9000 firms. *Review of Business,* 19(3), 13-16.

Sanjuluca, T. H. P.; de Almeida, A. A.; Cruz-Correia, R. (2022).Assessing the Use

of Hospital Information Systems (HIS) to Support Decision-Making: A Cross-Sectional Study in Public Hospitals in the Huíla Health Region of Southern Angola. *Healthcare*, 10, 1267.

Shi, P. Cui, Y. Xu, K. Zhang, M. and Ding, L. (2019). Data Consistency Theory and Case Study for Scientific Big Data. Information, 10, 137.

Starfield B. (2011). Politics, primary healthcare and health: was Virchow, right? *J Epidemiol Community Health*, 65(8), 653–655.

Tangcharoensathien V, Mills A, Palu T. (2015). Accelerating health equity: the key role of universal health coverage in the sustainable development goals. *BMC Med*; 13(1), 101.

Thuraisingam, S., Chondros, P., Dowsey, M. M., …. & Manski-Nankervis, J. A. (2021). Assessing the suitability of general practice electronic health records for clinical prediction model development: a data quality assessment. *BMC Medical Informatics Decision Making*, 21(297), 1-12.

Trist, E. (1981). The evolution of socio-technical systems. Conference on Organizational Design and Performance. *Occasional paper*, 2, 1981.

Walsh J, & Warren K. (1979). Selective primary health care: an interim strategy for disease control in developing countries. *N Engl J Med.*, 301(18), 967–74.

WHO, (2018). A vision for primary health care in the 21st century: towards universal health coverage and the Sustainable Development Goals. Geneva: World Health Organization, United Nations Children's Fund.

Zhu, Y.; Wang, J. (2010). Client-centric consistency formalization and verification for system with large-scale distributed data storage. Future Gener. Comput. Syst. 26, 1180–1188.

APPENDICES

Appendix I: Interview guide for Interviewees (Health Care Providers, Council Health Management Team and Regional Health Management Team)

A: Personal Particulars

i. What is your education level? ……..

ii. What is your professional? ……

iii. For how long have you worked in this work post? ……

iv. How old are you? …….

B: Interview guide on general respondent's Awareness

1. Do you understand about electronic Health Information System?

   i. Yes

   ii. No

2. If Yes in question 1 above explain what is electronic Health Information System?

   ……

   ……

   ……

   ……

3. Is your facility has and using electronic Health Information System?

   i. Yes

   ii. No

   iii.

4. If yes in question 3 above mention service points in your facility installed with electronic Health Information System

i. ……

ii. ……..

iii. ……..

iv. ……..

v. ……..

5. Explain the following terms in relation HIV data

   i. Data Accuracy

      ……

      ……..

   ii. Data Timeliness

      ……

      ……..

   iii. Data Completeness

      ……

      …….....

   iv. Data Consistency

      ……

6. Explain what are the importance of using electronic Health Information System in your facility?

   ……

   ……

   ……

   ……

   ……

7. Is the availability of electronic Health Information System has changed the HIV data quality in your Health facility?
    i. Yes
    ii. No
8. If yes in question 7 above explain how?

    ……

    ……

    ……..
9. If no in question 7 above explain why?

    ……

    ……

    ……..

C: Interview guide on effect of e-HMIS on completeness

1. Do you think availability of e-HMIS in Primary Health Facilities has increased the level of HIV data completeness?
    i. Yes
    ii. No
2. If yes in question 1 above please explain how?

    ……

    ……
3. If no in question 1 above explain why?

    ……

    ……

4. What is the current level of HIV data consistency in terms of completeness in your facility?

   ……

   ……...

5. Is there improvement of HIV data consistency after introduction of e-HMIS in your Health facility?

   i. Yes

   ii. No

6. If Yes in Question 5 above please explain how?

   ……

   ……

   ……

D: Interview guide on effect of e-HMIS on timeliness

1. Does the availability of e-HMIS in the facilities has increased the level of timeliness submission of HIV data?

   i. Yes

   ii. No

2. If yes in question 1 above please explain how?

   ……

   ……

3. If no in question 1 above explain why?

   ……

   ……

4. What is the current level of HIV data timeliness in terms of in your facility?

   ……

   …….

