EVALUATING UTILIZATION OF HEALTH INFORMATION MANAGEMENT SYSTEM FOR HIV/AIDS MONITORING IN ETHIOPIA

by

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DEDICATION

In memory of my mother, Sr. Sara Doda, who died of breast cancer. She dedicated her life to helping others than herself.

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ABSTRACT

A well-performing Health Information System (HIS) provides timely, complete, accurate and easily retrievable data. It also reflects the impact of guidelines and policies on the functioning of the health system. However, HIS in Low- and Middle-Income Countries (LMIC) is highly complex and influenced by pressures from donors, politics and the administration. Hence, these countries experience persistent challenges to produce quality data from their HIS.

Studies in Ethiopia indicate challenges in the data management processes, poor data quality, a low information culture, and difficulties in using HMIS data. The purpose of this study was to evaluate the use of the HMIS in generating quality health information for monitoring and evaluating the HIV and AIDS program in Ethiopia. The aim was to develop a framework for strengthening the information culture and the generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation. The study adopted the PRISM framework to inform the research methods.

A qualitative evaluative case study was used to address the research questions. The research was implemented in three phases: Phase 1, a qualitative document analysis; Phase 2, focus group interviews; and Phase 3, developing a framework to strengthen data management processes for HIV/AIDS, using a modified Delphi technique.

The study setting was public hospitals and health centres in Addis Ababa. These were selected due to their involvement with HIV/AIDS and sites for HMIS implementation.

The population for the first phase was government policy documents. The data sources included country-level developed HIS and HMIS/M&E documents currently in use.

The population for Phase 2 included stakeholders using the country HIS and implementing the HMIS, mainly those who produced and used data for HIV/AIDS monitoring. In the third phase, the population consisted of experts in HIS and HMIS. Non-probability sampling techniques, such as purposive criterion for Phase 1, purposive critical case sampling for Phase 2, and snowball for Phase 3, were used to select experts.

Data were collected over six months, starting with qualitative document analysis. The QDA provided a broad historical context for the study, suggesting possibility to explore further through other forms of data collection. The second phase involved data collection through focus group discussions (FGD) to describe participants' views on data generation and information used for HIV/AIDS monitoring and evaluation. This phase included the integration of both data sets. Phase 3 used a questionnaire to elicit the views of experts on the proposed framework.

Qualitative analytical techniques using Atlas.Ti version 8 were used to analyse data. Content analysis was used in Phase 1 and thematic analysis in Phase 2. Phase 3 used statistical analysis to quantify the level of consensus among experts. The trustworthiness of this study was safeguarded by applying credibility, transferability, dependability, and confirmability. The ethical measures in this study were followed to protect the rights of the institutions, the rights of participants, the dissemination of findings and scientific integrity.

This study showed that Ethiopia had an adequate regulatory framework for implementing HIS and HMIS to monitor and evaluate the HIV/AIDS program. However, the implementation of these policies at the facility level was not optimal. Stakeholders experienced various difficulties accessing the policies but were aware of their role and what was expected of them. Availability of resources and the design of HIS were found to be not ideal for users. Timely reporting was hampered by parallel reporting systems such as DHIS2 and Smart Care, a lack of interoperability between these systems, and a hybrid system consisting of paper documents and electronic data.

The study concluded that health facilities did not process information as expected. However, staff performed the HMIS tasks with the tools available to them as they tried

to make sense of data coming out of the HMIS. Challenges of the system, such as a lack of human resources and specialized skills, and support, could be improved for the effective use of the HMIS for generating useful information for HIV monitoring.
The proposed framework will hopefully strengthen data management processes.

KEY CONCEPTS: *Data generation; Data usage; Health information system; Health management information system; HIV/AIDS; Monitoring & Evaluation; Routine health information system*

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LIST OF ABBREVIATIONS

AGREE	Appraisal of Guidelines for REsearch & Evaluation
AIDS	Acquired Immunodeficiency Virus
ANC	Antenatal Care
ART	Antiretroviral therapy
DHIS2	District Health Information System2 (web-based DHIS)
DPG	Data Producers Group
DQA	Data Quality Assurance
eHMIS	Electronic HMIS
EHRs	Electronic Health Records
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focus Group Discussion
FGDU	Focus Group Data Users
FHAPCO	Federal HIV/AIDS Prevention and Control Office
FMOH	Federal Ministry of Health
GMH	Gandhi Memorial Hospital
HIT	Health Information Technologists
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HR	Human Resource
HRHIS	Human Resource Management Information System
HSDP	Health Sector Development Plan
HSTP	Health Sector Transformation Plan
ICC	Intraclass Correlation Coefficient
ICT	Information and Communication Technology
IS	Information System
IT	Information Technology
LMICs	Low and Middle-Income Countries
LIS	Laboratory Information System
LQAS	Lots Quality Assurance Sampling
M&E	Monitoring and Evaluation
MOFED	Ministry Of Finance and Economic Development

MOH	Ministry Of Health
NGOs	Non-Governmental Organizations
PEP	Pre-Exposure Prophylaxis
PHCU	Primary Health Care Unit
PhD	Doctor of Philosophy Degree
PICT	Provider Initiated Counselling and Testing
PLHIV	People Living with HIV
PMTCT	Prevention of Mother To Child Transmission
PRISM	Performance of Routine Information System Management
QDA	Qualitative Document Analysis
RHIS	Routine Health Information Systems
SD	Standard Deviation
TB	Tuberculosis
UNAIDS	Joint United Nations Programme on HIV and AIDS
UNISA	University of South Africa
VCT	Voluntary Counselling and Testing
WHO	World Health Organization
ZMH	Zewditu Memorial Hospital

CHAPTER 1 ORIENTATION OF THE STUDY

1.1 INTRODUCTION

Performance and results-based monitoring in low and middle-income countries (LMIC) is driven by increased assistance from international agencies such as the United States President's Emergency Plan for AIDS Relief (PEPFAR). This state of affairs has increased pressure on governments to improve health system performance and show results to their stakeholders (WHO 2010:3). Therefore, there has been a push to strengthen the Health Information System (HIS) in these countries. Health information is seen as a global public good that supports evidence-based decisions.

A well-performing HIS provides timely, complete, accurate and easily retrievable data. It also reflects the impact of guidelines and policies on the functioning of the health system and population health (Ministry of Health [Ethiopia] 2013:1). The HIS has multiple uses, such as providing surveillance data, reinforcing communication of health problems to various users, underpinning and stimulating research, enabling planning, supporting patient and health facility management, and supporting global reporting (WHO 2010:2). However, the information from such a system will be of little value if it is not available in formats that meet the needs of multiple users, namely policymakers, planners, managers, healthcare providers, communities, and individuals (WHO 2010:2).

This study focused on the use of the HIS or HMIS at the facility level, where individual-level data about HIV/AIDS patients, healthcare needs and treatment serve as a basis for clinical decision making since health records provide the basis for good patient care. Facility data include aggregated records and data from other sources such as drug procurement records, equipment and supplies, decision making regarding drugs and community outreach for tracing and treating. It was important to understand how the HMIS was used to generate, collate, and use these data.

HIS in low- and middle-income countries (LMIC) are highly complex and influenced by pressures from donors, political and administrative. Hence, they are experiencing persistent challenges to produce quality data from their HIS. These challenges hamper the development of effective health policies that are critical to managing resources

effectively and efficiently. Therefore, accountability and good governance are imperative (Koumamba, Bisvigou, Ngoungou & Diallo 2021:2).

In 2011, the Ethiopian health ministry implemented a Health Management Information System (HMIS) to capture core monitorable indicators to improve health services. In 2013, the HMIS was implemented in 122 (98%) public hospitals and 2,697 (87%) health centres (Ministry of Health [Ethiopia] 2015:45) to strengthen the health care programmes. However, a recent study in central Ethiopia by Bogale (2021:7) indicated that the HMIS programme was poorly implemented in data recording and data utilization.

This chapter provides an overview of HIS and its related components, the background to the implementation of the HMIS in Ethiopia. It includes the research problem, purpose, objectives, and significance of the study. The next section describes the significance of the study and its foundations in terms of the research paradigm and theoretical framework. After that, the research methodology is summarized. The focus of this study was on the use of the HMIS in generating quality data for monitoring the HIV/AIDS programme. The study was intended to contribute a framework for improving data management and use for HIV and AIDS monitoring and evaluation.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

Ethiopia's health system is organized into a three-tier system, tertiary (specialized), secondary (zonal), and primary (district hospitals and health centres). District/Sub-city is the main functioning unit for executing primary health care (PHC). It also functions as the starting point for the flow of health data from the community to the national level. Hospitals report directly to the regional level (Ministry of Health [Ethiopia] 2012:3). The HMIS is defined as an information system specially designed to assist in managing and planning health programmes instead of delivering care (WHO 2004:3). Purposes of the HMIS:

- Regular collection and accumulation of quality health data
- Presenting complete, accurate, and timely data
- Deliver specific information guide to health decision making practice

- Reinforcement of the usage of locally produced data for evidence based decision making

Therefore, an adequate HIS is vital for assessing the population's health needs and planning, implementing, and evaluating programmes in terms of effectiveness and coverage.

The Ethiopia Ministry of Health indicated in a five-year health sector transformation plan that information needs to be disseminated on time and used for strategic decision-making at all health system levels. Therefore, the focus should be given to strengthening the information culture, knowledge management and capacity to use the information for action at all levels (Ministry of Health [Ethiopia] 2015:157).

The policymakers developed indicators to improve health service provision at the facility level and ultimately improve the population's health status. This is the outcome envisaged by the whole HIS. The HMIS/M&E offices are expected to link the HMIS to different programmes like HIV/AIDS by using indicators to improve planning and monitoring (Federal Ministry of Health [Ethiopia] 2014:3).

The indicators have been designated to meet the important information needs of monitoring the performance of several health programs and services and deliver a snapshot of the existing health resources. The disease data deliver the status report on trends and distribution. The district-level health office and health facility level annual health sector planning and monitoring are usually undertaken according to the country-level plan (Ministry of Health, Federal Democratic Republic of Ethiopia 2013:3). Out of the 122 HMIS indicators, the Federal Ministry of Health [Ethiopia] selected 21 as key for routine monitoring. The HIV and AIDS programme has three keys, and these are clients receiving VCT (voluntary counselling and testing) services, PMTCT (Prevention of Mother to Child Transmission) treatment completion rate, and PLHIV (People Living with HIV) currently on ART. Data elements commonly recorded into registries are patient identifiers, demographics, diagnoses, medications, procedures, laboratory results, vital signs, and utilization events (Ministry of Health, Federal Democratic Republic of Ethiopia 2013:16).

An indicator can serve as a shortcut to understanding what is happening with a condition or disease. Therefore, countries must choose indicators carefully to have, at a glance, a general sense of the status of the disease in specific population groups. Selecting the wrong indicators may distort the actual data, resulting in key stakeholders incorrectly investing limited time and resources. Therefore, countries need to identify ways in which investment in the HMIS can be aligned to the context in a sustainable way (WHO 2010:7).

Health facilities produce data on disease patterns, health interventions coverage and service delivery as part of their routine activities. Periodically report can be produced through facility continuous data production. Facility data are key data source for national regional, and districts/ sub city leads to management decision at each level of the health system. The reports supports to follow the performance and progress over the year and also guide in planning of scarce resources (WHO 2014a:4).

The population groups most vulnerable to HIV infection are confronted with many barriers in accessing health care. Therefore, data on age and gender and improved accessibility and quality of services can be mainly critical in HIV prevention and care. In several countries it can be challenging collecting data on most-at-risk populations due to the deep stigma and discrimination directed towards them (WHO 2010:7). This study assumes that an effective HIS will ensure that information on vulnerable populations is available and accessible to ensure services that address their needs. The ability to use data to monitor these individuals over time will have an impact on how they experience healthcare.

However, Kebede, Adeba and Chego (2020:7) highlighted the low utilization of the HMIS generated information by health professionals in Ethiopia. The key obstacles in data use include the absence of information systems integration in vital care and throughout departments; data inaccessibility and a limit of their reuse; and lastly, data mainly used for reporting and research with less focus on data use to update clinical practice (Prince, Jones, Blackwell, Simpson, Meakins & Vuylsteke 2018:29).

As global efforts to rise access to health care, pharmaceuticals and supportive services for people living with HIV and AIDS and their families supported, the need for

information on monitoring and evaluation is also increasing. However, countries need to develop data collection standards to avoid the redundancy of data collection and reporting through different systems (Braa, Hanseth, Heywood, Mohammed & Shaw 2007:382). One of the main strategic directions in Ethiopia for the HIV and AIDS prevention and control programme is to strengthen the systemic collection and use of data relating to HIV and AIDS (Ministry of Finance and Economic Development [Ethiopia] 2010:113).

The development of appropriate integrated and scalable information systems in the health sector in LMICs has been difficult to achieve. There is a high probability that this would continue due to continued fragmented funding of health programmes, particularly related to the HIV/AIDS epidemic (WHO 2010:7).

Globally, most of the eastern Mediterranean region countries have national health information system plans. Still, some plans have limited scope, particularly in data collection, analysis, and capacity-building (WHO 2014b:4). India needs a policy directive to establish an integrated HIS as an important step to overcome the barriers to data use that resulted from a fragmented HIS (Kumar et al. 2017:92).

In south and eastern Africa region, Botswana struggled to create a functional HIS over the years. Substantial challenges happened in all aspects of the system undermining growth. Prolonged challenges such as absence of central coordination, feeble leadership, poor policy and regulatory frameworks, and insufficient resources were observed (Seitio-Kgokgwe, Gauld, Hill, & Barnett 2015:12). A study undertaken in Kenya indicates that most of the health information systems collect aggregate data that do not allow patient level quality of care evaluation (Gathara 2015:18). Poorly developed health management information systems in Uganda resulted in poor data quality. Considerable resources are needed to bring them to appropriate levels (Tashobya, Da Silveira, Ssengooba, Nabyonga-Orem, Macq, & Criel 2014:7).

Studies in Ethiopia reveal technical and behavioural factors related to reporting such as poor documentation, poor competency (a skills gap), and lack of experience, resulting in poor data quality, below the national targets (Endriyas, Alano, Mekonnen, Ayele, Kelaye, Shiferaw, Misganaw, Samuel, Hailemariam & Hailu 2019:5; Kebede et

al. 2020:7). To mitigate the risks involved in the poor utilization of data, performance review teams (PRT) have been established and tasked with monitoring and recording performance, gaps, solutions, and quality assurance at each health facility (Federal Ministry of Health [Ethiopia] 2014:71).

Health sector needs a systematic, continuing measurement of what data is vital in supporting the critical services of each department and then using that information to progress the total operations of the organization through preventive care at front lines (Lappa 2016:5). All these requirements point to the need to understand the implementation and use of the Health Management Information System (HMIS) at different health sector levels. This study focuses on using HMIS-generated data to monitor the HIV/AIDS programme.

1.3 RESEARCH PROBLEM

In an ideal system, the HMIS needs to produce quality data that are accurate, reliable, and relevant data to augment the proper way of managerial decision making in the health care system. It is well noted that information systems need to be simple and sustainable and must not overburden staff or be too costly to operate (Bill & Melinda Gates Foundation 2015:4). Evaluations of health information systems were carried out in different countries, and results reflected challenges with data quality and use of information (Ahanhanzo, Ouedraogo, Kpozèhouen, Coppieters, Makoutodè & Wilmet-Dramaix 2014:837; Hotchkiss, Aqil, Lippeveld & Mukooyo 2010:2).

Studies in Ethiopia indicate a low information culture due to a lack of knowledge or poor understanding of using the HMIS data to manage diseases with poor incentives such as reimbursement, training, and recognition. Information use was found to be below 40% and, in some areas, below 18% (Tadesse, Gebeye, & Tadesse 2014:37; Teklegiorgis, Tadesse, Mirutse, & Terefe 2016:8; Tessema 2011:36). The factors contributing to poor data generation and low health information use and decision-making at the facility level remain unknown.

Therefore, questions are raised regarding technical, organizational, and behavioural factors affecting the generation of reliable data and the use of information to monitor and evaluate Ethiopia's HIV and AIDS programme. The study assumes the

sustainable generation and use of quality data for monitoring and evaluation of health care programmes necessitates focusing on improving the programme's performance, hence, the need for this study.

1.4 AIM OF THE STUDY

1.4.1 Research purpose

The purpose of the study was to evaluate the utilization of the HMIS in generating quality health information for monitoring and evaluating the HIV and AIDS programme in Ethiopia. The ultimate aim was to develop a framework for strengthening the information culture and the generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

1.4.2 Objectives

The above purpose of the study was realized through the following objectives:

- To describe how HIS policies, strategy and protocols guide the use of the HMIS for HIV and AIDS monitoring and evaluation (M&E) in Ethiopia.
- To examine how the HMIS is used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation (data collection, processing, analysis, and presentation).
- To explore the views of stakeholders regarding technical, organizational, and behavioural factors that influence the use of HIV and AIDS health information.
- To develop a framework for improving data management for HIV and AIDS monitoring and evaluation.

1.4.3 The research questions

- How do policies, strategies, and protocols guide officials in using the HMIS for HIV and AIDS monitoring and evaluation in Ethiopia?
- How is the HMIS used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation?

- What are stakeholders' views regarding the technical, organizational, and behavioural factors that influence the use of HIV and AIDS data for monitoring and evaluation?
- What framework would be most appropriate for improving data management for HIV and AIDS monitoring and evaluation?

1.5 SIGNIFICANCE OF THE STUDY

There are few studies conducted on the HMIS data for performance monitoring, quality improvement and use for the HIV/AIDS programme in Ethiopia. Little was known about the utilization of the HMIS data for performance monitoring and quality improvement for Ethiopia's HIV/AIDS programme. Further, the outcome of the finding is important for Ethiopia's policies and the HMIS guidelines/manual that are in place to support the implementation at health facility levels in a similar set-up. The study is in line with the national health information system strategic plan of objective 4 (interventions to improve health data management and quality) and objective 5 (interventions to strengthen and institutionalize information dissemination and use) (Ministry of Health [Ethiopia] 2012:30).

This study produced a framework/guideline for strengthening the use of the HMIS in HIV and AIDS data monitoring and evaluation at the facility level. This study will benefit health care staff and managers at the facility level, district, sub-city, and regional level and possibly policymakers. Generation of quality data and use of it for the HIV and AIDS programme requires a sound and meticulous HMIS system at the health facility to facilitate the required decision making at the facility level to manage scarce resources and effective HIV and AIDS programme implementation.

This study emphasized support for the management of routinely collected data for programme performance monitoring and improvement at the facility level. The focus was on quality data generation and data use in decision making regarding HIS policy, training of personnel and resource allocation. It was important to provide evidence on how data are routinely used to track HIV/AIDS at the facility level, the quality of that data, and factors influencing data management processes.

1.6 DEFINITION OF KEY CONCEPTS

- **Data management**

Data management is a set of procedures to collect, store, analyses and distribute data (WHO 2012:59). In this study, data management is the process of data production/generation steps through data recording, data collection, data analysis, and presentation for information use and reporting.

- **Data/information use**

In this study, data use is part of data management processes characterized by the process through which stakeholders explicitly consider generated data/information in one or more steps in the process of programme review, planning and HIV service provision.

- **Data quality**

According to the Federal Ministry of Health [Ethiopia] (2018:6) guideline, data quality means data are fit for their intended uses in decision making and planning. Data should reflect the real value or factual performance. Data meet reasonable standards when checked against criteria for quality. In this study, the term refers to the closeness of data to the true value that the statistics were intended to measure and the availability of data in monthly reports to make timely decisions.

- **Health Information System (HIS)**

A system that integrates data collection, processing, reporting, and use of the information essential for cultivating health service efficiency and effectiveness through improved management in every levels of health facilities (WHO 2021:41). This study refers to HIS as the main country health information system that has different sub-systems such as the HMIS and routine health information systems.

- **Health Management Information System (HMIS):**

The HMIS is an information system specially designed to assist in managing and planning health programmes instead of delivering care (WHO 2004:3). In this study,

the HMIS refers to systematic data processes that include data production and information use for evaluating HIV/AIDS performance.

- **Monitoring & Evaluation**

Monitoring is to collect, analyse, interpret, and present data to know or understand the progress of the specific programme, while evaluation is supported by monitoring to determine the worth of a programme (WHO 2011:2).

In this study, the term means the HMIS data management processes involved in the routine use of HIV data for programme improvement and performance over time.

- **Routine Data Quality Assessment (RDQA)**

An institutional process that involves regular review of routine HIS performance as measured by the data quality level and data use for decision making (Heywood & Boone 2015:40). In this study, the term means data quality review processes and the documented use of data/information for monitoring and evaluation of the HIV/AIDS programme.

- **Routine Health Information Systems (RHIS)**

RHIS is defined as “the ongoing data collection of health status, health interventions, and health resources for decision making” (MEASURE Evaluation 2014a:13). In this study, the term means data collected at specified intervals using data elements at public health facilities.

- **Stakeholders**

MEASURE Evaluation (2013:115) defines a Stakeholder as anyone who has a stake, or interest, in a programme. This includes government agencies, policymakers, funding agencies, implementers or providers as stakeholders, beneficiaries, or health programmes/civil society.

In this study, stakeholders refer to professionals using the country’s HIS and implementing the HMIS, such as those who mainly produce data (data clerks, HIT,

and HMIS/M&E focal persons), and others who mostly use data for HIV/AIDS programme monitoring and evaluation (clinicians and facility management teams).

1.7 THEORETICAL FOUNDATIONS OF THE STUDY

1.7.1 Research paradigm

Paradigms are fundamental conceptions of how to do research in a specific field with the influence of methodology and theory (Flick 2014:540). Creswell (2014:35) equates paradigm with a worldview in terms of the researcher's overall understanding of the philosophical thinking about the world against the nature of research. The following sub-sections present assumptions of the paradigm concerning this study.

According to Creswell (2014:36), there are four worldviews widely discussed in the literature: post-positivism, constructivism, transformative, and pragmatism. This study utilized constructivism/interpretive paradigm to understand particular realities about the regulatory framework, data generation and use in monitoring the HIV/AIDS programme. This paradigm examined how the researcher engaged in the processes of constructing and reconstructing meanings during the study (Leavy 2017:128). The goal was to understand how realities are produced and maintained. The focus was on shared values and common practices. Hence, it is theoretically understood that the interpretive paradigm allows the researcher to view the world through the perceptions and experiences of the participants (Sinha & Sinha 2015:24). The basic assumptions of constructivism are presented below.

1.7.1.1 Ontology

Ontological assumptions are more concerned with the beliefs about how a phenomenon is making sense or is real, or the very nature or essence of the social phenomenon under investigation (Kivunja & Kuyini 2017:27). Fletcher (2017:182) defines ontology as what is real, the nature of reality. This paradigm views reality as dynamic and fluid. In this study, it was assumed that the context of the HMIS was significant. Hence, the belief was that HIS policies, strategy, and protocols are a social reality that influences the use of the HMIS for HIV and AIDS monitoring and evaluation. Stakeholders' views form a set of beliefs of what constitutes reality regarding the organizational and behavioural determinants. Therefore, they formed

the basis of wanting to know what can be learned from reviewing them. In addition, how they frame or understand the influence of the regulatory framework on the data management processes. These views provided a deeper understanding of how stakeholders create different meanings and make sense of the HMIS. The emphasis of constructivism is on multiple realities socially constructed through dialogue. The subjectivity and multiple realities were measured through numerous methods, such as a qualitative documentary review and focus group interviews.

Presenting results as themes and quotes in words of the participants reflects the stance of ontology in the interpretive paradigm. The researcher presents the evidence of different perspectives.

1.7.1.2 Epistemology

Epistemological assumptions are concerned with the bases or sources of knowledge in relation to its nature. These assumptions make it possible to acquire knowledge in research through interaction with participants to obtain an in-depth understanding of participants' views, experiences and understanding of the HMIS (Kivunja & Kuyini 2017:27). The perspective of constructivism is to view reality as constructed through and within human interactions (Fletcher 2017:182).

This study focused on new knowledge emanating from HIS policies, strategy and protocols for HIV and AIDS monitoring and evaluation (M&E) in Ethiopia and how the understanding of these policies shaped stakeholders' subjective beliefs about what works and what does not. This study was also based on the premise that the generation of truths/knowledge related to data generation and information use will come from the stakeholders, their interpretations, and meanings.

1.7.1.3 Axiology

The axiological assumption is indicated by Kivunja and Kuyini (2017:28):

> "It involves defining, evaluating and understanding concepts of right and wrong behaviour relating to the research. It considers what value is attributed to the different aspects of research, the participants, the data and the audience to which to report the results of research".

It, therefore, refers to values researchers carry when conducting research, recognizing that values are an integral part of social beings; no values are right or wrong. In qualitative research or constructivism, the role of values becomes critical not to influence the study's outcomes (Kivunja & Kuyini 2017:28). Researchers from this paradigm are viewed as actors or participants in the dialogue of social constructions who influence the analysis and interpretation of findings. Researchers are expected to avoid bias that might affect the study's outcomes.

Generally, axiology assumes that values and biases concerning the researcher and the participants would influence the way of addressing the study question. In phase one (qualitative documentary analysis), the information from documents such as the policy, framework, and guidelines was presented as it is; interpretation thereof was carried out to derive meanings from the content, and clear steps were followed to avoid biases. The researcher extracted what was important and valuable for the study.

1.7.1.4 Methodology

Methodological assumptions guide the selection of research processes based on the nature of the research problem or issue being addressed and the target audience for the study (Creswell 2014:31). Qualitative research is interpretative research; the inquirer is characteristically involved in a continued and exhaustive experience with participants (Creswell 2014:237). This approach enabled the researcher to identify the most appropriate method for finding the ‘truth’ and obtain in-depth information from stakeholders at different levels regarding organizational and behavioural factors that influence the use of HIV and AIDS health information in monitoring and evaluation.

It was believed that the qualitative approach would provide the best evidence. It allowed the researcher to capture the meanings and interpretations stakeholders had regarding the generation of quality data from HIMS and factors that influence those processes. As indicated by Creswell (2014:32), “qualitative researchers study things in their natural settings, attempting to make sense of, or interpret a phenomenon in terms of the meanings people bring to them”. This will involve collecting data in a natural setting, being mindful of the effect of the context on the research process and using appropriate logical reasoning processes to interpret and make meaning of data.

Therefore, an evaluative case study was most suitable for this study. The evaluation of the HMIS made it possible to identify its strengths and weaknesses and use those to propose a framework to strengthen data generation and use.

1.7.2 Theoretical framework

A theoretical framework is significant in research in that it guides the researcher to organize the study and provides the context for the research methodology (Brink, Van der Walt & Van Rensburg 2015:26). It connects the study to existing theories and knowledge, guides the choice of the methodology, shows the interrelationship between fundamental concepts, and defines the parameters of the survey (Henning, Van Rensburg & Smit 2004:25).

The study recognized the need to gain an understanding of contextual factors and how they impact the health care interventions and adopted Performance of Routine Information System Management (PRISM) framework from Aqil, Lippeveld and Hozumi (2009:220), which is revised by MEASURE Evaluation (2019a:10). The framework defines routine health information systems performance as both the production of quality data and the documented use of information for data-driven decisions suggesting a continuous way of strengthening routine health information systems performance (MEASURE Evaluation 2019a:10).

The framework is guided by three input factors that determine the system's performance. These determinants are technical, organizational, and behavioural in nature and directly affect the processes (data collection, data analysis and presentation), eventually influencing the output (data quality & information use), outcome (performance of health system) and impact (better health status) of the system (MEASURE Evaluation 2019a:8). These factors were used to get an understanding of the influences of data management processes.

The focus of Input assessment on routine information system determinants such as technical factors (design of the system, data collection forms/processes, Information technology and procedures), Organizational factors (availability of resources, training and supervision and culture of information use) and Behavioural factors (data quality checking skills, competence, confidence and problems solving skills). All activities

incorporated by process assessment involves the generation of information comprising data collection, processing, analysing, quality checks and giving feedback (MEASURE Evaluation 2019b:23). In this study, the outcome and impact part of the performance of routine information system management framework were not subjects for the research and are not covered. The review of policy documents provided an understanding of the context within which the HMIS operated.

The framework guided this study in all its stages, framing the methodology, literature review, data collection using key concepts, analysing, and integrating the data from all phases, and interpretation and discussion. The focus was on how the HMIS is used to produce quality data. It supported the systematic extraction of relevant data on data management processes and the use of information for decision-making in monitoring the HIV/AIDS programme. The concepts of PRISM provided the basis for the proposed framework to strengthen these processes.

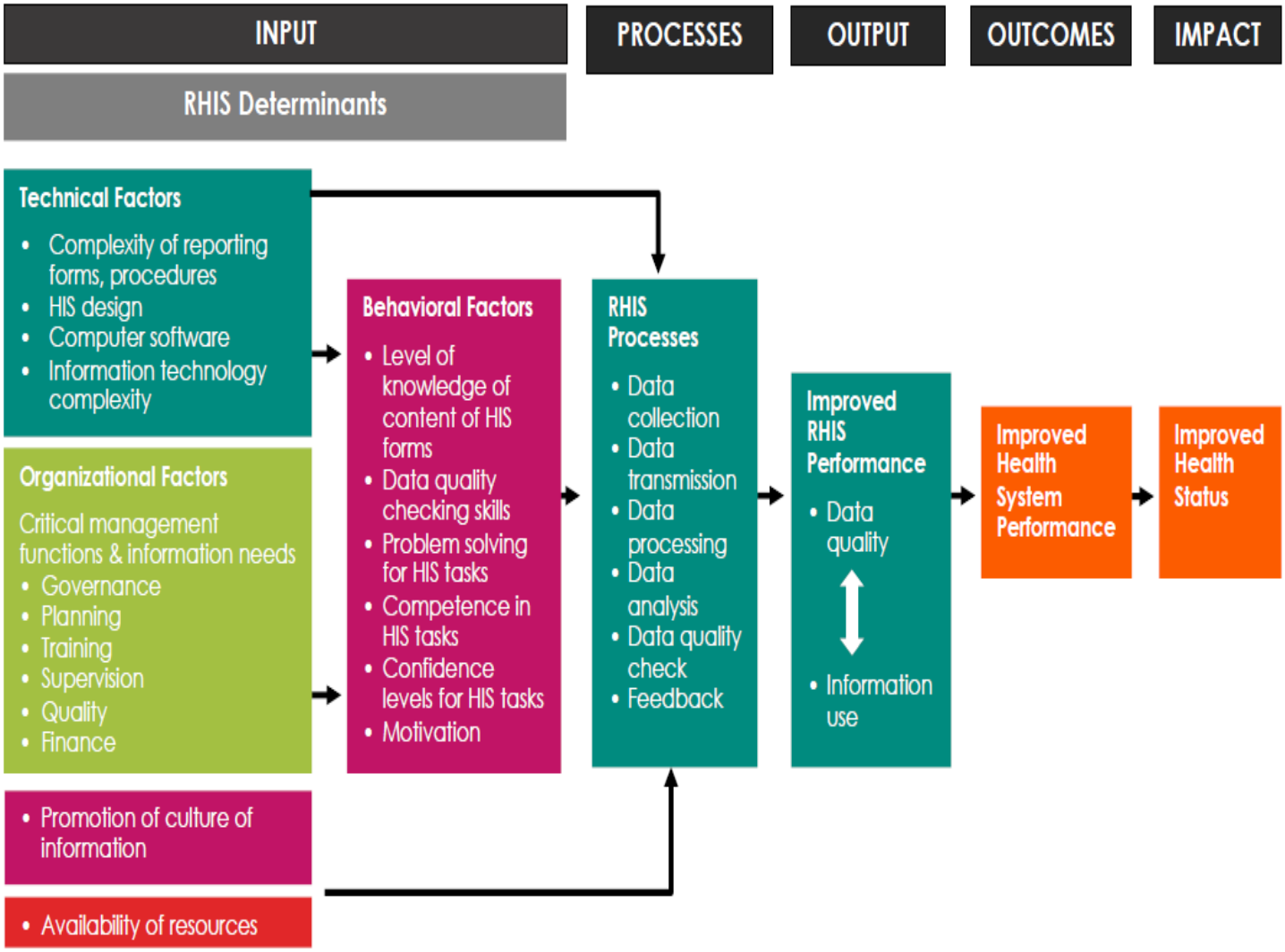

Figure 1.1: PRISM framework (Source: MEASURE Evaluation 2019b:9)

1.8 THE RESEARCH DESIGN AND METHOD

1.8.1 The research design

The research design is a road map for gathering data and finding answers to research questions considering the number of subject groups, the timing of data collection and study interventions if any (Polit & Beck 2017:56). A qualitative evaluative case study was used to address the research questions. The first phase, qualitative document analysis (QDA), provided evidence on how the HMIS was to be implemented, informing the timeline of reporting requirements, key actors, and the activities. The QDA provided a broad historical context for the study, suggesting leads of possibility to explore further through other forms of data collection.

The second phase involved data collection through focus group discussions (FGD) to provide a description of participants' views on data generation and information use for HIV/AIDS monitoring and evaluation. This phase included the integration of both data sets. Finally, in phase three, the combined findings were used to develop a framework to improve data management for HIV and AIDS monitoring and evaluation using a modified Delphi technique. A detailed description of the research methodology is presented in chapter three and the summary is in the following table.

1.8.2 Research method

According to Gray, Grove and Sutherland (2017:84), methodology refers to the type of research selected to answer the research question; it could be quantitative research, qualitative research, outcomes research, or mixed-methods research. For this study, a qualitative research method was better suited to provide answers to the research questions.

1.8.2.1 Study setting

Gray et al. (2017:1071) indicate that contextual research concentrates on particular happenings in "naturalistic settings". Naturalistic settings are, for example, field settings, in which data are collected without any attempts by the researcher to control for the effects of extraneous variables. The study setting was public hospitals and health centres in Addis Ababa. The government health care facilities in Addis Ababa

are classified as general hospitals, specialized referral hospitals, and health centres. They are referred to in this study as health facilities.

1.8.2.2 Research method

Table 1.1: Summary of different phases of the study

S.N	Stage of research	Population	Sampling	Data collection	Data Analysis
1.	**Phase I Qualitative document analysis (QDA)**	Country-level developed HIS, HMIS/M&E documents on government policy, procedures, protocols/ guidelines, strategic plan, and government reports	Purposive criterion for document selection: Strategic/plan=5 Policy/Framework=1 Guideline/manual=4 Total=10	Data extraction tool for QDA	Qualitative Content analysis and presentation
2.	**Phase II** **Focus group (FG) interviews** **Integration of Phase 1 and Phase 2 findings.**	Specific stakeholders (data producers and users) working directly with HMIS in an Addis Ababa public health facility.	Purposive critical case sampling	Focus group interviews	Thematic analysis and presentation
3.	**Phase III modified Delphi**	Facility HMIS focal person/manager and directors, regional/federal/ Non-Governmental Organizations HMIS/M&E experts	Purposive and snowball Round 1 = 18 experts Round 2 = 16 experts	Questionnaire	Statistical tests

1.8.3 Ethical considerations

Research conducted with human participants requires careful consideration of ethical issues that may arise during the study. The researcher followed ethical principles to establish trust between the participants and himself and report authentic results. This was done to ensure that the rights of participants are protected as well as the integrity of the study. The ethical principles details are presented in Chapter Three.

1.8.4 Trustworthiness

Lincoln and Guba (1985:293), as cited by Wood, Sebar and Vecchio (2020:463), identified four criteria to observe the trustworthiness of a qualitative study. These criteria are credibility, dependability, transferability, and confirmability. This study was ensured the trustworthiness through using these four criteria. Trustworthiness is discussed in Chapter Three of this study.

1.9 STRUCTURE OF THE THESIS

Table 1.2: Description and structure of the thesis

Chapters	Content of chapters
Chapter 1 Orientation of the study	Chapter 1 introduces the study topic, gives the background of the Ethiopian context research problem, research purpose, research objectives, significance of the study, foundations of the research and a summary of the research method.
Chapter 2 Literature review	In this chapter, the researcher describes the theoretical perspectives of the Health Information System, Health Management Information System and Ethiopia HIS and perspectives on HIV/AIDS Monitoring and Evaluation.
Chapter 3 Research design and methodology	This chapter introduces the research design and methods used in this study. In detail, the research methods include population, sampling, data collection process and approach, data analysis, ethical considerations, and trustworthiness.
Chapter 4 Presentation and description of the research findings	This chapter presents and describes the research findings of Phase I and II of the study.
Chapter 5 Integration, interpretations, and discussions of the findings	Integration and discussion of the findings from Phases I and II and literature control

Chapter 6 Discussion on the development and validation of a framework	Discussion on the development and validation of a framework for HIV and AIDS monitoring, including literature
Chapter 7 Contribution, recommendations, and conclusions	This chapter outlines the contribution, recommendations, and conclusions of the study.

1.10 SUMMARY

This chapter presented and discussed the general overview of the study. The focus was on providing a general introduction of the HMIS and the use of data for monitoring and evaluating health programmes. The research methodology is summarized, and details are provided in the methodology chapter. The next chapter discusses the broad literature that framed this study.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, the researcher recognizes the debates regarding the literature review in qualitative studies and presents it as a stand-alone chapter in qualitative reports (Creswell 2014:14; Flick 2014:178). Therefore, this chapter only gives a broad overview of key concepts relevant to the study topic to enhance understanding of the area of study. The first section describes the health system with a special focus on Ethiopia. The next sections present the theoretical understanding of the Health System Information (HIS), Health Management Information System (HMIS), Routine Health Information System (RHIS), District Health Information System two (DHIS2), Monitoring and Evaluation and data generation and use for the HIV/AIDS programme in the Ethiopian context. The interrelationship between the HIS, HMIS, RHIS and DHIS is also provided.

Literature is mainly used in this study to control, interpret and discuss findings.

2.2 THE HEALTH CARE SYSTEM

Donev, Kovacic, and Laaser (2013:1) define the system as inter-related components that have specific roles and contribute to the overall functioning of a system to achieve a common purpose. This definition assumes that there are many actors and actions within a system. Therefore, a health action is any effort, whether in personal health care, public health services or through inter-sectorial initiatives, whose primary purpose is to improve health. From this understanding, individuals, groups, and communities interrelate, and they all have one goal, which is to satisfy their health needs (Donev et al. 2013:5). The same can be said about various health professionals who have significant roles to ensure the smooth running of a health system.

The healthcare system is viewed holistically; its components are listed as political, economic, and cultural, technical, and organizational factors, relations, processes, and elements. WHO (2011:9) defines the health system as follows:

> "Health system: (i) all the activities whose primary purpose is to promote, restore and/or maintain health; (ii) the people, institutions and resources, arranged together in accordance with established policies, to improve the health of the population they serve, while responding

to people's legitimate expectations and protecting them against the cost of ill-health through a variety of activities whose primary intent is to improve health".

The above definition is closely related to the focus of this study, which is the HIV/AIDS programme, its performance to restore and maintain health, the stakeholders involved and the HMIS as a resource legislated by the Ethiopian health ministry to support monitoring and evaluation activities. MEASURE Evaluation (2013:10) defines the system as a collection of entities that work together towards a common objective. It consists of all organizations, people, and actions whose primary intent is to promote, restore or maintain health. This includes efforts to influence determinants of health and more direct health-improving activities. Therefore, the system is interconnected, and its subsystems function to achieve the common purpose, in this case, data-driven decision making.

2.2.1 Key components of a health system

The health system that performing good considers in a balanced way to a population's needs and expectations by:

- Improving the health status of individuals, families and communities.
- Protecting the people against what threatens its health.
- Defending population against the financial concerns of ill-health.
- Providing impartial access to people-centred care.
- Making it possible for people to participate in decisions affecting their health and health system (WHO 2010:1).

The WHO acknowledges the need to strengthen health systems and has formulated a health systems framework that is widely used in member countries. Health system frameworks identify key sub-systems or building blocks for health system performance, such as equity, quality, responsiveness, efficiency, and resilience. Policy decisions are based on the building blocks, which are a very important determining factor for the health system's performance. The three broad functions connecting sub-systems are governance, financing, and service delivery (WHO 2017b:11). Supporting the health systems is a priority of global issues, hence the high demand to strengthen

health information systems (Hotchkiss, Diana & Fleischmann Foreit 2012:26; WHO 2010:12).

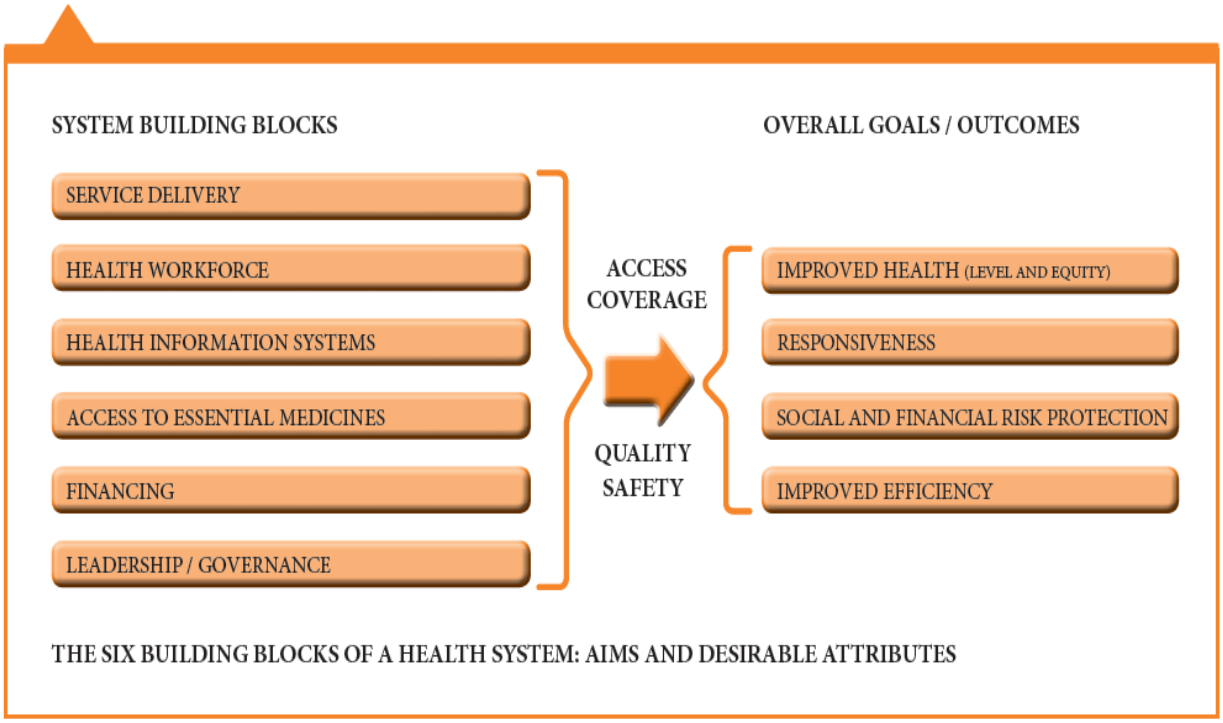

Figure 2.1: The WHO health system framework (Source: WHO 2010:7)

According to the MEASURE Evaluation (2019b:23), the health system core functions are health information systems, service delivery, and access to essential medicines, leadership/governance, health workforce, and financing. Mainly, the building blocks play a great role in strengthening health systems in different ways. The WHO (2021:11) has a strategy to strengthen health systems by applying digital health technologies for consumers, health care professionals and industry towards empowering patients and achieving the vision of health for all. The six building blocks contribute to health systems strengthening in diverse ways. Some cross-cutting constituents, such as leadership/governance and health information systems, offer the foundation for the overall policy and directive of all the other health system blocks. Main input components to the health system comprise specially, financing and the health workforce. A third group, namely medical products and technologies and service delivery reveals the immediate productions of the health system, i.e. the availability and dissemination of care (WHO 2010:6).

The Health Information System is key to maintaining the health system functioning efficiently. The understanding of the health system using a systemic approach takes into consideration different stakeholders, including those related to HIS. Periodic evaluation of the health system or any of its components is needed to identify challenges and develop the appropriate intervention. This study's purpose is also to strengthen data management processes in the health system to enhance data quality.

2.2.2 Health care systems in middle and low-income countries

The significant gap between the requirement for health care and the level of access in Low- and Middle-Income Countries (LMIC) is well-known. Many resolutions and goals have been endorsed, such as the Sustainable Development Goals (SDG) to enhance access to healthcare. However, evidence suggests that many low-income countries' institutions often aim at short-term and disease-specific interventions. This intervention usually has no sustainability (Swanson, Atun, Best, Betigeri, Campos & Chunharas et al. 2015:3). There are many factors that contribute to ineffective interventions in low- and middle-income countries. Swanson et al. (2015:3) cite a persistent shortage of funds. Even if the organization gets funding, which is often unreliable and mostly for short-term projects, the management of those funds remains a challenge.

The Alma Ata and the Astana Declarations identified accessible technologies as one of the key tenets of an effective primary health care model. However, incorporating the different facets is most challenging in low- and middle-income countries due to the lack of infrastructure to explore these (Oleribe, Momoh, Uzochukwu, Mbofana, Adebiyi, Barbera, Williams, & Taylor-Robinson 2019:395). This study contends that HIS promises health improvement, yet it functions within a resource-constrained context. Geographical accessibility, availability of healthcare, financial accessibility and acceptability of care are some often cited barriers to health care. The current analyses have drawn attention to the lack of well-planned health information systems to strengthen the health care system in low- and middle-income countries (Mills 2014:552). The majority of these countries are unable to meet basic requirements for good health care (Oleribe et al. 2019:306).

2.2.2.1 Organization of healthcare in Ethiopia

The Ethiopian government has invested a lot in strengthening health system in the last twenty years. The pro-poor policies and strategies derived in strengthening of health system to improve Ethiopian health status. The Health Sector Transformation Plan (HSTP) plans goals to advance coverage, equity, and utilization of essential health services, improve quality of care and enhance capacity within the sector. It describes plans to combat HIV, among other conditions, and a commitment to implement an information revolution (Ministry of Health [Ethiopia] 2015:12).

The health care delivery system in Ethiopia has a three-tier or level system. Level One is a Woreda/District Level health system. The district health system level has all primary health care units (PHCU), which comprise the primary hospital, health centre and health posts. This primary health care system functions as decentralized due to the implementation of Health Extension Workers (CEW's) that can refer patients to health centres or the primary hospital for more serious health issues. Level Two is a general hospital with a referral system from the district level health system. Level Three is a specialized hospital and highest in referral system in the country (Ministry of Health [Ethiopia] 2010:5).

Ethiopia has implemented a strategy for expanding and rehabilitating primary healthcare facilities by creating 16,440 health posts and constructing 3,547 health centres and 311 hospitals. In addition, there is an investment in human resource development and management and a transformed logistics management and supply chain system (Ministry of Health [Ethiopia] 2015:12).

NGOs make a substantial impact to Ethiopia's health sector. The NGO healthcare system encompasses more than 300 health facilities in the country, most of which are at the primary level. They deliver financing and overall (preventive, curative, and rehabilitative) healthcare services, HIV/AIDS and reproductive health services in clinics and through health education. NGOs are expected to report their activities to the regional health bureaus where they work, the reporting seems to be only chaotic. This situation creates accurate data difficult to access. Reported data is coded and

entered into the country health management information system (HMIS), where it turn out to be hard to disaggregate (Wamai 2008:6).

The private health sector has the potential to support Ethiopia meet its goal of worldwide access to HIV treatment and care with prevention ways. All private hospitals and clinics report service statistics to the appropriate government entity. Private facilities seem to be a key source for finding HIV positive patients. According to facility records, the amount of patients testing positive are high. A high proportion of health workers from all levels of private health clinics reported referring clients to a different place for PMTCT and ART services, mainly to public facilities by means of a standard referral form (Sulzbach, Wang & O'Hanlon 2009:11).

- **Financing of the health system in Ethiopia**

Ethiopia's health sector has several financing sources, together with the government Reserves (federal, regional and woreda/district levels), international and local NGOs, bilateral and multilateral donors, household out-of-pocket spending, insurance firms and private and parastatal employers. Most of the financial resources for health care come from the rest of the world, the government reserves and revenue, and household out-of pocket expenditures. The funds from the rest of the world originate from both loans and donations (WHO 2017c:14).

The figure below presents the Ethiopian health tier system.

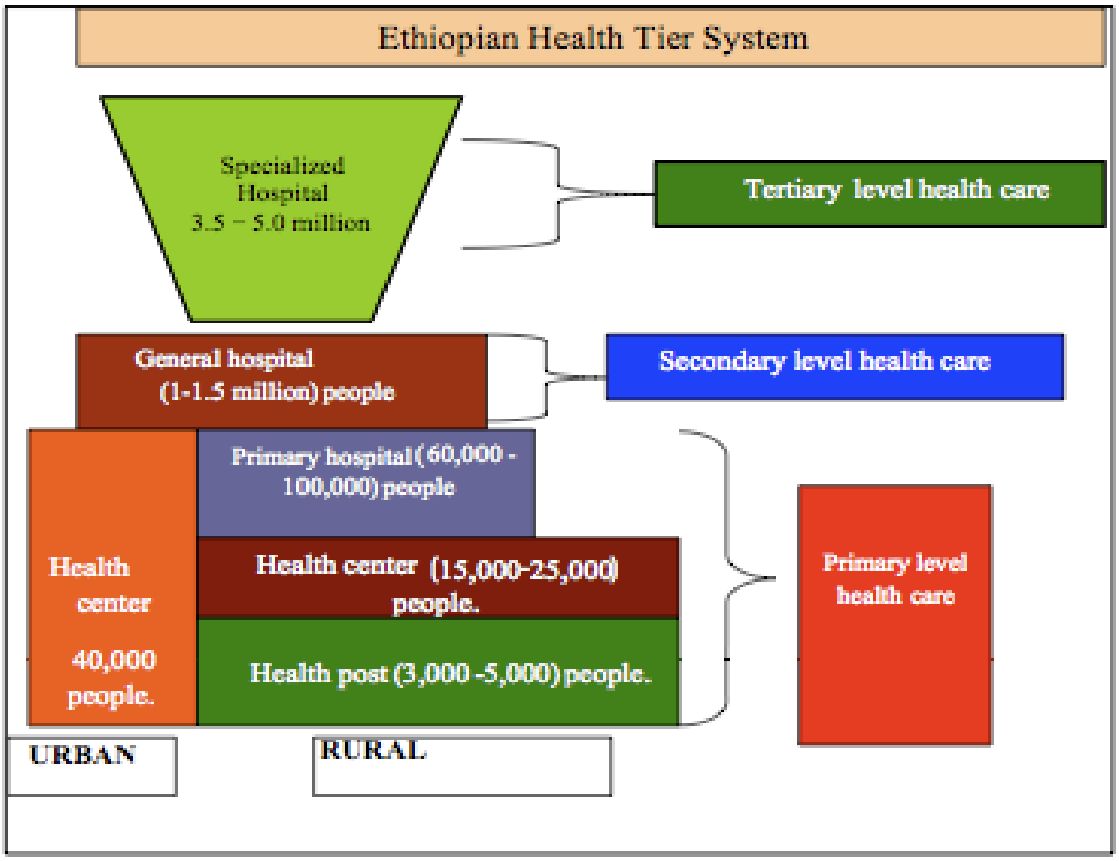

Figure 2.2: Ethiopian health tier system (Ministry of Health [Ethiopia] 2010:83)

2.3 THEORETICAL DESCRIPTIONS OF HEALTH INFORMATION SYSTEMS (HIS)

In the past decade, technological developments around the globe spurred high activity in the development of HIS. The advancement has been made in designing systems that meet the needs of health workers and patients. Though, their application is regularly affected by several challenges, which often end up with system failures (Mohamadali & Aziz 2017b:373).

HIS is defined as “A system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services” (WHO 2021:41). Therefore, the WHO recognises that reliable information is critical and supports decision-making processes across all health systems. Health information systems (HIS) are one of the six core components of a health system. These systems form the foundation of the health system. The importance of the HIS in proving information used

for monitoring and evaluation is acknowledged. Other data sources provide vital information to the health system, namely, civil registration, population census, health service data, and household surveys (Thomas 2016:3). Health information systems directly influence a diverse set of interested parties such as patients, health care professionals/staff and information system companies, as well as nations or regions to provide efficient health care (Haried, Claybaugh & Dai 2017:3). The HIS, therefore, provides alerts and early warnings of barriers in the delivery of healthcare.

