STRATEGIES FOR UTILIZATION OF ROUTINE HEALTH INFORMATION SYSTEM (RHIS) FOR MANAGEMENT OF CHILD HEALTHCARE IN NAMIBIA

by

RAUNA NDALILA NAMUKWAMBI

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SUPERVISOR: Prof MM Ramukumba

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DECLARATION

Name: Rauna Ndalila Namukwambi
Student number: 56228325
Degree: DOCTOR OF PHILOSOPHY IN NURSING

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In memory of my mother, MeeFiina Kaunapawa Makemba-Namukwambi, who passed on in March 2023. She dedicated her life to humanity.

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STUDENT NUMBER: 56228325
STUDENT : RAUNA NDALILA NAMUKWAMBI
DEGREE : DOCTOR OF PHILOSOPHY IN NURSING
DEPARTMENT : HEALTH STUDIES, UNIVERSITY OF SOUTH AFRICA
SUPERVISOR : PROF MM RAMUKUMBA

ABSTRACT

The Health Information System (HIS) encompasses all the information that can be utilised for planning and decision-making in the health sector. Namibia still experiences childhood illnesses such as diarrhoea, malaria, and pneumonia. Therefore, the Routine Health Information System (RHIS) is expected to produce reliable and useful data supporting child healthcare management. This study aimed to develop strategies to enhance the use of RHIS in managing child healthcare.

A qualitative collective case study was used to address the research objectives. The research was implemented in three phases: Phase 1, focus group interviews; Phase 2, individual in-depth interviews; and Phase 3, developing strategies to enhance the utilisation of RHIS for managing child health care using the modified Delphi technique.

The study setting was Primary Health Care (PHC) facilities as well as district and regional offices in the ||Karas Region, and data was also obtained from healthcare managers at the national level. The population for Phase 1 was nurses at PHC facilities in ||Karas; the population for Phase 2 included healthcare managers at the district, regional, and national levels, who mainly used data to manage child healthcare and those working with HIS. In Phase 3, the population consisted of experts in child health care and HIS.

Non-probability sampling techniques were used to recruit participants. Data were collected through focus group interviews with nurses, followed by individual in-depth interviews to explore healthcare managers' experiences of RHIS utilising in the planning and management of child healthcare services. Phase 1 and 2 data were integrated and used as the foundation for developing strategies. Phase 3 used a questionnaire to obtain the views of experts on the proposed strategies.

Thematic analysis was used to analyse Phases 1 and 2. Phase 3 used descriptive statistical analysis to quantify the level of consensus among experts.

The study revealed that Namibia still uses a hybrid approach in generating routine health data, exacerbated by inadequate Information, Communication and Technology (ICT) at health facilities and a lack of skills in District Health Information Software Two (DHIS2). The study showed dissimilarity in the understanding of RHIS between nurses and healthcare managers, with nurses having limited knowledge of broader concepts of RHIS, whilst healthcare managers had a good understanding. The majority of nurses could only generate and collate but could not analyse, disseminate, do quality checks, or use data. A good understanding of RHIS could enable them to generate quality data and utilise data for decision-making.

This study showed that there were limited policies, guidelines and regulatory frameworks on HIS. This resulted in the absence of HIS standards, leading to information systems running parallel to DHIS2, being unable to exchange data between various users, and lacking defined roles and responsibilities of various stakeholders. The study also revealed that there was a lack of HIS plans at the health facility level.

The study acknowledged that understanding RHIS functionality and experiencing its usability will contribute to the high performance of RHIS and child healthcare. Therefore, the researcher assumed that the focus areas in the proposed strategies would strengthen the use of RHIS in managing child health care.

Keywords: *Child Healthcare, Data demand, Data management process, Data quality, Health Information System, Healthcare managers, Information use, Nurse and Routine Health Information System*.

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LIST OF ABBREVIATIONS

AGREE	Appraisal of Guidelines for Research and Evaluation
ART	Antiretroviral Treatment
CDC	Centers for Disease Control and Prevention
DHIS2	District Health Information Software Two
DICOM	Digital Imaging and Communication in Medicine
E-Health	Electronic Health
EHR	Electronic Health Record
EMTCT	Elimination of mother-to-child transmission
EPI INFO	Epidemic Information
EPMIS	Electronic Patient Management of HIV
ETR	Electronic TB Register
FHIR	Fast Healthcare Interoperability Resources
HIS	Health Information System
HIS2K	Health Information System 2000
HISP	Health Information System Program
HIV	Human Deficiency Virus
HL7	High Level Seven
HMIS	Health Management Information System
ICD	International Classification Diseases
ICT	Information, Communication and Technology
IMNCI	Integrated Management of Neonatal and Childhood Illnesses
LMIC	Lower-and-Middle Income Countries
MoHSS	Ministry of Health and Social Services
MUAC	Mid-Upper Arm Circumference
NACS	Nutritional Assessment Counselling and Support
PEPFAR	US President Emergency Plan for AIDS Relief
PHC	Primary Health Care
PMIS	Pharmacy Management Information System
PMTCT	Prevention of Mother to Child Transmission
RHIS	Routine Health Information System
SDG	Sustainable Development Goals
SOP	Standard Operating Procedure

TB	Tuberculosis
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
WHO	World Health Organization

CHAPTER 1
ORIENTATION TO THE STUDY

1.1 INTRODUCTION

The Health Information System (HIS) is a set of elements and procedures that are organised to produce information as part of Routine Health Information System (RHIS) that enables decisions-making at all levels of health systems (Saigi-Rubio, Dereyra-Rodrigues,Torrent-Sellens,Eguia,Azzopardi-Muscal & Novillo-Oritz 2021:1).The HIS includes all the information that can be used for planning and decision-making in the health sector. However, in Namibia, HIS only collects health services and management-related information.