5. Is there improvement of HIV data timeliness after introduction of e-HMIS in your Health facility?

6. Yes

7. No

8. If Yes in question 5 above please explain how?

   ……

   ……

   ……

E: Interview guide on effect of e-HMIS on accuracy

1. Does the availability of e-HMIS has increased the level of HIV data accuracy in the facilities?

   i. Yes

   ii. No

2. If yes in question 1 above please explain how?

   ……

   ……

   ……

3. If no in question 1 above explain why?

   ……

   ……

   ……

4. What is the current level of HIV data accuracy in your facility?

   ……

   ……

5. Is there improvement of HIV data accuracy after introduction of e-HMIS in your Health facility?

i. Yes

ii. No

6. If Yes in question 5 above please explain how?

   ……

   ……

   …….

G: Interview guide on effect of e-HMIS on consistency

1. Does the accessibility of e-HMIS has increased the level of HIV data consistency?

   i. Yes

   ii. No

2. If yes in question 1 above please explain how?

……

……

……

3. If no in question 1 explain why?

……

……

……

4. What is the current level of HIV data consistency in your facility?

……

……

……

5. Is there improvement of HIV data consistency after introduction of e-HMIS in your Health facility?

i. Yes

ii. No

6. If Yes in question 5 above please explain how?

……

……

……

Appendix II: Checklists for Facility e- HMIS data Quality Check

Name of Council ……

Facility Name …….

Facility type ……

Date ……

a. Data Consistency

HIV e- HMIS module	To Total monthly number of HIV Clients using ART in the facility registered in e-HMIS	Total monthly number of HIV Clients using ART in the facility submitted in DHIS2
CTC		
Option B+ (ANC)		

b. Data Completeness

HIV e- HMIS module	Total number of ART user Clients Variables required to be registered in e-HMIS as per number of customers	Actual total monthly number of ART user Clients Variables registered in e-HMIS as per number of customers
CTC		
Option B+ (ANC)		

c. Data Timeliness

HIV e- HMIS module	Time required for monthly HIV report submission into DHIS2	Actual time monthly HIV report submitted to DHIS2
CTC	5TH of the following month	
Option B+ (ANC)	5TH of the following month	

d. Data Accuracy

HIV e- HMIS module	To Total monthly number of HIV Clients using ART in the facility registered in e-HMIS	Check the actual in clients individual file(s) the total monthly number of HIV clients who are using ART in the facility
CTC		
Option B+ (ANC)		

Key: CTC = Care and Treatment Centre; ANC = Antenatal Care; ART =Antiretroviral Therapy

Appendix II: Research Clearance Letters

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

THE OPEN UNIVERSITY OF TANZANIA

Ref. No OUT/ PG202000018 **17th May, 2023**

City Director,
Dodoma City Council,
P.O Box 1249,
DODOMA.

Dear Director,

RE: RESEARCH CLEARANCE FOR MR. ALLY YOHANA KANANIKA, REG NO: PG202000018

2. The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

3. To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. Ally Yohana Kananika, Reg. No: PG202000018)** pursuing **Master of Arts in Monitoring and Evaluation (MAME).** We here by grant this clearance to conduct a research titled **"Effect of Electronic Health Management Information Systems on Data Quality in Primary Health Facilities in**

Tanzania: Experience from HIV/AIDS Information: A Case of Dodoma City and Bahi District Council". He will collect his data at your area from 17th May to 30th June 2023.

4. In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam. Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours sincerely,

THE OPEN UNIVERSITY OF TANZANIA

Prof. Magreth S.Bushesha

For: VICE CHANCELLOR

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

THE OPEN UNIVERSITY OF TANZANIA

Ref. No OUT/ PG202000018 **17th May, 2023**

District Executive Director,
Bahi District Council,
P.O Box 2993,
DODOMA.

Dear Director,

RE: RESEARCH CLEARANCE FOR MR. ALLY YOHANA KANANIKA, REG NO: PG202000018

2. The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

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Yours sincerely,

THE OPEN UNIVERSITY OF TANZANIA

Prof. Magreth S.Bushesha

For: VICE CHANCELLOR