It is envisaged that health information systems, through appropriate technology, will provide more accurate and quality data about the organization, function and structure, units, and delivery of services for managers and policymakers (Mahmoud, Masoome, Arash, Borzoo & Razieh 2014:409). The role of information and communication technology (ICT) in health information system (HIS) strengthening, particularly in low- and middle-income countries, is emphasized (Marzuki, Ismail, Al-Sadat, Ehsan, Chan & Ng 2015:87). Interoperability of health information systems at national and international levels is important to establish integration of different digital technologies using shared services, ensuring data are of good quality (WHO 2021:22).

Different factors could influence the sustainability of HIS namely; organization factor, human factor, and technology factor (Mohamadali & Zahari 2017a:355). One major barrier to successfully implementing an electronic medical record (EMR) system was the attitude and acceptance of the innovation by clinicians. Many perceived EMR as meddling with clinical workflow, decreasing productivity, and introducing upsetting modifications to the workplace. This situation is much more serious in developing countries where computer anxiety is very high (Biruk, Yilma, Andualem & Tilahun 2014:2).

2.3.1 Functional Health Information Systems

Countries strive to achieve universal health care as part of their Sustainable Development Goals (SDG). The existence of a functional and integrated HIS which can connect with other information systems is critical in this regard (Tripathi, Sharma and Nagarajan 2018:2). Reliable evidence about actual health needs and the demand for and supply of health services require a well-functioning HIS. Countries need to

develop capacity building in data management processes and adhere to standards of data protection and data use (WHO 2017a:18). The Information about health, healthcare and healthcare delivery must be accurate, relevant, reliable, and standardized, and presented in an intelligible form, fit for its purpose (Hoyle 2017:1).

Efficient Information systems in health-care simplify access to information, save time for medical personnel, increase management of work practices and advance the efficiency of medical institutions (Abdikadirova, Chukmaiitov, Yermukhanova, Kaliyeva-Karabalina, Ktabalieva, Taushanova & Turdalina 2018:2382). Therefore, complete and reliable information is essential for the seamless functioning of health care systems and their future development and sustainability. PRISM Framework, as described in the previous chapter, also describes technical, organizational, and behavioural determinants of a well-functioning HIS (MEASURE Evaluation 2019a:8). These include factors such as the design of HIS, people and the organization.

The Health Metrics Network framework identifies six components of a functional HIS, namely: HIS resources, indicators, data sources, data management, information products, and information use (Seitio-Kgokgwe, Gauld, Hill, & Barnett 2015:3).

The importance of HIS for healthcare organizations is to improve healthcare delivery (Haried et al. 2017:2). A health information system is i for the health system to function well and for policymakers to evaluate the effects of health system efforts to improve the health of the population (Lemma, Janson, Persson, Wickremasinghe & Källestål 2020:2). HIS allows decision-makers at all levels of the health system to recognize progress, problems, and needs; make evidence-based decisions on health policies and programs; and optimally assign limited resources (Mutale, Chintu, Amoroso, Awoonor-Williams, Phillips, Baynes, Michel, Taylor & Sherr 2013:2).

2.3.2 Performance of HIS in low- and middle-income countries

Implementation of HIS does not only requires understanding of the system, there is also the necessity to distinguish about the organization itself. Hence, organization has an imperative role play, in order to safeguard the programs are effectively implemented in health facilities. However, there are some challenges faced by an organization. Mohamadali and Zahari (2017a:356) found out that organizations are

confronted with four main challenges which includes; build the infrastructure, security issues, top management participation and high adoption cost, when implementing HIS in the hospital.

The national health information system is computerized in all countries, at all levels, with varying degrees of functionality and integration. Most countries have defined national sets of indicators to report on (WHO 2014b:4). Low- and middle-income countries (LMICs) took strategic decisions to focus on the role of information and communication technology (ICT) in strengthening health information systems (HIS) (Marzuki et al. 2015:87). However, they need to develop the infrastructure for information and communication technologies for health to promote equitable, affordable, and universal access to their benefits (WHO 2021:4). These countries were also urged to direct their efforts towards forming a dependable electronic health vision in line with a country's health priorities and resources, developing an action plan to deliver the proposed vision, and making a framework for monitoring and evaluating electronic health application and growth (WHO 2021:4).

In sub-Saharan countries, the setting with resource-constrained have challenges in retaining skilled and experienced personnel through attracting, and training. These problems were more compounded by the need to up-skill and up manage for transitions from paper to digital processes. The attrition and high turnover staff, absence of local technical support, and low levels of computer literacy are major barriers for the transition. Other organizational barriers include presence of many parallel system without integration in good leadership and absence of local information system (Jawhari, Ludwick, Keenan, Zakus & Hayward 2016:5).

It is generally acknowledged that the process of developing and implementing information systems in developing countries is a challenging task due to poor technical infrastructure, insufficient skilled human resources and non-existence of funds. Similar encounters are also found in Ghana. Absence of funding for training, airtime and data packages for internet connection and replacement of damaged equipment (Denis, Bob, Jørn & Anthony 2015:7).

A study undertaken in Kenya indicates that most of the health information systems collect aggregate data that do not allow patient level quality of care evaluation. To consistently report on quality of in-patient hospital care we want to collect patient level data, which can let us to report on both progression and result (Gathara 2015:18).

Thomas (2016:3) identified four important contextual factors affecting HIS strengthening in LMICs: hierarchical roles, aid funding, corruption, and competing priorities of the host government. Countries need to get specific priority areas and context-based health system strengthening support (WHO 2017a:22). Botswana struggled to create a functional HIS over the years. Substantial challenges happened in all aspects of the system undermining growth. Prolonged challenges such as absence of central coordination, feeble leadership, poor policy and regulatory frameworks, and insufficient resources were observed (Seitio-Kgokgwe, Gauld, Hill, & Barnett 2015:12). Most of the eastern Mediterranean region countries have national health information system plans. Still, some plans have limited scope, particularly in data collection, analysis, and capacity-building (WHO 2014b:4).

Poorly developed health management information systems in Uganda resulted in poor data quality. Considerable resources are needed to bring them to appropriate levels (Tashobya, Da Silveira, Ssengooba, Nabyonga-Orem, Macq, & Criel 2014:7). In these countries, HIS exists with many parallel central programmes, which leads to the disintegration of the HIS. For example, the Health Management Information System (HMIS), the Mother and Child Tracking System (MCTS) and the Integrated Disease Surveillance Program are three dissimilar systems found in India (Kumar, Mostafa & Ramaswamy 2017:85). India needs a policy directive to establish an integrated HIS as an important step to overcome the barriers to data use that resulted from a fragmented HIS (Kumar et al. 2017:92).

Many of these countries are now focused on strengthening their own HIS. The Health Metrics Network was launched to support these countries in 2005, a global initiative strengthened and supported by the WHO, the European Union, and other international agencies (Braa et al. 2007:399). Short-term and long-term strategic plans are critical in addressing challenges in health information management (Ojo 2017:143). Patient flow and management of referrals will become even more difficult and challenging in

the near future as patient bulk rises. Stress on basic logistics systems, laboratory facilities and drug distribution will also grow rapidly; the overall health system must be supported to meet both immediate and longstanding HIV/AIDS treatment aims (Pfeiffer, Montoya, Baptista, Karagianis, De Morais Pugas, Micek, Johnson, Sherr, Baird, Gimbel, Lambdin & Gloyd 2010:5).

2.3.3 Health management information system (HMIS)

The HMIS is a sub-system of a larger HIS, where other information systems interact (Ministry of Health [Ethiopia] 2012:65; Tan 2001:18). It is defined as "the systematic collection, aggregation, analysis, presentation and utilization of health and health related data for evidence-based decisions for health workers, managers, policy makers and others" (Federal Ministry of Health [Ethiopia] 2014:14). The HMIS is an information system designed to assist in the management and policy, planning and monitoring, and evaluation of health programmes (Pratiwi & Utami 2014:100; Qazi & Ali 2011:245). The HMIS, as a component of the HIS, brings together data from multiple data sources such as health facilities and community-based sources, civil registration systems, household surveys, and censuses. These data constitute denominators used in calculating health indicators (Macfarlane & AbouZahr 2019:15).

Therefore, an efficient HMIS supports the generation of high-quality data at different levels of the health system and effective data flow between different levels (Tan 2001:11). Therefore, it is understood that the HMIS can build on existing data and health information system (HIS) infrastructure.

The HMIS is purposed for the collection, reporting and analysis, as well as data security supports accurate, relevant, and timely data are available to national policy makers, program heads and staffs at each level of the health-care system. In addition, HMIS supports the country to produce standard report according to the needs of international agreements to the donors (Mao, Wu, Poundstone, Wang, Qin, Ma & Ma 2010:86). In clinical and diagnostics equipment, information systems in health care service designed to capture, store, process, and timely communicate for decision making improve the health care for individual or community levels (Fichman 2011:419).

Several institutional performers are involved in HMIS implementation, playing different roles in the implementation of international standards. These stakeholders include global actors like WHO; development partners providing expertise to local ministries; countries; their regional and sub-regional offices; global open source software vendors. These actors deliver varying impacts on the standardization process of HIS operation in any country (Abdusamadovich 2013:23).

It is evident that health systems delivery and effectiveness depend on a good functional HMIS. Evidence-based decision-making or practice increases the efficiency and effectiveness of a health system, and a well-functioning HMIS supports improvements in the monitoring and evaluation of health programmes. Different stakeholders require different information in varying details to support decision making (MEASURE Evaluation 2014a:39).

All stakeholders need to understand the importance of indicators in routine HMIS and their correct reporting, so that quality data can be generated for its effective use. Accountability actions for safeguarding accuracy of data need to be institutionalized and efforts to uphold quality must be evaluated periodically so that observed deficiencies may be timely addressed (Sharma, Rana, Prinja & Kumar 2016:10).

Kabakama, Ngallaba, Musto, Montesanti, Konje and Kishamawe (2016:84) posit that the routinely collected data produced by the HMIS in developing countries are of poor quality. Health centres faces challenges in safeguarding good quality of data, stretching from system challenges to human resource-related and facility challenges. Unless these challenges are lessened or removed where possible, quality of HMIS data will persistently be affected (Kagoya & Kibuule 2018:9). The lack of reliable health-related information makes the development of effective policies a challenge. Lack of a National strategy was also found to be a threat to HIS performance in LMICs (Koumamba et al. 2021:2).

2.3.4 Routine Health Information System (RHIS)

According to Hotchkiss et al. (2012:3), RHIS is one of the sub-systems of HIS. RHIS may include both electronic and paper-based records at the level of the district or facility. In other term, RHIS is named as community or health facility information

system provides data not longer than a year interval but regularly basis to be collected at health facilities in public or private level, community level through clinics/health posts and organization. Healthcare providers collect, and document most of the health status data, and health services. The health facility survey on disease patterns and health resources, and supervisors contribute on information collection (MEASURE Evaluation 2017:7).

Health facilities produce data on disease patterns, health interventions coverage and service delivery as part of their routine activities. Periodically report can be produced through facility continuous data production. Facility data are key data source for national regional, and districts/ sub city leads to management decision at each level of the health system. The reports supports to follow the performance and progress over the year and also guide in planning of scarce resources. The reports supports to follow the performance and progress over the year and also guide in planning of scarce resources (WHO 2014:4).

Facilities managers continuously need data to advance facility infrastructure, human resources and equipment. System managers need data to monitor and plan for health service delivery from district level up to national level: data on health status, on provided services, and on management of resources such as, equipment, supplies, personnel, finances, transport, vaccines and drugs. Hence, Health workers need clinical data on a regular basis during ward rounds and usage local laboratory and other diagnostic data to monitor patients' clinical progress (Heywood & Boone 2015:5).

The routine health information systems allows users in following their progress in continuous basis to achieve organizational set objectives. Health system managers have no other option for routine monitoring to track the progress towards reaching objectives set to meet service coverage and other services for the targeted communities (Aqil, Lippeveld & Hozumi 2009:218).

Routine health information data are required to ensure adherence to minimize medical errors, to service delivery guidelines, and to ensure that commodities are available. Larger health system reforms also need information from routine health information systems as well (MEASURE Evaluation 2012:1).

The consistent use of dependable information from properly designed routine health information system (RHIS) is crucial for ensuring and supporting developments in health system performance. RHIS based reliable information use over time is a vital aid to improving health outcomes, fostering innovation, enhancing efficiency, and tackling disparities (Heywood & Boone 2015:1). The quality of the routine health information system data has been improved across diverse developed nations. However, low- and middle-income countries are still affected from a very low quality and insufficient use of data through routine health information systems generation. The possible factors that affect routine health information system performance are classified as organizational, technical, and behavioural factors according to the performance of routine health information system (PRISM) framework (Lemma et al. 2020:2). These factors involve the design of HIS, software and IT, the behaviour of users, and the organizational structure.

Evaluation of health information systems was carried out in different countries, and results reflected encounters with quality of data and the utilizing of information (Ahanhanzo et al. 2014:837). Similar studies in Ethiopia indicate a low information culture (Tadesse et al. 2014:37; Teklegiorgis et al. 2016:8). In Nigeria, Adindu and Babatunde (2014:269) showed a limited understanding of the value of data for local decision-making. In mitigation of challenges faced by LMICs, the WHO Framework and Standards for Country Health Information Systems report (WHO 2011:11) provide countries with universal standards for guiding data processes.

2.3.5 Web District Health Information System (DHIS2)

District Health Information Software 2 (DHIS2) is an electronic platform for the HMIS and a web-based open source for health information management. Most low- and middle-income countries use this platform for an HMIS. WHO authorized DHIS2 as a worldwide public good and has established data quality management normative direction to provide countries with a better application of DHIS2 (Braa et al. 2007:387). Many countries use DHIS2 as the system for generating routine health information.

DHIS2 is intended to support generation, analysis and dissemination of quality health information for informed decision making (Karuri, Waiganjo, Orwa & Manya 2014:39).

Data from the DHIS2 are integrated and aggregated at the operational level of service delivery. It also supports the proper management of data (Dehnavieh, Haghdoost, Khosravi, Hoseinabadi, Rahimi, Poursheikhali, Khajehpour, Khajeh, Mirshekari, Hasani, Radmerikhi, Haghighi, Mehrolhassani, Kazemi & Aghamohamadi 2018:11). Countries are at liberty to configure a specific module within the application called the "tracker". This allows data to be recorded in the most granular way possible and facilitates the automated compilation of reports (Koumamba et al. 2021:8; Braa et al. 2007:387). Healthcare workers can use the system to analyse the performance of the health programmes. They can also use data to predict future service needs (Karuri et al. 2014:44).

The District Health Information System (DHIS) provides a holistic picture that shows the policy makers and managers, in national and district level an improved image of the services delivery methods, organizational units and organization. Therefore, reinforcement and build-up of additional functionalities is one of the first steps in management and improvement of DHIS (Raeisi, Saghaeiannejad, Karimi, Ehteshami & Kasaei 2013:30).

Countries with vast experience in DHIS believe that, technically, DHIS2 has much more functionalities. The software has the capability of validating data, but there are specific rules embedded in the system. Implementation of the specific internal software tools is the solution that could improve the operation of the primary health care institutions and improve their information management system (Michalski, Bąkała & Bąkała 2015:135). In South Africa, DHIS2 is used as a routine health information system (RHIS) to collect, collate, analyse, and present routine data. DHIS2 generates data following the stipulated information cycle. Health facilities collect daily data following specific indicators. The South African government acknowledges the need for a National HMIS, which would consist of population-based information, health services-based information, health resources records and vital registration data and government support systems (National Department of Health Republic of South Africa 2011:11).

The widespread adoption of DHIS2 has allowed the realization of a whole series of other benefits. The World Health Organisation (WHO) developed data quality

management applications and normative guidance to support countries in better applying DHIS2. The University of Oslo (UiO) and WHO also collaborate on developing standards for health apps on DHIS2 with recommended indicators and best practices for data use at the country level. In December 2017, the Health Information Systems Programme – University of Oslo was designated as a WHO Cooperating Centre for Innovation and Implementation of Research for health information systems strengthening (the University of Oslo, Department of Informatics 2018:1).

Findings from Mugendi (2015:70) indicate that routine health data access is greatly compromised. Therefore, the importance of recorded data cannot be realized if there are barriers to easy access. Dehnavieh et al. (2018:11) indicate that HIS in Ghana, Uganda and Kenya have improved due to the highly effective reporting abilities of DHIS2. Facilities in Kenya were found to have fully utilized the DHIS to report routine health data.

Ethiopia also recognizes the need to strengthen health information. The Ministry of Health [Ethiopia] announced a five-year health sector transformation plan, and that information should be disseminated on time and used for strategic decision making at all levels of the health system. The focus should be on strengthening the information culture, knowledge management and capacity to use the information for action at all levels (Ministry of Health [Ethiopia] 2015:157).

It has to be noted that some countries use the terms, HMIS, RHIS, DHIS interchangeably, for example, DHIS2 is used to collect routine health information which is used for planning resources and health interventions.

2.3.6 Regulatory framework for HIS

Public health decision-making depends on the timeous availability of quality data and the ability to use data. According to WHO (2012:19), the HIS regulatory and legal contexts are very important where health information is generated and used. They enable mechanisms to be established to ensure data availability, exchange, quality and sharing. Particular attention to legal and regulatory issues is needed to ensure that private and NGOs healthcare institution are essential to the health information

system, including the use of accreditation where appropriate. The Ethiopian Federal Ministry of Health (2012:IV) vision makes provision for an HIS road map that reflects “timely, complete and accurate health and health related information from an integrated data repository made available and used for evidence-based decision making at all levels in the country".

Advances in health information and related technologies require an evaluation that focuses on the design, development, implementation, and routine use of health information. This would enable continuous improvement in the functionality of the system, including enhancement of users’ experiences (Federal Ministry of Health [Ethiopia] 2012:158). Therefore, there is a need for standards for guiding the collection, reporting and use of data. Regulatory framework development is required for routine checks of data quality directed by the standard operating procedures of the country’s HMIS. The standard operating procedures for routine health-facility data define the roles and responsibilities of the users and administrators of data and are country specific (WHO 2017a:25). The existence of written guidelines stipulating the methods and products of data analysis with explicit directions is vital for data analysis (Moore, Anthony, Lim, Jones, Overton & Yoong 2014:132). This study begins with examining the regulatory framework for HIS in Ethiopia to develop an understanding of the implementation of the HMIS at the facility level.

2.3.6.1 Implementation of HIS guidelines and protocols

According to different studies and research findings, the regulatory framework for HIS in LMICs is poorly developed (Ojo 2017:142). The nonexistence of shared data collection standards indicates challenges in data collection and reporting (Braa et al. 2007:382).

According to Koumamba et al. (2021:6), observations from eleven of the twelve African countries under study did not have a national strategy on HIS but rather strategies effected under a specific project. Malawi is the only one that has a national strategy for all actors, including donors. The WHO assessment of the HIS identified the challenge areas and provided valuable contribution to developing the new National Health Information System Strategy for Mozambique (Karuri et al. 2014:49). Mgbere,

Khuwaja, Vigil, Patel, Wang and Essien (2018:11) indicate that policymakers, health professionals, and financiers see guidelines as a tool for making care more consistent and efficient and for working in harmony between what clinicians do and what the government supports. This finding supports the approach taken by this study to explore users' views.

The government of Tanzania has developed strategies to address the HIS challenges as outlined in its Health Sector Strategic Plan. It is envisaged that health indicators will be streamlined, as well as data collection and analysis processes. It is believed that such efforts would enhance systems integration, encourage collaboration and information sharing among various stakeholders and enable more efficient use of healthcare resources (Karuri et al. 2014:48). In Kenya, the health ministry recognized the inadequacy of the existing health information systems. They developed and integrated HIS strategy. However, during its implementation, the country experienced major challenges with various development partners, introducing many systems from outside the national HIS. An HMIS National Advisory Committee (NAC) was created with representation from diverse stakeholders to develop and pilot test the new country-owned HMIS (Karuri et al. 2014:49).

In addition, a study conducted in the north-western part of Ethiopia indicates poor access to the HMIS data management guidelines. Access is a determinant of the use of routine health information at the health centres level (Asemahagn 2018:9). Similarly, Bogale (2021:2) indicated the HIS assessment also found fragmented legislation for health information covering specific components, such as private sector data, and vital statistics, notifiable diseases, fundamental principles of official statistics and confidentiality (Federal Ministry of Health [Ethiopia] 2012:11).

2.4 THE ETHIOPIA HEALTH INFORMATION SYSTEM

The Government of Ethiopia (GOE) emphasizes evidence-based decision making directed towards performance improvement and results-oriented management in all public sectors. Accordingly, the country HMIS at five critical strategic issues to support and continuous improvement of HMIS. The critical areas are standardization and integration of data collection and reporting, action-oriented performance monitoring, capacity building, linkage between information sources, and use of the appropriate

technologies (Federal Ministry of Health [Ethiopia] 2008:15). The next section gives a synopsis of the ministry of health plan regarding information revolution or transformation. The evolution of how these plans are implemented is presented in subsequent chapters.

In the past two decades, during the execution of health sector development plan 1-4, the Ethiopian federal ministry of health (FMoH) has implemented different electronic systems and technologies. These contribute to a national health information architecture and are aimed to streamline the efficiency and effectiveness of healthcare delivery from the community up to the country level. These electronic information systems have been considered into country HIS, point of service HIS and standards-based digital registries. These include the Electronic Medical/Health Record (EMR/EHR), The Electronic Health Management Information System (eHMIS), the Electronic Human Resource Information System (eHRIS), Electronic Integrated Financial Management Information System (eIFMIS), Electronic Logistics Management Information System (eLMIS), a Geographic Information System or Geographical Information System (GIS), Electronic Regulatory Information System (eRIS), Telemedicine and Tele-education, and mobile-Health, among others (Federal Ministry of Health [Ethiopia] 2016:35). In 2011, the Ethiopian Health Ministry organized an e-Health workshop to begin developing appropriate health informatics standards and an architectural framework for interoperability and scalability of the various e-Health initiatives in the country (Ministry of Health [Ethiopia] 2012:13).

The Electronic medical/health record (EMR/EHR) is a computerized patient tracking and patient caring system. The health sector needs to have complete and robust medical recording systems in every health facilities which captures all patient histories and related transactions confidentially in thus to bring the information revolution through ICT. This will give importance to the HMIS because a routine patient record will be accessible in the EMR. Therefore, the Ministry intends to implement EMR in all health facilities to change the entire medical recording system from manual to digital (Federal Ministry of Health [Ethiopia] 2016:40).

The Electronic health management information system (eHMIS) is the computerisation of the country health management information system. It is used to improve the health

data collection, organization, analysis, and management of the health information system. Presently the country health management information system is half paper and half electronic based. Hence, the Ministry of health strategies to install this electronic system throughout the country to shift the manual based system into a digital one (Federal Ministry of Health [Ethiopia] 2016:35). Since 2008, Tulane University technical assistance for Ethiopia developed comprehensive electronic HMIS support for doctors which is functioning at the health facilities in several regions of the country (Foster 2012:5). Under the supervision of Oslo University, the Ethiopian team customized the DHIS2, which incorporated a strong authentication procedure to access data (Thangasamy, Gebremichael, Kebede, Sileshi, & Elias 2016:1647).

The Electronic Human Resource Information System (eHRIS) is to deliver managers with information, appropriate knowledge, and tools to support them in the management and development of their staff for effective provision of service. eHRIS includes data for HR-related information such as personnel, and payroll. In time, information that is generated from eHRIS can ultimately be used for people management, workforce planning, budget management, learning development, and other important purposes. eHRIS is intended and developed to be a web-based application that helps to harmonize the countrywide human resource information systems (Federal Ministry of Health [Ethiopia] 2016:38).

The Electronic Integrated Financial Management Information System (eIFMIS) this financial system is a web based system and available through a wide area network or LAN, subject to the accessibility of the client through application to the main server hosting. This application supports ministry of health, regional health bureaus, all health facilities, agencies and other responsible donors to allocate the budget and manage expenditures in a timely basis in line with the achievement of tasks or activities (Federal Ministry of Health [Ethiopia] 2016:35).

The Electronic Logistics Management Information System (eLMIS) is a computerisation of the health sector Supply Chain Management System (SCMS). It is envisioned that this will enable and manage the end-to-end process of SCMS, such as procurement, distribution, usage of all medical equipment and drugs, functional status of medical devices, and drug stock-out including expiration dates. Using this

system, it is also possible to determine which health facilities are partially furnished, fully furnished, and not-equipped. Hence, by installing this electronic system the organization can safeguard fair delivery of medical equipment and drug resources and monitor their needs for repairs and/or replacement and future planning (Federal Ministry of Health [Ethiopia] 2016:41).

A Geographic Information System (GIS) is a system planned to “capture, store, manipulate, analyse, manage, and present all types of spatial or geographical data”. The researchers supported by geographic information systems, remote sensing (RS) satellites and other environmental observing technologies with the tools and the data to make clear the geographic relationships between the occurrence of disease and environmental habitats of disease vectors and agents. An electronic regulatory information system automates the present paper-based regulatory information system in the country and delivers integrated and centralized licensing-related activities including the issuing, suspension, renewal, and revocation of health sector licenses (Federal Ministry of Health [Ethiopia] 2016:36).

In order to address the challenges of available and quality health care provision, and also to rise the number and quality of health workers in the country, the Federal Ministry of Health has plans to scale up the implementation of different Telemedicine and tele-education (TM & TE) initiatives which create possible the success of the Health Sector Transformation Plan (HSTP) (Federal Ministry of Health [Ethiopia] 2016:40).

Mobile Health (m-Health) is the use of mobile phones and other wireless technology in the health system. Mobile phones can be used for training and education, referrals, data exchange, supply chain management, decision support during patient consultations, and information reference. Using mobile coverage and expansion as a prospect, mobile phones and technologies can also be considered as a main mechanism to convey data exchange, education, and health services to the community living in both rural and urban areas (Federal Ministry of Health [Ethiopia] 2016:41).

2.4.1 Flow of information within HIS

Ethiopia's health information system flows through four levels: national, regional, district/sub-city and health unit levels. First data is usually generated from the District/Sub-city to the National level (see diagram 2.3). Hospitals report directly to the regional level except for district hospitals and health centres (Federal Ministry of Health [Ethiopia] 2012:3).

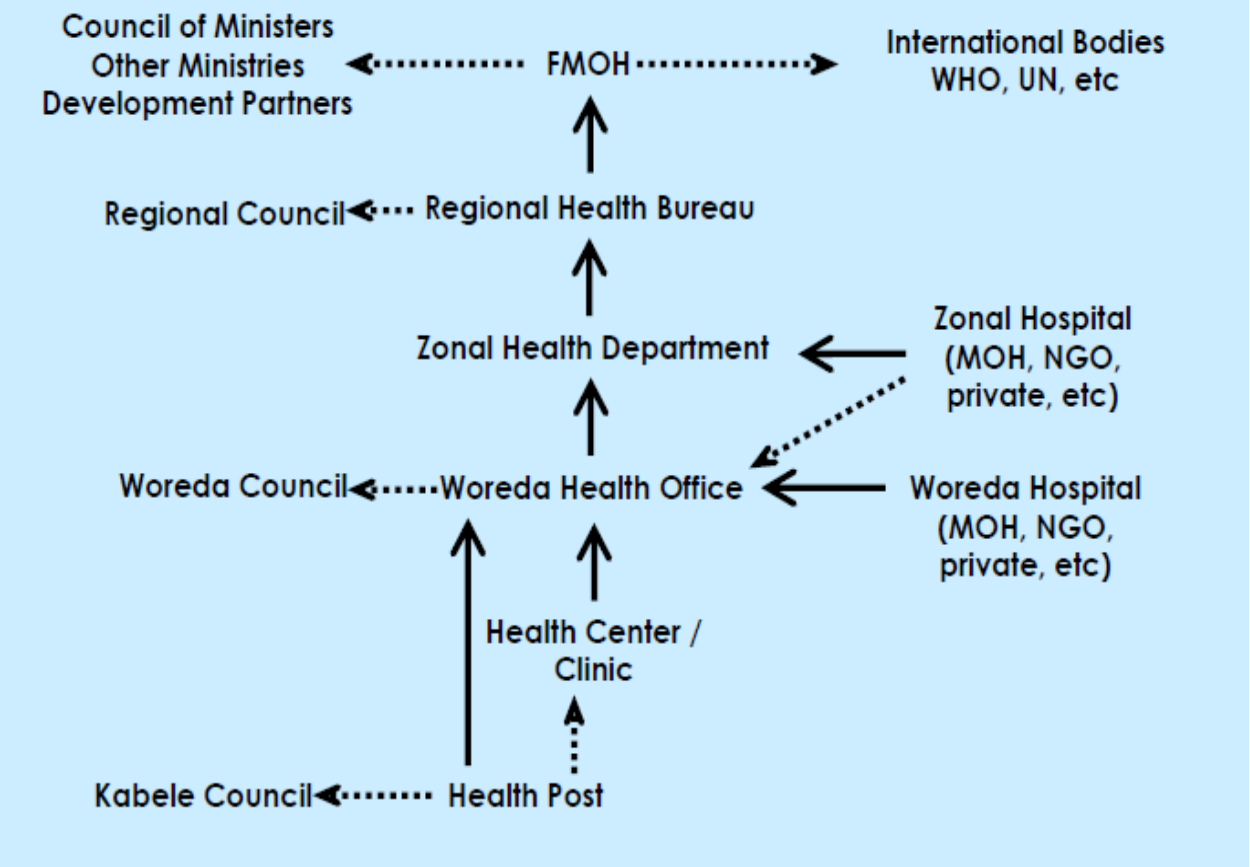

Figure 2.3: The HMIS data flow within the Ethiopia health system (MEASURE Evaluation 2013a:16)

According to the above diagram, data from health posts are sent in paper format to the health centre/clinic and Kebele council once a month. The kebele council will utilize the information for resource allocation and planning purposes at the local level. The staff at the health centres/clinics compile the data and submit them to the woreda/district health office (Hirvonen, Berhane & Assefa 2020:1130). Most HMIS data are generated at the health facilities level. Health facilities collect data on the services they provide and on administrative data such as human resources, finances, and logistics. Data on the services are collected by health workers in each service unit

or department at the time-of-service provision. Routinely collected data are compiled by HIS professionals working in the HMIS unit. HMIS units of health institutions are used as channels for data transmission vertically to the next reporting units and or laterally to the local government or other partners. Health facilities aggregate, check, review and report their data monthly, quarterly, and annually, then forward it to their designated administrative office (Federal Ministry of Health [Ethiopia] 2018:165).

The Administrative health offices (Woreda Health Offices, Zonal Health Departments (ZHDs) and Regional Health Bureaus (RHB)) collects the data it receives, adds its own administrative data, forwards the HMIS report to the next level, and monitors its own performance based on these reported and self-generated data (Federal Ministry of Health [Ethiopia] 2018:163). At the Woreda Health Offices (WoHOs), the data will be compiled and entered into a DHIS2. These digitalized data are sent to the zonal health department, which passes them on to the regional health bureau. The Federal Ministry of Health then gets the data from the regional health bureaus (Hirvonen et al. 2020:1130).

Administrative levels also submit their data monthly, quarterly, and annually. Data are transmitted through an integrated channel to assure standardization, consistency, and quality. The HMIS gathers data from all participating facilities, including the Ministry of Health [Ethiopia], Non-Governmental Organizations, private for-profit, and other governmental organizations. For regions with no functional woreda health offices, health facilities will send their report to Zonal health departments (Example: In Addis Ababa city Administration, health centres report to sub-cities). For regions that have no functional Zonal health departments, the woreda health offices will send their report to the Regional Health Bureaus (RHB) (Federal Ministry of Health [Ethiopia] 2018:165).

In Ethiopia, assessment of indicator components refers to the existence of national minimum core indicators for countrywide and sub national levels, existence of regular reporting mechanisms, covering all types of health indicators, and presence of explicit official plan for measuring each of the health-related indicators relevant to the country (Federal Ministry of Health [Ethiopia] 2012:13). The Federal Ministry of Health [Ethiopia] and sub national units lack integrated data warehouse. Even if the Ministry

of ICT has organized data management tools, there is no standard definition (Meta data dictionary) and data warehouse at national and sub-national level in the country. There is some level of confidentiality and data security with fragmented regulatory procedures. Still, it lacks applicability due to the lack of ICT infrastructure at the required level (Federal Ministry of Health [Ethiopia] 2012:14).

2.4.1.1 Role of stakeholders in data processes

As in other countries, there are differentiated roles for professionals engaged in data management processes. This study refers to stakeholders as those mainly tasked with producing data and others who use data. The study recognizes that all are expected to use data at their level of functioning. Data producers' role is to organize and manage health information data by ensuring quality, accuracy, accessibility, and security in both paper files and electronic systems at the facility level. Especially, a data entry clerk prepares patient data for the computer entry by compiling and sorting information; maintains data entry requirements by following data programme techniques and procedures; verifies entered patient data by reviewing, correcting, deleting, or re-entering data; purging files to eliminate duplication of data, and secures information by completing database backups. An HMIS focal person serves as secretary of review meetings. They are contact persons for reporting and communicating with the health bureau and sub-city. They also work in data compilation, analysis, and validation of data through lot quality assurance sampling (Federal Ministry of Health [Ethiopia] 2013:21).

Data users' roles at the department level, in contrast, is to develop plans every year for the department, take responsibility in the collection of data from the records through data collection formatting, attend review meetings and present the departmental status according to the plan, supervise physician and nurse practitioners in the department, and lead departmental meetings. They also perform clinical supervision of clinic staff, including regular performance appraisals and feedback. The facility director leads planning for the development of facility programmes, reviews performance and reports for the assessment of facility needs, performs or delegates responsibility for quarterly clinical report reviews for all clinic staff, focusing on the quality of care of the HIV/AIDS

programme, and demonstrates an understanding of the facility's mission in performing all aspects of the position (Federal Ministry of Health [Ethiopia] 2013:21).

The collected data from the patient and health facility levels are aggregated and analysed to identify the gaps in the facility performance (Ministry of Health [Ethiopia] 2010:84). According to the Ministry of Health [Ethiopia] (2012:6), for data management processes to function smoothly, there is a need for specialized skills, standards and a clearly developed policy framework regarding data management processes and outputs.

2.5 MONITORING AND EVALUATION (M&E)

Aqil and Lippeveld (2011:20) define M&E as "Monitoring as a continuous, systematic process" of checking that implementation is proceeding according to plan. In contrast, evaluation is the assessment of whether or not programme objectives have been achieved. From this definition, it is evident that monitoring can focus on different areas such as supply chain, service delivery and supervision, while evaluation determines whether the programme is on schedule with the planned activities. The facility-based routine data provide vital information for monitoring and evaluation. Specific data will be collected, analysed, and interpreted to generate knowledge, identify gaps and factors that influence outcomes and inform programme decisions. Evaluation is supported by monitoring to determine the worth of the programme on a deeper level.

Additional data are often needed to consider contextual changes and determine if a change is beneficial to services (WHO 2011:2). In other words, it means evaluation helps the programme or project managers decide the value or worth of a particular programme or project.

Monitoring is an integral part of day-to-day management. It delivers information by which organisation can find and solve implementation difficulties and measure progress. While Evaluation is an assessment, its design, implementation and results, as systematic and objective as possible, of an ongoing or completed project, program or policy. The purpose is to define the relevance and fulfilment of objectives, effectiveness, developmental efficiency, impact and sustainability (Umhlaba Development Services 2017:2). An evaluation need deliver information that is reliable

and valuable, allowing the integration of lessons learned into the decision-making process of both donors and recipients.

The MEASURE Evaluation (2014a:35) identified the five most significant factors in HIV M&E system strengthening; harmonized indicators to improve reporting processes, improved data quality due to training efforts and improved analysis and use of data. This study contends that a highly successfully performing HIS could play a significant role in monitoring indicators.

2.5.1 Monitoring and evaluation of health programmes

According to the WHO (2016:3), country monitoring is the basis for regional and global monitoring of priority health issues. M&E is needed for reporting progress on health-related Sustainable Development Goals (SDGs). Countries need functional surveillance mechanisms and accountability to ensure that priority health programmes are implemented as planned against stated objectives and desired results. The MEASURE Evaluation (2014a:35) identified that strengthening was required for the HIV M&E system. Indicators that are too complex challenge the effectiveness of monitoring the HIV programme (Gloyd, Wagenaar, Woelk & Kalibala 2016:5).

In Ethiopia, 108 indicators were defined and developed to follow up the level of functioning of the health sector in the context of the health sector development programme (HSDP) III, and these have been used in Ethiopia since 2008. The reformed HMIS has been implemented in almost all public health facilities, but it has not yet been started in the private health sector (Federal Ministry of Health [Ethiopia] 2014:6). However, Tadesse et al. (2014:37) showed that a lack of knowledge on using the HMIS data for monitoring and evaluation is the greatest barrier.

2.5.1.1 The HMIS and HIV/AIDS Programmes

Building national M&E systems requires multiple stakeholders' involvement as well as sustained efforts over long periods. National stakeholders have high demands as they seek to measure the impact of HIV interventions and incorporate cost measurement (Porter, Bouey, Curtis, Hochgesang, Idele, Jefferson, Lemma, Myrick, Nuwagaba-Biribonwoha, Prybylski, Souteyrand, & Tulli 2012:124).

Highly effective health systems enable providers and public health leaders in the local or lower-level health systems to use data for decision making (Kumar et al. 2017:89). The system should support more disclosure in the progress of delivery of care, client empowerment and engagement, facilitate data sharing, beneficial research initiatives for communities at the individual level and public health (Thorpe, Gray & Cartwright-Smith 2016:596). The data collection tools should respond to the information needs of the health professional, be easy to use, and support workflow to make proper decisions (Mgbere et al. 2018:14).

The main strategic directions for the HIV and AIDS prevention and control programme are to expand HIV and AIDS prevention activities, provide an all-inclusive and good quality health service for HIV and AIDS and related diseases, reduce vulnerability to HIV and AIDS, strengthen the systemic collection and use of data relating to HIV and AIDS, increase the accessibility of HIV and AIDS-related health services, and provide special care and protection for HIV and AIDS patients and families (Ministry Of Finance and Economic Development [Ethiopia] 2010:113)

The HMIS has a critical role in the monitoring and evaluation of a health system, as it integrates data from all healthcare levels and provides information for the management of programmes, facilities, policies, and resources (Qazi & Ali 2011:245). Ending the AIDS epidemic will stimulate wider international health and development efforts, indicating what can be realized through evidence-based action and multi-sectorial partnerships (UNAIDS 2014:1). HIV/AIDS data integration with data from other related public health information systems, such as hepatitis and tuberculosis, could support progress both disease prevention efforts and patient outcomes (Mao et al. 2010:86). HIV providers' preferences and clinical workflows is reflected through an integrated system intended for this purpose should provide evidence-based information. This will permit its usage in specific contexts, for specific user to solution of specific questions, thereby improving data torrents quality and efficiency, and leading to upgraded patient care and health outcomes (Mgbere et al. 2018:14).

The collection, reporting and analysis, as well as data security supports accurate, relevant, and timely data are available to national policy makers, program heads and staffs at each level of the health-care system. In addition, HMIS supports the country

to produce standard report according to the needs of international agreements to the donors (Mao et al. 2010:86). Senior management plays a significant role in influencing users in adopting new ways of thinking regarding health management information systems (Mohamadali & Aziz 2017b:375).

Electronic Health Records (EHRs) delivers an unparalleled opportunity for the use of regularly collected patient data to drive research and convey an epidemiological understanding of the basis of disease (Robbins, Lim Choi Keung, Sankar, Randeva & Arvanitis 2018:1). There is a requirement for data differentiating between individual and contextual factors that rise people's likelihood of engaging in high-risk behaviour. Although significant developments have occurred during the past decade in the collection, analysis and use of data on HIV/AIDS. Progressively, the significance of determinants (risk and protective factors) in influencing individual behaviours is acknowledged, and needs to be measured (UNAIDS & WHO 2004:4). The WHO (2013:12) indicated in a situation-analysis and justification for HIV/AIDS strategy in Africa the need to strengthen strategic information systems to track HIV drug resistance and adverse outcomes of medicines, the implementation and outcomes of interventions and the progress of the epidemic.

Health data users like health practitioners, policymakers, governments, researchers and patients need to be assured in the quality of the data being retrieved (Callen 2016:3). Strategic contributions to the health reform agenda will assist health services to leverage data and information for decision-making and self-improvement.

As early as the year 2000, the UNAIDS designed a guide for M&E of the HIV/AIDS programme, the collection and use of indicators for an M&E of HIV/AIDS programme in different countries to inform international agencies and donors at the national level that the indicators can be used for tracking trends, identifying problem areas, advocating for and allocating resources at district level (monitoring of AIDS programmes and the provision of data relevant for national-level monitoring and evaluation) and project level (evaluation of specific prevention and care projects) (UNAIDS 2000:5).

Indicators are used for routine monitoring of key aspects of programme performance (Gimbel, Mwanza, Nisingizwe, Michel, Hirschhorn & Hingora et al. 2017:61). An Indicator is a variable that describes a given situation and thus permits measurement of changes over time. It transforms crude information into a form that is more suited for decision-making (MEASURE Evaluation 2013a:10). A more standardized definition of indicators can improve the generalizability of all routine HIS indicators (Venkateswaran, Mørkrid, Abu Khader, Awwad, Friberg, Ghanem, Hijaz, & Frøen 2018:9). When indicators are chosen to track changes over time during the implementation process, it would be appropriate to consider the costs and benefits of data collection options (Diana, Hotchkiss & Yeager 2017:11).

In conjunction with lower health system levels, indicators can be developed according to locally prevalent priorities (Moore et al. 2014:132). The odds of routine health information utilization among health workers who use standard health indicators are about two times higher than those with no indicators (Wude, Woldie, Melese, Lolaso & Balcha 2020:9).

A study in Mozambique shows that loss to follow up (LTFU) from referrals of HIV-positive women from the prevention of mother to child transmission services to antiretroviral therapy services was reduced from 70% in vertical sites to 25% at integrated sites, based on the analysis of routine data. Nearly all integrated sites across both provinces demonstrated similar results. The dramatic improvement at integrated sites suggests that integrating ANC and antiretroviral therapy in the same health units helps reduce LTFU (Pfeiffer et al. 2010:5).

The MEASURE Evaluation (2015:15) supported Haiti in integrating diverse information systems reporting on the HIV/AIDS programme through harmonized indicators and data collection tools with the online reporting system to enhance timely decision making. In addition, Malawi has implemented quarterly national reporting based on quarterly monitoring visits and evaluations at every clinical site that provides HIV treatment. Malawi experiences challenges at the national and district health levels. The staff complement is a major barrier (UNAIDS 2014:26).

In Ethiopia, the HIV and AIDS programme has three key performance indicators (KPI) out of the 21 KPI like clients receiving VCT (Voluntary Counselling and Testing) services, PMTCT (Prevention of Mother to Child Transmission) treatment completion rate, and PLHIV (People Living With HIV) currently on antiretroviral therapy (Ministry of Health-Federal Democratic Republic of Ethiopia 2013:16).

In the voluntary counselling and testing department, the key indicator used to generate data are the number of individuals tested and counselled for HIV and who received their test results. While in the PMTCT department, the focus is on the number of HIV infected women on HIV care and using a modern family planning method. Furthermore, the antiretroviral therapy department generates data on key indicators such as the number of PLHIV newly enrolled in pre- antiretroviral therapy care, the number of PLHIV started on antiretroviral therapy, thus HIV positive persons receiving co-trimoxazole prophylaxis. A special focus is on generating data of patients currently on antiretroviral therapy drugs, differentiated by the type of regimen, age category, and sex (Federal Ministry of Health [Ethiopia] 2018:63). This detailed information is significant for this study.

Ethiopia endorsed the HIV/AIDS policy in 1998. The country then followed a multi-sectoral approach to fight the epidemic. Ethiopia established a federal HIV/AIDS prevention and control office (FHAPCO) as part of the Ministry of Health [Ethiopia], having regional, zonal, and wereda/district level offices. The HMIS/ M&E system was being strengthened to avail reliable, timely and complete information on the HIV/AIDS programme implementation (Federal HIV/AIDS prevention and control office 2014:38). Ethiopia identified four strategic objectives in an HIV/AIDS strategic plan for achieving UNAIDS goals and targets between the 2015–2020 health system strengthening, HMIS/M&E, and laboratory services (Federal HIV/AIDS prevention and control office 2014:11).

The antiretroviral therapy patients reporting systems are complex. Availability of data analysis skills at each level, adequate numbers of skilled human power and the level of infrastructure to aggregate and analyse data are fundamental in monitoring and evaluation (Moore et al. 2014:132). Currently, most clinicians lack the skills to deal with data. Improved training may help clinicians develop confidence with data

management processes and value detailed data task roles (Prince et al. 2018:30). Mugendi (2015:69) found that half of the clinicians do not engage the stakeholders in interpreting analyses to extract meaning from the data to inform programmes and policies.

The rapid expansion of financing for HIV/AIDS programming delivers an exclusive opportunity to develop all PHC services in African settings (Pfeiffer et al. 2010:8).

2.6 DATA QUALITY AND CULTURE OF INFORMATION USE

The performance of the Routine Information System Management framework adopted in this study provides a tool for evaluating the performance of routine health information systems. The performance of routine health information systems is based on the capacity to produce quality data, fit for use. This emphasizes how to obtain information most effectively and efficiently. In other words, how the HIS is generally used to produce reliable health information. The study assumes that sustainable production and use of good quality data is more likely to result from users who believe the organization is promoting the culture of information use.

In addition, the performance of routine information system management framework is based on the assumption that if organizations promote a culture of information use, there will be enhanced competence in conducting HMIS tasks (MEASURE Evaluation 2019a:8). Data quality is critical in providing reliable information for monitoring and evaluating programmes such as HIV/AIDS. Data must be consistent between different health system levels. Section 2.4.5.1 shows the levels and flow of data. If data from the primary facility, which is the first point of care, is faulty, that will have adverse implications for the whole chain and subsequently hamper effective decision making.

Completeness, timeliness, and accuracy are the three most-frequently-assessed dimensions of data quality, although literature reveals eight dimensions (Alipour & Ahmadi 2017:317). Poor data quality will lead to low data utilization efficiency and even bring serious decision-making mistakes (Cai & Zhu 2015:8). Data quality is a common challenge faced by developing countries (Manya & Nielsen 2016:124). In Uganda, the health departments were motivated to incorporate evidence-based planning because

of additional funding received from other partners and the local government (Henriksson, Ayebare, Waiswa, Peterson, Tumushabe & Fredriksson 2017:7).

The findings from Ethiopia on the overall status of data quality in terms of timeliness, completeness, and data accuracy was 72.2%, 86%, and 48%, which is below the national targets (Kebede et al. 2020:7). Ayele, Biruk, Habtamu, Taye, Tamire and Addissie (2021:39) also indicated that in Addis Ababa, overall data quality was much lower than the acceptable national level of 90%. However, other studies conducted in the southern part of Ethiopia indicated some level of improvement in routine health information utilization by health professionals who had training, skills, and frequent supportive supervision (Wude et al. 2020:8). Health workers who receive regular feedback on their reports might receive constructive and relevant advice to utilize their data for improving their service delivery (Shiferaw, Zegeye, Assefa & Yenit 2017:7). Shaikh, Khan, Kumar, Khushk and Hamid (2015:30) also supported the significant role of the district health office in improving the quality of the information system by providing integrated supervision.

As the above studies show, there is a very poor culture of the utilization of health information for quality improvement of health and follow-up of the performance. Callen (2016:4) indicates researchers, policy makers, managers and staffs working at different level in the government require access to accumulated health data important for planning, research and funding.

2.7 SUMMARY

This chapter provided theoretical perspectives of the health system, the HIS and its sub-systems. The interdependence between these components was articulated. Monitoring and evaluation were discussed concerning the use of the HMIS. The importance of data quality was emphasized and the promotion of a culture of information use because the fundamental principle of successful use of any HIS is the ability to generate useful information that will guide decision-making processes. The importance of a well-functioning health system was highlighted.

Next, Chapter 3 presents the research design and methodology.

CHAPTER 3 RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Qualitative data collection methods such as a focus group discussion, document analysis, and a modified Delphi technique were used to address the research questions in detail. This chapter details the research design and methods used in this study. It also includes a discussion of ethical considerations and trustworthiness. The focus of the study was to evaluate the utilization of the HMIS in generating quality health information for monitoring and evaluating the HIV and AIDS programme in Ethiopia. The ultimate aim was to develop a framework for strengthening the information culture and generating reliable and accurate data to support HIV and AIDS monitoring and evaluation.

The above purpose of the study was realized through the following objectives:

- To describe how HIS policies, strategy and protocols guide the use of the HMIS for HIV and AIDS monitoring and evaluation (M&E) in Ethiopia.
- To examine how the HMIS is used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation (data collection, processing, analysis, and presentation).
- To explore stakeholders' views regarding technical, organizational, and behavioural factors that influence the use of HIV and AIDS health information.
- To develop a framework for improving data management for HIV and AIDS monitoring and evaluation.

3.2 RESEARCH DESIGN

The research design is a road map for gathering data and finding answers to the research questions considering the number of subject groups, the timing of data collection and study interventions (Polit & Beck 2017:56). A qualitative evaluative case study was used to address the research questions. It allowed the researcher to ask the questions “how” and “why” and enabled the collection of in-depth information (Jones 2020:7). This study was carried out over three phases: Phase 1 – the qualitative document analysis (QDA) and Phase 2 – FGD discussion. Phase 3 was the

development of a framework and validation by experts using a modified Delphi technique.

3.2.1 Qualitative research

Qualitative studies involve an in-depth examination of phenomena holistically by collecting rich data and providing thick descriptions of data (Polit & Beck 2021:799). Qualitative studies are influenced by constructivism which emphasises natural settings and their influence on social interactions and meaning creation. The researcher employed a qualitative method to get a deeper understanding of the legislative framework of HIS implementation in Ethiopia and how stakeholders view the HMIS in generating relevant and reliable data for HIV and AIDS monitoring and evaluation and the influence of technical, organizational, and behavioural factors on HIV and AIDS programme management. This approach was appropriate as it was deemed the most correct to address the objectives. As indicated by Creswell (2014:255), “qualitative research occurs in natural settings, where human behaviour and events occur”. The focus is on natural settings such as health care facilities, where stakeholders interact in implementing certain programmes and understanding the HIV/AIDS programme context in which the HMIS was being implemented.

The qualitative research method helps collect in-depth and complete information about subjects under study. This stance is supported by Polit and Beck (2017:741), who state that qualitative research is an in-depth examination of a phenomenon in a complete manner through the gathering of rich narrative data. It is interpretative in that the inquirer is usually involved in a continued and rigorous experience with participants (Creswell 2014:237). This approach enabled the researcher to engage in a scholarly and rigorous manner to obtain in-depth data about the HIS and HMIS processes as experienced or viewed by HMIS stakeholders in the healthcare facilities (Gray et al. 2017:689). The constructivism research paradigm emphasises comprehension of the phenomenon from participants’ views; there is no emphasis on objectivity. Thus, allowing stakeholders to express their opinions regarding data management processes and the use of information for the evaluation of the HIV/AIDS programme.

Qualitative design is based on the constructivist tradition, which emphasises natural settings and human capability to form and build their own experiences. Constructivism emphasises the holistic, active, and individual aspects of human life and attempts to collect those features in their entirety, within the setting of those who are experiencing them (Polit & Beck 2017:12). The participants in this study were exposed to protocols guiding the data management processes. They had first-hand experiences of how those processes affect their workflow. This research used qualitative data collection methods such as qualitative document analysis, focus group discussions, and a modified Delphi technique.

Hence, it is theoretically understood that the constructivism paradigm permits investigators to view the world through the insights and practices of the participants and recognizes the impact on the research of their own background and experiences (Sinha & Sinha 2015:24). In broad terms, this study was conducted to explore the stakeholders' involvement and experience regarding HMIS use for HIV and AIDS programmes. This research was based on the assumption that the generation of truths/knowledge related to data generation and information use is an outcome of the interpretations and meanings held by stakeholders on how data is generated and used for quality improvement and performance monitoring of HIV and AIDS programmes.

The qualitative approach supported the researcher to get a deeper understanding of the legislative framework guiding the implementation of HIS and participants' interpretation, understanding and experiences of the HMIS. This understanding emerged from multiple sources such as qualitative documentary analysis and various stakeholders. In applying constructivism, the researcher obtained a deeper understanding of how policies supported the implementation of the HMIS and how participants interpreted the reality of working with the system in HIV/AIDS programme monitoring and evaluation.