The HIS in Namibia is fragmented, with multiple databases running parallel and scattered over different directorates in the Ministry of Health and Social Services (MoHSS), such as the Electronic Patient Management System for HIV (EPMS), Pharmacy Management Information System (PMIS) that captures information related to stock management and availability of medicines from all health facilities. However, District Health Information Software (DHIS2) collects most routine health data (Kapepo & Yashik 2018:206).

This chapter gives an overview of the HIS and its components and background information on the processes involved in implementing Namibia’s Routine Health Information System (RHIS). It also outlines the problem statement, the purpose of the study and the research objectives. The empirical foundation of the study is described, and the summary of the research methodology is included. The focus of this study is the use of the RHIS for managing child healthcare.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

The Health Management Information System (HMIS) is a vital part of the health system strengthening, particularly in making effective and efficient decisions to improve health in the general population. The aim is to routinely generate health information that can be used for management decisions to improve the performance of health status delivery (MEASURE Evaluation 2019:1). Hence, routine health information is crucial for decision-making at all levels in the health system, with policymakers using routine information for allocation of resources. Whereas, planners for designing of programmes, managers for better monitoring and evaluation of health outcomes and health facilities under their supervision and health professionals at facility level for ensuring that services provided are equitable (Cheburet & Odhimbo-Otieno 2016:192). Child healthcare providers need complete, accurate, and timely data for decision-making to plan and manage the service delivery related to children under the age of five.

Namibia's Health Information System has evolved since 1995 when data was generated manually and reported to the district on a daily basis. In 2017, the country launched its second Health Information System (HIS), called District Health Information Software 2 (DHIS2), at the district level. It is one of half a dozen different platforms (Nengomasha, Abankwah, Uutoni & Padzvawambwa 2018:372). Currently, data is collected at the point of care by capturing information from clients' health passports, then transferred to the appropriate register, tallied on tally sheets, and summarised in the monthly summary reports from where it is entered on DHIS2. Nurses are crucial in ensuring these processes are carried out per the country's Health Management Information System (HMIS) guidelines and protocols.

Registers used in child healthcare, including immunisation registers, growth monitoring, and mother-baby follow-up for HIV-exposed babies, are based at Primary Health Care (Ministry of Health and Social Services 2000:3). Data collected in health facilities has to be processed in order to become meaningful to policymakers, planners, healthcare managers, and health professionals. Therefore, many organisations, including public health systems, use Health Information Management Systems to process data to create sound health information (Karengera, Onzima, Katongole & Govule 2016:3).

An adequate response to nations' health needs requires sound information that will support evidence-based health policy. Hence, the need to intensify the RHIS is crucial in the public healthcare system (Teklegiorgios, Tadesse, Miruste & Terefe 2016:1). In Namibia, the most common challenges that cause child morbidity and mortality are diarrhoea, malaria, pneumonia and HIV associated illness. Furthermore, undernutrition among the under-fives is also a concern (Ministry of Health and Social Services 2010:21).

The relationship between improved routine information, demand for data, and continued data use creates a cycle that leads to improved health programmes and policies (Nutley & Reynolds 2013:4). Too often, routine information sits in databases and is not sufficiently used in programme development, policy development, and strategic planning. This could be attributed to insufficient data quality to support its use, and data use has not been sufficiently integrated into decision-making processes, or information needs of decision-makers are not adequately addressed in data collection efforts (Asemahagn 2017:3).

Namibia has good policies related to child health, which include the Namibia Child Health Survival Strategy 2010-2014, Integrated Management of Neonatal and Childhood Illnesses (IMNCI), National Health Policy Framework 2010-2020, Expanded Programme of Immunisation, Nutrition policy. However, policy monitoring, evaluation, and linkage to HMIS are not yet fully established (Ministry of Health and Social Services 2015:2). Child healthcare is planned and managed at all levels in the Ministry of Health and Social Services in Namibia, with the support from developmental partners such as United Nations Children's Fund (UNICEF) and Global Fund (Ministry of Health and Social Services 2015:3)

Routine health information utilisation remains inadequate at different levels of the healthcare system. Challenges such as incomplete, inaccurate, untimely health data and low information use in child healthcare need to be further explored (Bhattacharya, Umar, Audu, Felix, Allen, Schellenberg & Marchant 2019:3). Health professionals that provide child healthcare require skills and competence in the use of the RHIS in order to generate useful information that will be used to manage child health services. Nengomasha et al (2018:372) indicated that Namibia's data quality is compromised due to poor data capturing and the omission of recording data at the point of care. The achievement of the Sustainable Development Goals (SDG) targets relies on good quality information obtained from routine data collection systems. Data elements are utilised to calculate indicators. Ideally, information obtained should be used to recognise the strengths and weaknesses of health system functions and services and take suitable actions to facilitate improvements (USAID MEASURE Evaluation 2016:1).

1.3 STATEMENT OF THE RESEARCH PROBLEM

Routine health collected data is a key source of information for estimating healthcare coverage. However, data from low- and middle-income countries including Namibia, often sit in databases and are not sufficiently used in programme development, policy development and strategic planning (Asemahagn 2017:3). This could be attributed to poor data quality to support decision making (Dufera, Lomenew, Demissie & Guda 2018:231). According to the National Health Survey by MEASURE Evaluation, the proportion of health facilities districts in Namibia that use data for decision-making, monitoring, and evaluation is unknown; evidence for information use is lacking (MEASURE Evaluation 2019:2).

There are major challenges in Namibia HIS, which include the absence of HIS policy, guidelines and a negative impact on data collection, quality, processing, dissemination and actual use (Kapepo & Yashik 2018:201). Namibia has a fragmented HIS; the current system does not integrate data from all Ministry of Health and Social Services, and some critical child health programmes such as HIV and TB child-related data are not routinely included in DHIS2. (Dlodlo & Hamunyela 2017:61). The HIV data are captured in an Electronic Patient Monitoring System of HIV (EPMS). All Tuberculosis (TB) data are captured on the Electronic Tuberculosis Register (ETR). The HIV child health data available on DHIS2 is the elimination of mother to child to transmission for HIV exposed children (Kapepo & Yashik 2018:201). However, the HIV positive babies receiving ART data are on EPMIS. Hence, decision-makers in need of information find it difficult to obtain and use required information timely. Diarrhoea, malaria, pneumonia and HIV conditions and undernutrition among children under five remain a public health challenge (Ministry of Health and Social Services 2014:5). Better performing systems are linked to improvements in utilisation of health information for efficient allocation of resources and effective targeting of interventions (Dufera et al 2018:231). It is unknown how health professionals at all levels, including policymakers, use routine data to identify performance gaps and plan and monitor child healthcare services.

Therefore, strategies need to be developed to enhance RHIS utilisation in managing child healthcare services in Namibia.

1.4 PURPOSE OF THE STUDY

The study aimed to develop strategies to enhance the use of RHIS in managing child healthcare.

1.4.1 Objectives of the study

The objectives of the study were:

- Explore and describe the routine health information processes in Namibia.
- Explore and describe nurses' understanding of Routine Health Information Systems.
- To explore nurses' experiences of RHIS utilisation in the management and planning of child healthcare services.
- To explore healthcare managers' experiences of RHIS utilisation in the planning and management of child healthcare services.
- To develop strategies to enhance RHIS utilisation by nurses, healthcare managers and policymakers.

1.4.2 Research questions

- What are the routine health information processes in Namibia?
- What are the nurses' understanding of the Routine Health Information System?
- How do nurses experience the utilisation of RHIS in managing and planning child healthcare services?
- How do healthcare managers experience the utilisation of RHIS for the planning and management of child healthcare services?
- Which strategies could be implemented to strengthen the RHIS utilisation by nurses, healthcare managers and policymakers?

1.5 FOUNDATION OF THE STUDY

1.5.1 Research paradigm

Fouché, Strydom and Roestenburg (2021:5) define the paradigm as a model or pattern comprising a set of legitimated assumptions and a design for collecting and interpreting data. It is also an integrated system of thinking that informs the process of research.

This study adopted the constructivism paradigm, acknowledging that individuals develop subjective meanings of their experiences. Therefore, these meanings are varied and multiple; hence, researchers look for complex views rather than narrow meanings (Creswell & Creswell 2023:9). This means that the study believed there is no single truth, but there are multiple truths; every person has 'truth' that they experience and generate in their context. In this study, multiple realities were elicited through dialogue with nurses and healthcare managers, and each category demonstrated its own experiences with the RHIS. They provided realities in their context to obtain an understanding of their understanding and experience of the RHIS processes. Constructivists see reality as a result of a series of constructive processes that emerge from the interaction between people who experience it personally. Constructivism enabled the researcher to understand the participants' realities on the whole healthcare system, because this would encompass the views of nurses from rural and urban facilities. In addition, the views of healthcare managers responsible for HIS and the management of child health care will provide broad perspectives on HIS (Adom, Yeboah & Ankrah 2016:3).

1.5.1.1 Meta-theoretical assumptions

Meta-theoretical assumptions involve assumptions which respond to the basic philosophical questions regarding the values and beliefs about the nature of reality, knowledge, methods of obtaining knowledge, health, the health sciences and the environment (Brink, van der Walt & van Rensburg 2018:19).

The meta-theoretical assumptions of constructivism, the ontological, epistemological and methodological, are described below.

1.5.1.2 Ontology

Ontology is a branch of philosophy concerned with assumptions made to believe something makes sense or is real or the nature or essence of the social phenomenon we are investigating (Kivunja & Kuyini 2017:27).