The researcher engaged with participants in a natural setting, which is a health care facility, where the HMIS is being implemented for the HIV/AIDS programme. The documents were used to synthesise information on how HIS policies, strategy and protocols guide the use of the HMIS for HIV and AIDS monitoring and evaluation.

3.2.1.1 Evaluative case study

Case studies are a design of an inquiry found in many fields, especially evaluation. The researcher develops an in-depth analysis of a case, a programme, event, or process (Creswell 2014: 43). Yin (2013:322) describes the scope of a case study in the following manner: “a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. Yin (2013), therefore, regards the goals of a case study as understanding a social phenomenon and real-life events such as organizational and managerial processes. Typically, a case has defined space and time in a bounded context (Miles, Huberman & Saldaña 2014:28; Yin 2018:31). Morgan (2012:668) also alludes to the problems inherent in the definitions of case studies, especially in social studies fields. The author lists a few characteristics of definitions as found in the literature:

a. Case studies investigate a bounded whole object of analysis. The unit of analysis refers to a level of wholeness, within which there may be several single elements.
b. Case study research maintains a considerable degree of open-endedness, and the boundary between the subject of analysis and context is not clear.
c. A case study involves researching directly a real-life whole, which creates a considerable depth of engagement.
d. Many potential research methods may be used within the case study.
e. The outcome is a complex, well-narrated account that contains raw evidence.

Similarly, Yazan (2015:134) acknowledges that methodologists have yet to have full consensus on the design and implementation of the case study, and that hampers its full evolution.

This study adopted an evaluative case study, with all the characteristics described by Morgan (2012:668). Researchers adopting this approach are encouraged to seek out what is common and particular about the case. This involves in-depth consideration of the nature of the case, physical setting and other institutional and political contextual factors (Ebneyamini & Moghadam 2018:2). The evaluative case study is best used

when the major questions are “how” or “why” questions, for example, why the intervention has achieved or not achieved it’s intended (or unintended) purpose (USAID 2013:2). As indicated by Tracy (2013:265), “case studies usually consist of a descriptive narrative that illustrates a problem and potential solutions”. Experienced qualitative researchers have identified case study research as a stand-alone qualitative approach to capture the complexity of a single case (Ebneyamini & Moghadam 2018:2). This study also used the evaluative case study as a stand-alone approach.

The selection of an evaluative case study was the chosen study design since it permitted investigation of issues like data management processes, thus illustrating the complexities of generating quality data for use in the evaluation and monitoring of the HIV/AIDS programme.

The evaluation of the HMIS in a real-life context, such as health facilities, represented a natural setting, and the HMIS represented a typical case according to this definition. This approach enabled some detailed descriptions of what happened and the context in which it occurred from multiple viewpoints. In this case, qualitative document analysis was carried out, as well as focus group interviews with key stakeholders. The stakeholders in the HMIS were those who mainly produced data (the HMIS focal person, HIT, data clerks, data encoders, and M&E persons) and those who are mainly tasked with making data-driven decisions, such as data users (nurses, health officers, and doctors, who are department focal persons for ART, voluntary counselling and testing, and prevention of mother to child transmission). This enabled the researcher to seek out what is common and particular about the utilization of the HMIS at the facility level (Ebneyamini & Moghadam 2018:3).

The case study method was selected so that a clear set of propositions could be formulated about the evolving HMIS implementation, and the reaction of stakeholders as indicated by data management processes at the health facility level. The units of analysis were chosen to represent where the phenomenon could be studied at an operational level embedded within the case, and they were used as sources of data and units of analysis. The study used multiple data collection methods.

The qualitative document analysis (QDA) provided evidence on how the HMIS was to be implemented, informing the timeline of reporting requirements, key actors, and the activities. The QDA provided a broad historical context for the study, suggesting leads of possibility to explore further through other forms of data collection. The researcher collected in-depth information from the participants through FGD, which was then used to provide a description of participants' views on data generation and information use for HIV/AIDS monitoring and evaluation. Judgment occurred during the integration of both data sets.

The evaluative case study permitted exploration of issues like data management processes, thus giving insights into the complexities of generating quality data as well as the organisational, technical, and behavioural factors involved. Yin (2014:219) argues that "case study research has a functional and legitimate role in doing evaluations". Following this author's view, this study applied an evaluative case study as the primary approach, where the HMIS use, its contexts and related stakeholders became the main case.

The research was carried out in three phases according to the objectives of the study. A case study design relies on multiple data sources for the evidence (Yin 2018:15).

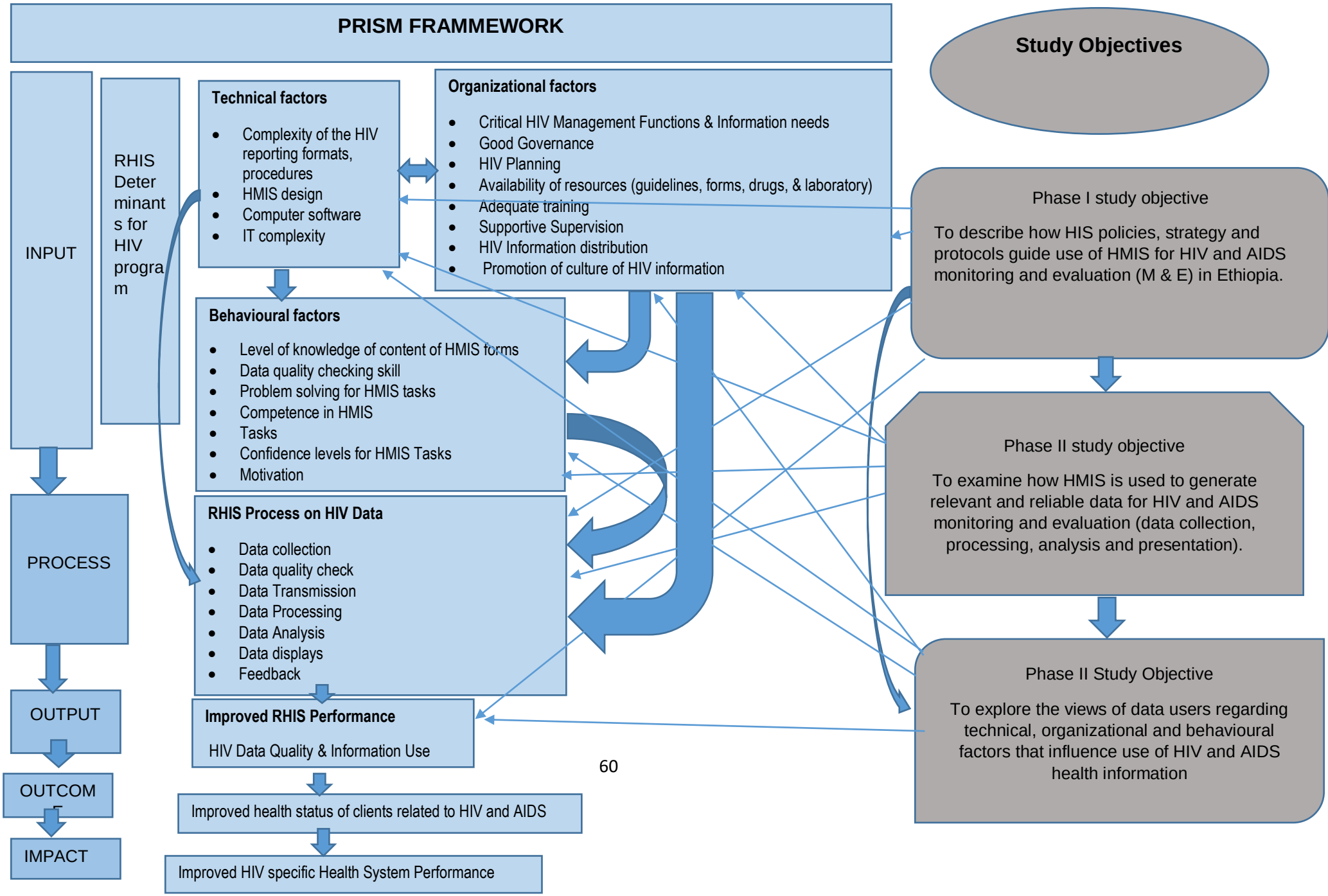
PRISM FRAMMEWORK
Study Objectives
INPUT
RHIS Determinants for HIV program
Technical factors
Complexity of the HIV reporting formats, procedures
HMIS design
Computer software
IT complexity
Organizational factors
Critical HIV Management Functions & Information needs
Good Governance
HIV Planning
Availability of resources (guidelines, forms, drugs, & laboratory)
Adequate training
Supportive Supervision
HIV Information distribution
Promotion of culture of HIV information
Behavioural factors
Level of knowledge of content of HMIS forms
Data quality checking skill
Problem solving for HMIS tasks
Competence in HMIS
Tasks
Confidence levels for HMIS Tasks
Motivation
PROCESS
RHIS Process on HIV Data
Data collection
Data quality check
Data Transmission
Data Processing
Data Analysis
Data displays
Feedback
OUTPUT
Improved RHIS Performance
HIV Data Quality & Information Use
OUTCOME
Improved health status of clients related to HIV and AIDS
IMPACT
Improved HIV specific Health System Performance
Phase I study objective
To describe how HIS policies, strategy and protocols guide use of HMIS for HIV and AIDS monitoring and evaluation (M & E) in Ethiopia.
Phase II study objective
To examine how HMIS is used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation (data collection, processing, analysis and presentation).
Phase II Study Objective
To explore the views of data users regarding technical, organizational and behavioural factors that influence use of HIV and AIDS health information

Figure 3.1: Study objectives and PRISM framework interrelation (MEASURE Evaluation 2019b:9)

The focus of input assessment on routine information system determinants such as technical factors (design of the system, data collection forms/processes, information technology and procedures), organizational factors (availability of resources, training and supervision and culture of information use) and behavioural factors (data quality checking skills, competence, confidence and problems solving skills). All activities incorporated by process assessment involves the generation of information comprising data collection, processing, analysing, quality checks and giving feedback (MEASURE Evaluation 2019b:23). In this study, the outcome and impact part of the performance of routine information system management framework were not subject to the study and are not covered. Refer to the theoretical framework in section 1.7.2 for a detailed description and application.

The research was implemented in three phases: Phase 1, a qualitative document analysis; Phase 2, focus group interviews; and Phase 3, developing a framework to strengthen data management processes for HIV/AIDS, using a modified Delphi technique.

3.2.2 Phase 1: Qualitative document analysis

Qualitative document analysis provides a systematic methodological process for eliciting meaning from documentary evidence. This approach can be considered an umbrella descriptor for this systematic, reflexive process that may employ various methods, including variants of thematic analysis, content, and discourse analysis (Wood et al. 2020:457). The authors seem to suggest that there is not one single, agreed-upon method of carrying out a qualitative document analysis. In this study, this phase dealt with the description of how the policies, strategy and protocols guide the use of the HMIS for HIV/AIDS programme monitoring and evaluation in the health facilities. The use of qualitative document analysis was methodologically congruent with the constructivist worldview this study adopted.

The justification for document analysis is based on its role in methodological and data triangulation, the huge value of documents in case study research, and its effectiveness as a standalone method for specified forms of qualitative research

(Bowen 2009:29). Yin (2013:323) argues that useful insights can be gained through documents analysis. Documents are manageable and accessible for study, more cost-efficient and time-efficient than starting from scratch, and stable or non-reactive over time (Bowen 2009:31).

In this study, the investigator needed to understand the context in which the HIS and HMIS are implemented. Documents provided the framework in the form of complementary data, as is commonly done in a case study (Wood et al. 2020:456). Moreover, documents may be the only way of collecting data when events can no longer be perceived or when participants have disremembered the details (Bowen 2009:30).

3.2.3 Phase 2: Focus group discussions

Phase 2 involved the use of semi-structured methods. Focus group interviews were conducted to examine how the HMIS is used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation (data collection, processing, analysis, and presentation) and to explore the views of stakeholders regarding technical, organizational, and behavioural factors that influence the use of HIV and AIDS health information.

This phase included a combination of data from both phases and a drawing of meta-inferences used to develop the framework for improving data management for HIV and AIDS monitoring and evaluation. The framework is based on the premise that functional monitoring and evaluation systems require strengthening of the HMIS and reliable information on service delivery and health status.

3.2.4 Phase 3: Development and validation of the framework

This phase involved the development of a framework to improve data management for HIV and AIDS monitoring and evaluation using a modified Delphi method. The study conducted the modified Delphi technique to elicit expert opinion on the draft framework and action plan developed. A modified Delphi technique can be utilised in those conditions where the action statements were derived from the literature or previous research findings (Stewart, Gibson-Smith, MacLure, Mair, Alonso, Codina et

al. 2017:3). The participants were identified through the snowball approach using non-probability sampling. Snowball sampling is a commonly employed sequential sampling method in qualitative research (Kirchherr & Charles 2018:1-3; Habibi, Sarafrazi & Izadyar 2014:10). The Delphi rounds were conducted electronically to ensure anonymity and minimize the bias that might occur through a group's interaction (Blalock 2014:56; Davidson 2013:58). Details are provided in Chapter 6.

3.3 RESEARCH SETTING

According to Creswell (2014:45), research conducted in a natural setting denotes an investigation completed in a setting free from any influence. Gray et al. (2017:1071) also indicate contextual research concentrate on particular happenings in "naturalistic settings". Naturalistic settings are, for example, field settings, in which data are collected without any attempts by the researcher to control for the effects of extraneous variables. Accordingly, this research was conducted at the selected health facilities where the HIV and AIDS programme is fully operational, and the HMIS is being used.

3.3.1 Study area

Ethiopia is the second most populated and oldest independent country in Africa. It has an exclusive cultural tradition with a varied population blend of ethnicity and religion. Addis Ababa is the capital and largest city of Ethiopia. The city is divided for administration purposes into ten areas, called sub-cities, and 99 districts (Federal Ministry of Health [Ethiopia] 2015:18).

This study was conducted in Addis Ababa, focusing on public hospitals and health centres, referred to in this study as health facilities.

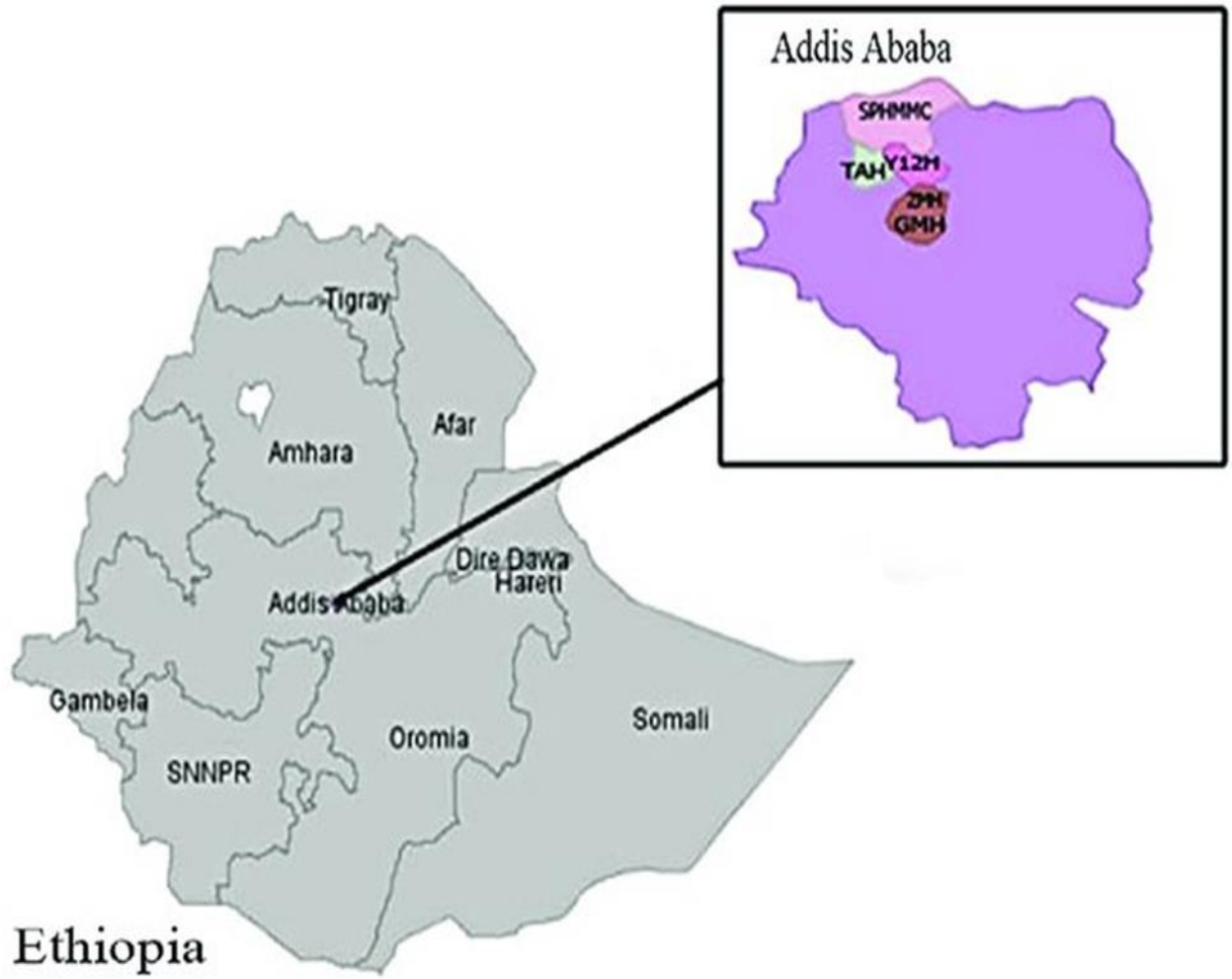

Figure 3.2: Location map of the study area in Addis Ababa, Ethiopia . (Liyew, Yalew, Afework & Essén 2017:3)

Keys: Y12H (Yekatit 12 Hospital), ZMH (Zewditu Memorial Hospital) and GMH (Gandhi Memorial Hospital).

The study was conducted at two different settings of health facilities (hospitals and health centres), which are governed by the Addis Ababa regional health bureau. Key to the setting were three factors: HIV/AIDS service, HMIS implementation and accessibility.

Hospitals: The Gandhi Memorial, Yekatit 12 and Zewditu Memorial Hospitals are managed by the Addis Ababa Administrative Health Office.

GMH was selected due to its experience in HMIS implementation. It was a site especially piloted for e-HMIS implementation more than any other hospital, even though it has the second-lowest HIV/AIDS patient burden of 945 cases, lower than the

other public hospitals. Zewditu Memorial Hospital was selected due to its long experience in HIV/AIDS patient management since 2005. ZMH has the second-highest HIV/AIDS patient burden of 7,446 cases. Yekatit 12 Hospital was selected due to its implementation of the HMIS system, even though it has a middle-level HIV/AIDS patient burden of 2,904 cases (Ministry of Health [Ethiopia] 2017a:3).

Health Centres: The six selected HC were selected due to their experience regarding long term HIV/AIDS service and varying levels of ART HIV/AIDS patient burden.

Table 3.1: ART patient number at the selected health centres (Ministry of Health [Ethiopia] 2017a:3)

S.N	Name of Health Centres	Number ART patients attending
1	Addis Ketema Health Center	1,408
2	Woreda 17 Health Center	1,663
3	Kazanchis Health Center	1,254
4	Lideta Health Center	818
5	Tekelehaymanot Health Center	1,405
6	Nifas Silk No2 Health Center	1,802

3.4 PHASE ONE RESEARCH METHOD

Gray et al. (2017:84) define methodology as the research process selected to answer the research question. Creswell (2014:45) also defines methodology as the specific processes involving data collection, analysis, and interpretation that researchers adopt for their studies. The next sections present the different processes the approach followed.

3.4.1 Population

The population contains all the required elements that suit certain criteria for inclusion in the research (Gray et al. 2017:518). The data sources included country-level developed HIS, HMIS/M&E documents that were currently in use.

3.4.2 Sampling

Sampling is the procedure of choosing study units from a well-defined study population. Sampling is key to reducing the cost of the study and makes the study practicable (Fletcher 2014:6). Types of qualitative sampling include convenience, purposive, theoretical, selective, within-case and snowball sampling (Elo et al. 2014:4). A critical issue in qualitative research is selecting information-rich sources, to purposefully select study units (participants, sites, documents and visual material), which will address the research question (Creswell 2014:239).

This study used purposive criterion sampling to select information-rich documents according to the criteria set to address the study objective. The documents that contained relevant information making provision for the use of HMIS for HIV/AIDS monitoring and evaluation were identified through search key terms and support from the Federal Ministry officials. The documents were purposively selected based on the inclusion and exclusion criteria described below. The description of sampling is elaborated under the search strategy.

3.4.2.1 Inclusion criteria

- Documents making provision for the HIS, HMIS/M&E and HIV and AIDS programme.
- Documents directly guiding health-facility level data generation and management, and data use for the HIV/AIDS programme.
- Documents that were in use from 2008 up to 2018. Three categories of documents were distinguished:

a. Policy/framework documents were found directly related to the HMIS/M&E on the HIV/AIDS programme.
b. Strategic documents were related to the implementation plan and roadmap for successful implementation of the HMIS and HIV/AIDS programme.
c. The manual/guidelines to guide implementation as per the required standards.

3.4.2.2 Exclusion criteria

- Documents that were policy/framework/guidelines but not related to HIS, HMIS implementation and monitoring of the HIV/AIDS programme at the health facility level.
- Historical documents that have been amended or no longer in use.

3.4.3 Data collection approach and method

The evaluative case study involves systematic data collection. The data collection steps include setting the boundaries for the study, collecting information documents, and establishing the protocol for recording information (Creswell 2014:239). This study used qualitative document analysis (QDA) as a data collection approach and method. Wood et al. (2020:458) give various ways documents can be part of a multi-dimensional case, indicating various ways of analysis: on the individual level, some focus on the contexts in which documents are produced. This QDA enabled capturing of rich content and going further to analyse the object of the policies, similarities and points of emphasis in each.

3.4.3.1 Development of data extraction sheet

The researcher designed the data extraction tool according to the research question then reviewed and revised it using literature (Büchter, Weise & Pieper 2020:4). The matrix of the data extraction tool follows the question: how do policies, strategy and protocols guide the use of HMIS for HIV and AIDS monitoring and evaluation in Ethiopia? Wood et al. (2020:464) indicate the need for making justifiable decisions about gathering sufficient depth of information to answer the research question. In this regard, the researcher wanted to understand the policy and strategic emphasis in guiding the HMIS implementation and use to M&E HIV and AIDS programme and this guided the data extraction form. The tool was a cost-effective way of data collection to support evidence in a structured way. Creswell (2014:240) indicates the data collection form needs to be specific about types of information to be included. The data extraction form was designed with the type, name and date of the document, the intended recipients, objectives in relation to HMIS, key issues in relation to data processes, and key issues in relation to the use of data for the HIV/AIDS programme (see Annexure F).

3.4.3.2 Data collection process/Data extraction

- **Search strategy**

All the documents relevant in this study are in grey literature databases and not conventional peer-review databases. This involved government and other websites. Identification of relevant electronic sources was conducted in consultation with the librarians from the university. Numerous keywords were used to obtain literature on the HIS/HMIS, M&E, and HIV/AIDS. The search criteria included full text published reports, policies, guidelines/manual, and strategic/planning documents from 2008 to 2018 and the entire process was documented for transparency, to be replicable and for possible reanalysing (Bengtsson 2016:10). 2008 was the year that HMIS was implemented in the country.

The researcher also contacted relevant officials to identify responsible bodies holding the documents in their archival system. The responsible agencies identified were the M&E directorate at the Ministry of Health [Ethiopia] and the HMIS/M&E coordinator at the regional health office level. The researcher contacted and requested the documents from the Ministry of Health [Ethiopia] and the regional health office.

49 documents were collected from the archival system and online websites. A form of preliminary content analysis was conducted to identify information-rich documents (Wood et al. 2020:460). The documents were checked according to the inclusion and exclusion criteria. Finally, ten documents met the criteria. All documents were recorded, numbered/labelled with the alphabet and numbers starting from D1 up to D10 and arranged for analysis according to Table 3.2. Quality assessment of the documents was not conducted as they were government papers, not scientific papers.

Table 3.2: The selected documents

S. N	Document Name	Author's name, date and type of document	Document label
1.	Health Management Information System (HMIS) / Monitoring and Evaluation (M&E)	Federal Ministry of Health [Ethiopia], 2008, Strategic	D1
2.	Health data quality training module	Federal Ministry of Health [Ethiopia], June 2018 Manual	D2
3.	DHIS2 IMPLEMENTATION PLAN	Federal Ministry of Health [Ethiopia], July 2017, Plan	D3
4.	National HIV/AIDS Monitoring and Evaluation Framework and cost Plan 2015-2020	Federal Ministry of Health [Ethiopia] & Federal HIV/AIDS prevention and control office, July 2017, Framework	D4
5.	HIV/AIDS STRATEGIC PLAN	Federal HIV/AIDS prevention and control office & Federal Ministry of Health [Ethiopia], December 2014, Strategic	D5
6.	HMIS Information Use Guide	Federal Ministry of Health [Ethiopia], May 2013 Guideline	D6
7.	HMIS Procedures Manual: Recording and Reporting Procedure	Federal Ministry of Health [Ethiopia], June 2018, Manual	D7
8.	Information Revolution Road map	Federal Ministry of Health [Ethiopia], April 2016, Strategic	D8
9.	Information use training module	Federal Ministry of Health [Ethiopia], June 2018, Manual	D9
10	National Health Information System Road Map	Federal Ministry of Health [Ethiopia], 2012, Strategic document/road map	D10

- **Data extraction**

Data extraction techniques collect the text in free form by extracting the most valuable and relevant information in a structured format (Adnan and Akbar 2019:6). In this study, data were extracted by selecting relevant parts of information from the document and pooled together on OneNote before being exported to the data extraction form in preparation for content analysis.

3.4.4 Data analysis

The study utilized qualitative content analysis. Data were presented in words and themes, which made it possible to draw some interpretation of the results (Bengtsson 2016:10). Krippendorff (2004:24) defines content analysis as "a research technique

for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use. The HMIS implementation as a case needed to be understood within the context of the country legislation and the understanding and views of key users. To understand the content, diverse reasoning strategies were applied. These were inductive reasoning, analysis, and synthesis. In the inductive approach, the organization phase included open coding, creating categories, and abstraction (Elo et al. 2014:2). The researcher used analysis software Atlas.ti.version 8 for coding qualitatively (Creswell 2014:246). This computer software increased the stability and reliability when the coding process and number increased due to the easy locating of codes and grouping data together in categories (Bengtsson 2016:11).

Four main stages of content analysis, namely, the de-contextualisation, the re-contextualisation, the categorisation, and the compilation, were followed. During the de-contextualisation stage, the researcher familiarised himself with the document by repeatedly reading it up to smaller meaning units until the researcher understood the document's central ideas and points (Erlingsson & Brysiewicz 2017:94). The re-contextualisation stage was when the researcher checked that the study objective is well addressed from the coding output.

In the categorisation stage, the abstraction/theme and categories were identified by considering the frequency of codes, not losing the background and context of data (Vaismoradi & Snelgrove 2019:7). In the final step of the compilation stage, the researcher presented a summary of themes, categories and sub-categories. The analysis and reporting component of the findings were presented in a meaningful and useful way, organised to give a concise summary of key results (Elo, Kääriäinen, Kanste, Pölkki, Utriainen & Kyngas 2014:60; Erlingsson & Brysiewicz 2017:94). As a final check, the researcher controlled the new findings with literature (Bengtsson 2016:12). Chapter four presents the findings.

3.5 PHASE TWO RESEARCH METHOD

3.5.1 Population

The population for this phase is referred to as stakeholders at the public health facility. These are professionals using the country's HIS and implementing the HMIS, such as those who mainly produce data (HMIS staff like data clerks, HIT, and the HMIS/M&E

focal person who generate data for information use), and others who mainly use data for the HIV/AIDS programme monitoring and evaluation (clinicians and the facility management team).

3.5.2 Sampling

A non-probability sampling process was used to select well-informed and experienced participants. This study chose purposive critical case sampling techniques to recruit participants (Gray et al. 2017:539). The rationale for using critical case sampling was that a small number of informants could be the source of theoretical saturation thus, being decisive in explaining health management information system processes in these facilities (Patton 2015:67). Data saturation is the guiding principle for sampling in qualitative research. The degree of data saturation is sampled to the point where it is impossible to obtain new information and achieve redundancy. In this study, the recruitment of research participants was continued until the data was saturated. Therefore, the sample size for the qualitative aspect was not predetermined.

Patton (2015:264) reasons that the power of purposeful sampling lies in choosing information-rich cases for in-depth study. Information-rich cases are “those from which one can learn a great deal about issues of central importance to the purpose of the inquiry”. Participants were identified from health facilities that provide HIV and AIDS service, have a high patient load, and have much experience toward HMIS implementation for the HIV/AIDS programme (see details in Section 3.3.1). The regional health bureau (RHB) manages 98 public health centres, and six hospitals provide health services to residents of the city. The public health facilities were selected based on the HIV/AIDS programme activities and the HMIS implementation status. The researcher requested a list of facilities from the regional health bureau (RHB) working on the HIV/AIDS programme entailing the years of service with HMIS implementation and the HIV and AIDS patient load (see table 3.1). All participants were included from selected facilities centres based on the following inclusion and exclusion criteria.

3.5.2.1 Inclusion criteria

Eligibility criteria include all the features that a subject or element must have to be included in the study population (Gray et al. 2017:331).

In this phase, the criteria included the following:

- Working on the HMIS and related activities, mainly producing data in the selected facility.
- Mainly giving service, support, and decision-making toward HIV and AIDS programmes (nurses, health officers, doctors working as directors/ head/focal persons for a health facility, disease prevention, ART, voluntary counselling and testing, and prevention of mother to child transmission).
- Those who have been working on the HMIS and related areas having the service time for at least 12 months.

3.5.2.2 Exclusion criteria

Gray et al. (2017:331) define exclusion criteria as all the “characteristics that can cause the person or an element to be excluded from the target population”.

In this phase, the criteria excluded the following:

- Staff who are not working with the HMIS or in HIV and AIDS service.
- Other staff not involved in data generation and use.
- Those who have been working on the HMIS and related areas having the service time less than 12 months.

The sample consisted of the willing and available population who met the criteria identified from the selected health facilities. Homogeneity was maintained through the selection criteria. Sixty-four participants were recruited. They were differentiated according to their key role and HIS tasks.

3.5.3 Data collection approach and method

3.5.3.1 Development and testing of the tool

In this study, the semi-structured interview was used for focus group discussions. Semi structured in-depth interviews are frequently applied in qualitative research and are the most common qualitative data source in health services research (DeJonckheere & Vaughn 2019:1). Focus groups are defined as “carefully planned discussions of 4–12 participants designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment” (De Vos, Strydom, Fouche & Delport 2011:374). The purpose or rationale of a focus group is when there are questions related to “why and how”. The focus group interview is very significant when the researchers do not have considerable information about the subjects and to discover the people‘s understanding and practices about the matter and details behind their particular way of thinking (Dilshad & Latif 2013:192). It is commonly accepted between six and eight participants are satisfactory for focus group interviews (Nyumba, Wilson, Derrick & Mukherjee 2018:23). The size and composition of the sample ranged from seven to nine for each FGD interview.

Focus group interviews were suitable for this study to further explore the views of stakeholders to understand data generation and management. It was important to start the interviews with those who mainly generate data in order to know the context in which information is produced. It allowed all participants to freely share relevant information regarding HIV data generation and information used for decision making.

The findings from phase one of qualitative document analysis guided the refinement and finalisation of the focus group discussion interview guide. The researcher ensured alignment between the research questions and areas of questioning. The interview guide had three major questions on HMIS knowledge and understanding, use of policies for data generation and culture of information use and five key questions on understanding HMIS data use, policies on the use of data, the condition of data used for the HIV and AIDS programme, and factors and challenges affecting the HMIS data usage in HIV/AIDS monitoring and evaluation. The focus group discussion interview tool developed and used is appended (Annexure H). The interview guide was developed in English and then translated to an Amharic version (Annexure I). During

translation, the researcher and language professional translated it independently and compared different versions for consistency and similarity of wording (Tsang, Royse & Terkawi 2017:S84). Amharic and English versions were compared, and the final version was pretested before it was utilised for focus group discussion interviews (FGD). One FGD group was used as a pilot study and restructuring of questions followed this.

3.5.3.2 Data collection process

The focus group interview data were collected from December 01, 2018, up to March 31, 2019. Before conducting the focus group discussion interview, approval of the health facility manager was sought and provided with ethics clearance and an information leaflet (Annexure G). The regional health bureau (Annexure D) granted the researcher permission to study. Researchers considered participants' comfort, access to the venue, and levels of disturbance during interviews (Nyumba et al. 2018:23). The meetings were conducted in a suitable venue that provided privacy and was convenient for most participants.

The participants who were willing to participate in the study signed informed consent forms (Annexure G), which outlined the purpose and processes of the study. The researcher outlined the rules for the discussions, such as that only one person was allowed to talk at a time, mobile phones had to be put on silent, and participants had to raise a hand when needing to speak. It was essential to build rapport with the participants; the researcher presented a general question followed by specifics.

The researcher specified that there would be no wrong or right answers during the interview. This permitted them to talk freely and give their opinions. Notes were taken, and all the sessions were recorded, with consent to record sought before the time. The use of tape recording offers the benefit of retrieving a full record of a possible rich source of data (Dilshad & Latif 2013:196). Participants were allowed turns to raise their opinions, ensuring that one participant would not dominate the sessions. The researcher followed the cues or leads for further probing the participants during the discussion. This allowed all participants to actively share information regarding HIV data generation and information use in HIV/AIDS monitoring and evaluation. Field

notes were taken by an assistant who signed a confidentiality agreement with the researcher to ensure the ethical principles were observed.

Each group interview took roughly 1–2 hours, based on the participation. Follow-up sessions were organized until data saturation was achieved. Finally, eight FGD was conducted with 64 participants from nine public health facilities.

3.5.4 Data analysis

Data analysis in qualitative studies is “constructivist” in nature, with the aim to know how individuals construct reality within their context (Polit & Beck 2012:562). According to Creswell (2014:245), the process of data analysis begins during data collection and continues up to the writing up of the thesis report. The qualitative data were thematically analysed with the support of ATLAS.ti. Version 8 software. The researcher maintained the quality of the process by assuring trustworthiness throughout all data the analysis steps (Wood et al. 2020:463).

3.5.4.1 Organising and preparing data for the analysis

The researcher organised the recordings from the focus groups and transcriptions. The audio recorded data were translated and transcribed by a language professional with a Master of Arts degree in linguistics and experience in data transcription for research studies. The researcher entered an agreement with the transcriber to maintain the ethical issue regarding data confidentiality. The transcripts were numbered separately for each FGD. Data producers’ focus groups were numbered one to four and labelled: DP G1 to DP G4. Data users’ focus groups transcripts were also numbered one to four and labelled: DU G1 to DU G4.

3.5.4.2 Reading and coding of all the data

The researcher repeatedly read the written data to immerse himself in it and find its meaning. The researcher used ATLAS.ti. Version 8 software to develop broad topics which were condensed into the descriptive codes. The software allowed managing, coding, and grouping in a thematic analysis. According to Gray et al. (2017:430) cited from Corbin and Strauss (2015:58), qualitative data analysis is “both the code and the thought processes that go behind assigning meaning to data”. Coded sections were

repeatedly read to align with the research questions. The computer software assisted in the grouping and classifying coded data to develop sub-categories, categories, and themes.

3.6 PHASE THREE RESEARCH METHOD

As described in Section 3.2.4 above, this phase involved the development of the framework and using the modified Delphi Technique to seek consensus from experts and validate the framework. Details of the validation process are described in Chapter 6.

The following diagram presents the steps that were used in developing the framework:

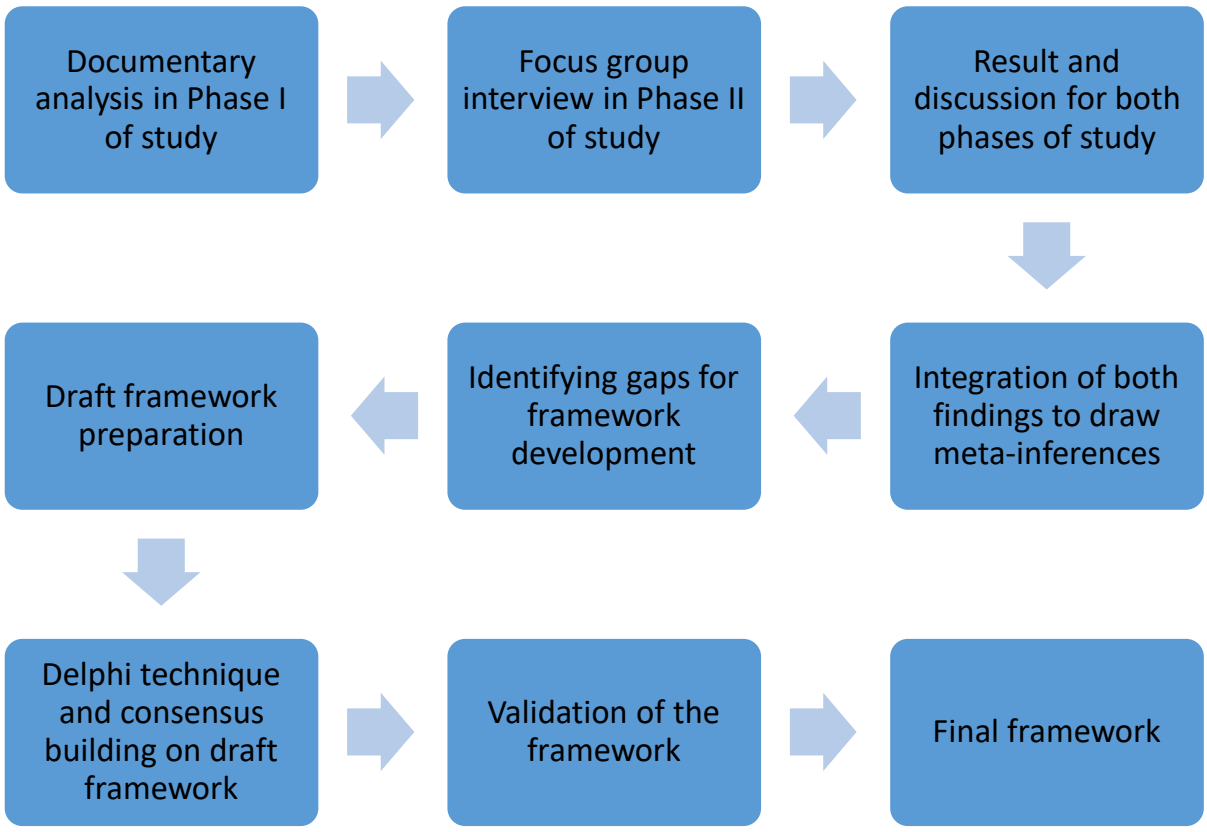

Figure 3.3: Steps for Framework development

3.7 ETHICAL PRINCIPLES

Ethical measures are as vital in qualitative research and hold ethical conduct towards participant's data as well as genuine writing of the results. The application of ethics arises with identifying a study topic and lasts through publication of the study findings (Gray et al. 2017:265). The ethical measures in this study were followed to protect

the rights of the institutions, the rights of participants, the dissemination of findings and scientific integrity.

3.7.1 Protecting the right of the institutions

Creswell (2014:134) recommends that researchers have their research proposals reviewed by an institutional review board (IRB) on their college and university campuses. The researcher secured ethical clearance from the Research and ethics committee of the department of health studies at the University of South Africa (UNISA) after fulfilling all their requirements (Annexure A). Then the researcher's request for permission to conduct the study was sent to the Addis Ababa Health Bureau of the Addis Ababa Region in Addis Ababa. Written consent was also obtained from the Addis Ababa health bureau for health facilities (see Annexure D), where the study was conducted.

3.7.2 Protecting the rights of the participants

The rights of the participants were protected in the areas of informed consent, justice, privacy, autonomy, confidentiality, beneficence, non-maleficence, and anonymity.

3.7.2.1 Informed consent

The researcher respected participants as sovereign human beings, thus permitting them to make sound decisions regarding participation in the study (Gray et al. 2017:274). The researcher obtained written permission (informed consent) from participants for the focus group discussion interview and Delphi experts (see annexure G & K) (Gray et al. 2017:301). For the Delphi consensus-seeking process, informed consent was included in the first round of the online questionnaire and completing and returning the questionnaires were considered as giving consent (Annexure L). The participants were informed about the study purpose, data collection procedures and benefits and risks of participation through leaflet and verbal communication. They asked for clarification before giving consent. Their right was clarified to them before the commencement of the study.

3.7.2.2 Justice

Justice refers to fairness, where the potential benefits of the research outweigh the risks (Corneli & Borasky 2015:3). The principle of justice holds that human subjects should be treated fairly (Gray et al. 2017:271). To respect the principles of justice, the researcher used an appropriate selection procedure and participants were informed of their rights.

3.7.2.3 Privacy and anonymity

Privacy denotes the freedom an individual has to regulate the time, scope and general conditions under which private information will be withheld or shared with the audience (Gray et al. 2017:282). In this study, the researcher kept their privacy by not exposing their names during interviews and protecting the raw data by using codes instead of names. The findings of the result are not linked with the name of health facilities and participants. The researcher clarified the role of assistants.

Anonymity means that even the researcher cannot link a subject's identity to that subject's individual responses (Gray et al. 2017:286). No names were attached to the information obtained in this study, but codes were used. Before submission, the signed consent form was detached from the FGD interview guide or notes. Anonymity is assured because the results do not indicate the participants' names.

3.7.2.4 Autonomy

Gray et al. (2017:300) describe participants as autonomous individuals capable of understanding and weighing the benefits and risks of a proposed study. The researcher respected the dignity and autonomy of participants at all times. They were free and legally capable of deciding whether to participate or withdraw from the study and to make an independent decision, and their self-determination rights were respected. The participants were allowed to participate voluntarily without coercion.

3.7.2.5 Confidentiality

Gray et al. (2017:286) describe confidentiality as the researcher's management of private information shared by a subject that must not be shared with others without

the subject's authorisation. In this study, confidentiality was protected by guaranteeing data attained were used so that no other person than the researcher and assistants had access to the raw data records and notes. The researcher kept them in a secure place.

3.7.2.6 Beneficence and non-maleficence

Beneficence is about activities to “minimize possible risks and maximize possible benefits” (Corneli & Borasky 2015:3). It is always important to keep the safety of study participants in mind. They should not be exposed to any harm because of their participation in research. In this study, maximum care was engaged to avoid risks and take full advantage of potential benefits to participants.

3.7.3 Ethical consideration in the dissemination of results

The study report avoided disclosing information that would harm participants or misuse the results to the advantage of one group or another (Creswell 2014:139). This research did not expose the confidential information or weaknesses of the health facilities to the readers, but it suggested advancements in the health service. The participants were informed that a copy of the research report would be handed to the regional health office and the health facilities where the study was conducted. The findings will be published in relevant journals.

3.7.4 Scientific integrity

Gray et al. (2017:309) indicate that scientific integrity is maintained by generating scientific knowledge through the honest conduct, reporting, and publication of studies. The researcher respected the work of others by acknowledging the source. To avoid plagiarism, all references are properly acknowledged. The researcher followed the accepted standard of research and was honest while collecting, analysing, and reporting the study.

3.8 TRUSTWORTHINESS OF THE STUDY

Lincoln and Guba (1985:293) identified four criteria to ensure the trustworthiness of a qualitative study. These are credibility, transferability, dependability, and confirmability. The trustworthiness of this study was safeguarded by applying these four criteria according to Table 3.3.

Table 3.3: Measures to enhance the trustworthiness of the study

Criteria for trustworthiness	Current research study
Credibility: The confidence that can be placed in the truth of the research findings (Korstjens & Moser 2018:121). The trustworthiness, plausibility, and good character of a researcher and of his/her study, which impacts the believability of the research findings (Tracy 2013:248). Credibility increases by prolonged engagement with data participants, reflexivity, triangulation, peer and participants debriefing, and member checks (Lincoln and Guba 1985:293).	The researcher increased credibility by prolonged engagement with participants during focus groups interviews until data saturation occurred. One moderator and one assistant facilitator checked the information consistency between notes and the scripts for each focus group for having confirmation that the information collected is a true reflection of their ideas, views, and experiences. During data collection, the researcher provided a summary of key findings for participants to confirm that they were true reflections. Further, the researcher made an effort to put aside his own preconceived ideas and personal biases and also, the researcher is trained in health systems and has experience implementing the health information management system.
Dependability: It refers to the consistency or stability of findings over time (Wood et al. 2020:463). Dependability is seen through obtaining credibility of the findings (Lincoln & Guba 1985:316).	The researcher provided a detailed description of the process used, like the procedure and purpose of selecting participants, method and length of data collection procedure, data analysis, and presentation. The supervisor assessed the research methods and procedures. An audit trail was created so that the supervisor could cross-check both the research methods and the researcher's interpretations. Participants' verbatim statements enhanced dependability.
Confirmability: According to Polit and Beck (2017:724), confirmability refers to the degree to which the results could be confirmed by other independent reviewers. It is also the degree to which the findings of the research study could be confirmed by	The researcher remained truthful to academic and ethical obligations. The researcher kept field notes and audio-tape records in a secured area from September 2018. A thick description of data was put together according to themes and categories, and an initial analysis was made to characterise participants' views and personal

Criteria for trustworthiness	Current research study
other researchers (Korstjens & Moser 2018:121).	experiences of HMIS use in HIV/AIDS programme monitoring and evaluation. The researcher also pursued validation from the participants that the interpretations were a true reflection of their views and experiences regarding the developed framework.
Transferability: Wood et al. (2020:463) state that transferability is also named "applicability" for it decides whether the research outcomes are applicable in or are transferable to similar contexts. It is the likelihood of research findings being generalised in other similar contexts or other respondents. The researcher facilitates the transferability judgment by a potential user through thick descriptions (Korstjens & Moser 2018:121).	The study results can be transferred to other similar settings or contexts due to the thick description of findings and clear description of the research method. The researcher reached out to the participants with experience and knowledge of the HMIS implementation for the HIV and AIDS programme. Recommendations for the HMIS programme improvement in the developed framework were specific to the Addis Ababa health facilities. And yet, having detailed descriptions of the research methods and data, the recommendations could be implemented in other regions of Ethiopia. The transferability was further enhanced by using statistical techniques in the analysis of data from experts in Phase 3 of the study. The researcher worked on the amendments and developed the final framework for strengthening HIV monitoring in the health facilities.

3.9 SUMMARY

The chapter described the research design and procedures, methods, the study population, samples, and sampling techniques. The data collection methods, the study phases and the data analysis procedures were also presented in detail. The trustworthiness of the research and ethical issues carefully considered during the research procedures were also discussed in detail. Chapter 4 discusses the research findings from the document analysis, focus group interviews with data producers and users with reference to the literature review.

CHAPTER 4 PRESENTATION AND DESCRIPTION OF THE RESEARCH FINDINGS

4.1 INTRODUCTION

This chapter presents the research findings for phases one and two. Themes, subthemes, and categories that emerged are presented and substantiated by verbatim statements from the documents and participants. Literature is used as a basis to compare and contrast emergent data (Creswell 2014:29). Part one presents findings from policy, strategy, and protocols/manuals and the second part data from focus group (FG) interviews. The focus for phase one was on how these policy documents guide the use of the HMIS for HIV/AIDS monitoring and evaluation in Ethiopia. Phase two intended to examine how the HMIS is used to generate relevant and reliable data and explore stakeholders' views regarding technical, organizational, and behavioural factors that influence the use of HIV/AIDS health information.

4.1.1 Flow diagram for the document search process

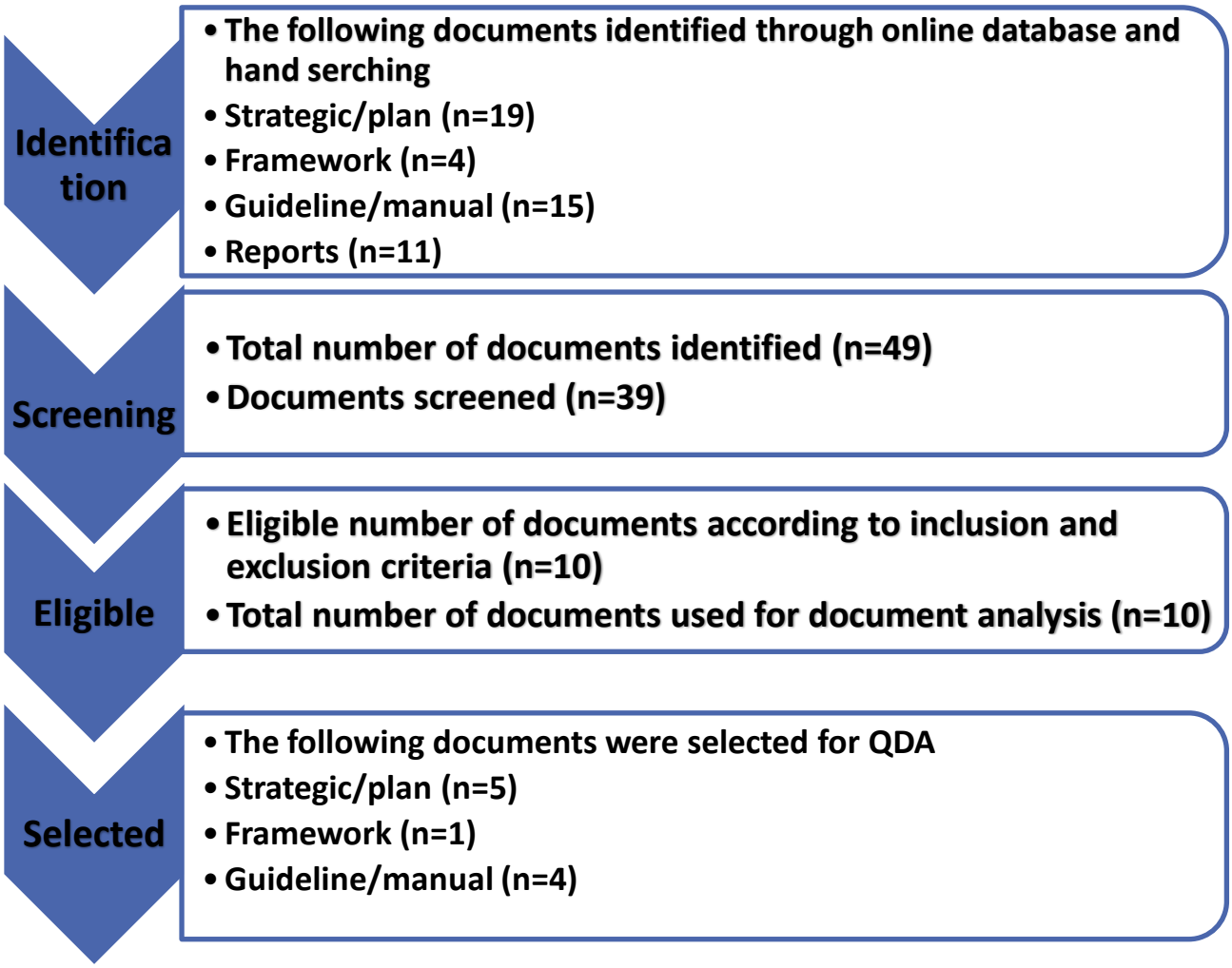

Figure 4.1: Flow diagram for the search process of documents

4.1.2 Description of number and types of documents analysed

The documents were produced by the Ethiopian federal ministry of health (FMOH) and the Federal HIV/AIDS prevention and control office (FHAPCO). The table below provides detailed information about the types of documents in terms of publisher, date, and focus areas.

Table 4.1: Summary of the selected document

S. N	Document Name	Key content related to HIS	Author's name, date, and type of document
1.	Health management information system (HMIS) / monitoring and evaluation (M&E). Document 1=D1	Support decentralized, action-oriented, evidence-based decision making, resulting in: − use of evidence-based M&E by managers and health workers at all levels of the health system to plan, monitor, and improve performance. Use of appropriate technology, information use and quality of information, HMIS training. The target audiences are all persons working in the health care system of Ethiopia toward improvement, but the focus is given to HMIS units and health facility managers.	Federal Ministry of Health [Ethiopia], 2008, Strategic
2.	Health data quality training module Document 2=D2	Completeness, timeliness of information, timeliness and completeness tracking, data legibility, data accessibility, precision, confidentiality, data integrity, data relevance, quality assurance, data quality assurance technique. This guide targets all staff working in the health care system of Ethiopia.	Federal Ministry of Health [Ethiopia], June 2018 Manual
3.	DHIS2 implementation plan Document 3=D3	eHMIS applications, steering committee, DHIS2 rollout objectives, switching from the existing eHMIS application, the DHIS2 customization, Ethiopian calendar issues, DHIS 2 pilot-testing, DHIS2 at health centres level. The target audiences are staff working at the HMIS unit at all levels of the health care system of Ethiopia.	Federal Ministry of Health [Ethiopia], July 2017, Plan
4.	National HIV/AIDS monitoring and evaluation framework and cost Plan 2015-2020	Monitoring and evaluation system, HIV/AIDS strategic plan, national HIV and AIDS M&E framework, national monitoring and evaluation system, development of the M&E framework, general objective of this M&E framework. The target audiences are HMIS and programme staff working in the	Federal Ministry of Health [Ethiopia] & Federal HIV/AIDS prevention and control office, July 2017, framework

	Document 4=D4	HIV and AIDS programme at the health facility and each hierarchy level of office.	
5.	HIV/AIDS strategic plan Document 5=D5	The HIV investment case, health system strengthening, performance measurement, and priority areas in the six years of implementation. The target audiences are staff working in the HIV and AIDS programme at the health facility and each hierarchy level of office.	Federal HIV/AIDS prevention and control office & Federal Ministry of Health [Ethiopia], December 2014, strategic
6.	HMIS information use guide Document 6=D6	Health information, the purpose of HMIS, indicator, HMIS indicators selection, data quality dimensions, data confidentiality, data accuracy, report timeliness, report completeness, lot quality assurance sampling (LQAS), LQAS decision rule table, major possible cause of data discrepancy, actions needed to be taken to improve data. The target audiences are all health workers, programme managers, process owners and other stakeholders.	Federal Ministry of Health [Ethiopia], May 2013 guideline
7.	HMIS procedures manual: recording and reporting procedure Document 7=D7	Health system building blocks, health system, primary level health care, secondary level health care, tertiary level health care, health information system (HIS), components of HIS, health management information system. The target audiences are health care staff and managers at all levels of the health system.	Federal Ministry of Health [Ethiopia], June 2018, manual
8.	Information revolution road map Document 8=D8	Information Revolution, quality of data, reformed HMIS, use of ICTs, gaps in knowledge and skill of HP, information use, lot quality assurances sampling (LQAS), performance monitoring, shortages of HIT personnel, performance improvement framework, electronic health (eHealth). Target audiences are all level health facility managers and staff.	Federal Ministry of Health [Ethiopia], April 2016, strategic

9.	Information use training module Document 9=D9	Information use and quality of information, data demand, data use, the culture of information use, information use at the facility level, determinants of Information use, data analysis, interpretation, data presentation techniques, DHIS2 visualizer, key point on data interpretation process. It is also expected to enable health care providers and managers at all levels of the health system to monitor performance.	Federal Ministry of Health [Ethiopia], June 2018, manual
10	National health information system road map Document 10=D10	HMIS and evidence-based decision, national HIS road map, routine HIS, HMN framework and standards, data management. The target audiences are various sectors and agencies of the government and health development partners to own.	Federal Ministry of Health [Ethiopia], 2012, strategic document/road map

Overall, the documents selected describe the HIS, HMIS and M&E. Data were extracted based on the focus and objectives of the study. Currently, the country is more focused on developing strategic documents, and half of the documents reviewed were strategic documents. Almost one third (n=3) of the selected documents directly address the HIS and HMIS. The other documents partially address both the HIS and HMIS. Two of the documents produced by the Federal HIV/AIDS prevention and control office are more focused on describing the HIV and AIDS implementation. The study shows the inter-connected regulatory framework for the HIS, HMIS and M&E in the HIV/AIDS programme.

4.2 PRESENTATION OF FINDINGS

Three themes and six categories with their subcategories emerged from the qualitative content analysis.

Theme 1: Quality data generation and reporting.

Theme 2: Availability of resources and functionality of the HMIS/M&E system.

Theme 3: Data demand and use.

4.2.1 Theme 1: Quality data generation and reporting

In Theme 1, two categories emerged, namely, data generation and management and data quality. The findings indicate the importance of policy documents on data management processes and data quality. Table 4.2 presents categories and subcategories.

Table 4.2: Theme 1. Quality data generation and report

Theme	Category	Subcategory
Quality data generation and reporting	Data generation and management	Data Sources
		Data collection
		Data safety
		Data Analysis
		Electronic data generation
		Data display/presentation
		Reporting
	Data quality	Significance of data quality
		Data quality checks
		Lot quality assurance sampling
		Supervision and feedback

4.2.1.1 Category: Data generation and management

In the category “data generation and management”, seven subcategories related to data processes emerged: data sources, data collection, data safety, data analysis, electronic data generation, data display/presentation, and reporting. There is an interrelationship between these sub-categories. Therefore, only relevant or specific content was analysed.

4.2.1.1.1 Data sources

Findings showed that the HMIS relies on data collected at different healthcare levels and from several sources, reflected in several documents: service delivery, finance, human resources, logistics, and disease trends. These include various organisations

in both public and private entities, the significance of interoperability between these different sources is acknowledged. However, nothing could be found outlining how interoperability needs to be achieved.

The emphasis seems to be on the following:

> "Data sources of the Ethiopian HIS at facility level Health centres (HCs), Hospitals and private health facilities: Routine HMIS report & surveillance report from Public Health Emergency Management (PHEM), facility-based researches (sic) and surveys." D7

> "Data Collection Routine information system data sources use various standard recording tools to capture data and these tools could be log sheets, registers, tally sheets." D4

> "Establish an interoperable architecture to strengthen integration, standardization and harmonization among priority data sources and health information systems." D8

Greenwell and Salentine (2018:8) give emphasis in aligning data sources as that will rise the HIS effectiveness to identify health inequalities, monitor health service delivery and people health status and allocate health finances to realise universal health care. Health information systems (HIS) accumulate information that is collected from patient records, health plans, surveys and other data sources. The obtainability of public health data in the healthcare system allows: improved data storage, quick information retrieval timely, fast information sharing, improved information and appropriate healthcare decisions to be made (Kassa & Grace 2018:2).

4.2.1.1.2 Data collection

The HMIS procedures manual document identifies data collection tools for the HIV/AIDS programme. These are the antiretroviral therapy register, antiretroviral therapy and regiment tally sheet, pre-antiretroviral therapy register, PEP register, provider initiated counselling and testing tally sheet, voluntary counselling and testing register and tally sheets, and prevention of mother to child transmission register and tally sheets. The review revealed that the focus is on the recording of client information and maintenance of records. In addition, routine data generated by HMIS tools at the

service level should be used to improve the programme. The need to improve the availability of such tools is highlighted in the documents.

Specific documents for capturing information are listed:

> "Currently data on clinical HIV prevention and care & treatment data is recorded using the HMIS tools and the nonclinical part is captured using MRIS recording formats." D4

> "…antiretroviral therapy register is used to record and document data for PLHIV who are on HIV treatment….Pre-antiretroviral therapy register is used to record and document data for patients who are HIV positive until they start antiretroviral therapy… Provider Initiated Counselling and Testing tally sheet is used to document provider-initiated counselling and testing and its result…voluntary counselling and testing register is used to record and document data of people who came for voluntary HIV counselling and testing." D7

> "The objective of data generation is for local use of information to decide actions to be taken to improve performance. A continuous supply of these instruments must be assured so that data will be consistently recorded and reported over time and across locations." D1

> Data accessibility means all necessary data are available when needed for patient care and for all other official purposes." D2

> "…use various standard recording tools to capture data as the service is provided to beneficiaries and these tools could be log sheets, registers, tally sheets." D4

MEASURE Evaluation (2014a:36) indicates the need for a supportive environment for ownership and sustainability of M&E. there must be directives that include partnerships, human power, and planning, which are essential to strengthen data collection and use. The lack of shared data collection standards threatens effective data collection and reporting when using different systems. This has the potential to be reliable reporting (Braa et al. 2007:382). However, Kassa and Grace (2018:7) argue that the Ethiopian healthcare system shows a lack of standardised protocols for data collection, a poor level of HIS utilisation, and the lack of a well-functioning HIS. Callen (2016:4) indicates guidance regarding strategies to advance data collection

processes, underlining the significance of infrastructure planning and governance, information and technology and staff education and training.

4.2.1.1.3 Data safety

Data security is an important feature of any health information system. The documents showed that the data collected need to be relevant, simple, accessible, and confidential. This is to ensure efficiency in the management of resources and increase the clients' trust that their health data is safe and that no unauthorised individual will have access to it. Systems should be upgraded to ensure only authorized users have access to health data.

> "Data confidentiality means that clients are assured that their data will be maintained according to national and/or international standards for data." D6

> "… Personal data are not disclosed inappropriately, and that data in hard copy and electronic form are treated with appropriate levels of security (kept in locked cabinets and in password-protected files)." D2

The safety and security of health facility records is a challenge to personnel in-charge of patient records. It shown that there were several instances where case notes were not preserved in secure conditions (Garba 2016:8).Technological developments will also contribute, through the support of privacy and security options, to enhanced use of health data in order to update health system decision making. In the preoccupation of policy makers or order emphasis given to electronic collection of personal health information to improve the security and privacy of personal data. Fortunately, employers are beginning to have tools to safeguard the safety guide of healthcare data security and the secrecy of private healthcare information (Mbonihankuye, Nkunzimana & Ndagijimana 2019:3).

4.2.1.1.4 Data analysis

Data analysis is shown as one of the fundamental processes in data management.

Users are familiarised with the process of data analysis, its importance, and its uses. This would enable stakeholders to summarize and compare data across different units

or levels, identify trends and gaps. Examples of what programme managers can do with data are provided.

> "Data analysis and presentation is a process of interpretation and comparison of generated information in the form of sentences, tables and graphs." D7

> "Data analysis is the process of systematically applying different techniques to describe, summarize and compare data. It is the iterative process of examining data for patterns, trends, and comparisons…the program manager will compare the antiretroviral therapy target with the actual performance for the specific time period." D9

Careful analysis of quality data and consideration of data elements will inform meaningful performance improvement activities (Abernethy, Gippetti & Rohit 2019:534). This will support the interpretation and use of information at the district and facility levels (Nicol, Bradshaw, Uwimana-Nicol & Dudley 2017:36).

4.2.1.1.5 Electronic data generation

The implementation plan D3 outlines the advantages of the digitization of the HMIS. Public health facilities are encouraged to implement the electronic HMIS (eHMIS) application governed by the Federal Ministry of Health [Ethiopia]. This would facilitate the integration of various systems such as DHIS2. Weaknesses have been observed in terms of infrastructure and skilled manpower. This points out the need to re-skill the existing users and integration of the systems.

> "Despite significant progress made towards scaling up the eHMIS applications to all health facilities in the country, various assessments and supportive supervisions identified major gaps in required infrastructure, skilled manpower, data quality, and information use…Switching from the existing eHMIS applications to DHIS2 requires time and other resources." D3

> "Establish central database and enhance integration of HAPCO and health sector at all levels in HIV program monitoring" D1

Equitable healthcare can be attained using Information and Communication Technology (ICT) to collect, store and analyse data to reach at treatment preferences

and interventions (Qureshi 2016:5). In low-resource settings the use of electronic health records is given low priority among funders and decision makers, however very high rates of lost to follow up in HIV/AIDS care and treatment are attributable to an information handling challenges, which can benefit from using ICT (Shiferaw & Zolfo 2012:6).

Southern Ethiopia MEASURE Evaluation's scale-up project reported that there are vast data that are produced daily, monthly, or annually. Such huge data elements are poorly managed and difficult to draw timely and relevant data without the aid of an electronic data management system (Kebede et al. 2020:3). The Federal Ministry of Health (FMOH) implemented the Electronic Health Management Information System (eHMIS) in 2010 with the objective of capturing, processing, and presenting health data based on the national core indicators embarked on to measure the provision of health services and ultimately improve the health conditions of the population (Ministry of Health [Ethiopia] 2017b:4).

4.2.1.1.6 Data display/presentation

Accessibility of information is another important task captured in the documents.

Documents highlighted the importance of information sharing through charts and tables. These should be visible and readily available at each health facility to enable ease of information use.

The following statements were extracted from the documents to show the emphasis:

> "Accessible different data presentation techniques from display charts in the health institutions to stakeholders and mass media." D8

> "Data presentation is the systematic process of making information available and accessible to potential users, stakeholders and/or beneficiaries." D9

Fisher and Myers (2011:8) indicate that the health department presents data in maps, tables, charts, and graphs. Maps are now also routinely used in presentations as a means of clearly and succinctly explaining key health data. In Ethiopia, staffs usually

displayed the catchment area map and summary of demographic information such as patients by age group (Chanyalew, Yitayal, Atnafu & Tilahun 2021:6).

4.2.1.1.7 Reporting

Data need to be communicated by various means. Most of the documents emphasised and outlined the procedures and processes of reporting on specific indicators in the form of period and annual reports. This is a requirement of international agencies. Therefore, the reports should flow through the correct channels to the ministry which is charged with global reporting. The quality of data and timeframes for reporting must be observed.

> "The annual report will cover the performances achieved ... The report will also include the way forward for better implementation in the future…Ethiopia will contribute to global reporting ..." D4

> "Report Completeness: this helps to examine the total reports received from all health facilities from the total reports expected for a given period of time. All health posts and Health facilities are expected to send monthly, quarterly and annual service reports once in a year." D2

> "The data from health facility levels is regularly sent to next reporting system. Overall, eighty-seven percent (sic) of health facilities report data through the government reporting system." D10

Kebede et al. (2020:3) stressed a need to use the electronic health management information system (eHMIS) for reporting as it satisfies the needs of the local system. However, the authors showed that in Ethiopia, report timeliness and content completeness were lower than the international standards.

4.2.1.2 Category: Data quality

In the category of "data quality", the subcategories that were associated with data quality in the documents indicate the significance of data quality, data quality checks, lot quality assurance sampling, and supervision and feedback.

4.2.1.2.1 Significance of data quality

Data quality module Document 2 outlines the meaning of quality data and the significance of generating quality data from the HMIS. Data of poor quality will affect the use of information. To monitor and evaluate the performance of a specific programme, quality data are critical. Extracts from reviewed documents are provided below:

> "Data are fit for their intended uses in operations, decision making, and planning. Data reflect real value or true performance. Data meet reasonable standards when checked against criteria for quality…Good quality health is dependent on the access to and use of good quality data…." D2

> "Quality of data is a key factor in generating reliable health information that enables monitoring progress and making decisions for continuous improvement. The need for organized, accessible, timely, and accurate data for health decision making has become a growing concern at national and international levels." D8

For efficient and effective healthcare delivery by health professionals and to ensure quality outcomes for patients, access to health information and the quality of that information is critical (Callen 2016:4). Effective and quality data collects can offer insight into enhanced health outcomes and improved policies (Theobald 2014:51). Timely, accurate, error free reporting and uploading of data are considered as the quality benchmarks of an ideal HMIS (Samal & Dehury 2016:8).

4.2.1.2.2 Data quality checks

The guidelines in the documents seem to emphasize data quality assessment through data quality assurance, types of data quality assurance techniques, data quality tracking of completeness and timeliness logbook and DHIS2 checks. The dangers of not conducting quality checks are highlighted.

The documents showed the following:

> "Data Quality Assurance: a systematic monitoring and evaluation of data to uncover inconsistencies in the data and data management system…Data Quality assurance techniques: Data Quality Desk review. The DHIS2 will give the users a message that

> the value entered is not the correct format…All health facilities have timeliness and completeness tracking logbook." D2

> "Strengthen routine data quality assessment at all levels…" D8

Routine checks of data quality should be governed by the standard operating procedures of the country's HMIS. The standard operating procedures for routine health-facility data are country-specific (WHO 2017a:25).

4.2.1.2.3 Lot quality assurance sampling (LQAS)

Lot quality assurance sampling is a diagnostic tool used to assess data quality. It is a statistical method of quality control widely used in the field of health to determine the quality of data of various lots against a threshold of decision making (Aqil et al. 2009:23).

Lot quality assurance sampling is given prominence because routine health information systems performance is judged on the production of quality information and its use in decision-making. As mentioned earlier, quality information is comprehensive, accurate and useful. Health facilities are encouraged to use this approach to measure the consistency of data using prescribed techniques:

> "The lot quality assurance sampling method will be used to check reporting accuracy at health facility level. The health facilities will maintain a registry to record the data consistency check results and the trend of the data quality improvement." D2

> "The overall data quality assurance and the tools that are commonly used are Lot Quality Assurances Sampling (LQAS), performance monitoring team, and ISS, with specific focus on data use." D8

Many countries, especially in developing nations, grapple with the quality of the data collected by routine information systems, either for specific and vertical programmes such as HIV programmes or for the activities of the health system. Health information systems in these countries often lack robust systems to assess quality. Lot quality assurance sampling could be a good approach for data quality assurance at the point of care (Ahanhanzo et al. 2014:837).

4.2.1.2.4 Supervision and feedback

Content from documents contends that regular, supportive supervision and feedback play key roles in successfully implementing the HMIS in the HIV/AIDS programme. The concepts are defined to enhance understanding and procedures to be followed. Provision is made for all stakeholders to know what is expected of them.

The documents present the following:

> "…supportive supervision refers to overseeing and directing the performance of others and transferring the knowledge, attitudes, and skills that are essential for successful M&E implementation of HIV activities." D4

> "Supportive supervision as with all aspects of health care, effective, continuously improving HMIS/M&E depends on ongoing supportive supervision… usually at quarterly intervals, has been identified by most programs as an essential element..." D1

> "…Information use can also be assessed and monitored using other mechanisms such as supportive supervision…feedback is provided to monthly reports submitted from lower levels/units." D9

Bogale (2021:7) pointed out the quarterly receipt of supportive supervision and discussions at performance review meetings is not done as per guidelines. Furthermore, other studies conducted in the southern part of Ethiopia indicated some level of improvement in routine health information utilization by health professionals who had frequent supportive supervision (Wude et al. 2020:8). The supervisory team needs to use the existing action plans in the policies and guidelines at the visit point and provide feedback (Federal Ministry of Health [Ethiopia] 2018:30).

4.2.2 Theme 2: Availability of resources and functionality of the HMIS

In Theme 2: Availability of resources and functionality of the HMIS, two categories emerged, namely key resources and design of the HMIS. Table 4.3 indicates Theme 2 categories and subcategories.

Table 4.3: Theme 2: Availability of resources and functionality of the HMIS/M&E system

Theme	Category	Subcategory
Availability of resources and functionality of HMIS	Key resources	Human resources for health
		Health professionals' skills and knowledge gaps
		Guidelines on data management
		National Indicators
		ICT & other related resources
		DHIS2
	Design of HMIS	Ethiopian Health System
		HIS
		Structure of HMIS
		M&E System
		Communication channel

4.2.2.1 Category: Key resources

For any HIS to function effectively and efficiently, adequate resources should be provided. In the category of 'key resources', the subcategories associated with key resources in the documents indicate human resources for health, health professionals' skills and knowledge gaps, guidelines on data management, National Indicators, ICT and other related resources and DHIS2.

4.2.2.1.1 Human Resources for Health

Documents reviewed indicated that adequate staffing is key to the success of the HMIS/M&E HIV programme. Emphasis is put on capacity development as certain HIS tasks require specialised skills. The content of some documents clearly depicts the need for training or capacity building for technical staff working with the HMIS/M&E, whether pre-service or in-service training. All training is aimed at improving data quality. The documents acknowledge the challenges of shortage and turnover of health information personnel. Extracts are described below:

> "Adequate skilled human resources should be ensured at all levels of the M&E system in order to complete all tasks …" D4

> "…training in both HMIS technical tasks and in action-oriented monitoring is needed. For M&E, in-service training is needed... This training should focus on problem-solving as well as interpretation of information." D1

> "Enhance HIS staff career development opportunities through improving the capacity of health professionals, M&E personnel, and health managers…strengthen human resources for health capacity to effectively use ICTs…the routine data quality assessment found that shortages of HIT personnel…" D8

> "High staff turnover rates are known to be a problem throughout the health system. This affects HMIS positions as well." D1

HR for health allows the health sector to recruit the best candidates for more efficient and responsive approach to train staffs in desired skills and deploy trained personnel to facilities where there is actual demand (Driessen, Settle, Potenziani, Tulenko, Kabocho & Wadembere 2015:8).

4.2.2.1.2 Health professionals' skills and knowledge gaps

Clinicians and other professionals working in the health system need specialised skills to manage HMIS tasks. Some documents acknowledged the existing shortcomings in health professionals' skills and knowledge in data management processes and maintaining the quality of data. The need for training and capacity building is emphasized.

> "Gaps in knowledge and skill of health professionals on data management are a critical issue... The knowledge and skill level of health workers on the reformed HMIS significantly influences data management processes, timeliness, completeness, and accuracy of data at the point of service delivery." D8

> "…health workers who perform HMIS/M&E tasks have opportunities for skills enhancement, and should be appreciated for their HMIS/M&E work by seniors." D1

> "…skill gap in collecting quality data, analysis and reporting which varies at different levels." D4

Developing and implementing information systems is a challenging task due to insufficient knowledge and skills (Adaletey, Jolliffe, Braa & Sahay 2014:7). There is some improvement in routine health information utilization by health professionals who have HIS competence (Wude et al. 2020:8). Training workshops, continuous supervision, monitoring of HIS are also needed (Nawaz, Khan & Khan 2015:113).

4.2.2.1.3 Guidelines on data management

The utilization of the HMIS is demonstrated by effective data management processes. Users need policies to inform what and how. The manual provides guidance on data management processes at the facility level. The emphasis seemed to be that guidelines or manuals are critical to guide the health professionals in data generation, data collection, analysis, and display and report. The content showed the following:

> "Manual is primarily intended for use by health workers at all levels of the health system who are involved in managing health related data." D7

> "Guidelines on data display Information display is helpful for clients, health professionals and managers to understand and keep in mind..." D6

> "…Ethiopia has recently revised the indicators, sources and associated guidelines in order to make the existing system more responsive to the program and other stakeholder's needs…" D9

Written guidelines that stipulate the methods and outputs of data analysis are important (Moore et al. 2014:132). A study conducted in the north western part of Ethiopia indicates poor access to HMIS data management guidelines. Access is a determinant of the use of routine health information at the health centres level (Asemahagn 2018:9).

4.2.2.1.4 National Indicators

Data mined from documents indicated that national indicators need to be used as a guide for monitoring and evaluating a programme. They are based on the national strategy. The importance of indicators is reflected in the documents to monitor the programmes and to show whether the programme is achieving its intended objectives

or not. There are key performance indicators in the HIV/AIDS programme to assess the plan versus achievement. The use of indicators allows data-driven decisions.

> "Indicators measure the value of the change of a single aspect of a program or project …Key performance indicator for HIV/AIDS program are Clients receiving voluntary counselling and testing services, prevention of mother to child transmission treatment completion rate, and patient currently on antiretroviral therapy. These indicators used by performance management team to review the performance." D6

> "Sub-national/ program level indicators provide more detailed information so that planners can make decisions." D4

The costs and benefits of data collection options should be considered when indicators are chosen to track changes over time during the implementation process (Diana et al. 2017:11). The generalizability of all routine HIS indicators can be improved by adopting more standardized definitions (Venkateswaran, Mørkrid, Abu Khader, Awwad, Friberg & Ghanem et al. 2018:9).

4.2.2.1.5 ICT and other related resources

ICT and other related resources are recognized as critical for the efficiency and effectiveness of healthcare delivery. Several ICT platforms are recommended to simplify the information exchange for timely decision making. Efforts are encouraged for bureaus and woredas [disricts] to acquire sufficient tools and infrastructure to support the generation of quality and useful data. The content of the documents depicts the following:

> "The health sector must invest significant resources to leverage these ICT investments as supportive tools for the effective and efficient delivery of services… applications including telemedicine, tele-education, mobile health, electronic HMIS (eHMIS), electronic medical records (EMR), geographic information systems (GIS), and human resource information systems (HRIS)." D8

> "…ensure all regional HIV/AIDS bureaus and woreda level will have sufficient computers and internet access…shortage of supplies and equipment for M&E functions (tools, computers, printers, photocopiers) and poor infrastructure (electricity, telephone services and internet access)." D4

Health providers are expected to provide data to feed into computerized reporting systems in their organizations (Prakash 2016:316). Recently the universal penetration of ICT solutions into clinical processes has pointed out their significance for the adequacy of existing healthcare systems (Stanimirovic & Vintar 2015:30).

4.2.2.1.6 Web District Health Information System two (DHIS2)

The DHIS2 is an open and free source that is web-based. It has functionalities that support the generation of quality data. The content of documents supports the utilization of DHIS2 to enable data generation activities such as data entry/capture, analysis and validation/checking of data. Regions are encouraged to pilot-test before roll-out and follow guidelines for implementation. Content revealed:

> "DHIS2 has several features that support initiatives for improving data quality; validation during data entry to make sure data is captured in the right format. DHIS2 auto checks that the value being entered is within a reasonable range." D2

> "DHIS2 to be pilot-tested before the national roll out. …." D3

The web based DHIS2 is envisioned to collect health facility service delivery data and allow analysis at that level (Mugendi 2015:70). Thus, DHIS2 is a new system. Sufficient consideration should be given to staff training in its implementation (Dehnavieh et al. 2018:12).

4.2.2.2 Category: Design of Health Management Information System (HMIS)

In the category of 'Design of the HMIS', the subcategories that emerged were: Ethiopian Health system, health information system, the structure of the HMIS, monitoring and evaluation system, and communication channels.

4.2.2.2.1 Ethiopian Health System

The documents reflect the importance of a full functioning health system. HIS is referred to as one of the building blocks of a health system. Different levels of the health system are recognized, and emphasis is on strengthening the system:

> “Health system is the sum total of all the organizations, institutions, resources and all activities …health system has six components/building blocks. These include: Service delivery, health workforce, health financing, health information system, medical products, and governance & leadership…” D7

> “…Health system strengthening: HMIS/M&E inadequate capacity in analysis, timely generation and information use for decision making at all levels of the health system is among the key challenges of HMIS.” D5

A health system (HS) needs health professionals, commodities, medicines, the organization of health services, and a governance structure that is dependent upon a health information system (HIS) to plan, manage, and monitor these activities as well as to create financing to sustain HS functions (Aqil, Silvestre, Hotchkiss & Maniscalco 2017:20).

4.2.2.2.2 Health Information System (HIS)

HIS is well defined, including its components, vision and objectives on the national level, roles of facilities, sources of information for HIS, principles of HIS, and three determinants of health information use (behavioural, organizational, and technical). Emphasis is on an integrated system that is governed by rules and legislation. The role of stakeholders is acknowledged.

> “Health information system has different components which include health information system resources, indicators, data sources, data management, information products and dissemination and use.” D6

> “To make the vision and objectives of the national HIS road map come true; the HIS road map needs to be endorsed with supporting legislation and regulations. …the most important principles for the national HIS framework include standardization, integration, simplification and institutionalization.” D10

> “Behavioural determinants data can also be underutilized because of the behaviours of health workforce. ... Determinants at the Organizational level the wider environment in which health system decisions are made include the institutions and stakeholders …Technical determinants a system without a sound technical design, well-trained people, and clear norms and standards.” D9

> "…The HMIS policy includes the people, procedures, datasets, hardware, and software that are essential to coordinate a functional information system and ensure that facilities use the information generated in decision-making…" D1

Everybody in the organization should provide positive support right from bottom to the top, down to the bottom level. Moreover, in one of the study also revealed that it is important to have a good plan in terms of infrastructures, budget, and awareness of security and privacy issue so as to bring successful HIS implementation (Mohamadali & Aziz 2017a:359). Designing and providing an infrastructure to collect the timely, dynamic and trusty data and information for decision-making. Increasing health equity indicators and electronics household records on health can advance the HIS functions and capabilities (Feyzabadi, Emami, & Mehrolhassani 2015:8).

4.2.2.2.3 Structure of the HMIS

Guidelines and HIS strategy are to outline how the system is organised and to be implemented. Specific content shows the HMIS goal, mission, vision, and strategic plan. The documents also indicate some challenges such as bottlenecks, impact, and the reforms made to improve the HIS in Ethiopia. The significance of the HMIS in monitoring and evaluation is acknowledged:

> "HMIS/M&E Goals to support decentralized, action-oriented, evidence-based decision making…The HMIS/M&E strategic plan aims to establish this single shared monitoring and evaluation system in Ethiopia…HMIS operating in most parts of Ethiopia." D1

> "HMIS is one of the major components of the health information system (HIS), the integration of DHIS 2 with other existing and upcoming electronic health systems will greatly impact the overall HIS." D3

> "The major routine information systems that will be used at a national level are the health management information system (HMIS)…" D4

> "…The standards and guidelines with regard to HIS governance reflect responsibilities and roles of different government sectors and donors indicate a multi-sectorial approach to ensuring a well-functioning HMIS…" D1

The regulatory framework is required for routine checks of data quality that could be governed by the standard operating procedures of the country's HMIS (WHO 2017a:25). The regulatory framework for HIS in LMICs is poorly developed according to different studies and research findings. The African health information management practice environment lacks a clear policy to lead practice (Ojo 2017:142).

4.2.2.2.4 Monitoring and Evaluation (M&E) system

The content reveals that a data management plan is critical in M&E. the relationship between strategic plans in response to HIV/AIDS using information is made explicit in the documents. The need to strengthen M&E is acknowledged. Emphasis is placed on capacity building:

> "…realization of a simple, coordinated, unified and effective results-based national M&E system for data management, dissemination and utilization of strategic information for the HIV/AIDS response…an efficient and effective M&E system will enable informed decisions to improve performance." D4

> "The HMIS/ M&E system will be strengthened to avail reliable, timely and complete information." D5

> "Ensure the pre-service curriculum includes training of health professionals on routine health information, e-Health, and M&E systems." D8

MEASURE Evaluation (2014a:35) recognizes that the HIV M&E System needs strengthening. In developing countries, monitoring and evaluation are problematic due to inadequate resources (Adaletey et al. 2014:7).

4.2.2.2.5 Communication channels

Health information use involves communication. Plans need to be formulated and communicated to various stakeholders. What was evident from document content was that when users of the HMIS are aware of the existence of a regulatory framework for the implementation of HIS, they will be better equipped to implement it effectively. Various means of communication are emphasised:

> "The primary purposes of communication is to gain support and approval for the annual HIS plan and budget proposal …" D1

> "Identify the types of health information and mechanisms for communication…" D8

> "…strengthen M&E system, advocacy and communication have been done at different levels, there is improvement in utilizing HIV related information for planning, and performance review at the national and regional level by organizational officials and managers of governmental organizations, partners and CSOs..."D4

The HIS provides the necessary support for decision making by doing four key functions, generation, compilation, analysis and synthesis, and communication and use of data (Alipour & Ahmadi 2017:313).

4.2.3 Theme 3: Data demand and use

The UN Sustainable Development Goals (SDG) document sets an agenda for countries to ensure healthy populations. This is the ultimate aim of health systems. The achievement of these goals demands reliable data to make effective decisions about health priorities and interventions (WHO 2010:2). Monitoring and evaluation of the HIV/AIDS programme are based on reports from the routine health systems. Data demand refers to the processes stakeholders engage in to actively and freely request information to inform a decision (MEASURE Evaluation 2019:5). Table 4.4 indicates the theme, categories, and subcategories.

Table 4.4: Theme 3. Data demand and use

Theme	Category	Subcategory
Data demand and use	Data collection and analysis	Health information needs
		HIV monitoring and evaluation plan
	Evidence-based decision making	Data use
		Performance monitoring
		Performance review meeting
		Decision making

4.2.3.1 Category: Data collection and analysis

In the category of “data collection and analysis”, the subcategories that were associated with data collection and analysis were: health information needs, and HIV monitoring and evaluation plan.

4.2.3.1.1 Health information needs

Various stakeholders require different kinds of information in varying detail to support decision-making. This is the data that is generated from the HMIS. Content showed that data demand is driven by the formulation of specific questions by different stakeholders, and there is an understanding that data should be available to provide answers to these questions to influence data-driven solutions.

> “…data demand is related to the value stakeholders attach to data. We say that data demand exists if: specific questions are raised and data are considered to answer them…evidence-based decision-making practice is influenced by demand for health information…” D9

> “Available information needs to be disseminated in a timely manner and used for strategic decision making at all levels of the health system. …” D10

At the policy level, information needs involve the type of healthcare, health problems, resources and costs involved, whereas users at the facility level, stakeholders, need the information to track their progress. Therefore, the system must be flexible and adapt to a renewal of information needs for health professionals (MEASURE Evaluation 2014a:39). According to Hotchkiss et al. (2012:3), routine health information systems collect and manage data at stipulated intervals to provide the expected information needs of stakeholders.

4.2.3.1.2 HIV monitoring and evaluation plan

Evidence from documents revealed guidance in terms of the implementation of monitoring and evaluation processes. Three documents showed and described the HIV/M&E plan, related activities, and cost. The plan needs to be driven by multiple

stakeholders to prevent duplication of efforts. The plan needs to reflect a multi-sectorial response to HIV using the performance of indicators as a basis for action.

> "A costed, multi-year, multi-sectorial and multi-level HIV M&E work plan is an extension of the principle of 'one national HIV M&E …' Such a work plan describes and costs all HIV M&E activities." D4

> "…the principle of having a single common plan, budget, and monitoring and evaluation system is a cornerstone of health sector development program III …" D1

> "…the preparation of the next five years sector strategic plan, this is a good opportunity to incorporate the multi-sectorial HIV response performance indicators to the information management systems." D5

The M&E Plan provides a description of aim, objectives, measurable indicators by thematic area, including collecting necessary M&E data for calculation of the known indicators, as well as the flow of data from the routine data sources. Finally, it defines plans for data utilization, M&E products and reports, and capacity building strategies to advance data quality and to support M&E systems at all levels. This M&E plan will lead all stakeholders working on HIV and AIDS to meet the countrywide HIV and AIDS aims and objectives (Ministry of Health [Uganda] 2011:7).

4.2.3.2 Category: Evidence-based decision making

Data-driven decision making is driven by all other issues raised and described earlier, such as data generation and data quality. Four subcategories emerged, namely data use, performance monitoring, performance review meetings, and decision making.

4.2.3.2.1 Data use

Health professionals need guidelines that clearly define various concepts and how they should be implemented. The use of data is the analysis, synthesis, and interpretation as part of decision-making. Content showed clear definitions of information use at different levels, the culture of data use, determinants of information use and other factors, steps in the use of information, and strengths of information use. The relationship between information use and decision making is reiterated. The issue of the HIS plan and its implementation was evident, as well as the use of

information for M&E. Data quality dimensions, such as timeliness and completeness, are again emphasized.

> "Data use is defined as: the process through which decisions makers and stakeholders explicitly consider information in one or more steps of the process of policymaking, program planning and management…the term data /information use refers to the use of data in the decision-making process." D9

> "The culture of data use to positively impact population health and health-system performance. The data-use transformation will be enabled and driven by the implementation and scale up of prioritized health information needs." D8

> "Use of information for decision making has been part of the M&E system of the HIV/AIDS response since inception…available information needs to be disseminated in a timely manner and used for strategic decision making at all levels of the health system." D4

HMISs are planned to serve all users at each health system level with reliable information on which to support decisions (Gimbel et al. 2017:61).

The connection between enhanced routine information, demand for data, and continued data use forms a cycle that leads to enhanced health programs and policies (Nutley & Reynolds 2013:4).

4.2.3.2.2 Performance monitoring

Resources required for performance monitoring are elaborated on. There must be a monitoring plan which shows achievement and the different tools that could be used. The importance of the HMIS data and external monitoring systems are acknowledged.

> "Performance monitoring well-designed and documented data sources, monitoring and evaluation structures, availability of guidelines, finance, and skilled staff are all key resources for an effective performance monitoring system…performance improvement framework, teams should monitor performance compared to planned targets using different decision support tools…" D8

> "Using HMIS data for Performance Monitoring and Improvement during the annual Woreda-based planning and the monthly Performance Review Meetings" D6

> "Ensure that performance monitoring through health facility self-assessment is supported by external performance monitoring modalities." D1

Performance monitoring is a key to using data, but studies in Nigeria indicate performance measurement of the HIV M&E system is limited (MEASURE Evaluation 2014b:35). When information is reused, the main emphasis is on reporting for research, auditing, or management purposes (Prince et al. 2018:29).

4.2.3.2.3 Performance review meetings

Performance review meetings are one of the strategies to ensure data quality and information use. The content of some documents reveals the structure and objectives of the performance review meeting, the regularity of the meeting, roles and responsibilities of the team, and the use of a minute book. The extracts below support the findings:

> "Objective of the monthly performance review meetings is to assure result-based monitoring and evidence-based decision making for improving the health sector's performance" D6

> "performance monitoring team (PMT) must be established at all levels of the health system, …heads or delegate heads of the institution are the chair persons (sic) of the performance monitoring teams at all levels; planning and M&E unit head or HMIS focal person will be a secretary… performance monitoring team meeting should be planned to be conducted regularly. Meeting date, venue and its members should be officially communicated/notified in advance and the meeting should be conducted at least a day ahead of submission of the monthly report to the next level." D9

Findings from the evaluation of the Canadian hospital indicate that the health information management managers, staff, and analysts felt that it was both a useful performance-reporting tool and a useful management tool to guide performance monitoring and review (Nippak, Veracion, Muia, Ikeda-Douglas & Isaac 2014:131).

4.2.3.2.4 Decision making

Data-driven decision making involves processes that use data during programme monitoring and review or planning. The need for evidence-based decision making, a

decision tracking matrix, is emphasized. Plans should form the basis for decision-making for performance improvement. Therefore, statistical tools need to support decision-making processes. D4 reiterates the need for data-driven decisions at all levels, including the primary level (point of care).

> "Data collected must be used for programmatic and technical decision making…decision tracking matrix will be developed along with the annual plan…analysis and storage of data take place at the level where it's collected and used for evidence-based decision making." D4

> "Government of Ethiopia (GOE) has guided all public sectors towards results-oriented management, emphasizing evidence-based decision making …to change the organizational values and practices to embrace evidence-based decision making." D1

> "Tools to assist in decision making, are statistical and data presentation tools, e.g., bar and pie charts, run charts etc…. There are several such tools that can aid in the process." D6

HMISs intended to assist all stakeholders in supporting decisions with regard to resource allocation, problem identification, and programme and policy development (Gimbel et al. 2017:61). In developing nations, data sit on shelves and reports and are not sufficiently used in programme development or monitoring. Reasons vary but most often cited is the complexity of HIS and the data management processes (Nutley & Reynold 2013:3).

4.2.4 Comparison between the HIS and HMIS

This study further highlights differences between the HIS and HMIS strategic focuses.

Table 4.5 Ethiopian HIS and HMIS comparison on strategy

S.N	Areas of similarity and differences	Ethiopian HMIS (Document 1)	Ethiopian HIS roadmap (Document 10)	Comments
1.	Strategic objectives	Five strategic issues have been identified as critical to strengthen and continuously improve health sector HMIS/M&E. 1. Capacity building. 2. Standardized and integrated data collection and reporting. 3. Linkage between information sources. 4. Information use. Action-oriented performance monitoring. 5. Appropriate technology.	There are five strategic objectives to achieve during and by the end of the eight-year period. These are 1) To strengthen HIS governance, legislation, coordination, and leadership 2) To improve, strengthen and institutionalize HIS resources. 3) To improve health data coverage. 4) To improve health data management and quality. 5) To strengthen and institutionalize information use for evidence-based planning, performance monitoring, feedback, and action at all levels.	Ethiopian HMIS shows focus on harmonizing three key issues, data generation and the use of information using appropriate technology. For HIS, the focus seems to be on governance and leadership, and also institutionalizing resources for proper data generation and information use.
2.	Data flow	Establish data flow procedures that capture and transmit information in a timely fashion through an integrated reporting channel. Selected strategies: • Establish an integrated reporting channel that delivers information to the primary user when it is needed.	Make all routine HIS interoperable, including HMIS (HMIS, facility mapping, HRHIS, LMIS, infrastructure IS, and IFMIS, LIS, RIS, mobile-health etc.)	With regard to data flow, HIS concentrates on regulation that will enable the systems to work together in an integrated format. Since the focus of the HMIS is on the use of information, data flow is supported through timelines and reporting channels.

3.	Development of standards	• Establish standardized cascaded indicators for M&E at all levels. • Develop a standardized indicator set for the health sector and programmes and disease list and case definitions for HMIS reporting. • Establish standardized client/patient recording procedures. • Standardized reporting instruments.	Ensure availability of appropriate infrastructure, standards, and tools for HIS. Develop a Standardized Data Management System.	For the HMIS, emphasis was given to standardizing the indicators, recording procedures, and reporting instruments. Whereas HIS concentrates on a standardized data management system through proper infrastructure and tools.
4.	Capacity building	Create the basic institutional structures and skilled staff to implement a well-functioning HMIS/M&E process. The first strategic issue addresses the need to institutionalize the HMIS/M&E responsibilities in the staffing structure and to establish pre-service and in-service HMIS/M&E training.	Strengthen the capacity of staff involved in HIS through in-service training.	Both the HMIS and HIS consider strengthening in-service training for capacity building of the staff. But the HMIS gives emphasis also on pre-service training and staffing structure.
5.	Information use	• To strengthen and institutionalize information use for evidence-based planning, performance monitoring, feedback, and action at all levels.	• Strengthen and ensure the functionality of performance monitoring teams at all levels. • Strengthen information dissemination mechanisms and use.	Both the HIS and HMIS focuses on performance monitoring and information use. But HIS is seen in the perspective of the functionality of the system, and mechanism for information use, whereas the HMIS focuses on detail to planning, implementing, evaluating and feedback on information use.

4.3 PRESENTATION OF PHASE TWO FINDINGS

The focus of this phase was on getting an understanding of how data management processes are conducted at the facility level and the views or opinions of stakeholders regarding the influence of technical, organisational, and behavioural factors on data processes.

4.3.1 Biographic data

The groups consisted of health information technologists (HIT), data clerks, the HMIS focal persons, and data encoders, antiretroviral therapy managers/focal persons, voluntary counselling and testing focal persons, prevention of mother to child transmission focal persons, health facility directors who work at the hospital and health centre level in Addis Ababa city. Four groups were mainly professionals responsible for data production, and the other four were mainly data users. Data users are involved in the performance monitoring team. They provide support and decision making in the HIV and AIDS programme in the selected health facilities. They need statistical data to evaluate the service provision. Therefore, information is used at the facility level for planning or reprogramming activities. In addition, they work closely with the data producers.

Data from all groups were merged and analysed as a unit due to overlaps in their data management processes.

Table 4.6: Biographic information of participants

Types of groups	Data Producers (DP)				Data Users (DU)			
Parameter	**Focus Group 1 N=9**	**Focus Group 2 N=8**	**Focus Group 3 N=7**	**Focus Group 4 N=9**	**Focus Group 1 N=7**	**Focus Group 2 N=8**	**Focus Group 3 N=7**	**Focus Group 4 N=9**
Gender	Male = 2 Female =7	Male = 3 Female =5	Male =3 Female =4	Male = 2 Female = 7	Male =3 Female =4	Male =0 Female =8	Male = 0 Female =7	Male = 6 Female =3

Types of groups	Data Producers (DP)				Data Users (DU)			
Parameter	**Focus Group 1 N=9**	**Focus Group 2 N=8**	**Focus Group 3 N=7**	**Focus Group 4 N=9**	**Focus Group 1 N=7**	**Focus Group 2 N=8**	**Focus Group 3 N=7**	**Focus Group 4 N=9**
Age range in year	23-38	22-35	21 - 31	22 - 50	26 - 54	25 - 48	29 - 50	30 - 55
Position	Data clerks	Data clerks	HMIS heads	HITs	VCT heads	PMTCT heads	ART heads	Medical director=2 Disease prevention department head=7
Range for year of Work experience	1 – 8	1 - 7	1 - 10	1 - 28	2 - 33	2 - 25	5 - 35	7 - 30
Range for Years of HMIS experience	1 – 8	1 - 7	1 - 7	1 - 10	1 - 7	1 - 7	1 - 10	1 - 7
Educational qualifications	Diploma=9	Diploma=8	Diploma=7 BSc. Degree=1	Diploma=9	BSc. Degree=7	BSc. Degree=7 MSc. Degree=1	Diploma=1 BSc. Degree=5 MD=1	BSc. Degree=9
Range for No. of Training in HMIS	1 - 10	2 - 6	1 - 10	0 - 10	0 - 2	1 - 2	0 - 4	0 - 2

In all focus groups, female numbers were higher than males. The level of education is higher in the data users group than data producers, and it ranges from diploma up to master's degree level. The lowest and highest year of focus group experience in the HMIS ranges from 1 year to 10 years, respectively. The lowest and highest age ranges from 21 year old (HMIS head) to 55 year old (Medical director), respectively. The mean for the HMIS training received was higher in data producers than data users and ranged from 0 to 10.

Statements from data producers are labelled DP and data users as DU. The respective focus groups are added, and a number, for example, DP G1, refers to data producers' focus group 1.

THEMES

Four themes with associated categories and sub-categories emerged from the data collected during the eight focus groups through a thematic analysis. These were:

THEME 1: ETHIOPIAN HEALTH MANAGEMENT INFORMATION SYSTEM

THEME 2: ROUTINE HIS PROCESSES

THEME 3: FUNCTIONALITY OF the HMIS

THEME 4: DETERMINANTS OF DATA USE

4.3.2 Theme 1: Ethiopian Health Management Information System (HMIS)

The HMIS has a critical role in the monitoring and evaluating of the health system. It is an information system that integrates data from all healthcare levels and provides information to manage programmes, facilities, policies, and resources. Users of the system are pivotal in managing the system effectively. The HMIS was designed to deliver reliable information timeously to various members of staff, health providers and managers, and top-level management at different levels of the health system (Qazi & Ali 2011:245). In Theme 1, two categories and six sub-categories emerged, as shown in Table 4.7.

Table 4.7: Theme 1: The Ethiopian Health Management Information System (HMIS)

Theme	Category	Subcategory
Ethiopian Health Management Information System	Interpretation and understanding of HMIS	• Meaning of the HMIS • Use of the HMIS at the facility level • Directives regarding data processes
	Enabling environment and feedback	• Staff motivation and recognition • Supportive supervision and problem solving • Feedback loop

4.3.2.1 Category: Interpretation and understanding of the HMIS

The HMIS critically relies on how healthcare workers and information managers understand and interpret its meaning and use (Federal Ministry of Health [Ethiopia] 2014:14). In the category "interpretation and understanding of HMIS", the subcategories linked with the category were: the meaning of HMIS, the use of HMIS at the facility level and directives regarding data processes.

4.3.2.1.1 Meaning of HMIS

The purpose and meaning of HMIS were well articulated by all groups. Some interpreted HMIS as the production of quality data that demand every user to work hard and be committed to quality assurance. Meanwhile, others defined it as an important function requiring the involvement of management in the training of staff on how to implement HMIS in managing HIV/AIDS services. The central theme that emerged from all interpretations was that the HMIS supports data-driven decisions in monitoring and evaluating the HIV/AIDS programme.

The participants reported their ideas as follows:

> “In general, HMIS requires a lot of work of data processes and use of information and health professionals need to understand the importance of good data collection to avoid errors” (DP G1).

> “If the leaders give more training on HMIS implementation, it will generate interest and HIV/AIDS data management processes will be good” (DP G4).

> “Everyone needs to know data management and reporting, to show understanding of the processes, in order to produce useful information to monitor the programme” (DP G3).

The Health Management Information System (HMIS) was established to “support informed strategic decision-making by providing quality data that help managers and health workers plan and manage the health service system” (Foster 2012:5). Accordingly, the National HMIS Strategy identifies five critical strategic issues to support and continuously improve the HMIS. Senior management plays a significant role in influencing users in adopting new ways of thinking regarding health management information systems (Mohamadali & Aziz 2017b:375).

4.3.2.1.2 Use of the HMIS at the facility level

Various stakeholders are involved in the use of the HMIS at the facility level. DHIS2 is the platform used for HIS tasks. There are professionals who mostly capture data and do the analysis, and others, who mostly use the information for management purposes and are involved in the monitoring of the HIV/AIDS programme.

Data users indicated that the HMIS is a management function used to provide users with reliable information to support decisions regarding the performance of the HIV/AIDS programme and to manage local factors that influence the utilisation of service. Data producers confirmed and said that routine facility reporting is critical for effective data management of antiretroviral therapy. Data flow within the facilities follows routine reporting processes, with each group having specific roles. However, they lamented frequent updates in routine data collection.

The participants shared their thoughts as follows:

> “HMIS is implemented in every activity in the facility and includes vital registration, providing information on program related factors. A comprehensive software is being utilized and the recently implemented DHIS2 is a huge resource for data management” (DU G4).

> “Mostly data clerks do data capturing and review for consistencies. We do paperwork and produce reports and there is HMIS officer who also analyses the data. We don’t participate in the data analysis activity” (DU G2).

> “Voluntary counselling and testing Registers and tally sheets are the main HMIS record format available to capture data. Summary sheets for daily work are used to provide monthly reports’” (DU G1).

> “HMIS is used for routine reporting on various programs such as antiretroviral therapy. It was updated many times since 2012, up to 2017, and then DHIS2 was implemented” (DP G1).

> “HMIS trained and experienced staff is needed to ensure appropriate decisions are made for HIV/AIDS monitoring” (DU G3).

Literature shows challenges with the use of HIMS in developing countries. A study conducted in Tanzania indicates the use of the HMIS was poor due to insufficient financial and technological resources; and the nonexistence of user-friendly systems (Nyamtema 2010:5). Similar studies conducted in Ethiopia indicate a low information culture due to a lack of knowledge on using HMIS data for the management of diseases or monitoring and evaluation (Tadesse et al. 2014:37; Teklegiorgis et al. 2016:8; Tessema 2011:36).

4.3.2.1.3 Directives regarding data processes

The directives referred to here are protocols, guidelines, legislation governing data generation and reporting. The majority of participants acknowledged the importance of guidelines with regard to understanding definitions of indicators to support the use of information. It appears that for data users, the HMIS reporting processes such as the performance guidebook provided directives. Meanwhile, data producers pointed out that existing guidelines are not always accessible. They are either too complicated or available only to a few individuals. Users mentioned that there are specific

guidelines for various departments, such as voluntary counselling and testing (VCT). Others use programme goals or targets developed by the Addis Ababa city administration health bureau to guide their activities.

Verbatim statements made by the participants:

> "The guidelines are important in directing the activities of the program. However, there are few, even the available ones do not support reporting mechanisms and definition of indicators. Well defined guidelines will be helpful, so that all staff can understand and use them. Difficult indicators need a reference" (DU G4).

> "Four Pocket size guidelines are provided but are not sufficient for 140 staff in the facility. The available disease classification guideline is too detailed, vast and complex to understand …." (DU G3).

> "We have guidelines for our voluntary counselling and testing service but they are not specific for information use, we mostly rely on HMIS staff to guide how to use information" (DU G1).

> "We are planning and following activities based on the HMIS report, we use guides for performance, and goals of the programme for monitoring". (DU G4).

> "Addis Ababa city administration health bureau has its own targets that we need to observe" (DU G4).

Mgbere et al. (2018:11) specify that health workers, policy makers, and financiers see guidelines as an instrument for making care more reliable and efficient and for closing the breach between what clinicians work and what scientific evidence informs. However, a study conducted in the north-western part of Ethiopia indicates poor access to HMIS data management guidelines. Access is a determinant of the use of routine health information at the health centres level (Asemahagn 2018:9).

4.3.2.2 Category: Enabling environment and feedback

The health facilities are expected to create favourable conditions and opportunities for the adoption and implementation of the HMIS. The enabling environment is the foundation for planning, implementing, and maintaining a health information system

(MEASURE Evaluation 2017a:2). Three subcategories emerged: staff motivation and recognition, supportive supervision and problem-solving, and the feedback loop.