Ontology is the philosophical study of the nature of being or reality; it often asks the question, “What does it mean to say something exists”? and “What are the essential characteristics that make up its identity”? The relativism nature of ontology argues that people can only access representations of the world in their consciousness. Constructivism is based on the notion that the truth about ‘what is what’ (ontology) is socially negotiated (Flick 2014:76). The research understood that the ontological foundations of constructivism that underlie this approach are that local and specific constructed realities of nurses and managers experiences of RHIS would emerge by using a qualitative approach.

This assumption indicates that reality can be known through the senses, meaning that reality is not discovered through objective means but agreed upon through interactions and conversations. From a constructivist viewpoint, the researcher will understand how participants interpret the reality of working with RHIS. The main focus is on their experiences utilising RHIS to manage child healthcare services. Using RHIS as the participants’ reality, the study assumed these experiences were unique and authentic. In addition, the manner in which healthcare managers utilise RHIS would have a direct effect on nurses’ generation of data.

Therefore, it was assumed that multiple realities would emerge as nurses and healthcare managers shared their understanding of RHIS processes (data collection, analysis, demand, and use). The views of nurses and healthcare managers influenced the research to discover and understand their realities.

1.5.1.3 Epistemology

Epistemology describes how one comes to know something and how one knows that it is the truth or reality. Epistemology asks the questions – what is knowledge? how is it acquired? and how do people know what they know? (Kivunja & Kuyuni 2017:27). This study wanted to find out how nurses in primary healthcare defined RHIS and the RHIS tasks such as data collection, collation, processing, analysis, dissemination and information used. In addition, the study would like to establish how the nurses and healthcare managers became knowledgeable of RHIS tasks. In this study, knowledge was co-created through interactions between the researcher and participants (Adom et al 2016:5). Therefore, a constructive researcher relies upon the “participants” view of the situation being studied (Creswell & Creswell 2023:9).

1.5.1.4 Methodological assumptions

Methodology refers to a framework that informs all designs, methods and techniques used in conducting research from beginning to end (Fouché et al 2021:11). In this study, qualitative approaches explained a phenomenon using multiple sources. This enabled the study to gain an in-depth description and understanding of nurses’ and healthcare managers’ beliefs and actions (Polit & Beck 2018:9). In this study, the qualitative approach supported the researcher in getting a deeper understanding of participants’ interpretation, understanding and experiences of the RHIS. These meanings emerged from multiple sources, such as nurses at Primary Health Care facilities, district managers, regional managers, and national managers involved in managing data and information related to child healthcare. The methodology this study proposed fits well within constructivism.

1.6 THEORETICAL FRAMEWORK

In this study, the logic framework was used to explore the use of an HIS, which in this case is a hybrid of paper-based and web-based DHIS2, with a special focus on routinely collected data for managing child healthcare services. It allowed the researcher to develop a conceptual map to explore how the RHIS is used in Namibia and how the different concepts relate to each other in a meaningful way.

A logic model is a systematic way to “present and share an understanding of the relationship among the resources you have to operate your programme, the activities you plan, and the changes or results you hope to achieve.” It assumes different names, such as idea maps, frameworks, results, or strategy maps. These models are unique in every context (Knowlton & Phillips 2012:4). They are used in different ways and for different purposes. Key concepts are activities (processes) and indicators of outputs (direct products of programme activities), outcomes (specific changes in participants behaviour, knowledge, skills, and level of functioning), and impacts (the fundamentals intended or unintended change) occurring in organisation, communities or system as a result of a phenomenon under study (Nutley & Reynolds 2013:2).

The key concepts of the framework were utilised as follows:

Inputs

This refers to available resources used to collect and process data. There should be adequate resources such as computers with DHIS2 web-based software, other data collection instruments such as paper-based monthly summary forms to capture child health related data, there potential of generating quality data so that the use of data can be realised. These data generated have child health data elements and Child health indicators (immunisation coverage, percentage of HIV-exposed babies tested negative for HIV, Morbidity rates among children under age of five years, wasting rate, stunting rate and underweight rate). The availability of skilled and adequate staffing to generate and use data and strong governance with sound and legislative framework will improve quality of data produced at point of care and the use of information in managing child healthcare.

Processes

These are activities or components of interventions that reflect what is being delivered. Focus is on data demand and information use. These activities influence the demand for and use of child health data, which are built upon the foundation of the inputs. RHIS processes involved are data collection and collation, data analysis, data dissemination, data quality checks, and identifying information needs among health professionals, healthcare managers and policymakers.

Outputs

Outputs are referred to descriptor indicators of what specific activities generated and quantified. Outputs are under direct control of those delivering the interventions (Kneale, Bangpan, Thomas & Waddington 2020:355).

The outputs will be: quality routine health information is available on child healthcare, improved HIS governance will reflect Routine Health Information System plans and visible leadership in HMIS.

Outcomes

Improved child healthcare as evidenced by increased immunisation coverage, improved nutritional indicators for under-fives, reduced elimination of mother to child transmission of HIV and reduced childhood illnesses.