4.3.2.2.1 Staff motivation and recognition

Data producers recognized the need for management to create an enabling work environment for the generation of quality data. They expressed that for the HMIS to function properly, staff need to be well trained and competent. A few mentioned that submitting quality data or reports enhanced their motivation. However, the majority believed that currently, staff are not motivated to perform at their peak. This was attributed to a number of factors, such as a lack of good communication with management, unsatisfactory compensation, and heavy workloads.

The participants said:

> "HMIS will work well if there is (sic) refresher courses and staff feel competent to work on it. This system involves a lot of work and knowledge and the possibility of burnout is high." (DP G1).

> "If we are not satisfied with our job then, the data quality will decrease…We will be limited to doing the expected and not go beyond the work we are doing, and salary is not satisfactory" (DP G3).

> "With regard to motivation for using HMIS, there is nothing attractive in working here…." (DP G2).

> "Motivation is good to prevent incorrect data reporting. I get motivated when I receive confirmation of sent data and submitting good reports" (DP G4).

According to Kebede et al. (2020:8), health professionals who receive a reward for good work on data quality and information use were two times more likely to use HMIS information for various decision purposes than those who have not got a reward. Yarinbab and Assefa (2018:9) also indicated staff motivation was significantly associated with HMIS data utilization.

4.3.2.2.2 Supportive supervision and problem solving

Data producers believed that supervision is important in data generation. They believed that structured supervision would enhance the quality of data. Data show that there was no structured supervision from management to give training in software updates. Staff relied on each other's experience on software related issues. The sporadic visits by management did not address the essential data processes issues. They would prefer to have supervision that includes finding solutions for the HMIS implementation.

They mentioned their concerns accordingly:

> "There is infrequent supportive supervision from health office and partner organization like ICAP…The health bureau staff conduct supervision…the feedback from visit will be given to our director. We will be provided with feedback during departmental meetings" (DP G2).

> "During supervision, they only check client registries and data quality" (DP G3).

> "The sub city does not support us regarding the new software implementation. Supervision is irregularly done, for example, this year supervision was conducted once. Our work needs follow up…" (DP G4)

> "Supervision is done every six-month by health bureau, but it is mostly for evaluation and not based on problem solving. They don't come to solve the HMIS problems during their visit" (DP G2).

Similar findings in other studies pointed out the vital role of the district health office in improving the quality of the information system by providing integrated supervision (Shaikh et al. 2015:30).

4.3.2.2.3 The feedback loop

Data producers acknowledged the impact of feedback on maintaining quality and indicated that reporting and other aspects could benefit from consistent feedback. This will keep the overall quality of data high. They expressed the opinion that during the initial stages of HMIS implementation, supervised by Tulane University, the feedback

was constant, which motivated them to find solutions in data processes. Currently, they submit data capturing and recording problems to management. However, there hasn't been feedback from them yet.

> "Giving feedback to improve quality is one way. Feedback is provided on registrations and reporting forms. Occasionally, oral or written feedback is provided to revise the reports" (DP G3).

> "When Tulane University supervised HMIS implementation, they provided us good and useful feedback and not at this time" (DP G4).

> "…Nowadays, we do not get any feedback, yet we tell them of several problems" (DP G1).

Similar findings from other countries noted that the facility management does not provide immediate written feedback after support supervision visits (Mugendi 2015:69). A study in Ethiopia noted that health professionals who had consistent feedback had 2.2 times higher initiative to utilize routine health information system when compared with health professionals who lack feedback (Shiferaw et al. 2017:7).

4.3.3 Theme 2: Routine Health information System (RHIS) processes

The purpose of the HMIS is to routinely generate quality health information that provides specific support to the decision-making process at every level of the health system for improving performance and the health of the population (MEASURE Evaluation 2012:2). Therefore, the health system needs to maintain the production of quality HMIS information to meet the country's information needs. This study assumes that the performance of the HMIS is dependent on how various data processes are carried out.

In Theme 2, two categories emerged. These were data generation and management and data quality assurance. The categories and sub-categories are presented in Table 4.8.

Table 4.8: Theme 2. Routine HIS processes

Theme	Category	Sub-categories

Routine HIS Processes	Data generation and management	• Data capturing • Data analysis and display • Electronic and paper-based data reporting • Challenges with reporting
	Data quality assurance	• Understanding data quality • Data quality checks • Confidence in data quality check

4.3.3.1 Category: Data generation and management

The subcategories linked with data generation and management were data capturing, data analysis and display, electronic and paper-based data reporting, and challenges with reporting. The participants expressed their views of HIS processes related to HIV/AIDS monitoring and evaluation. It is important to assess information flow within the system and the roles and responsibilities of users in routine health information systems.

4.3.3.1.1 Data capturing

Most participants indicated that using the correct tools for data capture and recording is important for producing useful information in HIV/AIDS monitoring. Therefore, protocols and guidelines must be followed during and after data collection, such as completing tally sheets. Data clerks in the antiretroviral therapy section are responsible for HIV related data collection from clients' cards. They also reported challenges with proper patient card management by clinicians who appeared to have difficulties recording clients' data.

Data from tallies and registers are collected, and data entered into the DHIS2 system in the the HMIS room. Data users, on the other hand, indicated that voluntary counselling and testing and the prevention of mother to child transmission are the only

departments that generate data. Routine data is collected daily using paper-based recording (registers and tally sheets).

> "We need to follow specific formats and registers when we capture data. HIV related data are collected mostly in antiretroviral therapy department at the data clerk level, then sent to HMIS unit for compilation" (DP G2).

> "Register and tallies are collected from each department to enter [the data] in the DHIS2 [system] in the HMIS room." (DP G3).

> "After medical treatment, doctors and nurses do not register the data as required" (DP G2).

> "The recording format is very detailed, we record in the register and summarize using tally sheets, then submit to the technicians (DU G2).

Data generation and management are basic and fundamental parts of the structure and function of the health information management system. The proper collection, management, and use of information within the healthcare system determine the systems' effectiveness (Bogale 2021:2). The findings of a study in Ethiopia show that behavioural factors affect data collection and documentation, especially not registering and/or tallying, and negligence (Endriyas et al. 2019:5).

4.3.3.1.2 Data analysis and display

The majority of the participants pointed out a division of labour in the units based on existing skills and knowledge. They indicated that data are entered into HMIS software for analysis and interpretation. The data clerks' main role is data generation, coding, and validation. They use software to produce graphs and put them on display. They were satisfied with DHIS2 as it produced a variety of charts and forms for ease of analysis. They believed that the software was helpful and user friendly.

The users refer to those graphs to report on their units' performance and outcomes. They also disaggregate according to age and gender and submit reports to the HMIS unit. However, they also recognized that specialized skills are still in short supply.

The following quotes support the findings:

> "We produce data such as number (sic) of clients newly initiated on antiretroviral therapy, TB clients screen and positive etc. The data are entered into HMIS software; the final report is printed for display" (DP G1).

> "We are the people, who check that data are consistent with the follow up card …" (DP G2).

> "During HMIS data entry, we usually support each other, which also helps in validation..." (DP G4).

> "The software is functional in providing the information in graphs, DHIS2 produces various types of graphs for ease of analysis and interpretation" (DP G3).

> "HMIS trained and experienced staff is needed for consistent and quality data management" (DP G3).

Chanyalew et al. (2021:8) reported the higher chances of routine health information system use for evidence-based decision making were found among department heads who displayed demographic and performance data for monitoring. When data users and data producers collaborate, they become more attentive of the data collection processes and methods, the obtainable data sources, and the quality of those data. They can cooperatively analyses and interpret data to respond programmatic questions (Nutley & Reynolds 2013:6). Currently, most clinicians lack the skills to deal with data. Improved training may help clinicians undertake such responsibilities (Prince et al. 2018:30).

4.3.3.1.3 Electronic and paper-based data reporting

Participants indicated that currently, the reporting uses both manual and electronic inputs. Some units, such as voluntary counselling and testing and prevention of mother to child transmission, as mentioned earlier, still use paper-based registers and tally sheets. On the other hand, data clerks use Smart care software. The HMIS focal persons enter all data in the DHIS2 (Web-District Health Information System). However, various challenges related to paper-based reporting were expressed. Most believed that manual reporting compromises quality, takes time, and increases risks of data entry errors. Some believed that paper-based reporting is still maintained due

to software incompatibility with the reporting system. Others contended that the paper-based system can serve as a backup during power shortages or system failure.

Data clerks indicated a need for a main computer server in the HMIS office that stores all data entered daily by different departments. The departments also need more devices and improved technology to minimize paperwork and empower health professionals.

> "We are manually working on some reports to HMIS. We use prevention of mother to child transmission register and tally sheet. The register is MNCH integrated part that is used in antenatal care" (DU G2).

> 'We use Smart care software and it has more detailed information" (DP G4).

> "Going manual may result in a lot of mistakes, quality will be compromised…paper based reporting system takes time through each level of reporting and takes months to reach federal level" (DP G1).

> "Paper-based system is needed for back up purposes, in case software gets corrupted. Hard copy is used when there is power cut" (DP G3).

> "If each room especially, OPDs, antiretroviral therapy unit and ANC, has a functional computer with network installation, and the server is in HMIS office. Each department will enter the data on a daily basis, this will minimize reporting time and decrease [the] burden of reporting" (DP G1).

Evidence reveals that the continuous usage of paper-based systems results in poor data quality regarding the availability, reliability, completeness, and timeliness of reporting and affects health service delivery (MEASURE Evaluation 2012:9). In other ways, studies elucidate that increased computer experience influenced a positive attitude and the perceived usefulness of HIT among healthcare providers (Adeleke, Erinle, Ndana, Anamah, Ogundele & Aliyu 2014:22).

The antiretroviral therapy patients reporting is complex. The regimen effectiveness in a cohort of antiretroviral therapy patients is more difficult to handle in paper-based systems (Braa et al. 2007:393). HMIS staff in many sites encountered increasing tension in keeping the paper-based registers and extracting monthly and quarterly

cohort reports. Even though creative revisions of the paper-based system to cope with ever increasing patient numbers and durations on antiretroviral therapy (Osler, Hilderbrand, Hennessey, Arendse, Goemaere, Ford & Boulle 2014:6).

4.3.3.1.4 Challenges with reporting

Participants raised several issues related to the generation of quality reports. Some were related to health professionals, timeliness, reporting formats and misunderstandings between health professionals and the HMIS unit. The other issue they emphasized was the mismatch between the software and report format regarding data elements. In addition, they lamented the dated software, which does not match the level of performance needed for accurate data analysis, especially medication records. Participants recommended appropriate software to replace manual reporting.

The following quotes support the findings:

> "Health professionals don't understand, even though HMIS staff prompt them to report accurately, if only they could provide reports on time that will improve the quality of data…we work with deadlines… Also, registration format hinders the speed of reporting. If possible, management must decrease the number of registration formats to improve quality of reports" (DP G3).

> "The smart care also doesn't save appointments schedule; but it also includes those (who) visited the facility showing as lost. In this regard, it has problem (sic)" (DP G2).

> "Data needs to be compatible for e.g. in IN Provider Initiated Counselling and Testing age categories is (sic) not compatible the register and HMIS system. Because of variations, these always require validation. Previously, the exported file from smart care could be entered in HMIS software but now the DHIS2 serial and number are not compatible" (DP G4).

> "This software reports mostly the type of drugs only. But viral load data is being done manually in formats … the printing from [Firms/Suppliers] takes from 3-6 months and that causes delays" (DP G3).

> "Software has problems in wrongly reducing the number of reports. DHIS requires update in data analysis by method, ages, and categories." (DP G4).

> "Provision of medical service for communicable disease report is still in hard copy and has drawback… reporting electronically is better" (DP G1).

Facility data are key data sources for national, regional, and districts/sub-city levels. They influence decisions at each level of the health system. The reports support follow-up on the performance and progress over the year and also guide in the planning of scarce resources (WHO 2014a:4). Routinely collected health service data need to be reported timely to higher levels, facilitating evidence-based decision-making at all levels of the health pyramid and especially at the point of collection (Cheburet & Odhiambo-Otieno 2016:135).

In Ethiopia, a late report was noticed mostly at a health centre level. This is the point where the reports from primary health care facilities are compiled, entered to eHMIS, generated, and sent soft copy to the district health office. The completeness of the report is checked at the district level (Kebede et al. 2020:6).

4.3.3.2 Category: Data Quality Assurance

The purpose of the HMIS is to generate quality data that are useful. In this study, behavioural determinants are defined as the knowledge and understanding of HIV and AIDS programme data elements together with health care providers' confidence level in data management tasks, data quality checks, problem-solving skills, and competence (MEASURE Evaluation 2019b:23). The elements of data quality are accuracy, validity, reliability, completeness, legibility, timeliness, accessibility, usefulness, and confidentiality (Endrias et al. 2019:2). In this category, three subcategories emerged: understanding data quality, data quality checks and confidence in data quality checks.

4.3.3.2.1 Understanding data quality

All participants agreed that to use information effectively, data generated from health facilities should be of high quality. They believed that the electronic reporting and the HMIS help in maintaining quality data. However, they also indicated that quality is affected by the level of job satisfaction of the staff. Performance monitoring team meetings are held to ensure accountability and to improve data quality. They all agreed

that quality data supports timely information about medication availability for clients, among other benefits.

Participants made the following statements:

> "Electronic HMIS supports effective communication and quality. What is required is sending updated information, which is very important" (DP G1).

> "We review data quality in performance monitoring team meetings, if the indicator shows under performance then, it will be discussed, including the causes for under performance (sic)" (DP G3).

> "When quality reports are produced, timely information is shared about drug availability, there will be no interruptions in therapy" (DP G3).

In the HMIS, data quality is key. A study conducted in Kenya reveals and highlights the common lack of data quality in the health information systems in low- and middle-income countries (Manya & Nielsen 2016:124). Timely, accurate, error-free reporting and uploading of data and the capacity to detect errors are considered the quality benchmarks of an ideal HMIS. The quality dimensions are completeness, timeliness, accuracy, detection of data and timely identification of systematic errors (Samal & Dehury 2016:8).

4.3.3.2.2 Data quality checks

The participants described various ways adopted to assess quality. Data clerks mainly collect, compile, analyse and validate data from different sources. The validation takes place after every shift and monthly and is usually done by two people to check accuracy and consistency for control. They also use lot quality assurance sampling to select a sample of files to check the quality, using HIV/AIDS indicators. The general agreement among them was that lot quality assurance sampling ensures efficiency at three levels: register, tally sheet, and report document. There can be as many as 20 data sets compared for accuracy.

The following statements support the findings:

"The data will be checked according to the proportion of files by comparing the previous and current month [and if the] difference is huge or exaggerated then indicators will be checked" (DP G3).

"There is (a) monthly data quality check after reports are generated from the software. Sometimes there is improper documentation and reporting… two people in each department will check for accuracy" (DP G4).

"We work with monthly data that come from the registers. We review to see how many clients are on treatment. We compile data at the end of our shift, identify improper recording and sometimes we find incompatible data from the recordings" (DU G1).

"There are things to be done to control data quality, like lot quality assurance sampling, by selecting 12 indicator data sets, we check data source documents such as tally and register for accuracy, that is, differences and similarities" (DP G4).

"If there are inconsistencies in 12 element data set, we can go up to 20 data sets" (DP G3).

Facilities need to have an adequate number of qualified employees and infrastructure to produce quality data (Moore et al. 2014:132). This will support the analysis and interpretation, and the use of information at the district and facility levels (Nicol et al. 2017:36). A study conducted in Kenya highlights poor data quality from the health information systems, especially in developing countries (Manya & Nielsen 2016:124). In support of the findings, Cheburet and Odhiambo-Otieno (2016:135) argue that the LOAS has a great potential for monitoring health programmes to improve data quality.

4.3.3.2.3 Confidence in data quality checks

Data clerks, in particular, expressed high to moderate confidence in the assessment of data quality. As mentioned earlier, they are tasked with generating data that will form the basis of information that will be used for decision making. The majority received three-day training on Smart care software for aggregation, analysis, and five days on data quality. They believed that training equipped them with sufficient data management skills. The HMIS Focal persons received training on DHIS2 and other modules such as TB and nutrition data management and believed they were competent enough to support other staff members.

"Training was mainly on data management and data quality. It was theory part and some exercises that were very practical which we completed in groups" (DP G3).

"The exercises helped us understand the use of indicators and data aggregation. We can extract, collate, analyse and display data easily using software" (DP G4).

"The training was good and I am confident enough to support staff doing mostly data capture and recording" (DP G3).

For reliable data use to occur, data must be of high quality so that data users are self-assured that the data they are referring are accurate, timely and complete (Nutley & Reynolds 2013:7). Organizations that provided training or education used registration forms; those that offered clinical services (HIV testing) used testing, lab, and counselling forms. Staff who received training on forms reported a high confidence level with filling in forms and using tools (Marshall & Fehringer 2013:7).

4.3.4 Theme 3: Functionality of the HMIS

Information use and decision-making are influenced by a strong data management system that supports the effective capturing and recording of data. As such, it was important to establish how the system users viewed the HMIS functionality.

In Theme 3: Functionality of HMIS resources, two categories emerged, namely, technical factors and availability and use of resources. Table 4.9 indicates categories and subcategories.

Table 4.9: Theme 3. Functionality of the HMIS

Theme	Category	Sub-category
Functionality of HMIS	Technical factors	• Usability of the system • Formats and registers • Indicators and disease classification • IT infrastructure and connectivity

	Availability and use of resources	• Specialized skills • Training needs • Management of updates

4.3.4.1 Category: Technical factors

This study defines technical factors as the usability of the paper-based data collection tool, HMIS design, computer software, and IT complexity which were assessed on the basis of its efficiency and affectivity in data collection (MEASURE Evaluation 2019b:23). In the category “technical factors”, the subcategories that emerged were usability of the system, formats and registers, indicators and disease classification, and IT infrastructure and connectivity.

4.3.4.1.1 Usability of the system

The majority of participants viewed as users of information expressed that the HMIS is very useful for registrations using specific data elements such as age and disease codes. They found it useful in providing information for planning, costing and research, information that is also used to evaluate the performance of the HIV/AIDS programme. However, they suggested that it can also be complicated at times, considering the number of experienced users. The main issues were the system's complexity, related disease classification, and too many indicators, as will be elaborated on later. These issues affect the efficiency of generating quality data and continuous use of information.

The following quotes support findings:

> “HMIS supports the use (of) information for various reasons, such as having the right data based on accurate registrations. When reporting, disease classification and age data support measurement of the disease prevalence. We find it useful in that information from HMIS can be used for planning, budgeting, monitoring and research…” (DU G4).

> “After HMIS was started, new terminology was brought and resulted in many disease codes [name]. Staffs have difficult(ty) to comprehend all the disease codes. In the past, HMIS reporting format was simple and less paperwork” (DU G3).

> “There are too much (sic) indicators that are almost similar, especially in prevention of mother to child transmission service. Currently, we have one experienced person supporting us. Most of the time, we support each other” (DU G2).

Organization are mandatory to show vital roles by planning and preparing people that use the system and the technology with the provision of budget (Mohamedali & Zahari 2017a:358). Adoption of the HIS requires an understanding of the importance of usability factors and being mindful of how the health professionals see the current HIS. Taking into account such usability factors will lead to successful implementation in the future (Alshamari 2016:178).

4.3.4.1.2 Formats and registers

The majority of participants, both those who mainly produced data and the data users, mentioned that the prevention of mother to child transmission reporting format changes regularly, and it can cause confusion and errors by those who are not trained. The main issue seemed to be reporting to different agencies, such as donors and the ministry of health. They were of the opinion that even the trained users need regular updates. However, a few were happy with the format and believed it was easy and clear.

This is indicated in the quotations from the participants:

> “In PMTCT (prevention of mother to child transmission) unit, the ministry supporting partner has their own reporting format. The data are not integrated and errors happen due to different types of reporting formats. I recommend the report format to be uniform and integrated” (DU G2).

> “The prevention of mother to child transmission format is frequently updated. For new untrained person, it will be difficult to understand and work with” (DU G2).

> “HMIS staffs (sic) support by giving clarification about the formats. Sometimes, they don’t even understand, or we make mistakes. The problem is recurring and it is good

> to make the format simple. Prevention of mother to child transmission report lacks specific or detailed information. The format is easily understandable to a trained person" (DU G4).

According to the study in Kenya, the process of reporting the data should be based on standardized report formats and periods from various departments or clinics (Cheburet & Odhiambo-Otieno 2016:135). Findings from the country HIS assessment in Mozambique found a wide variation in the implementation of paper and electronic systems reporting formats and recommended standardization for proper use (Hochgesanga, Zamudio-Haas, Moran, Nhampossa, Packel, Leslie, Richards & Shade 2016:325).

Further studies from Ethiopia presented that health personals usually devote more of their time in filling HMIS forms, but make diminutive use of the information from this system. Furthermore, data placed in data banks, reports, or shelves were not sort out and adequately utilized in program development, improvement, strategic planning and advocacy (Wude et al. 2020:2).

4.3.4.1.3 Indicators and disease classification

The majority of data producers expressed the importance of indicators and disease classification and that it is ideal to enter these in DHIS2 using codes to avoid errors. They raised several issues regarding the system: complex disease classification, some important indicators are missing, inconsistency between paper-based indicators and the software, and Smart care system indicator incompatibility with the DHIS2 system. The incompatibility seemed to be a consistent thread between various tools for data capturing.

The following quotations support the findings:

> "We see inconsistencies between hard copies and health information system data. There are many indicators included in hard copy or register/tally sheet but not in software ... it would be better for health professionals to use codes for diagnosis because their hand writing (sic) is difficult to read" (DP G1).

> "I want to comment on the software, previously, we used 97 disease classifications and now there are about 617 at health centre level, and this is not compatible with DHIS2" (DP G4).

If indicators are simplified, routine reporting and data collection efforts, along with focused efforts to maintain key indicators unchanged over time, will allow easy monitoring of the HIV programme (Gloyd, et al. 2016:5). In Ethiopia, the HMIS indicators have been formulated to meet the important information requirements of monitoring the performance of different health services and programmes. Indicators deliver a snapshot of the existing health resources (Ministry of Health, Federal Democratic Republic of Ethiopia 2013:3). In 2003, the health information systems program team created a module for International Classification of Diseases (ICDs) registration in the DHIS (Braa & Sahay 2012:144). The current study of routine HMIS data quality in Ethiopia showed quality problems for all indicators, especially when compared to external information sources (Adane, Adegeb, Ahmed, Anteneh, Ayalew & Berhanu et al. 2021:7).

4.3.4.1.4 IT infrastructure and connectivity

All groups emphasized that the IT infrastructure needed to be designed in such a way that it supported data management processes, including the use of information for monitoring and evaluation. Currently, the system has some functionalities missing, especially appointments, CD4 (Cluster of Differentiation 4) counts and viral load. In addition, the weight and calculation of dosage were problematic and had complex interfaces. There also appeared to be incongruence between the guidelines and the DHIS2. Participants reported that there were no computers in some facilities, and staff had to report using manual formats. On the other hand, the data producers highlighted issues with connectivity.

The following verbatim quotes illustrate the findings:

> "The system does not have a functionality to save appointment, CD4 [Cluster of Differentiation 4] count and viral load data. It does not produce the report accordingly. A child who is overweight will take adult drug regimen, but the system is rigid and doesn't recognize and record INH data." (DU G3).

> "The internet service installed in three rooms of human resource, pharmacy, & laboratory having fixed payment of 5,500 ETB. But this is not enough to access internet. It is good to connect all rooms through (the) server to communicate with each department and case team on patient information to minimize the paper work load" (DU G4).

> "The other part, we don't have computer system to report …we requested one with software application. HMIS staffs (sic) are expected to save reports on compact disk and flash if there is lack of internet service to send the report…we have started to use data display chart for monitoring the patient load...." (DU G4).

> "The software has problem (sic) in antiretroviral therapy. The system needs to be linked for easy communication. What makes it complex is that if you missed something you will have challenges in making updates in the software." (DU G3).

> "Internet service is poor, but I am requested to send online. Currently I am giving report in hard copy and I need to extract from smart care to DHIS" (DP G4).

In other regions of Ethiopia it has been noted that primary health care units (PHCUs) and district health offices sometimes have shortage of computers to enhance the collecting of the data and its utilization (Ouedraogo, Kurji, Abebe, Labonté, Morankar, Bedru, Bulcha, Abera, Potter, Roy-Gagnon and Kulkarni 2019:10). In Ghana, inadequate finance for training, airtime and data packages for internet connection and replacement/repair of equipment were found to be the main issues that hindered effective use of the HMIS processes (Adaletey et al. 2014:7).

4.3.4.2 Category: Availability and use of resources

Ethiopian health facilities need to be equipped with specialised HMIS teams according to the standards of the new HMIS directive. Several factors, such as skilled personnel, infrastructure, and system-related problems, were found to impede the smooth functioning of the HMIS in developing countries (Dehnavieh et al. 2018:12). Three subcategories emerged, namely: specialized skills, training needs and management of updates.

4.3.4.2.1 Specialized skills

All participants agreed that adequate knowledge and competence in the HMIS is critical. They indicated that one of the biggest challenges in healthcare is inadequate human resources, knowledge, and lack of specialized software skills, and this has a huge impact on the quality of information using HMIS protocols. Data entry processes are also impacted. The understanding of disease classification and coding seemed to be the biggest challenge in addition to a shortage of health information technologists (HIT).

The following quotes support the findings:

> "We didn't have a data manager for the past three years, who will do displays and analyse data for the facility. …there is high staff turnover due to retirement and separation. Every year, staff rotates and no one is fixed in one place" (DP G2).

> "For this hospital, the required HIT is 10 according to HR, but there is (sic) only 3 people for the full hospital information management system" (DP G3).

> "We have one HIT person for all departments in this facility and he has difficulty of supporting every room. 4-5 HIT persons are expected to be assigned. In the past, even one person was not assigned, which created problems in sending quality reports" (DP G1).

> "Most health professionals don't have knowledge on how to use data for decision making" (DU G1).

> "As I have said, there is (a) gap, staff complain about codes, disease classification and the way training is cascaded as compared to previous HMIS" (DU G4).

Increasing the number of skilled health information management professionals in the HMIS strengthens the health system (Makinde, Mami, Oweghoro, Oyediran & Mullen 2016:94). A study in South Africa found that training for HIS staffs and program managers in data collection, in combination with monthly data reviews and data audits, enhanced the completeness and accuracy of data for monitoring the HIV/AIDS program in PMTCT service (Mphatswe, Mate, Bennett, Ngidi, Reddy, Barker & Rollins 2012:178).

4.3.4.2.2 Training needs

Different system users require different types of information in varying details to support decision making. At the facility level, users need information to manage healthcare problems and resources. Participants indicated that there is an urgent need for staff training, especially after every software update. More funds need to be allocated to equip the staff adequately. This was perceived as necessary to enhance capacity and confidence in data management processes. The HIT technicians acknowledged being trained by foreign experts, but that training did not extend to clinicians who are on the frontline of data management. ART training was conducted a long time ago and there are also training gaps in specific areas such as paper-based data management, using software, and presenting data graphically. They contended that training was given on Smart care software, data aggregation, TB and nutrition data management, indicators, and tally sheets. However, they believed that more resources should be allocated to training and should include clinicians.

This is indicated in the following quotes from the participants:

> "As per the facility plan and budget, there is training on computer and software. And Non-Governmental Organizations from Korea trained 10 persons a year. I received training on Smart Care for ART service ..." (DP G3).

> "In HMIS, training on (the) use of software was not provided for health professionals but HMIS technicians. This has a negative impact on entering information into the computerized system" (DU G1).

> "Training need is high for many updated functionalities… ART training was provided (a) long time ago. Currently, HMIS training is not available. We need HMIS training in order to submit reports on time for (the) HMIS department" (DU G2).

> "I have attended training on HMIS data aggregation and analysis for three days, TB data management 3 days, data quality 5 days, eight years ago" (DP G4).

> "Good things I want to mention is that the guidelines and hand-outs provided, I am still benefitting from using guidelines, because most of trainings topics are practically seen on the ground, specifically, DHIS2 training has more practical sessions than others" (DU G3).

> "Before introducing any new data tools, it is good to observe and see the workflow of the frontline staff. How can they work with it, how should it be applied, and what are the problems? These type(s) of questions need consideration" (DU G1).

A study conducted in Greece indicated the importance of health information management in promoting education and training in organizations (Lappa 2016:5). This was to support awareness of HIS and also improve and promote HIS skills through education programmes, workshops and training (Sinha and Sinha 2015:436). The MEASURE Evaluation (2014a:35) distinguishes data quality as well as training and harmonization processes.

Lloyd, Collie, McInnes, King, Lollback and Garland (2011:30) found that the major challenge is to apportion resources for training and to advance the necessary skills regarding information in ideal formats. Trained medical staff support in the HMIS is low in the context of Low- and Middle-Income Countries due to resource constraints. It is important to consider the user requirements, how to implement system features, and how to support efforts to improve overall technology literacy and comfort with health information (Neyens & Childers 2017:316).

4.3.4.2.3 Management of updates

Almost all data producers believed that Smart care needs updating, and they also need regular training on updates. Data such as viral load, cohort chart and appointments are sometimes lost, and that influences everything from client dosages to tracking lost to follow up cases. The updates were perceived as necessary to enhance capacity and confidence in data management processes.

> "…It is good to provide training parallel with new updates. …all facility problems are related to updates and training. Specific training needs to be done to avoid burnout" (DP G1).

> "We need to be skilled in updates on indicator display, use of the system to track distribution and use of resources…refresher training needs to be planned in every year by the Health Bureau" (DP G4).

Health centres faced challenges in ensuring good quality of the HMIS data, ranging from system challenges to facility and human resource-related challenges (Kagoya & Kibuule 2018:9).

4.3.5 Theme 4: Determinants of data use

A well-functioning HIS ensures the production, analysis, dissemination, and use of reliable and timely information on health system or programme performance. Indicators are used for routine monitoring of key aspects of programme performance. HMISs are planned to serve all users at each level of a health system with reliable information for data use (Gimbel et al. 2017:61).

In this theme, two categories emerged, namely: culture of information use and data use in the HIV/AIDS programme.

Table 4.10: Theme 4: Determinants of data use

Theme	Category	Sub-category
Determinants of data use	Culture of information use	• Interconnected roles • Promotion of a culture of information use • Perceptions about health policies and information use • Capacity building in information use
	Data use in the HIV/AIDS programme	• Performance monitoring • Case management • Specific indicators for the HIV/AIDS programme • Ministry level data-driven decisions • Factors influencing data use for HIV programme

4.3.5.1 Category: Culture of information use

Participants' views seemed to indicate that data generators do use data at their level albeit, on a small scale. However, they play a significant role in that data they generate are used by the managers for planning, budgets, and disease control. Kumar, Gotz, Nutley & Smith (2018:e7) confirmed the challenges of creating a culture of data use.

Four sub-categories related to this category emerged: interconnected roles, promotion of a culture of information use, perceptions about health policies and information use, and capacity building in information use.

4.3.5.1.1 Interconnected roles

Participants expressed that the sustainability of the HMIS depended on processes affecting information culture within an organisation. Every individual has an important role to play. They verbalised the benefits of information sharing in managing a health programme. Findings show that there is a symbiotic relationship between data generators and users. As mentioned earlier, data clerks capture and generate reports and display them on the walls using graphs to show trends. HMIS focal persons assist data clerks in data quality checks. Display charts show the required information for each unit. This enables data users to take data-driven actions. Tallies and registers are summarised, and data are entered into the DHIS2 system in the HMIS room. Health professionals are provided with any HIV/AIDS-related data upon request. Data producers are represented in performance review meetings by HMIS Focal persons. However, there appear to be some overlaps in the data management tasks.

> "Mostly data clerks do data analysis. We do paperwork and produce reports and there is (an) HMIS officer who also analyses the data (DP G4).

> "In ART, the data clerk is responsible for data entry into the smart care software. They display the information on the wall chart, which shows number of visits, defaulters and deaths, we have quick reviews of data and make decisions during our monthly meetings" (DU G3).

> "Sometimes department heads and medical doctors request us to generate any information on work progress and impact at the facility" (DP G4).

> “In our health facility, we are using the data, but clarification needs who should use it.... and this will be discussed at the performance monitoring team meeting.
>
> “Data clerks are very helpful in providing information for tracking ART clients” (DU G3).
>
> “We develop annual plans based on HMIS data” (DU G1).

When data users and data producers collaborate, they become more attentive of the data collection processes and methods, the obtainable data sources, and the quality of those data. They can cooperatively analyses and interpret data to respond programmatic questions (Nutley & Reynolds 2013:6). Kumar et al. (2017:85) identified an absence of integrated information systems, non-alignment between data capture tools, inaccessibility of standardised reporting formats and barriers to information sharing.

4.3.5.1.2 Promotion of a culture of information use

Data users from various units expressed different perceptions on the promotion of the culture of information use. They described processes that are being followed at the facility level as an indication of some level of promoting a culture of information use. However, the majority believed that much more could be done by the management as currently, there are no incentives for information use. There are no guidelines, and training is inadequate for users to have a holistic understanding of the purpose of the HMIS. Some indicated that what they do is more procedural commitment. Meanwhile, data producers expressed frustration from the lack of clear communication within the organisation regarding data use at their level.

> “The information I get from HMIS staff is beneficial, we work together to make sure that information is used, it is not perfect, but there is a steady progress from where we were” (DU G2).
>
> “Data clerks are very helpful in providing information for compilation of reports and tracking the HIV/AIDS program progress. However, it would be good to have them participate in our tracking activities as well” (DU G3).

> "Each professional should know about how to use indicators for making decisions about the program. We need deep understanding of indicator (sic) for tracking" (DP G1).

> "The guidelines for our voluntary counselling and testing service are available but they do not provide specific directives on information use, maybe management could focus on providing more training on this aspect" (DU G2)

> "Information use is at the start level and I cannot say we are fully utilising data for decision making. We do support staff, recent implementation of DHIS2 may assist in getting data quickly to use for monitoring the program" (DU G4).

Sustainability of the HMIS, self-reliance and continuous improvement are influenced by how users perceive the culture of information use and promotion of information culture (Harikumar 2012:67). Tiwari, Kumar, Sherin and Kulkarni (2016:69) posit that more often, managers encounter inaccurate data, which is not useful in decision-making. There are various reasons for this; the culture of information use is not well promoted, especially at the facility level. In other settings, data are mainly used for reporting and research (Prince et al. 2018:29). Factors such as an organization's commitment and leadership style to the achievement of the electronic health information system will unquestionably add to its success (Ojo & Popoola 2015:5). In Ethiopia, in general level of routine health information utilization was low for evidence-based decision making. It indicated that department heads poorly utilized existing information to guide program performance and handle resources for effective usage (Chanyalew et al. 2021:9).

4.3.5.1.3 Perceptions about health policies and information use

The majority of the participants describe a few available policy documents that guide HMIS implementation in Ethiopia. They considered health policy and strategic documents as guiding tools at their workplace. Each directorate has specific goals, and besides the documents, they indicated that there is some support from the top-level management in developing plans to achieve long-term goals. In addition, they have standardised performance minute books for information use, which guide the use of information.

"The Ethiopian health policy is instrumental in implementation, at the country level there is (an) overall goal needed to be achieved by each unit of (the) health system. When it goes down to health facilities (they) are part of that system and I perceive health policy is (a) directive and fundamental guiding document for every health facilities (sic) to work accordingly" (DU G4).

"Government of Ethiopia has five-year health sector development strategic documents for each programme and these document (sic) has clear goals, objectives, and plans that are broken down by every year for all health facilities in the country. Currently the health bureau and sub city offices are supporting us on information use to be able to take decisions based on the facility data on (the) monthly meeting" (DU G3).

"The Ministry of Health [Ethiopia] developed standards, manual on information use and performance monitoring team minute books, which are used by every facility for performance reviews" (DU G4).

"Ethiopian health policy has a strategy in HMIS implementation and follow up system up to the level of our health facility. The way of communication is also established in informing any updates in the policy. In my perception, policy needs strong commitment by each one of us for HMIS implementation" (DP G4)

The challenge of creating a culture of data use is a behavioural change intervention, both at the individual and organizational level (Lippeveld & Hagan 2017:339).

4.3.5.1.4 Capacity building in information use

The study aimed to understand how capacity in the HMIS was developed in their facilities. Participants indicated that training in information use ranges from sporadic to non-existence. Some received training on the HMIS with the emphasis on how to use indicators to monitor a programme. Training on the prevention of mother to child transmission and ART was short and included a small part on monitoring and evaluation. They acknowledged that data use might be affected due to a knowledge gap. The key aspects where training would be beneficial were setting targets and calculating programme coverage. They appeared to be more comfortable with the calculation of indicators, plotting and interpretation. Participants also mentioned that supervision is not done regularly by the Health Bureau and Sub-City. Therefore, it is

not yielding the results expected. It appears that HMIS focal persons provide the necessary support.

> “I did not receive training on HMIS, I am learning on the job and getting support from HMIS Focal person” (DU G1).

> “I had training twice only in my 11 years of service in this facility. But, we get support from HMIS staff, they update us on new areas of reporting formats” (DU G2).

> “I received training two years ago and currently there are no updates” (DU G1).

> “The three day training was on a vast area of topics, it was not enough to give us skills and knowledge of information use”. (DU G2).

> “Most do not have knowledge on how to use data for decision making. For me the training was good, recently on the new HMIS format and monitoring and evaluation part clarifies how to use indicators to track progress” (DU G4).

> “Sub city and health bureau come for supervision and should give feedback for the facility improvement…Supportive supervision (is) seldom done in quarterly base” (DU G3).

Availability of data analysis skills at each level, and an adequate number of skilled human power and infrastructure to aggregate and analyse data are fundamental in monitoring and evaluation (Moore et al. 2014:132). In developing countries, the method of developing and implementing information systems is a challenging task due to insufficient skilled human resources (Adaletey et al. 2014:7).

In Ethiopia, health management strategic plan prepared standardized Data Management System, develops, publishes, updates, and institutionalize national health data quality assurance mechanisms (periodic assessments focused on data quality standard adherence and HIS resources including tools, materials, ICT, HR and strengthening integrated supervision, feedback) (Ministry of Health – Federal Democratic Republic of Ethiopia 2012:30).

4.3.5.2 Category: Data use in the HIV/AIDS programme

The main focus here relates to the performance of the HIV/AIDS programme and how data generated routinely from the HMIS are used to track progress on targets. The top-level health system enables providers and public health leaders in the local or lower-level health systems of health information to use data for decision-making and form a shared information infrastructure whilst proposing local autonomy to mitigate contextual health issues (Kumar et al. 2017:89).

In the category of "data use in the HIV/AIDS programme", five subcategories emerged: performance monitoring, case management, specific indicators for the HIV/AIDS programme, ministry-level data-driven decision making, and factors influencing data use for the HIV programme.

4.3.5.2.1 Performance monitoring

Different users require different information in varying details to track the HIV/AIDS programme performance. Participants confirmed the existence of some monitoring systems in the units, such as monthly review meetings. The composition of teams was similar across facilities. Departmental heads participate in teams chaired by the medical directors. Major items for review are testing, initiation levels and adherence to ART. HMIS reports form the basis for discussions using a variety of forms, indicators, and logbooks. They all agreed that monitoring is a team effort that includes inputs from different departments. Participants acknowledged that DHIS2 enhanced real-time access to information for performance monitoring. The interconnectedness of roles becomes very prominent during these performance review meetings.

Statements from participants:

> "In prevention of mother to child transmission department, there is (a) cohort monitoring chart system for checking (the) number of clients, defaulters, fatality rate, and children diagnosed and lost…. The reasons/causes are discussed in our monthly meetings" (DU G2).

"Currently, we assess programme outcomes, we use the report for checking the achievement versus plan and identify the gaps, for example, number of clients with STIs who have been tested for HIV. " (DU G1).

"We keep an eye on the supply chain, drugs such as cotrimoxazole are tracked consistently to ensure enough supply" (DU G4).

"Performance monitoring team use HMIS data to evaluate the strength and weakness of every report. Every plan of activities is reviewed for over 2-3 months. If there is under performance, then re-planning will be done." (DU G3).

"According to voluntary counselling and testing guidelines, we check if all clients were tested. We also use data to check antenatal cases tested, test results received and linked to prevention of mother to child transmission" (DU G1).

"The recent shift to DHIS2 provides great support to reporting and monitoring, we use indicators for that" (DU G4).

"In my hospital, we hold these review meetings to make sure that we use data from HMIS effectively and use annual plans for monitoring. The HMIS focal person makes sure that HMIS reports are done timely and completely for each department to check their performance. Finance and HR heads are also represented" (DU G4).

Silas (2017:46) found that in Kenya, a high number of respondents (70%) recognised the importance of monitoring performance and following up on information use through meetings. Collaboration across various government agencies, specifically data management units, is essential to allow this sharing and use of data (Hosseinpoor, Nambiar, Tawilah, Schlotheuber, Briot, Bateman, Davey, Kusumawardani, Myint, Tetty Nuryetti, Prasetyo, Suparmi & Floranita 2017:10).

4.3.5.2.2 Case management

Participants confirmed that data have proven very vital in managing HIV cases. It gives a lot of information that helps with managing drug therapy. Case managers provide an essential service. Lost cases are being followed up using specific algorithms, testing is monitored, and plans are developed based on the results. The guidelines provide definitions regarding tracing, and clients are followed within prescribed days of missing treatment. The plans mostly involve the initiation of treatment and counselling.

The following statements support findings:

> "In (the) antiretroviral therapy department, we have a case manager, who will follow the linked cases every week. On (a) monthly basis, they will call the lost cases, find out reasons for not following the treatment" (DU G3).

> "We at prevention of mother to child transmission, we have a cohort chart that we use to review children diagnoses, mothers and babies and it is updated at every visit". (DU G2).

> "The test and treat algorithm helps the adherence team to decrease defaults and lost cases. We are able to see if we are reaching our targets" (DU G3).

> "We identify the number of people tested, number of positive client (sic) and linked positive clients…tracing will be done if the client missed the appointment by 7 days" (DU G3).

> "Patients are followed up based on the information received from other units. During reporting time, (an) HMIS team evaluate the facility performance in terms of targets. In January, HMIS was revised, the medical director or HMIS focal person usual(ly) does the assessments to identify gaps" (DU G4).

The health facility data are useful to assess the strengths, weaknesses, adherence, tracking service availability, coverage, inequities in access, and understanding of overall improvements in health (Fapohunda 2012:3). There is a huge potential to utilize existing information and provide it to the clinicians on a routine basis for planning and following up their activities (Lloyd et al. 2011:30). Antiretroviral therapy coverage without bearing in mind system capacity for the delivery of suitable treatment monitoring to all patients will certainly lead to more treatment failures and increased development of drug resistance (Pham, Romero, Parnell, Anderson, Crowe & Luchters 2017:17).

4.3.5.2.3 Specific indicators for the HIV/AIDS programme

An indicator is "a variable that measures one aspect of a programme or project that is directly related to the programme's objectives". The HMIS indicators are the most vital tools for monitoring program performance and health system. Largely, the HMIS

indicators are categorised into programmatic areas like disease prevention and control (HIV/AIDS including), family health, HMIS/M&E and hygiene and environmental sanitation, and health system (Federal Ministry of Health [Ethiopia] 2013:2).

Participants recognised the significance of indicators in information use, and they linked them to the programme's performance. Specific departments have unique indicators, for example, prevention of mother to child transmission, ART, and voluntary counselling and testing. The annual plans are used as benchmarks to monitor the level of achievement by performance review teams. This gives them the opportunity to self-correct and learn from each other.

> "For voluntary counselling and testing department we use clients receiving pre-test counselling, HIV tests and clients with positive HIV test linked to ART department" (DU G1).

> "The indicators are number of pregnant women attending at least one ANC visit at a prevention of mother to child transmission site and acceptance of HIV testing, percentage of pregnant women testing positive for HIV, number of women testing positive who receive ART prophylaxis" (DU G2).

> "Positive clients from voluntary counselling and testing department and linked to our department, persons started ART, and patents receiving ART by specific regimen category" (DU G3).

> "Data analysis is very helpful in showing discrepancies in reporting. This helps to make more informed decisions going forward" (DU G4).

> "Indicators are useful to measure implementation level of the HIV/AIDS programme and to determine resources required, for us, we report to the ministry who take actions on supply of resources" (DU G4).

In the non-existence of an efficient and non-anonymous tracking system for HIV-testers, repeat testing of non-disclosing PLWHIV guides to misclassification between linkage and re-engagement in care and can possibly lead to lower the achievement of the first UNAIDS objective (Fuente-Soro, Lopez-Varela, Augusto, Sacoor, Nhacolo, Honwana, Karajeanas, Vaz & Naniche 2018:7).

4.3.5.2.4 Ministry level data-driven decisions

Participants acknowledged the usefulness of the HMIS in planning and mobilising resources at the sub-city health office, city health bureau and ministry of health levels. They described the data flow from facilities to the ministry level and recognised the significance of policy formulation based on data emanating from facilities. The Ministry of Health uses information for the management of healthcare programmes and the overall health systems. The majority of participants were aware of the important role they play in improving population health outcomes and viewed the HMIS as a system that enables them to make a contribution.

They elaborated as follows:

> "It is important to provide the ministry with useful data to enable them to set national targets and review the indicators. The city health bureau has its own targets in terms of resources allocation. We need to be mindful of different levels of information needs" (DU G3).

> "HMIS data facilitate our tasks. For example, movement of clients will be known at the end of the month, this enable(s) us to complete our tasks relatively easy and fast" (DU G2).

> "Management team looks at data and take(s) actions to improve the service, for example, counselling, training, and staff" (DU G4).

> "My role here is to make sure that as a team, we are achieving our targets according to the displayed charts" (DU G1).

The behaviour of data users in regards to decision-making and problem solving can heavily impact the crucial use of data for service delivery enhancements (Lippeveld & Hagan 2017:339). LMICs government and administrators must encourage an evidence-based decision-making culture through effective policies and establish strong political will to drive in resource constraint regions (Akhlaq, McKinstry, Muhammad & Sheikh 2016:1322). In Ethiopia, empirical evidence showed that the amount of information use for decision making was unreliable from place to place across the country (Chanyalew et al. 2021:2).

4.3.5.2.5 Factors influencing data use for the HIV programme

Participants indicated that organizational factors determine how data is generated and used. These are related to support systems that make the use of the HMIS desirable. They pointed out external factors such as the time it takes to register a case and tally the datasheet, the availability of guidelines as mentioned previously and the complexity of the expected reporting. The majority pointed to the behaviour of system users but indicated that tasks such as accurate and comprehensive documentation were deemed significant in the use of information.

> "…it takes a long time to register and tally the data sheet, in addition, mothers and children have to wait for a very long time to get the test result." FGDU2

> "One of the factors hindering HMIS implementation is (the) lack of (a) simplified and integrated approach at all levels" FGDU1

> "There are things that compromise (the) quality of data such as improper documentation and reporting." FGDU4

> "Lack of knowledge of disease codes, or written in short abbreviation form like AFI, which needs a key to explain." FGDU2

Organization are mandatory to show vital roles by planning and preparing people that use the system and the technology with the provision of budget (Mohamedali & Zahari 2017a:358). Kumar et al. (2018:e7) showed barriers to information use related to issues on an organizational and behavioural level, the information system, capacity building, and economic constraints in many low- and middle-income countries. Another study in similar contexts showed vast encounters with data inaccuracies that prevented using routine data for decision making. Users relied on or used other data sources and not routine health data to make decisions (Tiwari et al. 2016:69).

In Ethiopia, there is a need to ensure quality and timely data for decision-making. The healthcare organization needs to strengthen the existing HIS (Kassa & Grace 2018:8). The other study identified factors affecting data use are individual-level predictors were displaying demographic and performance data, and providing feedback, whereas using HMIS data for target setting, maintaining PMT minute, receiving HIS supervision,

issuing directives by senior management, and location were organizational level predictors (Chanyalew et al. 2021:7).

4.4 SUMMARY

Chapter 4 presented key findings obtained from the qualitative document analysis and stakeholders who participated in the focus group discussion (FGD) in Phase II.

The next chapter outlines an integration and discussion of the study's Phase 1 and Phase 2 findings. Key findings from both phases are discussed jointly, emphasising new meanings that emerged from both data sets.

CHAPTER 5 INTEGRATION, INTERPRETATIONS AND DISCUSSIONS OF THE FINDINGS

5.1 INTRODUCTION

This chapter describes the integration of Phase 1 and Phase 2 findings and discusses the key results of the study. The study adopted a qualitative approach, which started with qualitative documentary analysis, followed by a focus group interviews approach. The first phase included a review of major policies, guidelines and directives related to the structure and use of the HMIS in Ethiopia. The second phase involved focus group interviews with key stakeholders to explore their views of how the HMIS is used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation and the influence of technical, organizational, and behavioural factors on the use of HIV and AIDS health information. The findings from the two phases were presented separately in Chapter 4.

The study used the performance of routine information system management framework to frame the integration and interpretation of the results. Key findings from both phases are discussed jointly, emphasising new meanings that emerged from both data sets. Literature control is included in the chapter.

5.2 INTERPRETATION OF KEY COMBINED FINDINGS

5.2.1 The Health Management Information System in Ethiopia

In general, this study sought to understand the framework of the HMIS and stakeholders' perspectives about the use of the HMIS in generating quality data for monitoring and evaluation of the HIV/AIDS programme in Ethiopia. As this was a case study, it was important to get an in-depth understanding of the environment within which the HMIS operated. The combined findings showed the provisions the Ethiopian government made for the implementation of the HMIS as well as users' views.

The documents revealed the importance of a full functioning health system. The HIS is referred to as the strategic building block of such a health system. Findings indicate that the Ethiopian HIS provides a framework for the HMIS to function and support the health system. There is a framework for an inter-sectorial HIS working body at the

national level that is a formal interagency structure representing the Federal Ministry of Health (FMOH) and others key stakeholders of government sectors (Document 10). The standards and guidelines concerning the HIS governance reflect the responsibilities and roles of different government sectors and donors in a multi-sectoral approach to ensuring a well-functioning HMIS. The HMIS policy includes the people, procedures, datasets, hardware, and software that are essential to coordinate a functional information system and ensure that facilities use the information generated in decision-making (Document 1). This study finding is in line with Asangansi (2012:2), who argues that donors and organisations are creating a situation where an in-depth understanding of the HMIS implementation and the institutional logistics that shape them are useful if not crucial.

Both data sets indicate that the HIS and HMIS are designed to provide sufficient support in data generation, and proper data flow within the health system. This reflects considerable progress in formulating a framework for the HMIS to function optimally. However, this study contends that successful implementation of the HMIS requires a clear understanding of its purpose and use. The stakeholders understood the purpose and meaning of the HMIS, it was well-articulated. The theme that emerged from all interpretations was that the HMIS supports data-driven decisions in monitoring and evaluating the programme (Section 4.3.2.1.1).

Participants acknowledged the significance of having directives on issues of health data management as each will understand their role and area of function. They acknowledged the presence of the long-term organizational goals and plans at the health facility level (Section 4.3.5.1.3). The annual plans were used as benchmarks to monitor the level of achievement by performance review teams (Section 4.3.5.2.3). Although there were some weaknesses, it would appear that the users worked with data available to them. The importance of guidelines concerning understanding definitions of indicators to support the use of information was acknowledged.

This level of understanding is critical for proper HMIS implementation. This study assumes that this will improve data management processes, data quality and information use in the HIV/AIDS monitoring and evaluation. However, data show that access to these documents needs to be improved for all HMIS users. Data producers pointed out that existing guidelines are not always accessible. They are either too

complicated or available only to a few individuals (Section 4.3.2.1.3). There seemed to be a need to develop measures to ensure all staff have access to the legislation that controls the HIS and the HMIS in the country. This is consistent with the findings of Asemahagn (2018:9) and Ayele et al. (2021:39). They found that access influences the extent to which routine health information is used at the health centres and that availability of manuals at the facility level has a positive impact on data quality.

Health information use involves communication. Plans need to be formulated and communicated to various stakeholders. In addition, content showed the need for multiple means of communication (Section 4.2.2.2.5). The National HIS guiding document stipulates plans for data management, and M&E need to be formulated and communicated. However, it would seem that this was not adequately addressed. Therefore, there is a need to develop measures to ensure all staff have access to the legislation that controls the HIS and the HMIS in the country.

5.2.2 Data management processes

Data management comprises all the processes from data production to data/information use. The theoretical framework used in this study refers to the impact of technical, behavioural, and organizational factors on routine health information generated from the HMIS.