The concepts used in this study are highlighted:

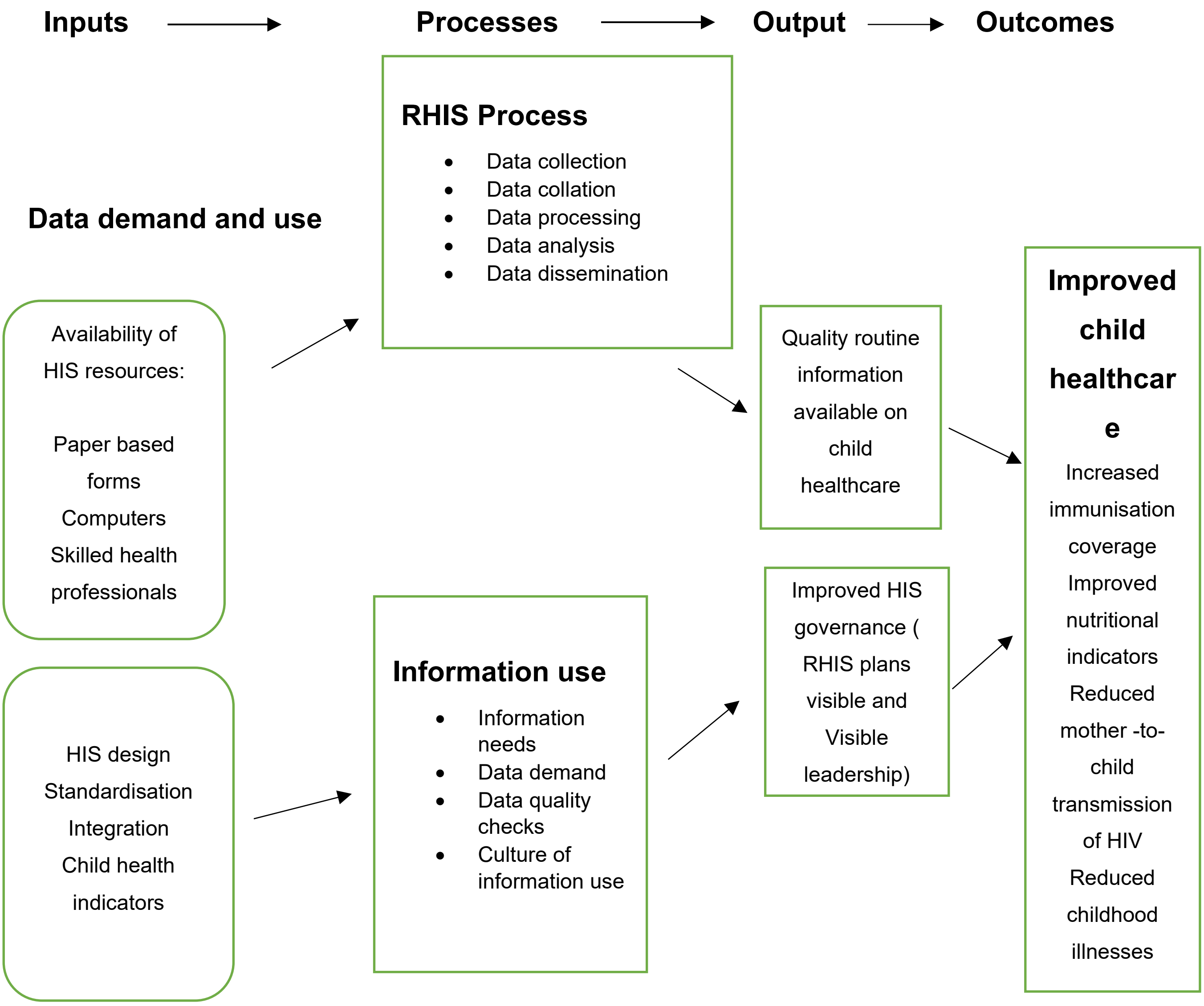

Figure 1.1: Application of the Logic model: Evaluation of data management processes and use of health information in child healthcare.

Source: Nutley and Reynolds (2013:3)

1.7 SIGNIFICANCE OF THE STUDY

Data generated from Routine Health Information System remains crucial in the public health system as it informs policymakers and managers about the performance of a healthcare service. RHIS processes such as data generation and information use affect the RHIS's performance. Those are influenced by complex factors such as the availability of resources, the design of the system, and HIS policies, among others. The outcomes of this study may benefit the healthcare systems, as strategies will be developed to enhance information use in managing child health programmes. Countries are focusing on strengthening their healthcare systems in order to provide universal coverage. This can only be possible if the HIS perform better. Hence, greater attention to HIS research.

The findings may also strengthen health professionals' capacity at all system levels to generate quality data that can be transformed into useful information. It is hoped that the culture of information use will be well established.

The use of routine health information will benefit children because the decision that will be formulated will be tailored towards the adequate allocation of resources and improved capacity among health professionals to increase immunisation coverage, meaning children under the age of five will be prevented from major preventable diseases as well as benefit from interventions that will reduce the underweight and stunting among the children under the age of five years. Routinely collected data is vital in measuring child health indicators at primary healthcare facilities in the catchment area where data is generated. This will assist in prioritising the needs of the community and ensure the best use of resources (Tilahun, Teklu, Mancuso, Abebaw, Dessie & Zegeye 2018:5).