It is evident that the HMIS relies on data collected from several sources, which are reflected in several documents: service delivery, finance, human resources, logistics, and capital assets. The procedures manual identifies data collection tools for the HIV/AIDS programme, such as tally sheets and registers for voluntary counselling and testing, prevention of mother to child transmission, and ART services. Evidence from the documents showed that the data features need to be relevant, simple, accessible, and confidential. There is also support for utilising electronic platforms such as DHIS2 to enhance data processes activities such as data entry/capture, analysis, and validation. The routine data recorded using HMIS tools at the service provision level should promote local use to improve the programme (Section 4.2.1.1.4). This indicates encouragement for strengthening an information culture, knowledge management and the capacity to use the information for action at all levels.

The M&E Framework provides guidance for gathering timely, accurate and complete information for monitoring and evaluating the implementation of the national HIV/AIDS strategic plan (D4). Most participants acknowledged the importance of using the correct tools for data capture and recording to produce useful information in HIV/AIDS monitoring (Section 4.3.3.1.1). However, gaps were identified when data users reported challenges with the tools, that they do not fully support information use locally. This study contends that users' perspectives are critical in HIS implementation. Mgbere et al. (2018:14) argue that data collection tools need to relate to the information needs of users in order to use data-driven decisions.

The main issue with the tools seemed to be a hybrid system of using manual and electronic reporting systems. The documents show the plan of the government to bring the information revolution to the health facilities through ICT (Section 4.2.1.1.6) to empower health professionals by minimising paper-based reporting systems (Section 4.3.3.1.3). However, the participants expressed the opinion that the ministry's intentions had not been realised. The burden of paperwork remains. The main challenge appeared to be a shortage of electronic devices for reporting. This seemed to hinder the data effective management processes. Nevertheless, the parallel system had some benefits. Participants mentioned that during power cuts, system failure and non-functionality of ICT equipment, the paper-based system was used to keep the systems processes functional. Manual and traditional approaches to data management at health facilities often make data management tasks difficult (Kebede et al. 2020:9). In the context of developing countries, a clear strategy is critical to maintaining standards for HIS and information infrastructure (Braa et al. 2007:399).

5.2.2.1 Data analysis, presentation, and reporting

Health systems require support in the analysis and interpretation, and use of information at the district and facility levels (Nicol et al. 2017:36). The goal of the HMIS, as stated in the policy documents, is to support evidence-based decision making in the health sector. It is evident that there is a framework that guides tasks involved in data analysis as well as the competencies required. The importance of information sharing and using graphs, charts, and tables for prompt information use was articulated (Section 4.2.1.1.7).

The majority of data producers used software to produce graphs and put them on display. They were satisfied with DHIS2 as they claimed that it produced a variety of graphs and forms for ease of analysis. The data users acknowledged that they refer to those graphs to report on their units' performance and outcomes. They also disaggregated according to age and gender and submitted reports to the HMIS unit (Section 4.3.3.1.2). Therefore, the data presentation will need current and updated information on the HIV/AIDS programme on wall charts especially, in ART rooms. It will give a quick, snapshot information on the HIV/AIDS programme status to facility managers, supervisors, partners, and donors. The web-based DHIS2 collects health facility service delivery data and encourages information use at all levels (Mugendi 2015:70). Information-use practices need to be supported; understanding the health indicators with added skills on analysis would enhance that process (Wude et al. 2020:9).

Evidence from the documents revealed that annual reports inform the country of specific health needs. These reports are compiled from facility-level data. Therefore, there is a need for reports to be complete, timely and accurate (Section 4.2.1.1.8). These are all dimensions of quality. The documents acknowledge challenges with reporting and low-quality data (Section 4.2.1.2.3). This is corroborated by participants who also raised several issues on the quality of reports, especially those coming from clinicians, the mismatch between software and report formats. This would point to a need to review the compatibility of the reporting systems in Ethiopia. The process of reporting the data should be based on standardized report formats and periods (Cheburet & Odhiambo-Otieno 2016:135).

5.2.2.2 Data quality

The guidelines in the documents seemed to emphasize data quality assessment through data quality assurance, types of data quality assurance techniques, data quality tracking of completeness and the timeliness logbook and DHIS2 checks. These include data quality assurance techniques documented earlier, such as lot quality assurance sampling, which seemed to be given prominence (Section 4.2.1.2.4). About supervision and feedback, it can be stated that regular and supportive supervision and feedback will play key roles in the generation of quality data and successful implementation of the HMIS in the HIV/AIDS programme. Participants agreed that, to

use information effectively, data generated from health facilities should be of high quality (Section 4.3.3.2.1). They described various ways adopted to assess quality. The general agreement was that lot quality assurance sampling (LQAS) ensures data accuracy and completeness at three levels: register, tally sheet, and report document (Section 4.3.3.2.2). Lot quality assurance sampling is done monthly after the compilation of the final report before submission by the data quality committee. The study recognizes the efforts made by the health bureau to ensure data quality. However, it seemed this process too needs to be strengthened. These interventions may improve the quality of data at health facilities in areas of data accuracy, completeness, and report timeliness. However, participants indicated that quality is also affected by other issues such as motivation levels, which fall under behavioural determinants. Nevertheless, they acknowledged that the electronic report and the HMIS somewhat support maintaining quality data. Timely, accurate, error-free reporting and uploading of data are considered the quality benchmarks of an ideal HMIS (Samal & Dehury 2016:8).

5.2.3 Determinants of HMIS use in monitoring and evaluation of the HIV/AIDS programme

This study used the performance of routine information system management framework that identifies technical, organisational, and behavioural determinants of HMIS use. The study found that these factors were interlinked, and there was a symbiotic relationship between them.

5.2.3.1 Technical influences

DHIS2, indicators, ICT and other related resources are discussed here as part of the technical factors highlighted in both data sets. ICT and other related resources are recognized as critical for efficient and effective healthcare delivery. Efforts are encouraged for bureaus and woredas [districts] to acquire sufficient tools and infrastructure to support the generation of quality and useful data (Section 4.2.2.1.5).

All participants agreed that the IT infrastructure is designed in such a way that it supported data management processes, including the use of information for HIV/AIDS monitoring and evaluation (Section 4.3.4.1.4). However, they alluded to the challenges

they experienced, such as unstable connectivity and intermittent power supply. Implementation of policies seemed to have challenges due to a lack of supporting structures. There were no backup systems to ensure a consistent flow of information. As mentioned earlier, Ethiopia uses a hybrid model of paper-based and electronic reporting. Using paper-based reporting during power or connectivity failures does not support the timeliness of reporting. There are stipulated intervals for reporting. This, in turn, will impact information use negatively. The WHO (2021:4) recommends the adequate provision of information and communication technologies for health to promote equitable, affordable, and universal access to their benefits.

The regulatory framework supports the utilization of DHIS2 (Section 4.2.2.1.6). Most of the participants found DHIS2 useful in providing information for planning, costing, research and monitoring the performance of the HIV/AIDS programme (Section 4.3.4.1.1). However, the parallel use of Smart care software brought interoperability challenges. They indicated that the software needed updating, and they also needed regular training on updates. The lack of standards for various software and hardware tools is a recipe for incompatibility among myriads of devices applicable to health information technology (Umezuruike, Nwankwo & Kareyo 2017:7729).

In Ethiopia, the HMIS indicators provide a portrait of the current health system and function (Ministry of Health-Federal Democratic Republic of Ethiopia 2013:3). The importance of indicators to monitor the performance of the programme, to show whether it is achieving its intended objectives or not, is acknowledged. The key performance indicators in the HIV/AIDS programme are clearly described (Section 4.2.2.1.3). The majority of data producers expressed the importance of indicators and disease classification. However, they raised several issues regarding the system: the complex disease classification, some important indicators are missing and inconsistent (Section 4.3.4.1.3). Data users linked them to the performance of the programme and indicated that specific departments have unique indicators, for example, prevention of mother to child transmission, ART, and voluntary counselling and testing. The key finding teased from both phases of study is the need for clear indicators with a simple disease classification system for improved data management and use in HIV/AIDS monitoring. Diana et al. (2017:11) articulate similar sentiments that the selection of indicators should be based on the importance of data collection

choices. Literature also emphasizes a need to harmonize indicators (Gloyd et al. 2016:5).

5.2.3.2 Behavioural aspects

This study defined behavioural influences as data quality checking skills, problem-solving skills, competence, and confidence in routine HIS implementation. Both data sets show shortcomings in health professionals' skills and knowledge in data management processes and maintaining data quality (Section 4.2.2.1.7). Only a few participants were satisfied with the system and believed it was easy and clear (Section 4.3.4.1.2). They all agreed that adequate knowledge and competence in HMIS is critical in M&E. Data show that understanding disease classification and coding seemed to be the biggest challenges, in addition to a shortage of health information technologists (Section 4.3.4.2.1). This awareness created an opportunity to develop capacity building actions in the framework. Data analysis, interpretation and display, need specialized skills and knowledge.

A study in Ethiopia attributed poor data quality to the behaviour of some health professionals, such as incomplete capturing of data in registers and tally sheets, illegible data, negligence, lack of commitment and missing reports (Endrias et al. 2019:5). Similarly, the absence of staff's technical knowledge concerning health information management affected the implementation of the DHIS2 in Zanzibar (Dehnavieh et al. 2018:8). Information systems implementation is compromised due to a lack of knowledge and skills in developing countries (Adaletey et al. 2014:7).

Behavioural modifications initiatives are required to ensure quality data and meaningful use in the monitoring and evaluation of the HIV/AIDS programme. Data clerks, in particular, expressed high to moderate confidence in the assessment of data quality. The majority believed that training equipped them with sufficient data management skills. HMIS Focal persons received different training and thought they were competent enough to support other staff members (Section 4.3.3.2.3).

Users were found to have sufficient confidence in carrying out data quality checks. However, gaps were identified in the level of problem-solving of HMIS tasks. This could be related to inadequate specialized skills. The question of the motivation of staff

to use the HMIS will be discussed jointly with organizational factors as the two are intertwined.

5.2.3.3 Organisational factors

This study assumes that developing a strong data management system that supports effective capturing and recording of data is a core function of management. Technical factors such as data collection tools, the HMIS design, computer software, and reporting formats are all strategic decisions taken by the organisation, which influence users' behaviour. Leadership in the HMIS implementation is critical, and so is the provision of adequate resources for HIV/AIDS management.

5.2.3.3.1 Availability and functionality of resources

It has already been reported that the Ministry of Health formulated the HMIS procedures, guidelines and protocols for data management processes, data quality and information use. In terms of human resources, content analysis of documents reveals that adequate staffing is key to the success of the HMIS/M&E for the HIV programme. There is also an emphasis on capacity development. However, there is an acknowledgement of the challenges of shortages and turnover of health information personnel (Section 4.2.2.1.1).

As described earlier, participants expressed that one of the biggest challenges in healthcare is the shortage of human resources, inadequate knowledge, and lack of specialized skills in software (Section 4.3.4.2.1). The staff shortage affects the HMIS implementation, starting from data generation to information use for HIV/AIDS monitoring at the facility level. Some of the participants indicated a shortage of health information technologists (HIT). For example, the required HIT for a hospital is ten, but there were three available, and for health centres, it ranges from four to five persons, but only one was available at a specific facility.

This study observed that the challenge of adequate staffing would require proactive and innovative strategies to ensure smooth HMIS implementation and improve the data quality. The timely production of quality reports and the use of information is highly dependent on human resources, where mostly the paper-based information

system is implemented. In addition to the number of staff, the skills required for tasks, such as the calculation, production of data, interpretation, and use of the information, are essential for a better performance of the HMIS.

In Ethiopia, each health facility is expected to put the necessary team on the HMIS according to the requirement and standards (Ministry of Health [Ethiopia] 2010:84). Other findings are consistent with this finding and indicate that the primary reasons for poor data quality are the shortage of qualified personnel, especially the nurses and data entry operators who are responsible for data inputs (Tripathi et al. 2018:13). Therefore, there could be a need to have targeted resource mobilization through staffing allocation and recruitment with adequate budgeting for the staff.

On the other hand, participants reported that some functionalities of the IT were missing, especially appointments, CD4 (Cluster of Differentiation 4) counts and the viral loads of patients. In addition, the weight and calculation of dosages were problematic and had complex interfaces. There also appeared to be incongruence between the guidelines and the DHIS2. Studies also show that developing countries face a myriad of system and infrastructure challenges. Lack of technological resources appeared to hamper the successful implementation of the HIS (Dehnavieh et al. 2018:12).

Participants also acknowledged an urgent need for staff training, especially after every software update. They believed that more resources should be allocated to training and include clinicians (Section 4.3.4.2.2). Data from both phases reveal that capacity building activities combined with mentoring and coaching at supportive supervision will result in sustainable improvements in the health information system. Government officials need to fill the gap by involving other partners to identify gaps in a specific area of the HMIS to design meaningful capacity building activities.

Other findings are consistent with this finding. Improving capacity building in overall technology will result in staff accepting the HIS and its general implementation (Neyens & Childers 2017:316). Insufficient skilled human resources are often cited as one major barrier (Adaletey et al. 2014:7).

5.2.3.3.2 Culture of information use

Content showed that data demand is driven by the formulation of specific questions, and there is an understanding that data should be available to answer these questions (Section 4.2.3.1.1). Three documents showed and described the HIV/M&E Plan, related activities, and costs. The plan reflects a multi-sectorial response to HIV using the performance of indicators as a basis for action (Section 4.2.3.1.2). Data from participants showed collaborative work between three departments through performance meetings, developing the plans and monitoring each department's programme implementation. However, those were units within the HMIS department, there was no evidence of multi-sectoral collaboration at this level.

The important relationship between information use and decision making is reiterated (Section 4.2.3.2.1). The use of a decision tracking matrix is emphasized – plans to form the basis for decision-making for performance improvement (Section 4.2.3.2.4). Resources required for performance monitoring are highlighted. There must be a monitoring plan which shows achievement. Different tools could be used. The importance of the HMIS data and external monitoring systems are acknowledged (Section 4.2.3.2.3). Performance review meetings (PRMs) are strategies to ensure data quality and information use. However, there was no evidence of the supply of monitoring tools to the facilities. Participants also confirmed the existence of a monitoring system in the units, such as monthly review meetings. Other processes or mechanisms could not be identified. They all agreed that monitoring is a team effort that includes inputs from different departments. The interconnection of roles becomes very prominent during these performance review meetings (Section 4.3.5.2.1). Bogale (2021:7) indicated in his study that more than half of the respondents conducted review meetings as per the standard at the facility level.

Stakeholders acknowledged the usefulness of the HMIS in planning and mobilization of resources at sub-city health office, city health bureau, and ministry of health levels (Section 4.3.5.2.4). They described processes that are being followed at the facility level as an indication of some form of promoting a culture of information use. They also confirmed that data have proven very vital in managing HIV cases. Case managers provide an essential service, lost cases are being followed up using specific algorithms, testing is monitored, and plans are developed based on the results

(Section 4.3.5.2.2). The majority believed that much could be done by the management through incentives, guidelines, and training on information use (Section 4.3.5.1.2).

Culture of information use is at the infancy stage at the local health facility level. Measures will need to be implemented to improve the culture of information use through training, improved supervision, and better structured review meetings. The role of the HMIS focal persons will require a review and strengthening, especially with regard to the facilitation of the use of information. This intervention will bring in capacity building and behavioural change.

Literature shows that this finding is not unique to Ethiopia. Lippeveld and Hagan (2017:339) confirmed the challenges of creating a culture of data use as mostly related to the behavioural and organizational, information system, capacity building, and economic issues in many low- and middle-income countries. Similarly, the MEASURE Evaluation (2014a:35) indicated that in HIV monitoring and evaluation, a planned data demand is necessary as planning forms the basis for decision making and the use of a decision tracking matrix.

The focus is placed on performance monitoring teams utilizing the HMIS data for proper decision making. Study findings and literature support the idea that review meetings are key areas where information use for HIV/AIDS monitoring can occur. The functionality of the performance monitoring team has been associated with the data quality and use level of health facilities (Ayele et al. 2021:39). The country guidelines provide the framework for interpretation and use. Indicators are used to evaluate performance. Local and timely use of data will have a more meaningful impact than just reporting to a higher level.

5.2.3.3.3 Supportive supervision and feedback

Documents stipulate the importance of regular and supportive supervision for improving HMIS implementation to support the use of information for monitoring the HIV/AIDS programme (Section 4.2.1.2.5). Similarly, an enabling environment and feedback were found to be significant for participants. Data producers acknowledged the impact of feedback on maintaining quality and indicated that reporting and other

aspects could benefit from consistent feedback (Section 4.3.2.2.3). However, they lamented that there was no structured supervision from management and no frequent training on software updates. Instead, staff relied on each other's experience on software related issues.

The study recognizes that the sporadic visits by management did not address the essential data processes issues as participants indicated that they would prefer to have supervision that includes finding solutions for the HMIS implementation (Section 4.3.2.2.2). This finding seemed to tie in with the observation about insufficient problem solving on HMIS tasks discussed earlier. Well-structured supervision is believed to be critical for smooth implementation of the HMIS and information use for HIV monitoring because staff will be made aware of their level of strengths and weaknesses and how others perceive their performance. This would have a positive impact on their motivation for self-growth. Mungedi (2015:69) supports these data by stating that the management of the public health facility in Nakuru County does not provide immediate written feedback after supportive supervision to the staff.

In terms of the motivation of staff, nothing was observed in the reviewed documents. The main issue seemed to be a lack of recognition for the efforts. Data users also indicated that issues such as the lack of a well-structured programme for capacity building, heavy workload and burnout, low salary incentives, a lack of recognition, low job satisfaction, and an unfavourable working environment negatively impact their motivation levels.

Feedback on performance has been described as a powerful motivating agent. The data also showed a strong relationship between contextual factors, supervision, and work motivation. The success of the productivity improvement strategy is dependent on employee commitment, job satisfaction, skills, and motivation. Work content and context play significant roles in an employee's life (Jegede & Ola-Olorun 2017:5).

5.3 DISCUSSION OF KEY FINDINGS FROM COMBINED DATA SETS

5.3.1 The HMIS and data management processes

The performance of an HIS is measured by two processes: the quality of data generated from the system and the culture of information use in making strategic

decisions. In this case, the behaviour of data collectors and users and the context in which the HIS operates are critical. There must be adequate support for the production of good quality data. It is evident from the findings that countries need a well-thought-out strategy to enhance data quality, data processes and relevant tools. This would support the generation of and use of quality data.

Ethiopia seems to have relevant protocols, guidelines to ensure sustainable data production. However, data from participants show some serious challenges with the implementation of the HMIS. The study identified the need for an in-depth understanding of the HMIS for programme follow-up and information. The assumption was that the HMIS understanding is a foundation for proper HMIS use and implementation through management inducing staff to embrace an innovative HMIS understanding (Mohamadali & Aziz 2017b:375).

This study revealed that data analysis, interpretation and presentation need technical skills and knowledge (Ayele et al. 2021:33). Participants received training ranging from three to five days, but this was during the initial implementation phase, and there seem to be issues with subsequent capacity building initiatives.

Findings show that the role of data producers and users are interconnected. This supports the view taken by this study in referring to both groups as stakeholders and also to merge data from all groups. Both data users and producers have interconnected roles in data generation activities. For data management processes to be effective, every individual plays an important role to ensure data quality leading to effective use of the information. When data users and data producers collaborate, they become more attentive of the data collection processes and methods, the obtainable data sources, and the quality of those data. They can cooperatively analyses and interpret data to respond programmatic questions (Nutley & Reynolds 2013:6).

Concerning data flow, the HIS concentrates on regulations that will enable the systems to work together in an integrated format. Since the focus of the HMIS is on the use of information, data flow is supported through timelines and reporting channels. Hence, Ethiopian strategic plans show a focus on harmonizing data generation/production, use of information, and use of technology. However, structural or systemic challenges seems to hamper effective implementation of these plans.

As mentioned earlier, data clerks capture and generate reports and display them on the walls using graphs to show trends. The HMIS focal persons assist data clerks in data quality checks. Display charts show the required information for each unit. All these processes enable data users to take data-driven actions. Tallies and registers are summarized, and data are entered into the DHIS2 system in the HMIS room. Data entered into the DHIS2 system in the HMIS room are organized around twelve (12) key indicators for each department to generate useful information for monitoring the HIV/AIDS programme. These indicators were found mentioned in several documents reviewed.

Findings show the importance of three key departments, namely, voluntary counselling and testing, prevention of mother to child transmission, and antiretroviral therapy. In the voluntary counselling and testing department, people are engaged in monitoring and evaluating the programme. Key indicators are used to generate data, such as the number of individuals tested and counselled for HIV and who received their test results. In the prevention of mother to child transmission department, the focus seemed to be on the number of HIV infected women on HIV care and using a modern family planning method in addition to all the indicators which are used at the antiretroviral therapy department. Furthermore, the antiretroviral therapy department was found to generate data on key indicators such as the number of PLHIV newly enrolled in pre-antiretroviral therapy care, the number of PLHIV started on antiretroviral therapy, and HIV positive persons receiving co-trimoxazole prophylaxis. A special focus was on generating data about patients currently on antiretroviral therapy drugs, differentiated by the type of regimen, age category, and sex. All these units used the HMIS to generate relevant data and plan activities accordingly.

Data producers demonstrated a good understanding of the type of data using the HMIS. Although they also expressed some challenges, such as a lack of clarity in the disease classification code, the use of the HMIS did not appear to present any issues. They were able to articulate their data management tasks according to the guidelines, protocols, and procedures. Moore et al. (2014:132) support the findings and argue that indicators should be developed jointly with lower levels of the health system and according to locally prevalent priorities to enhance the understanding of some complex indicators. This will support the analysis, interpretation, and use of information at the

district and facility levels (Nicol et al. 2017:36). These indicators are important for strategic information use required for the antiretroviral therapy programme improvement (Braa et al. 2007:382).

The display of information, which in this study was mainly performed by data producers, is an important mechanism in the implementation of the health information systems. It shows the use of information in monitoring performance through visual presentation of data and strengthening transparency. Participants indicated that data display requires specialised skills in data analysis and the availability of tools (charts, computers, and printers). This would require the health facility to have the necessary ICT infrastructure. Data producers lamented the inadequacy of resources, and this study did not measure the impact of that on the use of information. This challenge is reported in other developing countries as well. Ouedraogo et al. (2019:10) indicated that primary health care units and district health offices sometimes have shortage of computers to enhance the collecting of the data and its utilization.

Nevertheless, the symbiotic relationship between those who mainly produce data and those who are charged with using that data to monitor and evaluate the programme seemed to work smoothly. Health professionals are provided with any HIV/AIDS-related data upon request. The data clerks based in the antiretroviral therapy department indicated that they provide data aggregation results from the Smart care software and work with an HIT person in entering the data into the DHIS2 system. Each department head will get the results generated by data producers to be used at performance review meetings.

The prevention of mother to child transmission and voluntary counselling and testing heads are responsible for collecting data from the records following a specific format. In comparison, antiretroviral therapy heads obtain reports from Smart care software in collaboration with antiretroviral therapy data clerks and lead the performance review meetings. These are usually medical directors who oversee the integration of medical services in the HIV/AIDS programme. What is evident is that HMIS use demands interrelated roles and clearly articulated links between data production and the use of information.

Even though participants mentioned some challenges, these processes appeared to be consistent with the approach espoused in the protocols and policies that guide the HMIS implementation in Ethiopia. This does not mean that they were in total compliance. A study by Gimbel et al. (2017:61) reveals that HMISs are planned to serve all users at each level of a health system with reliable information on which to support decisions.

The demand for specialized skills and capacity shortage of personnel calls for an urgent review of the staff compliment as these challenges will affect the quality of data and reporting times. There was also an understanding that the design of the HIS was critical in the successful implementation of the HMIS. Ethiopia uses a hybrid model of paper-based and electronic reporting. Views were expressed that the use of paper-based reporting did not support timely reporting, while power failures and connectivity were also cited as challenges. However, many participants indicated that the paper trail provides a reliable backup, especially during power failures that seemed to be frequent. The system seemed to be hampered by reporting formats, the load, and the tools used to capture data. Evidence reveals that the continuous usage of paper-based systems results in poor data quality regarding availability, reliability, completeness, and timeliness of reporting and that it affects health service delivery (MEASURE Evaluation 2012:9).

The effective monitoring of HIV/AIDS service requires timely, complete, and accurate information through a functional IT system. The involvement of external agencies also seemed to be an issue. For example, the Ministry of Health [Ethiopia] had its mandates for the data management process, but external agencies also bring software that is not compatible with the local IT infrastructure. This study views that as a divergence between the guidelines and actual implementation in reporting. Therefore, management might need to review the reporting formats and software currently being used. In developing countries, the HIS exists with many parallel central programmes, which leads to the disintegration of the HIS (Kumar et al. 2017:85).

Mozambique also showed that a wide variation in the use of paper and electronic systems reporting formats, the incompatibility of reporting formats and a shortage of skilled professionals are the main challenges that require a standardization of reporting (Hochgesang et al. 2016:325).

Participants were satisfied with DHIS2 as it produced a variety of graphs and forms for ease of analysis. Alshamari (2016:178) indicates that DHIS2 utilization is critical for proper implementation of data management and facilitating the use of information in HIV/AIDS monitoring. Having a usable system can significantly help the practitioners to implement the HMIS successfully.

There was also no evidence of collaboration between supervisors and managers in developing a performance appraisal system. Nothing could be found on reviewed documents regarding measures to enhance staff motivation to use the HMIS efficiently and effectively. However, the study assumes that it would be naïve to assume that motivation alone would be sufficient to ensure data quality and the use of the HMIS information for HIV/AIDS monitoring. Evidence pointed out the vital role of the district health office in improving the quality of the information system by providing integrated supervision that includes performance monitoring and appraisal as an effective way of ensuring the quality of data (Shaikh et al. 2015:30). Several suggestions were made by all stakeholders regarding external motivation initiatives.

5.3.2 Monitoring performance of the HIV/AIDS programme

This section discusses inputs on routine information systems, which included organizational, behavioural, and technical determinants. These factors influence not only information use but also the processes as described in 5.3.1. The interplay between these determinants is acknowledged. Therefore, the discussion is integrated.

The complexity of reporting formats, interoperability of software used, non-alignment with paper-based tools, the DHIS2, HIV/AIDS specific indicators, ICT and other related resources were highlighted as key barriers to the successful use of the HMIS. Participants believed these technical issues impacted the quality of data adversely and subsequently the conversion of that data to information and using it to monitor the programme's performance. Ethiopian guidelines emphasize the benefits of DHIS2 in ensuring the production of good quality data. However, without clear indicators, the system will not produce useful data.

The findings from Ethiopia on the overall status of data quality in relations to data accuracy, report completeness, and report timeliness was under the country set

targets (Kebede et al. 2020:7). It is also evident that the availability of resources, culture of information use, supervision and feedback, directly and indirectly, influence data demand and data use. For example, availability and access to directives, well-structured capacity building initiatives and supportive supervision were seen as imperative in developing a culture of information use. Ojo and Popoola (2015:5) also confirm that management and leadership advocacy and an organization's commitment to promoting a culture of information affects the success of the health information system.

For the HMIS to be fully utilized, users need adequate knowledge, problem-solving skills, competence in data validation and confidence in data management processes. The findings mentioned all these specialised skills in varying degrees, and the conclusion is that they were below optimal levels. The impact on data quality and converting that data into useful information for monitoring and evaluation (M&E) will be negative. The facilities need to be well-resourced, both in staffing terms and in other essential tools. These weaknesses in the system did not prevent users from performing tier tasks. Healthcare professionals have a significant role in using data to monitor programmes (Prince et al. 2018:29).

The HMIS governance in Ethiopia is well presented in strategic and guiding documents. The government of Ethiopia has put in place legislation covering roles and responsibilities for each sector to improve the HMIS implementation. However, structural and systemic challenges seem to thwart the full achievement of objectives.

Quality reporting benefits from a well-designed HIS, but system users need a good understanding of what needs to be recorded and the format and time intervals. The data quality measures undertaken through the support of HMIS staff in the recording of tallies and register books were acknowledged. Those responsible for data aggregation performed their tasks with a full understanding of the implications of information use. The DHIS2 also had functionalities that verify data ranges. However, it is evident from the findings that more still needs to be done to improve the performance of the HMIS. Information use requires quality data that have been checked by lot quality assurance sampling. The application of lot quality assurance sampling methodology is predominantly striking because of its simplicity, the speed of

operation and its possible effectiveness during the assessment (Ahanhanzo et al. 2014:841).

Different units tracked their performance routinely through data generated by the HMIS. This was achieved by comparing their plans with data. Some units, such as the prevention of mother to child transmission, had a cohort monitoring chart system that enabled the use of data to monitor the programme. The format of presenting data, namely, the use of bar and pie charts, supported early identification of problems and analysis of the performance of the HIV/AIDS programme. This will support analysis, interpretation, and use of information at the district and facility levels (Nicol et al. 2017:36).

Participants understood indicators as key to addressing information needs. The content of some documents reflected the need to understand how the HMIS could be improved for performance monitoring of health programmes. Timely data were identified as crucial for immediate use in tracking antiretroviral therapy client adherence and drug and HIV testing kit supplies. The study assumes that these processes can reinforce initiatives to encourage information use if they are well supported. In other studies, Silas (2017:46) found the importance of monitoring performance and following up on information usage through performance review meetings.

The participants claimed that review meetings provided a platform to collaborate and monitor the programme performance using various tools. They believed that the collective approach following the performance review meetings enabled them to identify and resolve issues across the units. Participants perceived these meetings as vital and their roles as significant for the continued use of the HMIS in monitoring the programme's performance. However, it was evident that these meetings were conducted irregularly, not as provided by the guidelines. The management team seemed busy with many tasks and other competing demands. The study believes that it had an impact on the degree of information use at the health facilities. Despite the challenges, users had a good understanding of how to use data for monitoring the performance of the HIV/AIDS programme. Data producers used the data for follow-up on their programme achievements and tracked the resources needed at their department level. Information was used to track antiretroviral therapy defaulters and

monitor the supply chain of the antiretroviral therapy. If plans can be developed to mitigate risks and barriers, health facilities will have a positive experience of the HMIS.

The MEASURE Evaluation (2017b:26) also support the view that HIS should be designed to support a positive transformation in the performance of the HIS, as considered by enhanced data quality and the use of data to produce health-sector indicators and update data-informed decision making.

5.3.2.1 The culture of information use

Based on the findings, this study assumes that building capacity in the use of the HMIS for monitoring and evaluation requires interventions that address all the determinants (organization, technical and behavioural). If organizations promote the use of information, that will increase competence in conducting routine health information systems tasks resulting in high confidence in data management processes. Various documents described the HIV/AIDS M&E Plans and related activities. Promoting a culture of information use is emphasized. However, specific guidance at the operational level would be beneficial. Most documents are silent on step-by-step implementation. Central to successful evidence-based decision making is that users must perceive the organization as actively promoting this culture. The performance review meetings reflected some commitment to data quality and the development of a culture of information. Lippeveld and Hagan (2017:339) agree that there must be a plan at every level of the health system for the creation of a culture of data-driven decisions. It is well-documented that the sustainability of the HMIS depends on all processes affecting organizational information culture. Harikumar (2012:67) agrees that the advancement of an information culture cultivates the programme implementation. Wude et al. (2020:9) also indicate that a perceived culture of information enhances routine health information utilisation.

5.4 SUMMARY

This chapter presented new meanings that emerged from combined data sets. The theoretical framework guided the integration. These new meanings will be used to develop a framework to support health facilities in the quality data generation and strengthening of the use of information to support HIV/AIDS monitoring and evaluation.

The next chapter presents the processes followed to develop and validate the framework.

CHAPTER 6 DISCUSSION ON THE DEVELOPMENT AND VALIDATION OF A FRAMEWORK

6.1 INTRODUCTION

Chapter 6 discusses the process followed to develop and validate a framework for the use of the HMIS for HIV and AIDS monitoring. The fourth objective of the study is to develop a framework for improving data management for HIV and AIDS monitoring and evaluation. The chapter presents the goals and scope of the framework, followed by the steps and methods used to develop the framework, then the framework validation process with results. Finally, the final framework is presented with a discussion. The discussion in this chapter justifies the action plans developed and the literature used to support that. The development of the framework is based on scientific evidence from the combined Phase 1 and 2 and expert opinions in Ethiopia. The validation process followed a modified Delphi technique to gain consensus.

6.2 GOALS OF THE FRAMEWORK

The overall aim is to improve the HMIS data management and use of data for HIV/AIDS monitoring and evaluation at the health facility level. The primary purpose was to have agreement on the content and scope of the framework.

The framework goals are:

- Strengthen the data management processes of the HMIS.
- Enhance the use of data to develop operational plans to guide HIV/AIDS monitoring and evaluation.
- Improve the ICT infrastructure, design, and functionality.
- Build the capacity of the health professionals.

6.3 SCOPE OF THE FRAMEWORK

The framework acknowledges the interactions between data producers and data users, including management at the health facility. It recognizes that different data users require different information in varying detail to support decision-making.

Monitoring and evaluation demand data-based decisions that will lead to better performance of the HIV/AIDS programme and better health outcomes.

The scope of this framework is for health facility level use. Nevertheless, it includes policy-related issues with implications for federal, regional, and sub-city/woreda levels. Therefore, the Ministry of Health, regional health bureau and sub-city health office could benefit from the recommended framework.

The framework provides detailed action points under each objective. The implementation of the framework will be influenced by the context and unique needs of each level, such as the users, facilitators, and barriers for implementation. The findings revealed barriers and facilitators such as budget constraints, availability of skilled persons, efficient HMIS management, and leadership.

There is some element of flexibility in the framework, which allows for updates. The proposed action may cause additional workload. However, the study assumes that each facility will adapt it according to their needs.

6.4 DEVELOPMENT OF THE FRAMEWORK

A framework is a set of principles used to form an idea. The components of the framework are related to each other or support one another. Finally, the framework itself should have an overall purpose; all the elements must contribute to its purpose (Abduh, Wirahadikusumah, & Messah 2018:3). This study assumes that this framework will lead to improved data demand and continued data use, thus creating a cycle that leads to improved health policies, programmes, and, ultimately, health outcomes (Matee, Somi, Wengaa, Darcy & Perera 2017:76).

In the case of the HMIS in the HIV/AIDS programme, the framework is based on the premise that strengthening the HMIS requires functional monitoring and evaluation systems, informed by reliable information on service delivery and health status. The draft strategic framework document was developed from the integrated data from study findings.

The researcher used qualitative documentary analysis to examine the policies and protocols governing the use of the HMIS for HIV and AIDS monitoring and evaluation

(M&E) in Ethiopia. The findings from the analysis indicated gaps in the implementation of the HMIS for HIV/AIDS monitoring. This technique contributed to understanding the subjectivities embedded in the documents regarding the use of the health management information systems for HIV/AIDS monitoring.

In the second phase, the focus group discussion was used to explore health practitioners' views at different levels regarding technical, organizational, and behavioural determinants that influence the use of health information in HIV and AIDS monitoring and evaluation. It was also used to evaluate the impact of the design of the HMIS on the data management process, data collection, processing, analysis, and presentation.

The study used the performance of routine information system management framework to frame the integration and interpretation of the results. Meta-inferences were drawn and used in the development of the framework. Both deductive and inductive reasoning were applied, and literature was also used to support the framework.

The researcher developed actionable points under each key area based on identified gaps. The detailed, actionable points framed the action plan, responsible authorities, time frame and indicators of success.

Table 6.1: Key areas of action for the framework

Goal 1: Strengthen data management processes	Goal 2: Enhance use of data to develop operational plans to guide HIV/AIDS monitoring and evaluation	Goal 3: Improve ICT infrastructure	Goal 4: Build Capacity
Strengthen key data sources (patient data – ART, VCT and PMTCT log sheet and recording book)	Data demands and needs database/spreadsheet	RHIS infrastructure/architecture – a strategic planning tool	User participation in system design – consensus building
Quality of data practices	Flow of data – reporting processes/communication between various levels	Interoperability between RHIS subsystems	Accessible in-service programmes: data management processes
Data aggregation: individual clinical data/ cumulative data from registers and tally sheets	Data use manual/procedures	Implementation of hybrid systems	Staff access to the regulatory framework – manuals and protocols
Standardization of definitions/indicators and procedures	Monthly and annual targets	Donor funded monitoring programme	Supportive and integrated supervision
	Routine tracking of progress and changes in HIV/AIDS programme performance	Management of resources – integration and linkage with information systems supporting the HIV/AIDS programme	Performance-based management systems
Customised applications for data processing and analysis	Calculating programme coverage and service utilisation	Procedures for data security, confidentiality	Quality control - standards and indicators
Clear roles and responsibilities for HMIS staff	Incentive system for data use – a culture of information use	Reporting tools and formats	

Records of review meetings	Strengthen regulatory framework for HMIS implementation	Leadership for the HMIS	
Use of computer technology	Sustainability of the HMIS - ongoing evaluation of strategic priorities	Political willingness – regulatory framework	

6.5 VALIDATION OF THE FRAMEWORK – MODIFIED DELPHI TECHNIQUE

The study conducted the modified Delphi technique to elicit expert opinion on the draft framework and action plan prepared. A modified Delphi technique can be used in those conditions where developed action statements were derived from the literature or previous research findings (Stewart et al. 2017:3). The Delphi rounds were conducted electronically to ensure anonymity and minimize the bias that might occur through a group's interaction (Blalock 2014:56; Davidson 2013:58). There was a need for professionals' input and group agreement to validate the framework (Habibi et al. 2014:8). The Delphi method gives the participants a chance to re-evaluate their responses in the light of the reactions from the other panel members (Wathen, MacGregor, Hammerton, Coben, Herrman, Stewart & MacMillan 2012:4).

6.5.1 Preliminary stage

- Draft framework and action plan prepared

The draft framework consisted of key areas of action identified from the combined findings from Phases 1 and 2 and the last objective of the study (see Table 6.1). The researcher developed the actionable points framed as an action plan, responsible authorities, time frame and indicators of success.

- Identification and selection of a panel of experts

The Delphi participants were recruited based on specific expertise on HIV/AIDS monitoring and evaluation, the HMIS implementation, and those who were willing to contribute to a change and had sufficient time to participate in a consensus-building technique. Participants for the Delphi method are expected to be highly trained and competent within the specialized area of knowledge related to the target issue (Habibi et al. 2014:10). The population consisted of HMIS experts who are the HMIS focal person or manager from the health facilities levels and sub-city health office, regional level, federal level and non-governmental organizations for HMIS/monitoring and evaluation.

The experts were purposefully selected to address the wider representation from health facilities, health offices and donor or Non-Governmental Organizations. The

participants were identified through the snowball approach using non-probability sampling. Snowball sampling is a commonly employed sequential sampling method in qualitative research (Kirchherr & Charles 2018:1; Habibi et al. 2014:10). The researcher presented the criteria to the federal health bureau and regional health bureau staff working on the HMIS to recommend persons for the Delphi. Experts who expressed willingness were asked to give more recommendations for participants. Staff recommended highly knowledgeable persons with multiple specialities in the area of study. Twenty-one experts were recruited. However, only 18 participated in the Delphi rounds.

Table 6.2: Experts' biographic data

S.N	Sex	Age	Profession	Position	Experience (Year)	Education qualification	Remarks
1	F	39	Public health	Medical Director	12	BSc. Health officer (degree)	
2	F	44	Public health	Data use Specialist	18	MPH	
3	M	48	Health informatics	Data Manager	15	MPH	
4	M	35	Public health	Medical Director	14	BSc. Health officer (degree)	
5	M	49	Public health	HMIS/M&E specialist	22	MPH, MBA	
6	M	48	Public health	HIV/AIDS M&E officer	23	MD, MPH	
7	M	51	Monitoring and Evaluation	M&E manager	25	MSc. In M&E	
8	F	41	Public health	Medical Director	16	MSc. In Hospital Administration	
9	M	47	Public health	Data Use Specialist	18	MPH	
10	F	42	Health Informatics	Data Specialist	19	BSc. Health Informatics	
11	M	45	Public health	M&E Manager	14	MPH	
12	M	33	Monitoring and Evaluation	Statistician	12	MSc. In Demography	

13	F	41	Health information technicians	M&E specialist	15	BSc. Health Informatics	
14	M	37	Monitoring and Evaluation	Data use Coordinator	14	MSc. In Health M&E	
15	F	43	Management	M&E Director	17	MSc. In Health M&E	
16	F	36	Public health	HMIS data management lead	13	MPH	
17	M	31	Health informatics	M&E Officer	10	BSc. Health Informatics	
18	M	45	Public health	M&E Manager	14	MPH	

Table 6.2 above presents 18 experts' biographic data. Experts included HMIS experts who are HMIS focal person/managers from the health facilities level, the sub-city health office, sub-city/regional or federal level and non-governmental organizations for the HMIS/monitoring and evaluation. 61.1% (n=11) were male experts, and the rest were females. The mean age and year of work experience were 41.94 and 16.17, respectively. Experts having a master's degree and above constitute 72.2% (n=13), and the rest, 27.8% (n=5), have bachelor's degrees. 55.6% (n=10) of experts have a public health background, and the rest have other health fields or a health-related education.

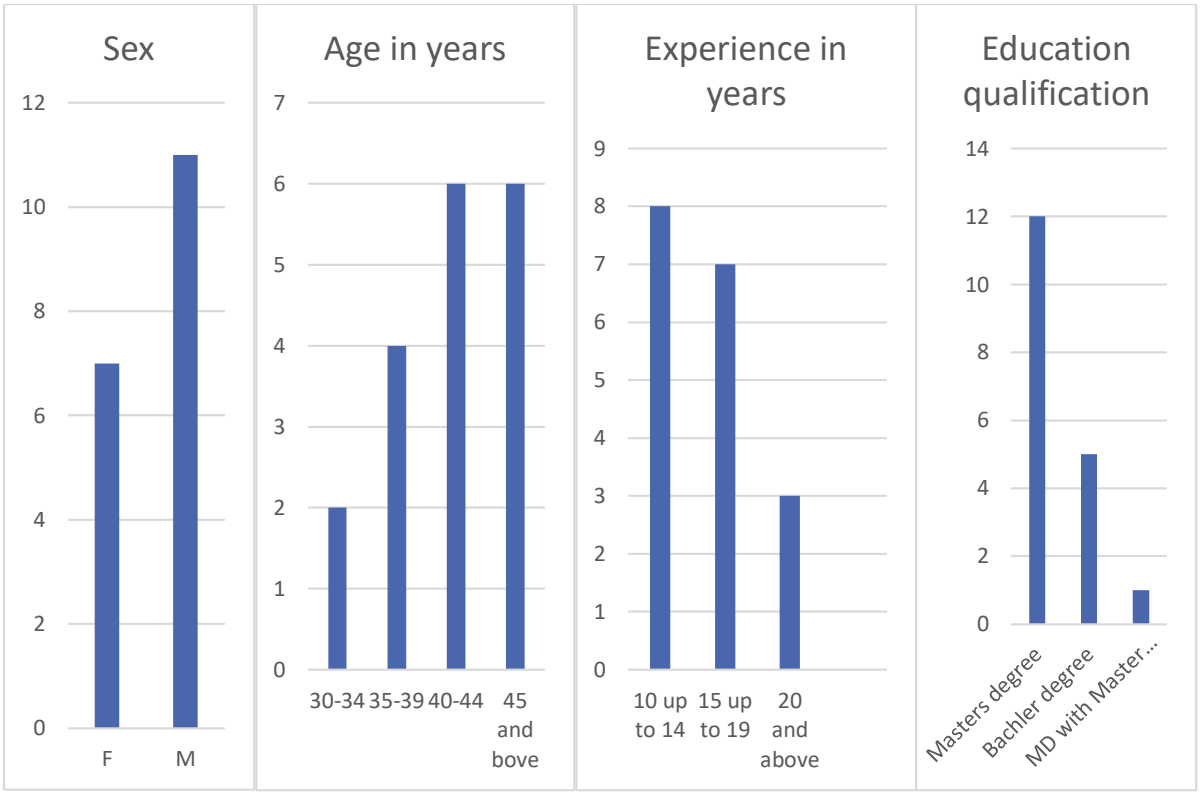

Figure 6.1: Socio-demographic graphical presentation of experts

6.5.2 First round

The researcher invited the experts through email for online platform participation to present the major findings and the draft framework. The researcher communicated the major findings through a summary of key findings for the experts to have a clear background of the study results and to enable them to provide useful and informed suggestions and comments. The researcher included the draft framework with the action plan and the consent form. The questionnaire had a two-point Likert scale and open spaces for comments or suggestions (Annexure L). A timeframe of seven days was set for the response, but it could be extended, and the final deadline was four weeks. The researcher provided clear guidelines on the response and reached out for further clarification.

- Collected comments

The researcher sent reminders through email and phone calls every week for four weeks. Round one response rate was 86% (n=18) of experts' responses. Data from the collected questionnaires were prepared for analysis.

- Analysis and feedback

In the Delphi classical approach, the analysis usually follows both qualitative and quantitative methods (Keeney, Hasson & McKenna 2010:85). The qualitative part was addressed through coding, grouping and categorization of the reflections of experts (Saldaña 2009:13). The quantitative part used percentages of scores and the frequency of responses to determine consensus. Consensus was considered reached when the level of agreement reached 70% and above (Slade, Dionne, Underwood & Buchbinder 2014:2).

The result indicated that all experts agreed to the framework objectives and specific activities, making recommendations to amend certain areas. The level of agreement for each action points ranged from 78% up to 100% (78 – 82%= 2 experts, 83-88%= 5 experts, 89-93%= 4 experts, 94-100%= 7 experts).

Comments from the experts were summarized. Most were on activities, and they mentioned some repetition in the activities. The experts suggested the adjustment of the time frames from weekly to yearly for each activity. They recommended the inclusion of responsible bodies like the Ministry of Health [Ethiopia], regional health bureaus and Non-Governmental Organizations depending on the type of activities. As part of the success of indicators, some experts proposed the inclusion of specific indicators for some activities. Comments from experts included:

- Smart and well-formulated objectives should be considered (n=2).
- The framework objectives are well aligned with the findings (n=12).
- There seems to be an overlap of Goal 1 and Goal 4 objectives in the knowledge and capacity building area (n=1).
- Goal 1 objective on DHIS2 software needs to be reviewed. There appear to be similarities with Goal 3 ICT objective (n=1).
- The framework seems comprehensive, which is required to be implemented (n=7).
- Some of the objectives may be unrealistic due to resource constraints and budget allocation (n=4).
- The framework objective is well-described for implementation (n=10).

- Incorporated the comments in the framework

The responses were summarized and incorporated to improve the framework.

6.5.3 Second round

- Shared the revised framework with a validation tool

The revised framework was again shared with the experts through email. The researcher included the final revised framework for the second round with clear guidelines and a description of the rating process with an adopted tool based on AGREE II manual (Annexure M). Only those who completed Round 1 were invited to participate in Round 2. A narrative summary of the findings, comments and suggestions was sent to each panel member after each round (Slade et al. 2014:3).

- Collection and analysis

The response rate was 88.9% (n=16). The data were prepared for analysis.

The quantitative data analysis used mean score percentages for the frequency of the responses with standard deviations and Cronbach's alpha values with IBM SPSS Version 27 to determine consensus. The criteria for rating the framework were adopted from the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument.

The purpose of the AGREE II instrument is to assess the quality of guidelines and how the information ought to be reported in guidelines (Brouwers, Kho, Browman, Burgers, Cluzeau & Feder et al. 2010:1). The six domains of the criteria that were used are scope and purpose, stakeholder involvement, the rigour of development, clarity of presentation, applicability, and editorial independence. They consist of 23 items for evaluating the quality of guidelines in six domains. Scores were allocated on a 7-point rating scale (1–strongly disagree to 7–strongly agree) for each of the items in the six domains. The researcher set the 70% mean score percentage as benchmarks (Brouwers et al. 2010:13).

According to the AGREE II instrument, "the domain scores are calculated by summing up all the scores of the individual items in a domain and by scaling the total as a

percentage of the maximum possible score for that domain" (Brouwers et al. 2010:10). The researcher calculated the mean score through an Excel sheet. According to the following formula, the researcher calculated each domain and presented it in Table 6.3:

Maximum possible score = 7 (strongly agree) x no. of items x no. of experts

Minimum possible score =1 (strongly disagree) no. of items x no. of experts

The scaled domain score will be:

$$\frac{\text{Obtained score} - \text{Minimum possible score}}{\text{Maximum possible score} - \text{Minimum possible score}} =$$

Agreement between reviewers (concordance) was measured in terms of the levels of discrepancy that is a low discrepancy with a standard deviation (SD) from the mean < 1.5, or medium discrepancy with a standard deviation from the mean ≥ 1.5 but < 2, or high discrepancy with a standard deviation from the mean ≥ 2 (Brouwers et al. 2010:11). According to the findings below in Table 6.3, there is no high discrepancy from the mean in any of the domain scores. The overall rating result for the second round was 15 (93.8%) experts recommended the strategy for use and the other 1 (6.2%) expert recommended it with some modification on the strategy.

6.6 RESULTS

Table 6.3: Analysis and result

Criteria Domains	Mean score by Items	Standard deviation by Items	Domain score
Domain 1. Scope and Purpose			**78%**
The overall objective(s) of the framework is (are) specifically described.	5.6875	0.79320	
The M&E framework question(s) covered by the framework is (are) specifically described.	5.8125	0.98107	
The population (health professionals, HMIS staff, public, etc.) to whom the framework is meant to apply is specifically described.	5.6250	0.80623	
Domain 2. Stakeholder Involvement			**75%**

The framework development group includes individuals from all the relevant professional groups.	5.5000	1.03280	
The views and preferences of the target population (health professionals, HMIS staff, public, etc.) have been sought.	5.4375	1.03078	
The target users of the framework are clearly defined.	5.5625	1.20934	
Domain 3. Rigour of Development			**84%**
Systematic methods were used to search for evidence.	5.7500	0.93095	
The criteria for selecting the evidence are clearly described.	6.0625	0.68007	
The strengths and limitations of the body of evidence are clearly described.	5.3125	1.01448	
The methods for formulating the recommendations are clearly described.	5.3125	0.87321	
The M&E framework benefits, side effects, and risks have been considered in formulating the recommendations.	5.3125	1.01448	
There is an explicit link between the recommendations and the supporting evidence.	5.5000	0.96609	
The framework has been externally reviewed by experts prior to its use/publication.	5.3750	0.71880	
A procedure for updating the framework is provided.	5.4375	1.03078	
Domain 4. Clarity of Presentation			**82%**
The recommendations are specific and unambiguous.	5.6875	0.60208	
The different options for management of the condition or health issue are clearly presented.	5.9375	0.92871	
Key recommendations are easily identifiable.	5.8125	0.65511	
Domain 5. Applicability			**78%**
The framework describes facilitators and barriers to its application.	5.9375	0.57373	
The framework provides advice and/or tools on how the recommendations can be put into practice.	5.8750	1.02470	
The potential resource implications of applying the recommendations have been considered.	5.3125	1.70171	
The framework presents monitoring and/or auditing criteria.	5.6250	1.50000	
Domain 6. Editorial Independence			**79%**
The views of the funding body have not influenced the content of the framework.	5.5000	0.81650	
Competing interests of framework development group members have been recorded and addressed.	5.9375	0.68007	

Table 6.3 shows that the rating agreement/concordance between the experts was good, except for some items having low discrepancy in relation to the standard deviation. The involvement of stakeholders and applicability had a medium standard deviation and a relatively low domain score compared to others, namely 75% and 78%, respectively. The researcher assumed that the revision of the framework would continue at each implementation level.

The applicability domain for item resource implication scored medium deviation (SD=1.7) due to concerns about financial constraints and resource shortages which may hinder the possible implementation of the framework. In this regard, the involvement of Non-Governmental Organizations and donors may be invaluable for achieving the goals. The monitoring and auditing item was also rated as medium deviation (SD=1.5). The researcher acknowledged that this could be adjusted during the implementation.

The scope and purpose domain was concerned with the overall objective of the framework, the specific M&E questions, and the target users of the framework. The overall score for this domain was 78%, which is in the highly acceptable range. The stakeholder involvement domain emphasises the framework's development by the appropriate stakeholders and represents the views of its intended users and well-defined users. The overall score for this domain was 75% and the lowest of all other domain scores. The rigour of development includes methods of formulating, evidence selection criteria, risks, benefits and side effects of the framework, reviews, and updates. This domain scored 84%, which was the highest score.

Clarity of presentation describes whether the key and specific recommendation is well represented. The overall score for this domain was 82%. The applicability domain deals with strategies for updates, resources implication, and barriers and facilitators of the framework. The overall score for this domain was 78%. The major recommendation raised in this domain is resources need to be available, and the monitoring aspect needs strengthening during implementation. The final domain, editorial independence, was concerned with bias with the funding body and competing interests. The overall score for this domain was 79%. The suggestion was further reviewed by other users for better use and to minimise the biases.

Some of the experts' responses on overall recommendations and suggestions are presented in the following quotes:

> "The framework has addressed target user needs specific to position in their work areas…" Expert 03.

> "The framework has clear purpose, objective and recommendation to put into practice in the field, somehow other viewer's input further needed for effectiveness of framework" Expert 08.

> "At this level, the framework appear (sic) ready to be implemented" Expert 09.

> "The application of framework may need further testing at the ground level to have a contextual view and revised for better use" Expert 14.

6.6.1 Intraclass Correlation Coefficient for inter-rater reliability

The study determined the inter-rater reliability with Intraclass Correlation Coefficient (ICC) score. ICC was measured in a two-way mixed-effects model where people effects are random, and measures effects are fixed. Intraclass correlation coefficients using a consistency definition conducted with IBM SPSS version 27. The ICC/ Cronbach's alpha is high when there is little variation between the items by the experts (Govender 2018:795).

Table 6.4 below presents the mean score with standard deviation for each item in the domain score and domain score results. The study found a strong agreement (0.80) across the experts' ratings with a 95% confidence interval.

Table 6.4: Intraclass correlation coefficient for inter-rater reliability

Intraclass Correlation Coefficient							
	Intraclass Correlation[b]	**95% Confidence Interval**		**F Test with True Value 0**			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.148[a]	.068	.325	4.993	15	330	.000
Average Measures	.800[c]	.625	.917	4.993	15	330	.000
Two-way mixed-effects model where people effects are random and measures effects are fixed.							
a. The estimator is the same, whether the interaction effect is present or not.							

b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.
c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

6.7 PRESENTATION OF FINAL STRATEGY AND DISCUSSION

The final framework presented is based on scientific evidence and full expert opinion. The framework includes four goals and related objectives. The framework proposes key action plans regarding data management, data use in decision making, enhancing ICT infrastructure and capacity building activities.

6.7.1 Goals and objectives

Figure 6.2: Goals and objectives for improving data management for HIV and AIDS monitoring and evaluation

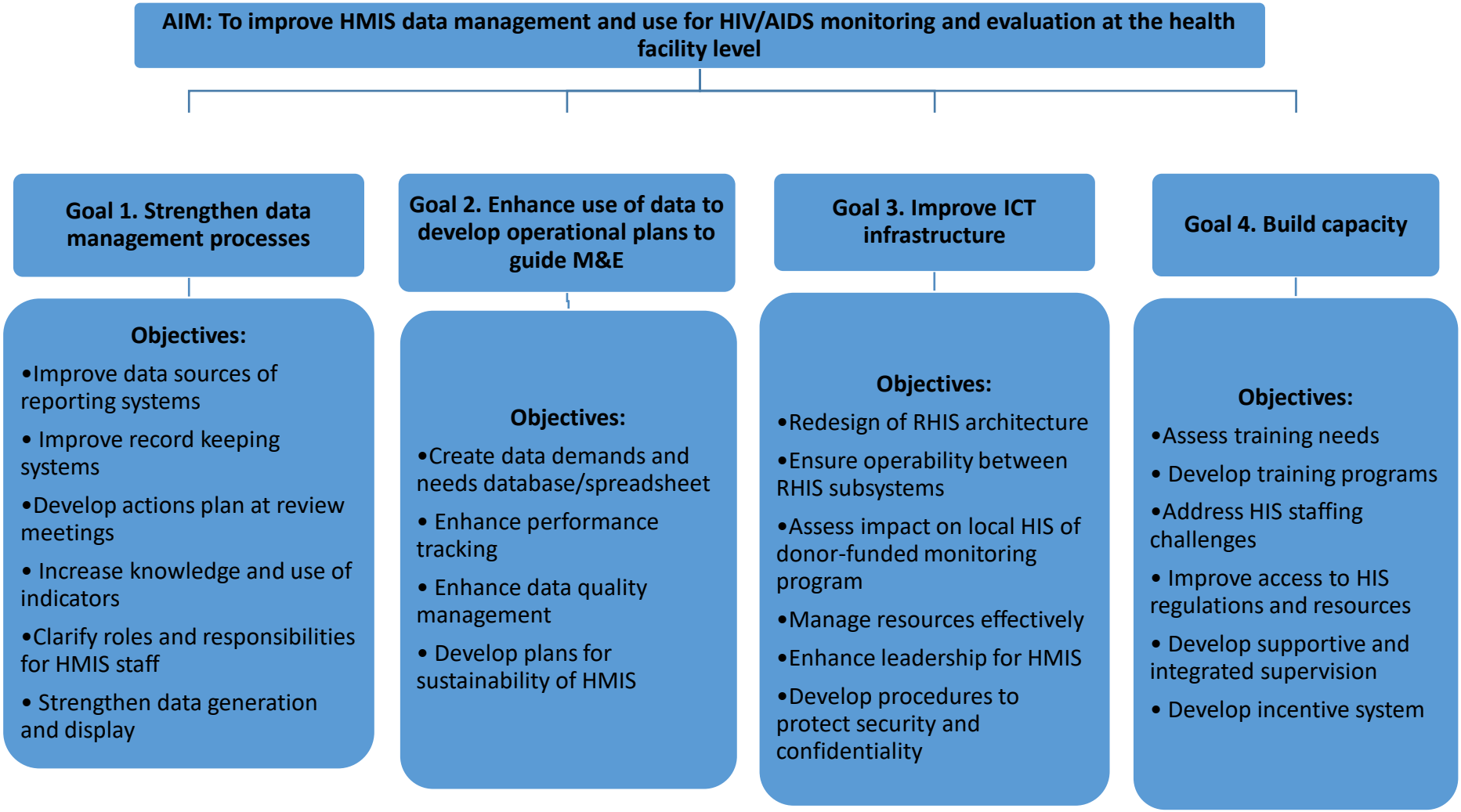
AIM: To improve HMIS data management and use for HIV/AIDS monitoring and evaluation at the health facility level
Goal 1. Strengthen data management processes
Objectives:
•Improve data sources of reporting systems
• Improve record keeping systems
•Develop actions plan at review meetings
• Increase knowledge and use of indicators
•Clarify roles and responsibilities for HMIS staff
• Strengthen data generation and display
Goal 2. Enhance use of data to develop operational plans to guide M&E
Objectives:
•Create data demands and needs database/spreadsheet
• Enhance performance tracking
• Enhance data quality management
• Develop plans for sustainability of HMIS
Goal 3. Improve ICT infrastructure
Objectives:
•Redesign of RHIS architecture
•Ensure operability between RHIS subsystems
•Assess impact on local HIS of donor-funded monitoring program
•Manage resources effectively
•Enhance leadership for HMIS
•Develop procedures to protect security and confidentiality
Goal 4. Build capacity
Objectives:
•Assess training needs
• Develop training programs
•Address HIS staffing challenges
• Improve access to HIS regulations and resources
• Develop supportive and integrated supervision
• Develop incentive system

Figure 6.2: Goals and objectives for improving data management for HIV and AIDS monitoring and evaluation

6.7.2 Framework for action points to improve data management for HIV/AIDS monitoring and evaluation

As much as documents had provisions for most of the actions proposed in this framework, it is meant to serve as a reminder or to draw attention to the significance of policy implementation. Findings show that changing policies into reality is hampered by many challenges. Ajulor (2018:1497) confirms that Africa has severe challenges in implementing policies, and problems caused by the inability to initiate participatory policy formulation approaches, bureaucratic bottlenecks, and improper planning are highlighted.

Table. 6.5: Outline of framework

Goal 1: Strengthen data management processes

Key action plans	Responsible authority	Time frame	Indicators for success
Improve data sources of reporting systems **Design in-service programme with special focus on**: - Recording and collecting information from the source document, including the tally sheet, and registers - Data collection and reporting for staff with HMIS tasks (HIV/AIDS department staff and data clerks). - report preparation and timely submission - implementation of guidelines, protocols, and HIS strategy	Regional health bureau, health facility management, the HMIS department	Semi-annual Quarterly Annually	High level of accuracy across data sources management Professionals skilled in HMIS tasks Skilled in quality report submission Effective implementation of HIS regulations

- These initiatives will be successful if accompanied by increasing awareness of their need.			
- Review data collection instruments to ensure simplicity, acceptability, and user-friendliness - Strengthen data sources - Data elements in the tools to be clear and reflect indicators - Involve users in the design of data collection tools. Mechanisms to be put in place to elicit user input.	Ministry of Health [Ethiopia] and regional health bureau	Annually	Improved data collection system
- Increase awareness of timeliness of reporting. Review current reporting systems - Develop plans to manage paper-based and electronic reporting in a way that will not disrupt the workflow but ensure quality	Health facility management, Performance review team, the HMIS department	Annually	Regular and quality reports
- Quality of reports to be a standing item on the monthly meeting agenda to raise awareness on all dimensions of quality	Health facility management, Performance review team, the HMIS department	Monthly	Regular and quality report
Improve record-keeping systems - Ensure that Performance review meeting minutes are properly filed and circulated on time to members for further action every month - Develop an action tracker to follow up on outstanding issues **Develop actions plan at review meetings**	Performance review team, the HMIS department	Monthly	Minutes are easily retrievable All staff are familiar with upcoming discussions

- Elicit views of stakeholders about health information needs - Improve development of action plans, use of report and information provided at review meetings - Strengthen local use of information for monitoring HIV/AIDS – analysis of long-term plans and targets			Improved information use
Increase knowledge and use of indicators - Provide enough guidelines and manuals specific to the HMIS like code, indicator and disease classification guidelines, standardized definition, and procedures. - Devise plans for the provision of electronic/mobile types of guidelines – to increase accessibility and implementation. - Provide training, mentoring, and coaching on uses of indicators, codes, and disease classification - Mechanism to be put in place for stakeholders to participate in reviews of indicators - Review HIV/AIDS indicators and make them simple to use	Ministry of Health [Ethiopia], regional health bureau and sub-city health office	Annually	Manuals/guidelines available and accessible to all users Professionals knowledgeable and skilled in the HMIS indicators
Clarify roles and responsibilities for HMIS staff - Provide clear guidelines defining HMIS roles and responsibilities (data management processes and data use at the health facility level)	Ministry of Health [Ethiopia], regional health bureau and Health facility management team	Annually	Staff are aware of their specific roles
Strengthen data generation and display - Review staffing and recruit suitably qualified staff - Apply suitable technological tools like LCD for the presentation of updates	Regional health bureau, HR department and Sub-city health offices	Annually	Competent and capacitated staff in data

- Piloting of mobile technology to improve aspects of the HMIS			generation and display skills
- Review existing protocols for data generation and display (from facility to programme management level). - Make modifications where necessary to support users - Conduct regular assessment of how information is being generated and displayed - Make sure reporting systems are suitable for data display	Ministry of Health [Ethiopia], regional health bureau and sub-city health office, Health facility management	Annually	Proper and quality data generation
- Ensure DHIS2 is customised for local use	Ministry of Health [Ethiopia], regional health bureau and sub-city health office, the HMIS team head	Quarterly	Updated and usable data display system
- Design special training programme on data analytics, use of information to track programme performance	Regional health bureau, sub-city health office, Health facility management, and the HMIS department	Annually	Highly capacitated and skilled staff

Goal 2: Enhance Use of data to develop operational plans to guide HIV/AIDS monitoring and evaluation

Key action plans	**responsible authority**	**Time frame**	**Indicators for success**
Create data demands and needs database/spreadsheet	Health facility management, the HMIS department, performance management team	Annually	Clear data elements for HIV

- Identify key HIV/AIDS programmatic indicators and link to the data elements - The data elements on data collection tools to be reviewed periodically to reduce the burden of reporting			
- Data be available on resource availability and full functioning of the HIV/AIDS programme	Ministry of Health [Ethiopia], regional health bureau and sub-city health office, Health facility management	Annually	Adequate resources
- Develop mechanisms for identifying health information needs for VCT, ART and PMTCT services - Review indicators periodically	Ministry of Health [Ethiopia], regional health bureau and sub-city health office, Health facility management	Quarterly	Improved information use monitoring based on specific information needs
Enhance performance tracking - Develop SOP that will guide the setting of monthly and annual targets by each HIV/AIDS Unit	VCT, PMTCT and ART department, Performance management team, regional and sub-city office, health office	Annually and monthly	Measurable plans
- Develop a performance-based system to track the changes in the programme - Design rapid tools for assessing service (self-assessment). - Increase use of data visualization tools, scorecards, and dashboards	Ministry of Health [Ethiopia], regional health bureau and sub-city health office, Health facility management	Annually	Effective performance tracking systems
- Design protocols for data calculation system specific for HIV/AIDS programme information	Ministry of Health [Ethiopia], regional health bureau and sub-	Quarterly	Data-driven activities

- Capacitate staff skills in data analysis and description for effective data use - Support department heads on skills and knowledge for the use of data	city health office, Health facility management		
Enhance data quality management - Strengthen routine data quality assessment (DQA) at the health facility level	Regional health bureau and sub-city health office	Quarterly basis	High data quality
Develop plans for sustainability of the HMIS - Conduct assessment of the programme output on a monthly level at each department of the HIV/AIDS programme - Identify the gaps - Implement the remedies/ solutions	VCT, PMTCT and ART department, the HMIS team Performance management team	Monthly basis	Regular programme output assessment
- Strengthen the routine monitoring and evaluation system for the implementation of the HMIS in the HIV/AIDS programme by revising and developing standard operating procedures	The HMIS team, management team, Ministry of Health [Ethiopia], regional health bureau and sub-city health office	Quarterly basis	Well-functioning of the HMIS in the HIV/AIDS programme

Goal 3: Improve ICT infrastructure

Key action plans	responsible authority	Time frame	Indicators for success
Redesign of RHIS architecture - Identify and procure required ICT tools - Restructure and integrate donor-funded Smartcare software with DHIS2 reporting system - Update the software to enhance compatibility with formats and registers - Customise DHIS2 and other new IT open/free software to ensure inclusion of local content	Ministry of Health [Ethiopia], regional health bureau and sub-city health office, Non-Governmental Organizations /Donors	Annually	Adequate and modern ICT infrastructure Customised and functional software
Ensure operability between RHIS subsystems - Expand and network e-HMIS system through computerizing the data reporting system. - Ensure interoperability of all systems used in data generation.	Ministry of Health [Ethiopia], regional health bureau and sub-city health office	Quarterly	Well-functioning and networked IT system
Assess the impact on local HIS donor-funded monitoring programme - Conduct assessment and monitoring of donor-funded programme related to HMIS management - Identify the gaps and challenges based on the assessment	Ministry of Health [Ethiopia], regional health bureau and sub-city health office, Non-Governmental Organizations /donors	Annually	Enhanced inter-sectoral HIS management

Management of resources - Develop a protocol for ICT resource management, maintenance, and support - Assign IT experts or firms for maintenance of ICT equipment's - Develop a plan for the recruitment of health information technology specialists	Ministry of Health [Ethiopia], regional health bureau, sub-city health office,	Annually	Improved and functional ICT infrastructure
Enhance Leadership for the HMIS - Plan for regular supervision and support for ICT management - Capacitate the ICT department for full control of IT resources and use. - Plan and execute targeted training to effect sustainable improvements in the HMIS governance	Ministry of Health [Ethiopia], regional health bureau and sub-city health office management team	Quarterly	Improved and functional ICT infrastructure
Develop procedures to protect security and confidentiality - Develop protocols for data security through authorisation mechanisms - Design a plan for safe data storage and disposal	Ministry of Health [Ethiopia], regional health bureau and sub-city health office	Annually	Health information security

Goal 4: Build Capacity

Key action plans	responsible authority	Time frame	Indicators for success
Assess training needs develop training programmes - Conduct HIS training needs assessment - Design appropriate and relevant training programmes – e.g., big data analytics, decision tracking matrix - Use online training platforms	Health facility management, regional health bureau and sub-city health bureau, Donor and Non-Governmental Organizations	Annually	Organised capacity needs assessment
Address HIS staffing challenges - Improve working conditions in all settings to prevent staff turnover. - Formulate an integrated package, attraction, and retention policies to be addressed - Increase budget for manpower, recruitment, development, and training of the HMIS staff in health facilities.	Ministry of Health [Ethiopia], Regional health bureau and sub-city health office	Annually	Adequate budget for staffing Improved staff capacity
Improve access to HIS regulations and resources - Provide technical support to access and implement existing HIS guidelines, protocols, policies - Develop standard operating procedure (SOP) to guide implementation of policies	Ministry of Health [Ethiopia], regional health bureau and sub-city health office	Annually	Accessible HIS regulations

- Conduct feasibility studies on mobile, electronic guidelines			
Develop supportive and integrated supervision - Develop a jointly negotiated supervision schedule - Provide integrated supervision with a focus on data quality checks and HMIS/M&E system support.	Ministry of Health, Regional and sub-city health bureau	Quarterly	Effective implementation of the HMIS
- Devise mechanisms for feedback from supportive supervision activities	Ministry of Health [Ethiopia], Regional and sub-city health bureau	Quarterly	Well-structured feedback mechanism
Develop incentive system - Develop performance-based incentive system for HIS staff	Health facility management team The health bureau supervisors	Annually	Engaged employees Motivated staff

6.7.3 Rationale for the framework

The assumptions of performance of routine information system management are that if organizations promote the culture of information, there will be increased competence in conducting HMIS tasks, which will enhance self-confidence. Therefore, increasing capacity in data management processes requires interventions that address behavioural, technical, and organizational determinants. The proposed framework is intended to trigger further discussions on the implementation of the HIS and the use of the HMIS in monitoring and evaluation of programmes. Key findings are used to support the action plans.

6.7.3.1 Strengthening data management processes

Data management processes are the foundation for generating useful information used for planning, budgeting, monitoring and evaluation. Therefore, specific processes must be in place to effectively get the data. There must be relevant and appropriate hard/software programmes to support users. The output from these processes should be valid, reliable data and information, easily accessible, where and when needed in user-friendly formats. Input such as national indicators, resources, the culture of information, and user skills has a great impact on these processes.

Evidence from documents showed that the HMIS relies on data collected from several sources, reflected in several documents. If data collection tools are complex, there is an incompatibility between systems that capture data. Mechanisms are needed to strengthen these processes. In addition, the study found that users were not happy with the overall design of the HIS, different software being used except for DHIS2. These inputs had an influence on data management processes. Therefore, the framework proposes actionable points to strengthen recording and collection of information from the source document, review of data collection systems and capacity building and improving ICT infrastructure. The aim is to enhance the generation of HIV/AIDS information in the most effective and efficient way. The guidelines provided some of these. However, the health facilities need to interpret these regulations and apply them in their context. Where resources are required, there must be plans put in place to increase the supply according to priority areas such as ICT. Efforts should also be directed toward strengthening the organization/context in support of data

collection and use. Standardization of data capture systems will lead to an improvement in data collection and reporting (Braa et al. 2007:382).

6.7.3.2 Culture of information

The promotion of a culture of information enhances more evidence-based decision making, transparency and accountability (Harikumar 2012:67). Monitoring and evaluating a health programme requires the sustained promotion of information use culture. There is a need at the organizational level to review the tools and systems that enhance evidence-based decision making. National indicators are critical in reporting the performance of programmes and the health system. These need to be simple and understood by all users. Gloyd et al. (2016:5) agree that if indicators are simplified, routine reporting and data collection efforts will allow easy monitoring of the HIV programme.

There must be sufficient capacity to perform data analytics to track performance. Nicol et al. (2017:36) also confirm that analysis support, interpretation, and use of information at the district and facility levels are imperative. Several challenges were raised regarding the current complex disease classification system; some important indicators were missing or inconsistent. The framework suggests improvement in the formulation of indicators, using a simple disease classification system to improve data management and use in HIV/AIDS monitoring. A smart and locally useable indicator selection with an easily understandable disease classification system is proposed, capacity building in information use and a well-designed HMIS are other dimensions the framework includes. Venkateswaran et al. (2018:9) also believe that the generalizability of all routine HIS indicators can be improved by adopting more standardized definitions of indicators.

The study found that indicators of low performance led to investigations of data at the facility level. This reflects good use of data to support monitoring efforts. However, the study proposes that the roles and responsibilities of users need to be clarified. The information required at each level or HMIS unit should be identified to enable more effective monitoring of coverage, quality, and efficiency. The information management strategies that promote evidence-based decisions need to be robust, and attention must be given to behavioural interventions.

Challenges with data quality have been documented in low- and middle-income countries (Manya & Nielsen 2016:124). The evidence from documents shows commitment and efforts to ensure data quality. Several documents emphasize the significance of quality data. However, challenges remain in implementing the provisions of the regulations. There are still weaknesses in health professionals' skills and knowledge in quality assurance systems. The study believes that sustainable production and use of quality health data are more likely to result from a strategy that provides detailed systems, tools, and action plans on improving data quality (WHO 2017a:25). Improved technology could also empower users. The framework emphasizes the IT infrastructure to be designed in such a way that it supports data management processes, including the use of information for HIV/AIDS monitoring and evaluation. This can be achieved through ICT resource management, maintenance and support, procurement of new IT technologies and protocols for data security. Organization are mandatory to show vital roles by planning and preparing people that use the system and the technology with the provision of budget (Mohamedali & Zahari 2017a:358).

6.7.3.3 Addressing resources for the HMIS

Developing countries experience a myriad of challenges with the implementation of health information systems. There are various and often complex contributory factors. The intended outcomes are not realized. Lack of resources hamper efforts of successful use (Adaletey et al. 2014:7). This study also identified inadequate human and materials resources, knowledge and skills, and inadequate supervision as barriers. Content indicates that this negatively affects HMIS implementation, starting from data generation up to the level of information use for HIV/AIDS monitoring. A strategic plan to increase staff compliment and retention, capacity building and other resources are proposed in this framework. The study recognizes that this is a systemic challenge. Hence, a plan to manage the HMIS resources is outlined. This includes access to the country regulatory framework and suggestions of mobile technologies for users. The involvement of higher management would be ideal for addressing systemic issues. Jegede and Ola-Olorun (2017:5) confirm that the success of productivity strategy is dependent on employee commitment, job satisfaction, skills, and motivation. Work content and context play significant roles in an employee's life.

Therefore, a well-structured regular and supportive supervision will support the production of quality data, improve communication channels, and build capacity in HMIS tasks. The Ministry of Health [Ethiopia], regional health bureau and sub-city health office will coordinate the staffing issues.

6.8 SUMMARY

Chapter 6 presented an integrated discussion of the development of a framework as a rationale for the proposed action plans for utilization of the HMIS in generating quality health information and its use for monitoring and evaluating HIV and AIDS programmes. The framework specifies responsible authorities and indicators for success to guide the implementation.

The next chapter, Chapter 7, discusses the study's contribution, lists recommendations and limitations, and concludes.

CHAPTER 7 CONTRIBUTION, RECOMMENDATIONS AND CONCLUSIONS

7.1 INTRODUCTION

This chapter begins with an overview of the research design followed, then summarises key findings and recommendations based on the implementation plan of the framework, including indications for further research. Finally, the chapter describes the study's contributions, acknowledges limitations, and draws conclusions.

The purpose of the study was to evaluate the utilization of the HMIS in generating quality health information for monitoring and evaluating the HIV and AIDS programme in Ethiopia. The ultimate aim was to develop a framework for strengthening the information culture and the generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

The performance of routine information system management theoretical framework guided the development of new framework of action points for the conclusions of the research.

7.2 RESEARCH DESIGN

A qualitative evaluative case study design was used to direct and frame the methods adopted. The research was executed in three phases according to the research objectives and questions. The first phase provided the context for the implementation of the HMIS. A qualitative documentary analysis (Phase 1) was carried out to understand how the regulatory framework in Ethiopia guides the use of the HMIS to generate useful data that are used for monitoring and evaluation of an HIV/AIDS programme. The results from this phase were used to refine the interview guides for focus group discussions with stakeholders. Focus group interviews (Phase 2) were conducted to examine how the HMIS is used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation (data collection, processing, analysis, and presentation). The views of stakeholders regarding the technical, organizational, and

behavioural factors that influence the use of HIV and AIDS health information were also investigated.

Data from both phases were integrated, and meta-inferences were drawn. These meta-inferences were used to develop the framework, which experts then validated through a modified Delphi technique (Phase 3).

7.3 SUMMARY OF KEY FINDINGS

The summary of key findings for each phase is presented to allow easy connection between the findings, contributions, and conclusions.

Phase 1: Research question

How do policies, strategies, and protocols guide officials in using the HMIS for HIV and AIDS monitoring and evaluation in Ethiopia?

- The documents show the presence of standards and guidelines regarding HIS governance. Roles and responsibilities are allocated to different government sectors, non-governmental actors, and donors. There is an emphasis placed on the critical role of these documents in the HMIS use.
- The data management plan is critical in M&E. The relationship between strategic plans and the use of information in response to HIV/AIDS is made explicit in the documents. The need to strengthen M&E is acknowledged. Plans should form the basis for decision-making to improve performance.
- The documents highlight challenges with reporting. Low quality of data is mentioned as leading to poor decisions. The information must be shared through graphs, charts, and tables for prompt information use to succeed.
- Adequate staffing and capacity-building with a future career in mind is a key for the success of the HMIS/M&E for HIV programme. Shortages of specialized skills and knowledge are highlighted.
- ICT and other related resources are recognized as critical for the efficiency and effectiveness of healthcare delivery. There is support for the utilization of DHIS2 as a routine health information system.

- Documents showed clear definitions of use, a culture of data use, determinants of information use and other factors, facility-level usage, steps in using information, and strengths of information use. The relationship between information use and decision-making is reiterated.

Phase 2: Research questions

How is the HMIS used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation?

What are stakeholders' views regarding the technical, organizational, and behavioural factors that influence the use of HIV and AIDS data for monitoring and evaluation?

- Various roles are involved in the data generation and use of the HMIS at the facility level. The management needs to create an enabling work environment for generating quality data through supervision and feedback, staff motivation and recognition of efforts in data management processes.
- The reporting uses both manual and electronic means. The departments also need more devices and improved technology to minimize paperwork and empower health professionals. Stakeholders were satisfied with DHIS2 as it produced a variety of graphs and forms for ease of analysis. The data users refer to those graphs to report on their units' performance and outcomes and submit reports. However, several issues were raised about quality reporting related to health professionals, timeliness, a mismatch between the software and the report format, reporting formats and misunderstandings between health professionals and the HMIS unit.
- The biggest challenges in healthcare are a shortage of human resources, guidelines, inadequate knowledge, and a lack of specialized software skills. Participants indicated an urgent need for staff training, especially after every software update. The IT infrastructure needed to be upgraded. An inadequate number of facilities have internet connectivity.
- Adequate knowledge and competence in the HMIS are critical. Data clerks, in particular, expressed high to moderate confidence in the assessment of data quality. The participants described various ways adopted to assess quality.

HMIS Focal persons received different training but believed they were competent enough to support other staff members.

- Indicators and disease classification are complex. Disease classifications and some important indicators are missing and inconsistent. Participants recognized the significance of indicators in information use, and they linked them to the programme's performance.
- There is some level of promoting a culture of information use. Participants confirmed the existence of some monitoring systems in the units, such as monthly review meetings. They all agreed that monitoring is a team effort that includes inputs from different departments. The interconnection of roles becomes very prominent during these performance review meetings. The majority believed that the management could do much more through incentives, guidelines, and training on information use.
- The usefulness of the HMIS is acknowledged in planning and mobilization of resources at sub-city health offices, city health bureaus and Ministry of Health levels. The annual plans are used as benchmarks to monitor the level of achievement by performance review teams.
- Data are vital in managing HIV cases. The data give a lot of information that helps with managing drug therapy. Case managers provide an essential service, lost cases are being followed up using specific algorithms, testing is monitored, and plans are developed based on the results.

Phase 3: Research question

What framework would be most appropriate for improving data management for HIV and AIDS monitoring and evaluation?

AIM: To improve the HMIS data management and use for HIV/AIDS monitoring and evaluation at the health facility level.

The following goals and corresponding objectives were developed to address the gaps identified in both data sets:

- Goal 1: Strengthen Data management processes.
- Goal 2: Enhance the use of data to develop operational plans to guide M&E.

- Goal 3: Improve ICT infrastructure.
- Goal 4: Build Capacity.

7.4 CONTRIBUTIONS OF THE STUDY

The study made contributions in three areas: the implementation of the HIMS in a resource-constrained environment, the significance of data quality, and threats to the sustainability of the HMIS in Ethiopia. Findings highlighted the political will to strengthen the health system by implementing the HMIS. The study showed how key policies guide and impact the structure and functioning of the HIS. The Ethiopian vision of the HMIS is presented.

However, it is also important to note that low and middle-income countries struggle with limited resources and capabilities. The HIS is purported as having the potential of maximising the value of scarce resources. Having reliable data on the health system's performance supports effective strategies to implement and measure interventions (Kebede et al. 2020:7). This signals a need to ask new questions about innovations in developing countries. The findings leaned toward showing the local experience of the HMIS as in itself an innovation for the organization implementing it. Such information reforms require well-managed changes in management.

There is an extensive legislative framework that guides the HIS in Ethiopia and the use of the HMIS. This body of documents provided a rich and diverse source of material to inform a deeper understanding of the HIS infrastructure, organisation, and development. This allowed the researcher to make valid inferences from documents and link those to the statements made by the stakeholders. What was of the greatest importance for this study was to identify key meanings contained in the documents that drive the generation of quality data; how content in these documents was organized to enhance the understanding and promotion of information use; and that the HMIS had to generate useful data for it to be able to support the HIV/AIDS programme. However, this study revealed that pertinent questions need to be raised regarding the implementation of these policies.

The study also highlighted that a successful HIS depends on the health system it serves. The multi-sectoral approach taken by Ethiopia shows the increasing demands

on the HIS to incorporate data from private practitioners, insurers, and facilities. However, it was unclear how this would be achieved as the HMIS appeared to collect data from public facilities only. This study identified that as a risk as it omits data from the private sector. This requires flexibility in the design of the HIS and the inclusion of mobile technologies as proposed in the framework. It revealed that Ethiopia has the characteristics of the first generation of HIS. Where activities are still recorded in registers and at stipulated periods, data are tallied, and summary reports are sent to higher levels in the system (WHO 2010:5). It is assumed that the incorporation of data from other sectors would effectively move Ethiopia to the second HIS Generation.

Findings showed that the HMIS is implemented to improve the quality of health data and understanding of the effectiveness of the HIV/AIDS programme. It also revealed that any initiatives to develop an HIS involve a high commitment to providing necessary resources and ensuring favourable conditions under which the system will operate. Policymakers and health care professionals recognize the HMIS as a vital component for solving the socio-economic problems and the fragmented health systems in LMICs. The study revealed that this seemed like an ambitious initiative in developing countries, taking into consideration the disease burden and other systemic challenges. Therefore, an evaluation of any HIS in LMICs needs to be cognisant of these complex factors. The process of establishing the HMIS is confronted with constraints from within, the global standards, and the existing local practices (Abdusamadovich 2013:23).

The performance of routine information system management framework was used consistently throughout the study to ensure focus and relevance. It provided an assessment system to gain information on the context, performance of the HMIS in producing quality data, and documented use of the information for the HIV/AIDS programme monitoring and evaluation.

The study found some technical challenges. Participants lamented the reporting formats. These were found to be complex, probably due to parallel reporting using different systems. They also complained that there was no interoperability between these systems, non-alignment with paper-based tools and the DHIS2, challenges with HIV/AIDS specific indicators, ICT, and other related resources. Umezuruike, Nwankwo and Kareyo (2017:7729) also confirm that a lack of standards for various software and

hardware tools is a recipe for incompatibility among myriads of devices applicable to health information technology.

It is evident that at the facility level, processes must be in place to obtain reliable data from the system effectively. The output should be valid and easily accessible in a user-friendly format. Of particular note is that the DHIS2 provided a platform to aggregate routine HIV/AIDS data, and users could disaggregate data according to specific elements. It was found useful, and its built-in functionalities somewhat supported quality data. The main challenge using it effectively was that it was not integrated with Smart care.

Participants believed that these technical issues impacted the quality of data adversely and subsequently conversion of that data to information and using it to monitor the performance of the HIV/AIDS programme effectively. Mainly, the data collection instruments did not promote immediate use of the information at the service delivery levels. Hence, the proposed framework provides some measures to overcome these challenges on HMIS use. Mgbere et al. (2018:14) argue that in order to make data-driven decisions, data collection tools need to relate to the information needs of users. This acknowledgement emphasizes the significance of HIS users' views. The study assumes that if users are comfortable with the system, there will be an appropriate use of data management processes. Timely, accurate, error-free reporting and uploading of data are considered as the quality benchmarks of an ideal HMIS (Samal & Dehury 2016:8).

There was a clear interplay between technical and behavioural factors. Data showed that data analysis, interpretation and presentation need technical skill and knowledge. Therefore, there is a need to design appropriate skills development programmes to ensure staff is capacitated adequately to ensure data analysis and reporting. The symbiotic relationship between data generators and users gives rise to overlaps in the data management tasks. This will require proper roles allocation and empowerment. The study acknowledges that provision is made in the documents about the roles. But implementation on the facility level seems to be suboptimal. The framework makes suggestions about the need to review and clarify roles so that every user is aware of institutional expectations.

Adequate resources, supervision, and feedback will enable data analysis, interpretation, and presentation of useful data. This type of support will help analyse, interpret, and use the information at the facility levels (Nicol et al. 2017:36).

Nothing could be found on reviewed documents regarding measures to enhance staff motivation to use the HMIS efficiently and effectively. Yet, participants indicated that data quality was also affected by low motivation levels. This study showed that staff attitude and acceptance of innovation would impact its adoption. Yarinbab and Assefa (2018:9) also indicated that staff motivation was significantly associated with the HMIS data utilization. Furthermore, the productivity improvement strategy's success depends on employee commitment, job satisfaction, skills, and motivation (Jegede & Ola-Olorun 2017:5).

Several factors were associated with motivation levels, such as lack of a well-structured programme for capacity building, workload and burnout, low salary incentives, lack of recognition, low job satisfaction, and unfavourable working environment, all negatively impacting motivation levels. This study also identified gaps in joint discussions between supervisors, managers, and staff regarding performance appraisal. This again brings in the organisational factors and their influence on the culture of information use as well as users' attitudes. The enabling environment is the foundation for planning, implementing, and maintaining a health information system (MEASURE Evaluation 2017a:2).

The framework was developed, based on empirical data from the two phases of the study, and validated by experts to guide health professionals, staff, and management teams of health facilities, including the health bureaus and the Ministry of Health, to improve the HMIS use for HIV and AIDS programme monitoring and evaluation. The framework focuses on strengthening data management processes and evidence-based decision-making in monitoring and evaluation, improving ICT infrastructure and capacity building among HIS users. It is assumed that this framework will lead the improved data demand and continued data use. Matee et al. (2017:76) also believe that health systems need to create HIMS cycles that lead to improved programmes and, ultimately, health outcomes. The WHO (2021:4) introduced a strategy for developing an action plan to deliver the proposed vision and creating a framework for monitoring and evaluating e-Health implementation and progress.

7.5 RECOMMENDATIONS

The recommendations are based on the key findings of the study. The proposed framework gives adequate plans for implementation.

7.5.1 Recommendations regarding the enhanced use of the HMIS

- The focus should be on the HIS governance on the country level indicating the roles and responsibilities of each sector and all staff to enable effective appraisal of their performance.
- Emphasis must be on capacity building, using approaches such as supportive supervision and mentoring, to increase users' motivation, confidence in specialized HIS skills, and problem-solving. Supervisors may need structured mechanisms or programmes negotiated with staff in advance to identify areas of need. This could be accomplished by adding specific questions to the supervisory reminders on their checklists.
- Issues of staff retention at the health facility level need urgent attention. These would include well-planned capacity building programmes. In addition, stewardship in public policy, governance, and leadership for the HMIS could be reviewed, gaps identified and addressed.
- The HMIS and M&E system must include measures to enhance the culture of information use. Indicators are to be also used in self-assessment.
- The Ministry of Health server must be integrated with the regional level servers, where offline activities will proceed while waiting for the Ministry of Health [Ethiopia] server to be active.
- Issues of connectivity require upper-level management interventions. Mechanisms should be put in place to mitigate risks related to the power supply.
- Health facilities should put incentives in place to promote the culture of information use. The issue of staff turnover and staffing needs urgent attention. The framework provides some cues on how this could be accomplished.
- The health system should advocate a two-way reporting system, which ensures the information shared is similar and uniform at all levels to improve data quality.

7.5.2 Recommendations on the implementation of the framework

This study contends that each country has specific needs and resources to implement an HMIS. This framework is flexible and provides for localisation and expansion to suit the context.

- Policymakers must develop mechanisms for a periodical review of the policies and guidelines, especially in the light of constant changes in information needs.
- A task team could be set up to investigate this framework and begin the implementation process.
- Communication channels should be strengthened to ensure that all users are updated with any changes. Facility managers are to be tasked with that role.
- Users must also strive to function within the legal framework and take an active role in seeking and familiarizing themselves with the guidelines.
- Staff workloads should be reviewed, and the health system should develop the capacity to promote values and beliefs to ensure data collection, analysis, and use of information to accomplish its goals.
- Mangers at the facilities should create a healthy environment where each staff member is valued for helping create awareness of the HMIS protocols and policies.

7.5.3 Recommendations regarding further research to be conducted

The researcher found some challenging issues concerning the HMIS utilisation in the HIV and AIDS programme at the facility level. Further research on the following areas would shed more light on measures to strengthen the use of the HMIS.

- Cost analysis studies on hybrid systems and dual reporting systems.
- Assessment of strategies to enhance compatibility/interoperability of DHIS2, Smart care and the HMIS formats.
- The design of the HMIS to contribute to the production of quality and useful data in LMICs.
- Further research on users' perspectives of the HIS and HMIS, with a special focus on the influence of vertical donor-funded programmes on the country HIS.

- Evaluation of the effectiveness of the proposed framework.

7.6 LIMITATIONS OF THE STUDY

The study focused on policies and guidelines existing in the Ethiopian Federal Ministry of Health and the Federal HIV/AIDS Prevention and Control Office. Since this was a qualitative study, other important factors such as the impact of organisational, behavioural, and technical factors were not quantified. This was not the aim of the study. The study was conducted in an urban region. The views of users in rural contexts would have enriched the findings. The depth of analysis and production of thick descriptions have addressed the limitation of transferability. Therefore, the study assumes that in similar contexts, the findings of this study might be useful. The study was conducted in public health centres and hospitals; therefore, the findings can be only transferable to similar contexts.

7.7 CONCLUSIONS

Ethiopia formulated guidelines and manuals on information use at the facility level to monitor the programmes, including the HIV/AIDS programme. Therefore, the study concludes that Ethiopia has adequate HIS and HMIS policy infrastructure to sufficiently support data generation and proper data flow within the health system. However, the distribution and availability of guidelines at the facility level could be improved, or other mechanisms put in place to ensure adequate access to the content of these vital documents. The structure and content of these policy documents provide a framework and support the HIV/AIDS programme. Including policymakers in the study would have yielded more insights, especially issues around funding and implementation.

Ethiopia uses a hybrid model of paper-based and electronic reporting. Using paper-based reporting during power or connectivity failures does not support the timeliness of reporting. The main challenge appeared to be the inadequacy of information technology. The study found that DHIS2 is useful in providing information for planning, costing, research and monitoring the performance of the HIV/AIDS programme. However, this system needs to be compatible with the existing Smart care software. HIS faces a challenge if it is fragmented by a donor-funded system. The actual impact on the production of useful information still needs to be quantified. Developing

countries, including Ethiopia, need to put mechanisms in place to facilitate systems integration to achieve universal coverage and reach the Sustainable Development Goals, especially those related to the provision of infrastructure to support health systems.

The availability, access and understanding of the policies will ensure that users understand their role and area of function. There must be effective communication between all levels regarding the expectations. Users need to have a clear understanding of indicators and disease codes so that appropriate data is captured. This was found to be a challenge to some. The importance of indicators to monitor the performance of the programme, to show whether it is achieving its intended objectives or not, is acknowledged. The common fact is the need for clear indicators with a simple disease classification system for improved data management and use in HIV/AIDS monitoring.

Clear plans for data management and M&E appeared to be individual or position-based. There seems to be good support between all stakeholders (data generators and users), as their roles often overlap. These need to be made clear so that each incumbent could be comfortable executing their specific tasks. The study believes that there will be clear work plans when each level or position in the system has identified unique information needs/demands. These differentiated responsibilities strengthen the approach taken by this study to refer to them as stakeholders.

Various views were expressed regarding how the HMIS is used to generate relevant and reliable data for HIV and AIDS monitoring and evaluation. ICT and other related resources are recognized as critical for efficient and effective monitoring of a health programme. Data revealed that IT infrastructure needed to be designed in such a way that it supported data management processes, including the use of information for HIV/AIDS monitoring and evaluation. Other issues that were found to be a challenge were the absence of backup systems to ensure a consistent flow of information and specialized skills in data analysis and information display.

Technical factors such as data collection tools, the HMIS design, computer software, and reporting formats are all strategic decisions taken by the organisation, which in turn influence the behaviour of users. Other factors that seemed to influence data

quality were errors, a mismatch between the software and reporting format, and misunderstandings between health professionals and the HMIS unit.

This study defined behavioural influences as data quality checking skills, problem-solving skills, competence, and confidence in routine HIS implementation. The HIS processes are data capturing, reporting, data utilization, training, and monitoring. Findings revealed existing shortcomings in mainly data users' skills and knowledge in data management processes and maintaining the quality of data. The study assumes that understanding the rationale for checking data quality, motivation, and competence influences data analysis, plotting, interpretation and use of information. The study showed that health facilities did not process information as expected. However, users did use the information for annual work plans and setting priorities. Therefore, the gaps identified need to be addressed through adequate training and capacity building, especially after HIS updates. The framework proposed makes provision to address that gap. The study concludes that frequency and quality of solution-focused supervision, detailed planning and feedback provision after supervision could be improved.

In addition, users or participants need to believe that the organization promotes the culture of information use and creates an enabling environment that encourages staff engagement. Staff turnover, lack of specialized skills and shortages of health information technologists (HIT) require immediate attention. This would require proactive and innovative strategies to ensure smooth HMIS implementation and improve the data quality.

The need for evidence-based decision making and a decision tracking matrix is well emphasized. The study notes that focus is placed on performance monitoring teams utilizing the HMIS data for proper decision-making. The study acknowledges the usefulness of the HMIS in planning and mobilization of resources at the sub-city health office, city health bureau and Ministry of Health levels.

As mentioned earlier, there is a need to position arguments on HIS policies in LMICs within broader and more diverse opinions of the HIS field. The deficit perspective that is evident in the literature on these countries tends to cloud the examination of real issues within which the HIS operates and what efforts users are making to make it

work against all odds. Stakeholders used whatever tools they had at their disposal to generate and make sense of HIV information despite power cuts, lack of resources, and a shortage of skills. They could still make a contribution. The impact of working in such environments was evident. The knowledge these stakeholders gained in having to do with less is worth pursuing to develop a new narrative on the HMIS use. Government efforts and willingness to support data-driven decisions need to be given due recognition. It is evident that, despite the difficulties health systems face, the promotion of HIS initiatives remains unabated.

In conclusion, the study acknowledges that the evaluation of health information systems is key to their development. It contends that the HMIS is a management tool that can be used at any level of the health system. Its use is influenced by the information needs of each stakeholder group. The theoretical framework used provided a clear direction on the determinants of performance of HIS. Focus was mainly on the technical, organizational and behavioural factors. Key findings from both data sets influenced the framework, which is intended to support health facilities in the generation of quality data and improved use of information in monitoring and evaluation. It also includes action plans on using policies, guidelines, and protocols. The researcher believes this would increase the confidence of users to set targets and track performance during their review meetings, in turn enhancing the use of data to monitor the HIV/AIDS programme. In addition, the evaluation of the structure and use of the existing HMIS made it possible to identify its strengths and weaknesses and develop the framework for strengthening the use of data, which can unify efforts and coordinate actions to harmonise the use of HMIS at the facility level. This would support the implementation of the goals of the HIS as shown by the government strategy plan.

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ANNEXURE A: ETHICAL CLEARANCE FROM UNISA

UNISA university of south africa

RESEARCH ETHICS COMMITTEE: DEPARTMENT OF HEALTH STUDIES

REC-012714-039 (NHERC)

6 December 2017

Dear Mr Befekadu Elfiyos Dekita

Decision: Ethics Approval

HSHDC/792/2017

Mr Befekadu Elfiyos Dekita

Student No.:5375-336-4
Supervisor: Dr MM Ramukumba
Qualification: PhD
Joint Supervisor: -

Name: Mr Befekadu Elfiyos Dekita

Proposal: Evaluating the utilization of health management information system for HIV and AIDS in Ethiopia

Qualification: **DPCHS04**

Thank you for the application for research ethics approval from the Research Ethics Committee: Department of Health Studies, for the above mentioned research. Final approval is granted from 6 December 2017 to 6 December 2022

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the Research Ethics Committee: Department of Health Studies on. 6 December 2017

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*

2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Research Ethics Review Committee, Department of Health Studies. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

4) *[Stipulate any reporting requirements if applicable].*

Note:
The reference numbers [top middle and right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the Research Ethics Committee: Department of Health Studies.

Kind regards,

Prof J. E. Maritz

Prof JE Maritz
CHAIRPERSON
maritje@unisa.ac.za

Prof MM Moleki
ACADEMIC CHAIRPERSON
molekmm@unisa.ac.za

Prof A Phillips
DEAN COLLEGE OF HUMAN SCIENCES

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ANNEXURE B: PERMISSION REQUEST LETTER OF UNISA ETHIOPIA TO ADDIS ABABA CITY ADMINISTRATIVE COUNCIL HEALTH BUREAU

UNISA university of south africa

16 JULY, 2018

UNISA-ET/KA/ST/29/16-07-18

Addis Ababa City Administration Health Bureau

Addis Ababa Health Research and Laboratory Services

Ethics Committee

Addis Ababa

Dear Madam/Sir,

The University of South Africa (UNISA) extends warm greetings. By this letter, we want to confirm that Mr. Befekadu Elfiyos Dekita (student number 53753364) is a doctoral student in the Department of Health Studies at UNISA. Currently, he is at the stage of data collection on his PhD research entitled ***"Evaluating the utilization of health management information system for HIV and AIDS in Ethiopia".***

This is therefore to kindly request you to assist the student in any way that you can. Attached, please find the ethical clearance that he has secured from the Department of Health Studies.We would like to thank you in advance for all the assistance that you will provide to the student.

UNISA REGIONAL LEARNING CENTRE
PO BOX 13836 ADDIS
TEL
FAX
MOBILE

Sincerely,

Dr. Tsige GebreMeskel Aberra

Deputy Director – Academic and ICT Support

University of South Africa
Regional Learning Center
P.O. Box: 13836, Addis Ababa, Ethiopia
Telephone: +251 11 435 2244 / +251 11 435 0078
Facsimile: +251 11 435 1242/ 43/ 44
Mobile: +251 912 19 1483
www.unisa.ac.za

ANNEXURE C: PERMISSION REQUEST LETTER TO CITY GOVERNMENT OF ADDIS ABABA HEALTH BUREAU

To: City Government of Addis Ababa Health Bureau

Addis Ababa Health Research and Laboratory services Ethics Committee

Addis Ababa, Ethiopia

REF: REQUEST FOR PERMISSION TO CONDUCT THE STUDY AT YOUR GOVERNED HEALTH FACILITIES

Dear,

The above matter refers. I am enrolled with University of South Africa (UNISA) as PhD in public health student. In partial fulfilment of the requirements to complete my studies, I must carry out a study, and it is entitled: **EVALUATING UTILIZATION OF HEALTH INFORMATION MANAGEMENT SYSTEM FOR HIV/AIDS MONITORING IN ETHIOPIA.**

The purpose of the study was to evaluate the utilization of HMIS in generating quality health information for monitoring and evaluating HIV and AIDS program in Ethiopia. The ultimate aim was developing a framework for strengthening the information culture and generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

The study is to be done in the Department of Health Studies of the University of South Africa (UNISA), with the assistance of a supervisor who is allocated to me. My supervisor and the chairperson of the Ethics Committee can be accessed through the following details:

Supervisor: Dr. Margaret Ramukumba

Tel: +27726302504

Email:ramukmm@unisa.ac.za

Ethics committee chair: Prof JE Maritz

Tel: +2712 429 6534

Email: maritje@unisa.ac.za

I hope to hear from you.

With warm regards,

Mr Befekadu Elfiyos Dekita

Student Number: 53753364

Ras Desta Damtew road,

Addis Ababa, Ethiopia

Cell Number: +251912889953

Email: 53753364@mylife.unisa.ac.za

ANNEXURE D: PERMISSION LETTER TO HEALTH FACILITIES

አዲስ አበባ ከተማ አስተዳደር ጤና ቢሮ

City Government of Addis Ababa Health Bureau

Ref.No ፊ/ሰ/ጤ/1574/227

Date 17/11/2010

- **Gandhi memorial hospital**
- **Zewditu memorial hospital**
- **Yekatit 12 Med.college hospital**
- **Bole/Woreda 17 Health Center**
- **Lideta Health Center**
- **TekelehaymanotHealth Center**
- **Addis KetemaHealth Center**
- **Nifas Silk No. 2 Health Center**
- **Kazanchis Health Center**

Addis Ababa

Subject: Request to access health facility to conduct approved research

This letter is to support **Befekadu Elfiyos Dekita** to conduct research, which is entitled as **"Evaluating utilization of health information management system for HIV/AIDS monitoring in Addis Ababa, Ethiopia."**The study was reviewed and approved by Addis Ababa Health Bureau ethical Clearance Committee, and the investigator is informed with a copy of this letter to report any changes in the study procedures and to submit progressive report once in six months, apply for renewal 30 days prior to the expiry date, and submit technical report within three months of study completion.

Therefore we request the mentioned Facilities and staffs to provide support to the investigator.

With Regards

ካሳዬነው አማረ
የህብረተሰብ ጤና ምርምር ንዑስ ስራ ሂደት አስተባባሪ
Kassayenew Amare
Public Health Research Sub-Process head

cc

- **Befekadu Elfiyos Dekita**
- **Ethical Clearance Committee**

Addis Ababa

ስልክ፡ Tel. 251- 115-51-3911 FAX: 251-115-51-56-89 E-mail: aahb@ethionet.et P.O.BOX 30738Addis Ababa, Ethiopia In replaying please quote our Ref.No.

Page 268

ANNEXURE E: LETTER OF REQUEST FOR PERMISSION TO CONDUCT THE STUDY FOR HEALTH FACILITY

To: _____

Addis Ababa, Ethiopia

REF: REQUEST FOR PERMISSION TO CONDUCT THE STUDY AT YOUR HEALTH FACILITY

Dear,

The above matter refers. I am enrolled with University of South Africa (UNISA) as PhD in public health student. In partial fulfilment of the requirements to complete my studies, I must carry out a study, and it is entitled: **EVALUATING UTILIZATION OF HEALTH INFORMATION MANAGEMENT SYSTEM FOR HIV/AIDS MONITORING IN ETHIOPIA.**

The purpose of the study was to evaluate the utilization of HMIS in generating quality health information for monitoring and evaluating HIV and AIDS program in Ethiopia. The ultimate aim was developing a framework for strengthening the information culture and generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

The study is to be done in the Department of Health Studies of the University of South Africa (UNISA), with the assistance of a supervisor who is allocated to me. This request is introduced to the City Government of Addis Ababa Health Bureau to obtain approval to collect information from public health facilities staffs located in Addis Ababa, Ethiopia for the study.

My supervisor and the chairperson of the Ethics Committee can be accessed through the following details:

Supervisor: Dr. Margaret Ramukumba

Tel: +27726302504

Email:ramukmm@unisa.ac.za

Ethics committee chair: Prof JE Maritz

Tel: +2712 429 6534

Email: maritje@unisa.ac.za

Please also find attached Ethical clearance letter from Addis Ababa Health Bureau.

I hope to hear from you.