1.8 DEFINITION OF THE CONCEPTS

The key concepts in the study were defined as follows:

- **Child health indicators** are a set of quantifiable variables that have been developed to assess the status and quality of implementation of interventions (WHO 2011:8). In this study, child health indicators include immunisation coverage, underweight rate, stunting rate, wasting rate, child morbidity and HIV status among HIV exposed babies.

- **Child healthcare** is defined as a comprehensive healthcare service that health professionals provide to children. It aims to promote health, prevent diseases and disability, ensure that diseases among children are managed properly and promote optimal function of children with impairment and disabilities (Kibel, Westwood & Saloojee 2014:3). In this study, child healthcare refers to services that are offered in public health facilities such as immunisations, nutrition growth monitoring, HIV prevention and care for under-fives.
- **Data demand** is referred to as the ability of stakeholders to request information actively and openly in order to inform a decision (MEASURE Evaluation 2019:5). In this study, data demand is the ability of health professionals, managers at district and region and policymakers to specify and actively seek information from the routine health information to inform the decisions that strengthen child healthcare.
- **Data management processes** are defined as a process of acquiring, entering, processing, coding, outputting, retrieving, and storing data gathered and data analysis in different healthcare services (SAP Business Technology 2022:1). In this study, data management process refers to child health data collection, collation, analysis, dissemination and feedback loop.
- **Data quality** is referred to as the degree to which data is fit for its intended use, free of defects and possess desired features (Kahn,Brown,Chun ,Davidson, Meeker, Ryan et al 2015:2). In this study, data quality is referred to as the completeness, accuracy, reliability, consistency and timeliness of child health data.
- **District Health Information Software 2 is** a tool for the collection, validation, analysis, and presentation of aggregate statistical data tailored to integrated health information management activities (DHIS2 2019:1). In this study, DHIS2 is an open software used in Namibia for data collection, validation, analysis and presentation of routine health information on child health data.
- **Health Information System (HIS)** is a system that collects, processes, stores, report and use health information and knowledge to influence policy-making programme, implementation and research (Tulu, Demie & Teshome 2021:2). In this study, a health information system is the District Health Information Software.
- **Health Management Information System (HMIS)** is defined as a data collection system designed to support planning and decision-making in health facilities, organisations and public health systems (MEASURE Evaluation 2019:1). In this

study, HMIS refers to all processes involved in data generation and use of information to formulate interventions that will improve child healthcare in Namibia.

- **Health policymakers** are health officers who are responsible for decisions, plans and actions that are undertaken to achieve specific healthcare goals (WHO 2019:1). In this study, health policymakers are those responsible for formulating policies, protocols and plans regarding child healthcare in the Ministry of Health and Social Services in Namibia.
- **Healthcare managers** are health officers who provide leadership and direction to organisations that deliver health services. This is done by overseeing organisational functions such as strategic planning, budgeting, policy-making, personnel training and professional development in the healthcare system (Tulane University 2021:1). In this study, healthcare managers are the district and regional professionals who are responsible for data management processes and use child health data/information for planning, implementing, monitoring and evaluating child healthcare services, provide feedback to primary healthcare level, ensuring that staff at a lower level are trained, provide support in terms of ensuring that resources are available to generate quality data.
- **Information use** is defined in five different ways: 1) information packaging, 2) information flow, 3) developing new knowledge, 4) shaping decisions, and 5) influencing others (Yohannes 2022:16). In this study, information use is defined as the practice of information repackaging, data demand, developing new knowledge, shaping and influencing decisions related to child health using RHIS.
- **Nurse** is a person who is registered in terms of Nursing Act 8 of 2004 and is trained to assist sick or well persons in performing activities contributing to that person’s health or recovery or peaceful death (Republic of Namibia 2004:3). In this study, nurses are those directly involved in providing healthcare to under-fives, generating entry-level data and using information to improve the service in primary healthcare.
- **Primary Health Care facility** is a health facility that serves as an entry level to the public healthcare system and offers comprehensive care, which includes promotional services, preventative services, and treatment, and it is situated closer to people (WHO 2019:2). In this study, a primary healthcare facility is the first level in the public health system in Namibia that provides comprehensive child healthcare and generate routine health information on child healthcare.

- **Routine Health Information System (RHIS**) is defined as a system that provides information at regular intervals in a year to meet the information needs and can be used in day-to-day operations, track accountability and improve accountability (Tulu, Demie & Teshome 2021:3). In this study, routine health information system refers to regularly collected child health data using paper-based, and DHIS2 used to make decisions to improve child healthcare.

1.9 RESEARCH METHODOLOGY

The research methodology provides the framework for how investigations were carried out and specifies the type of data collected and the motive behind selecting designs and methods in the study (Brink et al 2018:19).

1.9.1 Research design

The study used a qualitative, collective case design approach in the two phases of the research process. In Phase 1, data was collected from nurses from primary health facilities, while in Phase 2, data was collected from managers responsible for the data management process and managing child healthcare services. In Phase 3, experts in Health Information Systems and child healthcare validated the strategies.

1.9.2 Study setting

The study setting was public health facilities as well as district and regional offices in the ||Karas region. In addition, data were obtained from managers at the national level. A full description of the research methodology is provided in Chapter 3.

1.9.3 Trustworthiness

The trustworthiness of the study was enhanced through Lincoln and Guba’s four criteria. These criteria are credibility, dependability, transferability and confirmability. The criteria ensure that the data collected is of good quality. Trustworthiness will be discussed fully in Chapter 3.

1.9.4 Ethical consideration

The rights of human subjects in this study were protected, and all relevant authorities were contacted to get permission.

The researcher obtained ethical clearance from the Health Studies Research Ethics Committee at the University of South Africa before commencing with the actual research. Permission was also obtained from the Executive director of the Ministry of Health and Social Services, who accountable for health matters in the country.

The participants were informed about the nature and the purpose of the study. Informed consent was signed before the commencement of the study, and participants were informed that they had a right to withdraw from the study at any time without penalties. Ethical considerations used the following principles: beneficence, informed consent, right to justice, right to privacy, anonymity, confidentiality and autonomy. Further details on the ethical principles applied in this study are provided in Chapter 3.

Table 1.1: Summary of the research process

	Phase I	Phase II	Phase III
Research Objective	• To explore and describe nurses understanding of Routine Health Information Systems • To explore nurses' experiences of RHIS utilisation in management and planning of child healthcare services	• Explore and describe the routine health information processes in Namibia • To explore healthcare managers' experiences of RHIS utilisation in planning and management of child healthcare services	• To develop strategies to enhance RHIS utilisation by nurses, healthcare managers and policy makers
Approach	Qualitative • Collective case design	Qualitative • Collective case design	Modified Delphi Technique
Population	• Nurses working in primary healthcare facilities	• All district, regional and national healthcare managers responsible for data management processes and managing child health	• National, regional and district healthcare managers

Sampling	Non- probability sampling homogenous purposeful sampling was used to select participants used Inclusion criteria • Nurses directly involved in data management processes and child healthcare • Nurses with an experience of one year and more in Primary Health care	Non-probability sampling, purposeful sampling healthcare managers, district, regional and national responsible for Health Information Management, supervision, planning and planning of child healthcare	• Non-probability purposeful sampling to recruit experts in Health information Systems and child healthcare
Data collection processes	Focus group interviews • Semi-structured interview	Individual in-depth interview • Semi-structured interview	Self-administered questionnaire
Data analysis	• Thematic analysis	• Thematic analysis	Descriptive statistics