With warm regards,

Mr Befekadu Elfiyos Dekita

Student Number: 53753364

Ras Desta Damtew road,

Addis Ababa, Ethiopia

Cell Number: +251912889953

Email: 53753364@mylife.unisa.ac.za

ANNEXURE F: DOCUMENT ANALYSIS REVIEW SHEET

This document analysis tool prepared to examine the policies and protocols on use of HMIS for HIV/AIDS monitoring and evaluation (M & E) in Ethiopia and support to develop framework for improving data management for HIV/AIDS monitoring and evaluation

This documentary analysis guide is designed to elicit information regarding to guideline, policies and protocols on use of HMIS for HIV/AIDS monitoring and evaluation.

This analysis will involve government policies, procedures, protocols/ guidelines, strategic plans and government reports

Document and date	intended recipients	Objectives in relation to HMIS	Key issues in relation to data processes	Key issues in relation to use of data for HIV/AIDS	Challenges and successes (Government reports only)	Remarks
Government policy						
Procedures						
Protocols/ guidelines						
Strategic plan						
Government report						

ANNEXURE G: CONSENT FORM FOR FGD PARTICIPANTS

What is the study about?

This is a study being conducted by Befekadu Elfiyos Dekita as part of PhD in public health at the University of South Africa. You are invited to participate in this study in your capacity as a staff working in HMIS implementation and HIV/AIDS service in your health facility located in Addis Ababa, Ethiopia. The purpose of the study was to evaluate the utilization of HMIS in generating quality health information for monitoring and evaluating HIV and AIDS program in Ethiopia. The ultimate aim was developing a framework for strengthening the information culture and generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

What will I be asked to do if I agree to participate?

You will be requested to answer questions related to the study that will be asked by the researcher. The questions will not take more than one hour. The answers will be based on your experience or views. They do not require any prior preparation.

Would my participation in this study be kept confidential?

The information you will share with the researcher will be kept confidential as much as possible. Your name or address is not required. The documented interview responses will be locked away by the researcher. No individual names or identity will be used in the report. Should an article be written about this study, your identity will be protected to the maximum extent possible.

What are the risks of this study?

There are no known risks associated with your participation in this study. However, you have the right to refuse to answer any question that makes you feel uncomfortable.

What are the benefits of this study?

This study will not have any monetary benefit to you as a participant. However, your experiences will assist the researcher to make recommendation for better planning and quality management in HIV/AIDS control program at different hierarchy of health tiers (system). Your participation will contribute to the learning process of the researcher.

Do I have to be in this study and may I stop participating at any time?

Your participation in this study is entirely voluntary. You may choose not to take part in the study. You may decide to withdraw your participation at any time should you decide to participate in the study, and you will not be penalised or lose any benefits which you otherwise qualify for.

What if I have questions?

If you have any questions about the study itself, please contact me (Befekadu Elfiyos Dekita) on Telephone: +251912889953 or on Email: 53753364@mylife.unisa.ac.za or befida@gmail.com

This study has been approved by the Department of Health Studies' Ethics Committees, University of South Africa. Should you wish to report any problems you have experienced in relation to the study, please contact Dr. Margaret Ramukumba, the study Supervisor on Tel number: +27 726302504 or E-mail: ramukmm@unisa.ac.za or Prof J Maritz, the Head of the Department of Health Studies' Ethics Committees on Tel number: +27-827888703 or E-mail: maritje@unisa.ac.za

Declaration by the participant

I ..... voluntarily consent to participate in the study mentioned above project. The background, purpose, risks and benefits of the study have been explained to me. I also understand that I may withdraw from the study at any time without consequences. I know that my participation in the study will be acknowledged, although my identity and the identity of health facility will be withheld.

I agree to be audiotaped during my participation in this study. I understand that my participation in the study is voluntary.

……. ……..

Participants' signature Date

....

Witness Date

Declaration by investigator

I, **Befekadu Elfiyos Dekita** declare that:

- I explained the information in this document.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the study, as discussed above.
- I did/did not use an interpreter.

…… _____

Signature of investigator **Date**

ANNEXURE H: FOCUS GROUP DISCUSSION GUIDELINE ENGLISH FORM

BIOGRAPHIC DATA

1. What is your position in this organisation? _____
2. What is your highest qualification? _____
3. How many years of working experience do you have? _____
4. How long have you been working at HMIS? _____
5. How old are you? _____
6. Employment status (Permanent or Fixed Term): _____
7. Gender? _____
8. Have you received any training in the Health Information System? _____
   If “yes”, how many times? _____

FOCUS GROUP: DISCUSSION GUIDE

Facilitator’s welcome, introduction and instructions to participants

Welcome and thank you for volunteering to take part in this focus group. You have been asked to participate as your point of view is important. I realise you are busy, and I appreciate your time.

Introduction: This focus group discussion is designed to assess your views and opinions about HMIS tasks (collecting, collating and analysing) HIV/AIDS data and the use of these data by the health facilities for better planning and quality management of the HIV/AIDS programme. The discussion will take no more than one and a half hours. May I record the conversation to facilitate adequate capture of the discussions?

Ground rules

- The most important rule is that only one person speaks at a time. There may be a temptation to jump in when someone is talking, but please wait until they have finished.
- There are no right or wrong answers.

- You do not have to speak in any particular order.
- When you do have something to say, please do so.
- You do not have to agree with the views of other people in the group.

General question for all groups

1. What is your understanding of HMIS and its Implementation in your facilities? (Probe about the meaning of HIS/HMIS, relevance to tasks (generating relevant and reliable data regarding HIV/AIDS monitoring and evaluation).

2. How are guidelines, protocols and policies implemented in data generation? Probe: Describe your daily tasks in data generation.

3. How is the culture of information use supported in your service area? How do technical factors influence data generation? How do personal/behavioural issues affect data generation (probe on data generation, processing, collating, and dissemination)

4. What are the barriers to effectively using HMIS?

   Probe: measures taken to work around barriers, recommendations for improvement.

Broad questions (mainly users)

1. Tell me about how you use HMIS to generate data (probe about all data management processes).

2. What guidelines, protocols and policies regulate the use of data generated by HMIS? (Probe HIV/AIDS programme.)

3. How is data used to monitor and evaluate HIV/AIDS programmes?

4. What are the factors that affect health information management?
   Probe: concepts in framework to drive probing
   (Technical, organisational and behavioural).

ANNEXURE I: FOCUS GROUP DISCUSSION GUIDELINE AMHARIC FORM

የቡድን ዉይይት መመርያ ለመረጃ አስባሰብዎች እና ለመረጃ ተጠቃምዎች በአማርኛ

ግላዊ መረጃ

1. በድርጅቱ የስራ ድርሻ _____
2. ከፍተኛ የትምህርት ደረጃ የደረሱበት _____
3. ስንት አመት የስራ ልምድ አለ/ሽ? _____
4. ምን ያህል አመት በአችአምአይአስ (HMIS) ሰርተሃል/ሻል? _____
5. እድሜ/ሽ ስንት ነዉ? _____
6. የስራ ሁኔታ (ቋም ወይስ ጊዚያዊ) _____
7. ጾታ_____
8. በመረጃ አያያዝ ስልጠና ወስደዋል? _____ አዎ ከሆነ ለስንት ጊዜ_____

የቡድን ዉይይት መመርያ

የአስተባባሪዉ የሰላምታ፣ ማስተዋወቅ ና መመርያ መስጠት

ሰላምታ፡- ይህንን የቡድን ዉይይት በፈቃደኝነት ለመሳተፍ ሰለመጣችሁ እናመሰግናለን ። እናንተ እዚህ ለመሳተፍ የተጋበዛችሁት የናንተ አመለካከት ለጥናቱ በጣም አስፈላግ ስለሆነ ነዉ። ካላችሁ የስራ ጫና በዚህ ለመሳተፍ ሰለመጣችሁ እናመሰግናለን።

ማስተዋወቅ፡- ይህ የቡድን ዉይይት የተዘጋጀዉ የናንተን አስተሳሰብ ና ስሜታችሁን ለመዳሰስ በ አችአምአይአስ (HMIS) መረጃ አስባሰብ እና ጥናት በ ኤችአይቭ እና ኤድስ(HIV/AIDS) መረጃ እና መረጃ አጠቃቀም በጤና ተቋማት ባሉ መሪዎች የተሻለ እቅድ ለማዘጋጀትና ለ ፕሮግራም ማስተባበር ሀደት መመልከት ነዉ። የቡድን ዉይይት ከአንድ እስከ አንድ ተኩል ሰዓት ድረስ በወስድ ነዉ። ይህን የቡድን ዉይይት ድምጽ መቅዳት እችላለሁ ወይ።

መመርያ

- ወሳኙ መመርያ አንድ ሰዉ ተራ ጠብቆ መናገር ያስፈልጋል። በመሳል ጣልቃ መግባት ሳያስፈልግ አንድ ሰዉ ሳሳቡን እስኪጨርስ መጠበቅ ያስፈልጋል።
- ይህ ትክክል ወይም የተሳሳቴ መልስ ነዉ አይባልም።
- ለመናገር የተቀመጠ ልዩ የመመርያ ሂደት የለዉም
- አንድን ነገር ለመናገር የፈለገ ሰዉ በቀጥታ መናገር ይችላል።.

- በሌላ ሰዉ ጎሳብ የግድ መስማማት አይጠበቅም።
  - **ዋና ጥያቄዎች ለሁሉም ቡድን**
  1. ስለ አችአምአይአስ (HMIS) ምን መረዳት እና አተገባበር ያዉቃሉ? (ጥልቅ(ፕሮቢንግ) ጥያቄዎች ስለ አችአይአስ (HIS)/አችአምአይአስ (HMIS)፤ ከስራ ጋር ያለዉ አስፈላግነት (መረጃ አስፈላግነት እና አስተማምኝነት ኤችአይቭ እና ኤድስ(HIV/AIDS) ክትትል እና ግምገማ)
  2. እንዴት መመርያዎች እና ፖልስዎች በመረጃ አሰባሰብ ዙርያ አገለግሎት እየሰጡ ይገኛሉ? ጥልቅ(ፕሮቢንግ) ጥያቄዎች ቀን በቀን ከስራ ጋር ባለዉ የመረጃ አሰባሰብ
  3. እንዴት የመረጃ አጠቃቀም ልምድ ማጎልበት ይቻላል በእናንተ አገለገሎት መስጫ ቦታ? እንዴት ተክንካል ተግዳሮቶች በመረጃ አሰባሰብ ላይ ጫና ሊያደርሱ ይችላሉ? እንዴት ሰባዓዊ/ባህሪያት ላይ ጫና ሊያደርሱ ይችላሉ በመረጃ አሰባሰብ (ጥልቅ መጠይቅ በመረጃ አሰባሰብ ፤ በመረጃ አያያዝ ስራ፣ ማጠናቀር፣ እና ማሰራጨት)
  4. ምን ዓይነት ተግዳሮቶች አሉ አችአምአይአስን (HMIS) በትክክል ለመጠቀም? ጥልቅ(ፕሮቢንግ) ጥያቄ፡ ተግዳሮቶች ለመቅረፍ ምን ዓይነት ስራዎች ተሰርተዋል፤ ለማሻሻል ምን መደረግ አለበት

  ሰፋ ያሉ ጥያቄዎች ለመረጃ ተጠቃምዎች

  1. እንዴት ነዉ አችአምአይአስን (HMIS) የምትጠቀሙት በመረጃ አሰባሰብ አጠቃቀም (ጥልቅ(ፕሮቢንግ) ጥያቄ ስለ መረጃ አጠነቃቀር)
  2. ምን መመርያዎች እና ፖልስዎች ስለ አችአምአይአስ (HMIS) የመረጃ አጠቃቀምን የምቆጣጠሩት? (ጥልቅ መጠይቅ በኤችአይቭ እና ኤድስ(HIV/AIDS)ፕሮግራም)
  3. እንዴት በኤችአይቭ እና ኤድስ (HIV/AIDS) ፕሮግራም ላይ የመረጃ አጠቃቀም ክትትል እና ግምገማ እየተካሀደ ነዉ?
  4. ምን ዓይነት ችግር ከአችአምአይአስ (HMIS) የመረጃ አጠቃቀም በኤችአይቭ እና ኤድስ(HIV/AIDS) ክትትል እና ግምገማ ወቅት አለ? ጥልቅ(ፕሮቢንግ) ጥያቄዎች፤ ጽንሰ-ሃሳብ በፈርምዎርክ ዙርያ፤ ጥልቅ(ፕሮቢንግ) ጥያቄ (ተክንካል፤ ድርጅታዊ ና ሰባዓዊ/ባህሪያት)

ANNEXURE J: LETTER OF INVITATION FOR EXPERTS

To: Health facility Directors

HMIS/M&E Managers

HIV/AIDS Data Managers

RE: INVITATION TO PARTICIPATE IN STUDY ON EVALUATING UTILIZATION OF HEALTH INFORMATION MANAGEMENT SYSTEM FOR HIV/AIDS MONITORING IN ETHIOPIA

This study is conducted by Befekadu Elfiyos Dekita as part of PhD in public health at the University of South Africa. The purpose of the study was to evaluate the utilization of HMIS in generating quality health information for monitoring and evaluating HIV and AIDS program in Ethiopia. The ultimate aim was developing a framework for strengthening the information culture and generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

This third phase of the study seeks the participation of experts who have worked and have experience in HMIS implementation through collecting, collating and analysing HIV/AIDS data and the use of these data by the health facilities in government and non-governmental organizations.

You are requested to review and provide expert input on the framework developed. The proposed framework is derived from findings of qualitative documentary analysis of policies and protocols guiding the implementation of HMIS to monitor HIV/AIDS program implementation in Ethiopia, as well as the focus group interviews result.

This study is seeking your expert opinion through participation virtual zoom meeting in scheduled time of 60 minutes for presentation of the research findings and discussing the proposed framework. The participation link and questionnaires will be provided by email. I hope you will find the process interesting and results will be made available to you at the conclusion of the consensus seeking phase. There will be follow up rounds.

Your participation in this study is entirely voluntary. If you do not wish to take part in this study, it will not affect you in any way. In addition, any information that you provide will be confidential and when the results of the study are reported, you will not be identified in the findings. Your name will not be recorded in any rounds; instead you will be allocated a unique code that is only identifiable to the researcher.

Your participation highly valuable that any help you will be able to offer to this study.

With warm regards,

Mr Befekadu Elfiyos Dekita

Student Number: 53753364

Ras Desta Damtew road,

Addis Ababa, Ethiopia

Cell Number: +251912889953

Email: 53753364@mylife.unisa.ac.za

ANNEXURE K: CONSENT FORM FOR EXPERTS

What is the study about?

This is a study being conducted by Befekadu Elfiyos Dekita as part of PhD in public health at the University of South Africa. You are invited to participate in this study in your capacity as a staff working in HMIS implementation and HIV/AIDS service in your health facility located in Addis Ababa, Ethiopia. The purpose of the study was to evaluate the utilization of HMIS in generating quality health information for monitoring and evaluating HIV and AIDS program in Ethiopia. The ultimate aim was developing a framework for strengthening the information culture and generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

What will I be asked to do if I agree to participate?

You will be requested to answer questions related to the study that will be asked by the researcher. The questions will not take more than one hour. The answers will be based on your experience or views. They do not require any prior preparation.

Would my participation in this study be kept confidential?

The information you will share with the researcher will be kept confidential as much as possible. Your name or address is not required. The documented interview responses will be locked away by the researcher. No individual names or identity will be used in the report. Should an article be written about this study, your identity will be protected to the maximum extent possible.

What are the risks of this study?

There are no known risks associated with your participation in this study. However, you have the right to refuse to answer any question that makes you feel uncomfortable.

What are the benefits of this study?

This study will not have any monetary benefit to you as a participant. However, your experiences will assist the researcher to make recommendation for better planning and quality management in HIV/AIDS control program at different hierarchy of health tiers (system). Your participation will contribute to the learning process of the researcher.

Do I have to be in this study and may I stop participating at any time?

Your participation in this study is entirely voluntary. You may choose not to take part in the study. You may decide to withdraw your participation at any time should you decide to participate in the study, and you will not be penalised or lose any benefits which you otherwise qualify for.

What if I have questions?

If you have any questions about the study itself, please contact me (Befekadu Elfiyos Dekita) on Telephone: +251912889953 or on Email: 53753364@mylife.unisa.ac.za or befida@gmail.com

This study has been approved by the Department of Health Studies' Ethics Committees, University of South Africa. Should you wish to report any problems you have experienced in relation to the study, please contact Prof. Margaret Ramukumba, the study Supervisor on Tel number: +27 726302504 or E-mail: ramukmm@unisa.ac.za or Prof J Maritz, the Head of the Department of Health Studies' Ethics Committees on Tel number: +27-827888703 or E-mail: maritje@unisa.ac.za

Declaration by the participant

I ..... voluntarily consent to participate in the study mentioned above project. The background, purpose, risks and benefits of the study have been explained to me. I also understand that I may withdraw from the study at any time without consequences. I know that my participation in the study will be acknowledged, although my identity and the identity of health facility will be withheld.

I agree to be audiotaped during my participation in this study. I understand that my participation in the study is voluntary.

…… ……..

Participants' signature Date

....

Witness Date

Declaration by investigator

I, **Befekadu Elfiyos Dekita** declare that:

- I explained the information in this document.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the study, as discussed above.
- I did/did not use an interpreter.

…… _____

Signature of investigator **Date**

ANNEXURE L: DELPHI QUESTIONNAIRE FOR ROUND ONE

Dear Sir/Madam

This study is conducted by Befekadu Elfiyos Dekita as part of PhD in public health at the University of South Africa. The purpose of the study was to evaluate the utilization of HMIS in generating quality health information for monitoring and evaluating HIV and AIDS program in Ethiopia. The ultimate aim was developing a framework for strengthening the information culture and generation of reliable and accurate data to support HIV and AIDS monitoring and evaluation.

This third phase of the study seeks the participation of experts who have worked and have experience in HMIS implementation through collecting, collating and analysing HIV/AIDS data and the use of these data by the health facilities in government and non-governmental organizations.

You are requested to review and provide expert input on the framework developed. The proposed framework is derived from findings of documentary review of policies and protocols guiding the implementation of HMIS to monitor HIV/AIDS program implementation in Ethiopia, as well as the focus group interviews.

This study is seeking your expert opinion. I hope you will find the process interesting and results will be made available to you at the conclusion of the consensus seeking phase. There will be follow up rounds.

Your participation in this study is entirely voluntary. If you do not wish to take part in this study, it will not affect you in any way. In addition, any information that you provide will be confidential and when the results of the study are reported, you will not be identified in the findings. Your name will not be recorded in any rounds; instead you will be allocated a unique code that is only identifiable to the researcher. You will remain anonymous to the other participants (up to 25 experts have been invited). I would be grateful if you could complete the enclosed questionnaire and return it at your earliest convenience (preferably within one week's time) to me using online form, or my personal email address befida@gmail.com, call me with +251912889953 to collect filled hard copy at convenient place. I sincerely hope you will agree to participate. If you have any questions, please e-mail Befekadu Elfiyos, befida@gmail.com or call +251912889953.

Thank you for your time and any help you may be able to offer to this study. If you consent to participate in the study, please proceed to complete the questionnaire.

Yours sincerely

Befekadu Elfiyos (BSc, MSc)

UNISA, PHD Candidate

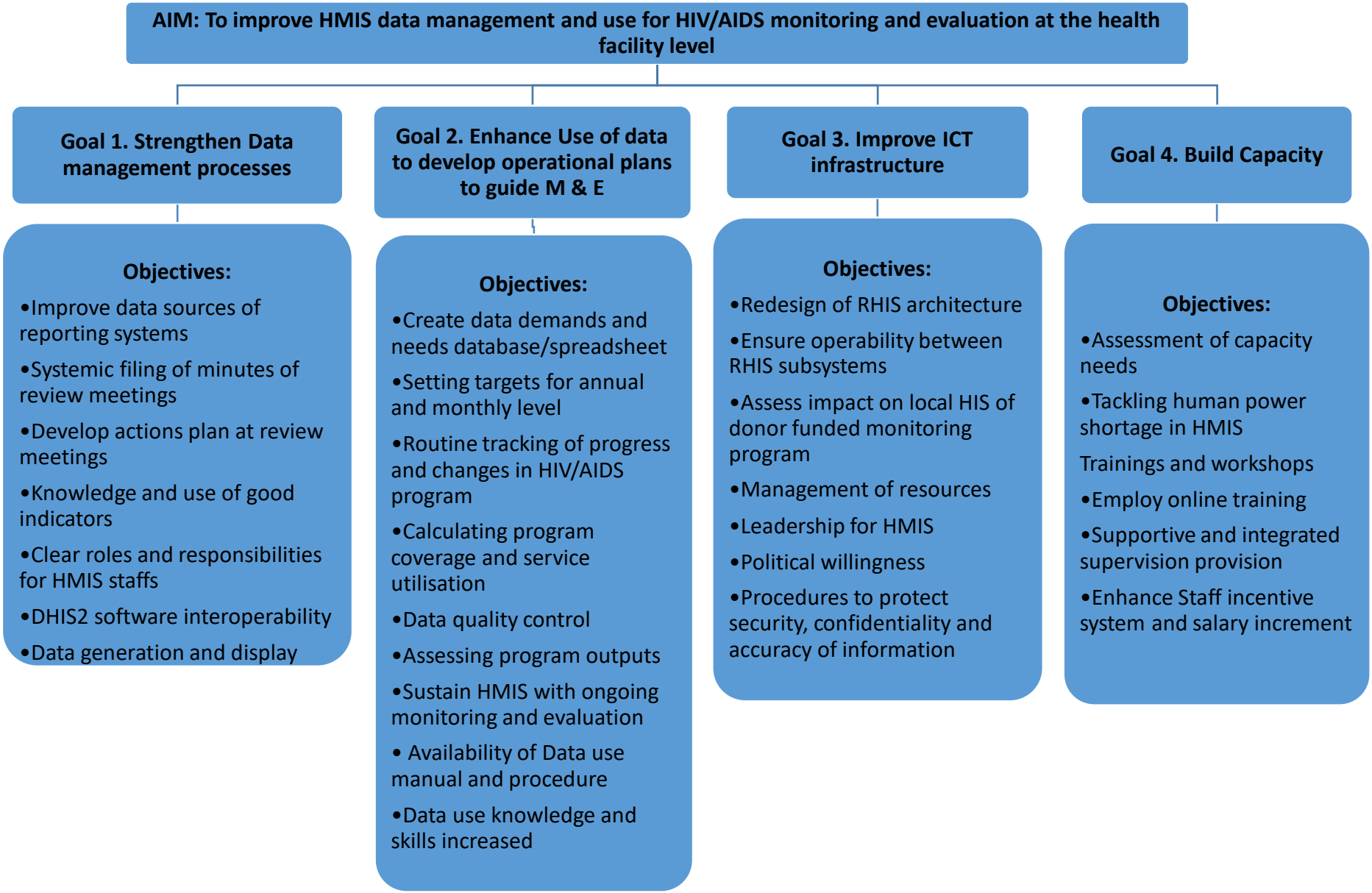
The following framework and action plan statement listed below are designed to seek your personal opinion. Please reply to each one but please do not feel limited in the length or style of your answers.

Delphi consensus seeking questions for round 1

BIOGRAPHIC DATA

1. What is your position in your organisation? _____
2. What is your Education qualification? _____
3. How many years of working experience do you have? _____
4. What is your profession? _____
5. How old are you? _____
6. Gender_____

Please provide your opinion toward each of the proposed actions to be included in the framework to strengthen the use of HMIS in HIV/AIDS program monitoring.


AIM: To improve HMIS data management and use for HIV/AIDS monitoring and evaluation at the health facility level
Goal 1. Strengthen Data management processes
Goal 2. Enhance Use of data to develop operational plans to guide M & E
Goal 3. Improve ICT infrastructure
Goal 4. Build Capacity
Objectives:
•Improve data sources of reporting systems
•Systemic filing of minutes of review meetings
•Develop actions plan at review meetings
•Knowledge and use of good indicators
•Clear roles and responsibilities for HMIS staffs
•DHIS2 software interoperability
•Data generation and display
Objectives:
•Create data demands and needs database/spreadsheet
•Setting targets for annual and monthly level
•Routine tracking of progress and changes in HIV/AIDS program
•Calculating program coverage and service utilisation
•Data quality control
•Assessing program outputs
•Sustain HMIS with ongoing monitoring and evaluation
• Availability of Data use manual and procedure
•Data use knowledge and skills increased
Objectives:
•Redesign of RHIS architecture
•Ensure operability between RHIS subsystems
•Assess impact on local HIS of donor funded monitoring program
•Management of resources
•Leadership for HMIS
•Political willingness
•Procedures to protect security, confidentiality and accuracy of information
Objectives:
•Assessment of capacity needs
•Tackling human power shortage in HMIS
Trainings and workshops
•Employ online training
•Supportive and integrated supervision provision
•Enhance Staff incentive system and salary increment

Please tick 'Yes' if you agree and 'No' if you disagree, you can add comments/suggestions on the statements.

Goal 1: Strengthen Data management processes

Statements of action plans	Yes	No	Comment/suggestion
Improved data sources of reporting systems **Build capacity on**: - Recording and collection of information from the source document, including the tally sheet, and registration			
- Design in-service program on data collection and reporting for staffs who have HMIS tasks such as HIV/AIDS department staff and data clerks			
- Record, collect and compile up-to-date and quality report of the month at VCT, PMTCT, and ART department submitted to HMIS department - Provide support through mentoring and coaching for report preparation and submission			
- Assign fixed and regular reporting period at each level in the health facility - Quality reporting to be a standing item on the monthly meeting agenda			
Systemic filing of minutes of review meetings - Ensure that Performance review meeting minutes are properly filed and circulated on time to members for further action every month - Follow up the action taken according to the minutes filed **Develop actions plan at review meetings** - Develop action plan depending on report and information provided at review meeting - Promote the local use of information for monitoring HIV/AIDS. -			
Knowledge and use of good indicators - Provide enough guidelines and manuals specific to HMIS like code, indicator and disease classification guideline. - Provide electronic/mobile application types of guidelines. - Provide training, mentoring and coaching of data collection staffs on the knowledge and uses of the data indicator, codes and disease classification			

- Select indicators based on easy understanding, robust, and representing the most important aspects of the HIV/AIDS program			
- Empower HMIS teams to have a pivotal role in the development and implementation of indicators codes and disease classification			
Clear roles and responsibilities for HMIS staffs - Provide a clear guidelines defining roles and responsibilities regarding data management processes and data use at the health facility level			
DHIS2 software interoperability - Update the software to be functional and compatible with formats and registers			
- Restructure and update the Smart care software compatible to DHIS2 system implementation. - Revise and align the soft wares having strong support by global and national partners. - Re-inform DHIS2 with data elements of smart care so as to make congruence of software system.			
- Download, upgrade or update the software through online internet connection. When there is internet access, skilled person should update the software.			
Data generation and display skills - Ensure that adequate number of data clerks available and provided with the knowledge and skill in data generation and display.			
- Ensure data generation and display, feedback mechanisms, and capacity to generate information are in place. - Provide regular assessment of how information is being generated and displayed for information use has to be in place.			
- Advocate dynamic data generation and display system, which ensure the information shared are visible and accessible at all level for consistent information use.			
- Design special training program for regular oversight and mentoring with feedback			

Goal 2: Enhance Use of data to develop operational plans to guide HIV/AIDS monitoring and evaluation

Statements of action plans	Yes	No	Comment/suggestion
Create data demands and needs database/spreadsheet			

- Identify key HIV/AIDS programmatic questions and link to the data available at the facility or to be collected			
- Identify the patient-nurse ratio in the HIV/AIDS program - Demand information regards to drug availability and full functioning of laboratory services for HIV/AIDS program			
- Demand information link of positives from VCT services to ART clinics			
- Request information about status of baby born from HIV positive mother who was receiving ART			
- Request information regarding the patient level of adherence to ART services			
Setting targets for annual and monthly level - Set monthly up to annual target for their activity plan by each department of HIV/AIDS program			
- Routine tracking of progress and changes in HIV/AIDS program performance - Collect data regarding the plan achievement from HMIS department - Check achievement against the plan to see the level of accomplishment - Discuss on level of achievement is low or high to revise the plan for next month and take action			
Calculating program coverage and service utilisation - Calculate specific HIV/AIDS program information according to the data demands and request - Highlight the analysed data with description for effective use by data users - Support department heads in clarifying the analysed and calculated data usage			
Data quality control - Conduct routine data quality assessment (DQA) at the health facility level -			
- Conduct monthly data quality check-up with LQAS at reporting period			
- Have a regular meeting on data quality follow up and data quality committee activity report			
Assessing program outputs - Conduct assessment of the program output on monthly level at each department of HIV/AIDS program - Identify the gaps of implementation after the assessment - Implement the remedies/ solution for the gaps identified			
Sustain HMIS with ongoing monitoring and evaluation - Ensure monitoring and evaluation for the support of HMIS is conducted for HIV/AIDS program			

Availability of Data use manual and procedure - Provide adequate data use manual and procedure at departmental level in the health facility - Support manual in mobile application system and soft copy - Create awareness on data use manual availability and use			
Data use knowledge and skills increased - Conduct capacity building and mentoring on use of decision tracking matrix in evidence based decision.			
- Promote use of data and reports for decision making for HIV/AIDS program to improve service delivery.			
- Advocate, create awareness and conduct supervision on data use for action at the facility level for health professionals.			

Goal 3: Improve ICT infrastructure

Statements of action plans	Yes	No	Comment/suggestion
Redesign of RHIS architecture - Identify and procure required computer and infrastructure from their internal review or health office/donors.			
Ensure operability between RHIS subsystems - Expand and network e-HMIS system through computerizing the data reporting system. - Ensure and supervise the compatible paper based system for the electronic data generation.			
Assess impact on local HIS donor funded monitoring program - Conduct assessment and monitoring of donor funded program related to HMIS management - Identify the gaps and challenges based on the assessment - Provide solution for the challenges and implement accordingly			
Management of resources - Identify ICT resources required for maintenance and support - Repair dysfunctional ICT equipment's or replace with new one - Label and control use of ICT equipment at individual or department level for accountability - Ensure the ICT system is fully functional and well supported			
Leadership for HMIS - Regularly supervise and support ICT infrastructure - Ensure and follow up ICT resources are at required level and functional			

- Empower ICT department in full control of IT resources at use. - Advocate staffs to manage well the scarce IT resources			
Political willingness - Allocate budget required amount at regional and sub city offices level to be cascaded to health facilities levels. - Purchase the required ICT equipment and infrastructure with other types of connectivity like CDMA, and 3G apparatus in adequacy level.			
Procedures to protect security, confidentiality and accuracy of information - Encrypt sensitive files with pass words - Allow limited access to data sources with pass codes - Place the ICT devices and storages in safe and secured areas with lock - Provide data that cannot identify or link to personal sensitive information - Securely dispose of sensitive data after usage if no longer required			

Goal 4: Build Capacity

Statements of action plans	**Yes**	**No**	**Comment/suggestion**
Assessment of capacity needs - Identify the gaps between the actual situation and the desired state - Conduct assessment of training needs for the staffs especially on data recording and collection, data quality, and data demand and use - Recommend the appropriate capacity building intervention need			
Tackling human power shortage in HMIS - Improve working conditions in all settings to prevent staff turnover. - Formulate an integrated package of attraction and retention policies - areas to be addressed such as job security, a manageable workload, family and lifestyle incentives, housing and education allowances.			
- Increase budget for manpower, and the recruitment, development and training of the HMIS staffs in health facilities.			
- Strengthen data on availability of HMIS staffs (information on HR) for fair distribution, monitoring and ensuring accountability for the implementation of HIV/AIDS and other similar programs.			
Training and workshops - Provide workshops and work-based training programs for strengthening capacity of staffs based on capacity need assessment			

- Capacitate staffs through hands-on training that allows skills building with minimum work disruptions. - Encourage experience sharing workshop through involvement of other institutional staff to enhance continuity and sustainability. - Provide targeted training paired with coaching, and supportive supervision efforts aim to effect sustainable improvements in health information system capacity for e.g., HMIS leadership and governance, data management, and data use.			
Online training - Employ online training through use of technologies, like video conferences, and social media.			
Supportive and integrated supervision provision - Develop a supervision schedule set ahead and informed of visit with supervisee. - Provide integrated supervision with adequate time of need to do data quality check and HMIS/M&E system support. - Provide routine mentoring and coaching for staffs working directly on HMIS.			
- Communicate reports of feedback from supportive supervision activities with supervisees.			
Enhance Staff incentive system and salary increment - Support on the collaborative development of performance goals or a performance checklist with staffs.			
- Create an impact on staff's motivation through the recognition of positive employee efforts and accomplishments.			
- Create recognition within their daily operations as a culture - Avail regular mechanism of motivation usually at the end of year through salary increase and provision of incentive should be instituted.			

Please list any crucial issues or points, which are not mentioned above regarding HMIS/M&E implementation in HIV/AIDS program at the health facility level.

_____
_____
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_____

The following action plans in details below are designed to seek your personal opinion or to re-evaluate according to above response.

AIM: To improve HMIS data management and use for HIV/AIDS monitoring and evaluation at the health facility level

Goal 1: Strengthen Data management processes

Key action plans	Responsible authority	Time frame	Indicators for success	Comment/suggestion
Improved data sources of reporting systems **Build capacity on**: - Recording and collection of information from the source document, including the tally sheet, and registration	VCT, PMTCT and ART department, HMIS department	Monthly	High level of accuracy across data sources	
- Design in-service program on data collection and reporting for staffs who have HMIS tasks such as HIV/AIDS department staff and data clerks	VCT, PMTCT and ART department, HMIS department	August 2021 up to July 2022	Professionals skilled in HMIS tasks	
- Record, collect and compile up-to-date and quality report of the month at VCT, PMTCT, and ART department submitted to HMIS department - Provide support through mentoring and coaching for report preparation and submission	VCT, PMTCT and ART department, HMIS department	Monthly	Skilled in quality report submission Up to data and quality reports	
- Assign fixed and regular reporting period at each level in the health facility - Quality reporting to be a standing item on the monthly meeting agenda	Health facility management, Performance review team, HMIS department	July 2021 up to June 2022 and Monthly	Regular and quality report	
Systemic filing of minutes of review meetings	Performance review team, HMIS department	Monthly		

- Ensure that Performance review meeting minutes are properly filed and circulated on time to members for further action every month - Follow up the action taken according to the minutes filed **Develop actions plan at review meetings** - Develop action plan depending on report and information provided at review meeting - Promote the local use of information for monitoring HIV/AIDS.			Minutes are easily retrievable All staff are familiar with upcoming discussions	
Knowledge and use of good indicators - Provide enough guidelines and manuals specific to HMIS like code, indicator and disease classification guideline. - Provide electronic/mobile application types of guidelines. - Provide training, mentoring and coaching of data collection staffs on the knowledge and uses of the data indicator, codes and disease classification - Select indicators based on easy understanding, robust, and representing the most important aspects of the HIV/AIDS program	MOH, regional health bureau and sub-city health office	July 2021 up to December 2021	Adequate manuals/guidelines available Professionals knowledgeable and skilled in HMIS indicator	
- Empower HMIS teams to have a pivotal role in the development and implementation of indicators codes and disease classification	MOH, regional health bureau and HMIS team	July 2021 up to December 2021	Staffs skilled and knowledgeable in indicator and disease classification codes	
Clear roles and responsibilities for HMIS staffs - Provide a clear guidelines defining roles and responsibilities regarding data management processes and data use at the health facility level	MOH, regional health bureau and Health facility management team	July 2021 up to December 2021	Staffs are responsible and active in data management	

DHIS2 software interoperability - Update the software to be functional and compatible with formats and registers	MOH, regional health bureau and sub-city health office	July 2021 up to December 2021	Software are functional and compatible	
- Restructure and update the Smart care software compatible to DHIS2 system implementation. - Revise and align the soft wares having strong support by global and national partners. - Re-inform DHIS2 with data elements of smart care so as to make congruence of software system.	MOH, regional health bureau and sub-city health office	July 2021 up to December 2021	Updated and functional soft wares	
- Download, upgrade or update the software through online internet connection. When there is internet access, skilled person should update the software.	HMIS department	Weekly and monthly level	Capacitated staffs handling the software updates	
Data generation and display skills - Ensure that adequate number of data clerks available and provided with the knowledge and skill in data generation and display.	Health facility management, HMIS team, performance management team	July 2021 up to December 2021	Competent and capacitated staffs in data generation and display skills	
- Ensure data generation and display, feedback mechanisms, and capacity to generate information are in place. - Provide regular assessment of how information is being generated and displayed for information use has to be in place.	Health facility management, HMIS department, performance management team	Monthly and quarterly	Proper and quality data generation flow and system	
- Advocate dynamic data generation and display system, which ensure the information shared are visible and accessible at all level for consistent information use.	Health facility management, HMIS department, performance management team	Monthly and quarterly	Updated and usable data display system	

- Design special training program for regular oversight and mentoring with feedback	Health facility management, HMIS department, performance management team	July 2021 up to December 2021	Highly capacitated and skilled staffs	

Goal 2: Enhance Use of data to develop operational plans to guide monitoring and evaluation

Key action plans	responsible authority	Time frame	Indicators for success	Comment/suggestion
Create data demands and needs database/spreadsheet - Identify key HIV/AIDS programmatic questions and link to the data available at the facility or to be collected	Health facility management, HMIS department, performance management team	Every month	No. of programmatic questions linked	
- Identify the patient-nurse ratio in the HIV/AIDS program - Demand information regards to drug availability and full functioning of laboratory services for HIV/AIDS program	Health facility management, HMIS department	Annually and quarterly	Adequate staffs and resource available for the patients	
- Demand information link of positives from VCT services to ART clinics	VCT department, HMIS department	Monthly	High linkages of HIV positive clients	
- Request information about status of baby born from HIV positive mother who was receiving ART	PMTCT department, HMIS department	Monthly	HIV free baby born for HIV positive mothers	
- Request information regarding the patient level of adherence to ART services	ART department, HMIS department	Quarterly	High adherence of patient for ART	
Setting targets for annual and monthly level - Set monthly up to annual target for their activity plan by each department of HIV/AIDS program	VCT, PMTCT and ART department,	Annually with monthly details	Well-developed plan	

	Performance management team			
Routine tracking of progress and changes in HIV/AIDS program performance - Collect data regarding the plan achievement from HMIS department - Check achievement against the plan to see the level of accomplishment - Discuss on level of achievement is low or high to revise the plan for next month and take action	VCT, PMTCT and ART department, Performance management team	Monthly basis	Well tracked activities of plan and progress	
Calculating program coverage and service utilisation - Calculate specific HIV/AIDS program information according to the data demands and request - Highlight the analysed data with description for effective use by data users - Support department heads in clarifying the analysed and calculated data usage	VCT, PMTCT and ART department, HMIS department	Monthly basis	Calculated data are used at departmental level	
Data quality control - Conduct routine data quality assessment (DQA) at the health facility level	regional health bureau and sub-city health office	Quarterly basis	High data quality system	
- Conduct monthly data quality check-up with LQAS at reporting period	Performance management team , HMIS team	Monthly basis	Staffs skilled in data quality check-up	
- Have a regular meeting on data quality follow up and data quality committee activity report	Performance management team , management team	Monthly basis	Improved data quality level	
Assessing program outputs - Conduct assessment of the program output on monthly level at each department of HIV/AIDS program	VCT, PMTCT and ART department, Performance management team	Monthly basis	Regularly program output assessed	

- Identify the gaps of implementation after the assessment - Implement the remedies/ solution for the gaps identified				
Sustain HMIS with ongoing monitoring and evaluation - Ensure monitoring and evaluation for the support of HMIS is conducted for HIV/AIDS program	HMIS team, management team, MOH, regional health bureau and sub-city health office	Quarterly basis	Well-functioning of HMIS in HIV/AIDS program	
Availability of Data use manual and procedure - Provide adequate data use manual and procedure at departmental level in the health facility - Support manual in mobile application system and soft copy - Create awareness on data use manual availability and use	MOH, regional health bureau and sub-city health office	July 2021 up to December 2021	Highly Improved data use system	
Data use knowledge and skills increased - Conduct capacity building and mentoring on use of decision tracking matrix in evidence based decision.	MOH, regional health bureau and sub-city health office	July 2021 up to June 2022	Well capacitated in data use	
- Promote use of data and reports for decision making for HIV/AIDS program to improve service delivery.	Performance management team , HMIS department	Monthly	High level of information use at the facility	
- Advocate, create awareness and conduct supervision on data use for action at the facility level for health professionals.	HMIS department, management team, MOH, regional health bureau and sub-city health office	Every month and quarterly	Well acknowledged and understood information use at the facility	

Goal 3: Improve ICT infrastructure

Key action plans	responsible authority	Time frame	Indicators for success	Comment/suggestion
Redesign of RHIS architecture - Identify and procure required computer and infrastructure from their internal review or health office/donors.	Management team, HMIS and ICT department	July 2021 up to December 2021	Availability of new and recent IT resources	
Ensure operability between RHIS subsystems - Expand and network e-HMIS system through computerizing the data reporting system. - Ensure and supervise the compatible paper based system for the electronic data generation.	HMIS department, Management team, MOH, regional health bureau and sub-city health office	December 2021 up to June 2022	Well-functioning and networked IT system	
Assess impact on local HIS donor funded monitoring program - Conduct assessment and monitoring of donor funded program related to HMIS management - Identify the gaps and challenges based on the assessment - Provide solution for the challenges and implement accordingly	Performance management team , management team, HMIS team	Annually	Enhance the positive impact of donor-funded monitoring	
Management of resources - Identify ICT resources required for maintenance and support - Repair dysfunctional ICT equipment's or replace with new one - Label and control use of ICT equipment at individual or department level for accountability - Ensure the ICT system is fully functional and well supported	HMIS and ICT department, and management team	Monthly and quarterly	Controlled and functioning ICT resource	

Leadership for HMIS - Regularly supervise and support ICT infrastructure - Ensure and follow up ICT resources are at required level and functional - Empower ICT department in full control of IT resources at use. - Advocate staffs to manage well the scarce IT resources	MOH, regional health bureau and sub-city health office management team	Monthly and Quarterly	Improved and functional ICT infrastructure	
Political willingness - Allocate budget required amount at regional and sub city offices level to be cascaded to health facilities levels. - Purchase the required ICT equipment and infrastructure with other types of connectivity like CDMA, and 3G apparatus in adequacy level.	Regional health bureau and sub-city health office	Annually	Improved availability of ICT equipment	
Procedures to protect security, confidentiality and accuracy of information - Encrypt sensitive files with pass words - Allow limited access to data sources with pass codes - Place the ICT devices and storages in safe and secured areas with lock - Provide data that cannot identify or link to personal sensitive information - Securely dispose of sensitive data after usage if no longer required	HMIS and ICT department	Monthly and quarterly	Highly confidential and accurate information are well secured	

Goal 4: Build Capacity

Key action plans	**responsible authority**	**Time frame**	**Indicators for success**	**Comment/suggestion**
- Identify the gaps between the actual situation and the desired state	Health facility management, Donor and NGO	Annually	Organised capacity need assessment	

- Conduct assessment of training needs for the staffs especially on data recording and collection, data quality, and data demand and use - Recommend the appropriate capacity building intervention need				
Tackling human power shortage in HMIS - Improve working conditions in all settings to prevent staff turnover. - Formulate an integrated package of attraction and retention policies areas to be addressed such as job security, a manageable workload, family and lifestyle incentives, housing and education allowances.	Management team, Regional health bureau and sub-city health office	July 2021 up to December 2021	Professionally skilled staffs stabilised	
- Increase budget for manpower, and the recruitment, development and training of the HMIS staffs in health facilities.	Regional health bureau and sub-city health office	Annually	Adequate budget allocated for staffing	
- Strengthen data on availability of HMIS staffs (information on HR) for fair distribution, monitoring and ensuring accountability for the implementation of HIV/AIDS and other similar programs.	MOH, Regional health bureau and sub-city health office	Annually	Updated HMIS staffs in HR information system	
Training and workshops - Provide workshops and work-based training programs for strengthening capacity of staffs based on capacity need assessment - Capacitate staffs through hands-on training that allows skills building with minimum work disruptions. - Encourage experience sharing workshop through involvement of other institutional staff to enhance continuity and sustainability. - Provide targeted training paired with coaching, and supportive supervision efforts aim to effect sustainable improvements in health information system capacity for e.g., HMIS leadership and governance, data management, and data use.	Regional health bureau and sub-city health office, health facility management team and HMIS department	July 2021 up to June 2022	Skilled and knowledgeable staffs in the facility	

Online training - Employ online training through use of technologies, like video conferences, and social media.	Regional and sub city health bureau, Health facility management team, HMIS team and M&E mentors	Quarterly	Improved online training system	
Supportive and integrated supervision provision - Develop a supervision schedule set ahead and informed of visit with supervisee. - Provide integrated supervision with adequate time of need to do data quality check and HMIS/M&E system support. - Provide routine mentoring and coaching for staffs working directly on HMIS.	Ministry of health Regional and sub city health bureau HMIS team of the facility and M&E mentors	Quarterly	Well supervised and supported HMIS	
- Communicate reports of feedback from supportive supervision activities with supervisees.	Regional and sub city health bureau HMIS team of the facility and M&E mentors	Quarterly	Highly organised feedbacks mechanism	
Enhance Staff incentive system and salary increment - Support on the collaborative development of performance goals or a performance checklist with staffs.	Health facility management team The health bureau supervisors	Annually	Improved incentives system	
- Create an impact on staff's motivation through the recognition of positive employee efforts and accomplishments.	Health facility management team Health facility supervisors	Quarterly or Annually	Well promoted and recognised hard working staffs	
- Create recognition within their daily operations as a culture - Avail regular mechanism of motivation usually at the end of year through salary increase and provision of incentive should be instituted.	Health facility management team	Annually	Organised staff motivation system	

ANNEXURE M: FRAME WORK VALIDATION TOOL

Please rate the fame work according to the following criteria and add any comments and suggestion.

Domains of Criteria	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	Remarks and comments
Domain 1. Scope and Purpose								
1. The overall objective(s) of the framework is (are) specifically								
2. The M&E framework question(s) covered by the framework is (are) specifically described.								
3. The population (health professionals, HMIS staffs, public, etc.) to whom the framework is meant to apply is specifically described.								
Domain 2. Stakeholder Involvement								
4. The framework development group includes individuals from all the relevant professional groups.								
5. The views and preferences of the target population (health professionals, HMIS staffs, public, etc.) have been sought.								
6. The target users of the framework are clearly defined.								
Domain 3. Rigour of Development								
7. Systematic methods were used to search for evidence.								
8. The criteria for selecting the evidence are clearly described.								
9. The strengths and limitations of the body of evidence are clearly described.								

10. The methods for formulating the recommendations are clearly described.								
11. The framework benefits, side effects, and risks have been considered in formulating the recommendations.								
12. There is an explicit link between the recommendations and the supporting evidence.								
13. The framework has been externally reviewed by experts prior to its use/publication.								
14. A procedure for updating the framework is provided.								
Domain 4. Clarity of Presentation								
15. The recommendations are specific and unambiguous.								
16. The different options for management of the condition or health issue are clearly presented.								
17. Key recommendations are easily identifiable.								
Domain 5. Applicability								
18. The framework describes facilitators and barriers to its application.								
19. The framework provides advice and/or tools on how the recommendations can be put into practice.								
20. The potential resource implications of applying the recommendations have been considered.								
21. The framework presents monitoring and/ or auditing criteria.								
Domain 6. Editorial Independence								

22. The views of the funding body have not influenced the content of the framework.								
23. Competing interests of framework development group members have been recorded and addressed.								
Overall framework assessment								
24. Rate the overall quality of this framework.								

(Tool adopted from Brouwers et al 2010:2)

I would recommend this framework for use.
A. Yes B. Yes with modification C. No

Additional comments

_____
_____
_____
_____
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_____
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_____

Thank you!

BE Dekita

53753364

befida@gmail.com

ANNEXURE N: CERTIFICATE OF EDITING

CERTIFICATE OF LANGUAGE EDITING

I, the undersigned, declare that I have edited the DLitt et Phil thesis in Public Health of Befekadu Elfiyos Dekita, titled: **Evaluating utilization of Health Information Management system for HIV/AIDS monitoring in Ethiopia.**

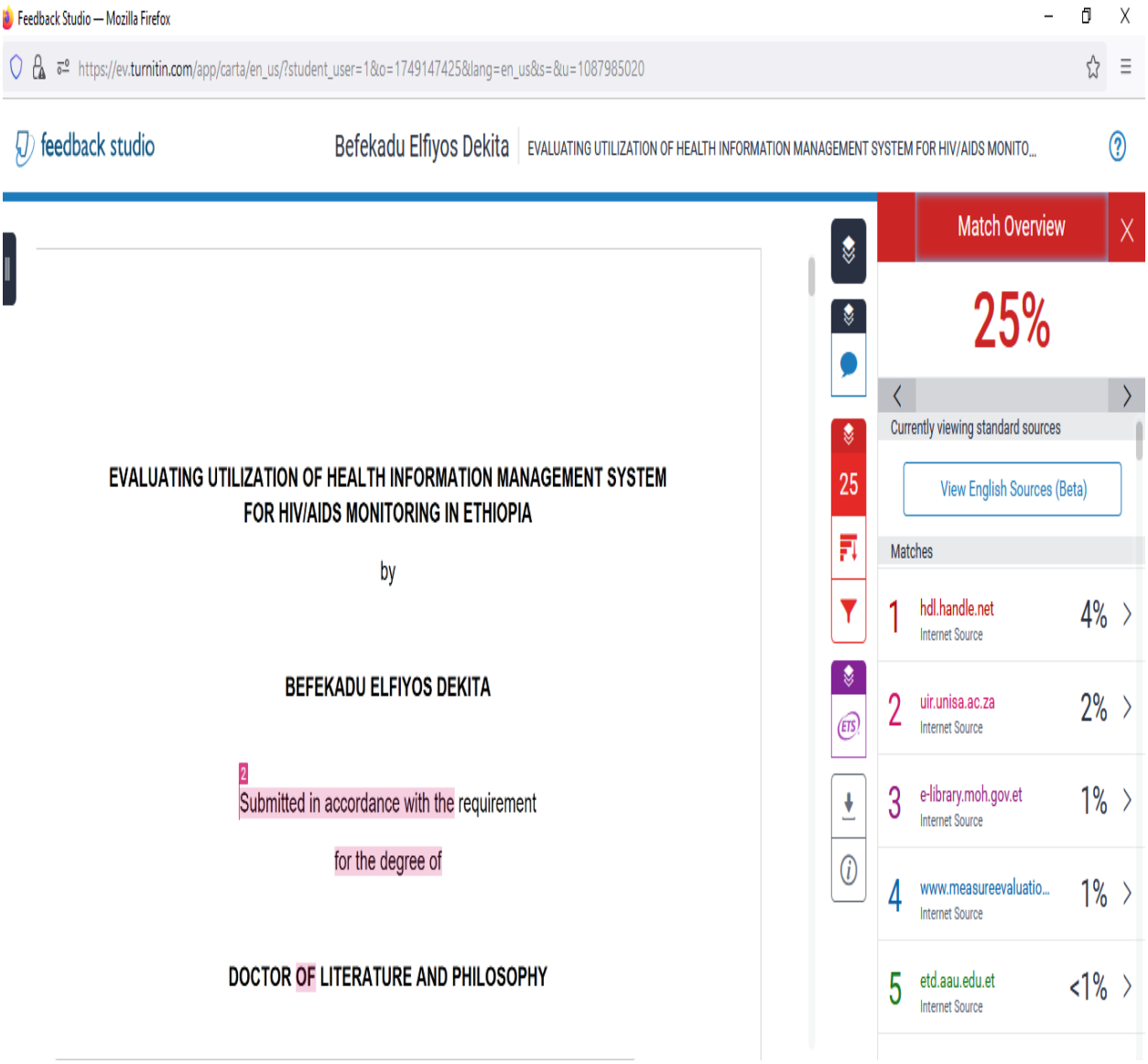
Some sections of the thesis, such as quotations from the transcriptions of interviews, were checked for language errors but could not be corrected. Some words may have been added between brackets or errors marked with (sic) for better readability.

Signed: 

Prof P.J. Botha (emeritus)

Date: 21st January 2022

ANNEXURE O: TURNITIN ORIGINALITY REPORT



NB: Exclude quotes: **on**

Exclude bibliography: **on**