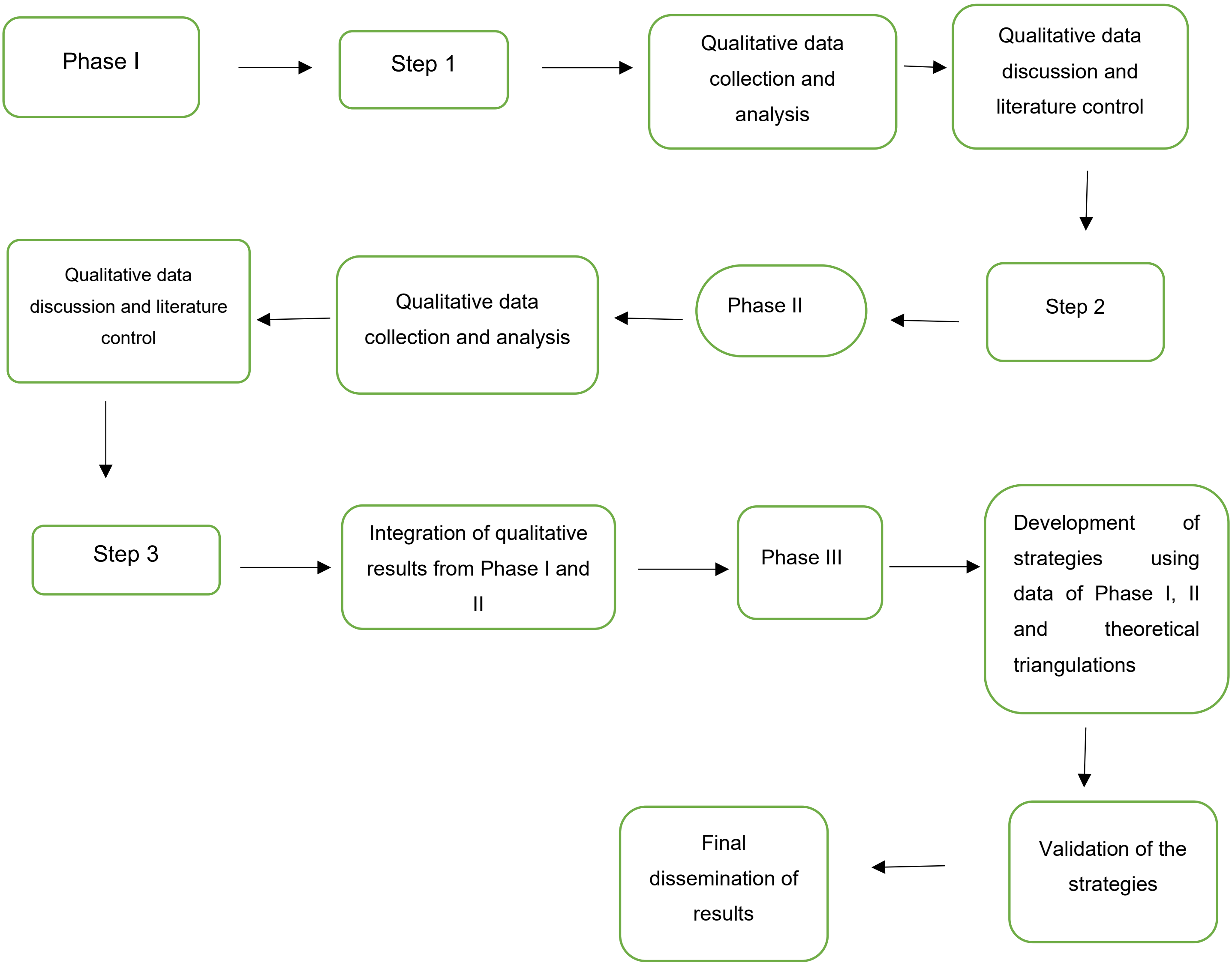

Figure 1.2: Diagram illustrating the research process

1.10 SCOPE OF THE STUDY

The study involved health professionals who are involved in planning and managing child healthcare for one year or longer. The focus is on proposed strategies to enhance routine health information utilisation by nurses, healthcare managers and policymakers in child healthcare. This study is limited to routine health information system use in child healthcare. Information from surveys and research are excluded from this study.

1.11 STRUCTURE OF THE THESIS

The structure of the thesis includes:

Chapter 1: Orientation of the study	The study's orientation introduces the study's background, theoretical framework, problem statement, purpose, research question, and significance of the study. A brief introduction to the methodology, ethical consideration, scope and limitation and summary of the research content are also part of this chapter.
Chapter 2 Literature Review	This chapter overviews the main issues related to HIS, RHIS, DHIS, and HMIS. It provides knowledge on RHIS processes and the extent of information used with regard to child health. An elaborate literature control will be done with research findings.
Chapter 3: Research design and methodology	The chapter on research methodology used in the study includes the research design, study population, sampling methods, and data collection methods. The chapter also describes credibility, transferability, dependability and conformability, ethical consideration, and data analysis methods.
Chapter 4: Presentation of the findings and literature control	This chapter presents data analysis and research findings in this study. Furthermore, the integration of the literature is presented.
Chapter 5: Integration, interpretation and discussion of findings	This chapter provides an integration of the research findings.

Chapter 6: Development and validation of strategies	This chapter provides the developed strategies, supported by theoretical triangulation and validation of the strategies by a panel of experts through modified Delphi.
Chapter 7: Contributions, Recommendations and Conclusion	This final chapter provides summary and contribution of the study. Furthermore, this chapter will present the conclusion and recommendations to strengthen the use of Routine Health Information Systems to improve child healthcare in Namibia.

1.12 SUMMARY

The chapter presented an introduction, background to the problem and the problem statement. Theoretical framework using logic framework model which is are inputs, processes, outputs and outcomes was discussed. The chapter also highlighted research the paradigm, definition of key concepts, purpose of the study, objectives of the study, research methodology, ethical considerations, significance of the study, and scope and limitations of the study. A chapter outline of the study was provided.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews literature related to the Health Information Systems (HIS) generally, including Namibia. The aim is to critically analyse what is known about this phenomenon and give a new interpretation of the literature (Brink et al 2018:70).

The first section of the chapter gives broad perspectives on the foundations of healthcare systems, the Health Information System (HIS), and the Routine Health Information System (RHIS). The chapter further discusses the factors that influence the performance of routine health information systems.

Lastly, the chapter highlights the extent of the use of routine health information in child healthcare.

2.2 FOUNDATIONS OF THE HEALTHCARE SYSTEMS

2.2.1 Healthcare systems

The healthcare system is a dynamic environment comprising of stakeholders such as health professionals, health information systems officers, healthcare managers and policymakers. These stakeholders have different roles in the data management process, and they interact in terms of data generation and the use of routine information systems in child healthcare. Additionally, the organisation keeps track of its environment by collecting information through RHIS in order to plan and manage child healthcare services.

Durrani (2016:5) refers to the healthcare system as an organisation comprising all people whose primary aim is to promote, restore, and maintain health. Hence, the health system is more than the pyramid of public health facilities that provide health services; it extends healthcare in the community. As is the focus of this study, health systems can provide health services through national immunisation campaigns and nutritional screening of children under the age of five years. Therefore, the health system's goal is to utilise the available resources in order to improve health and health equity in ways that are responsive, financially stable or efficient (Malakoane, Heunis, Chikobvu, Kigozi & Kruger 2020: 2).

In the global health context, strengthening health systems is a top priority in many nations as a way of improving health outcomes (Nutley & Reynolds 2013:1). This consists of interventions to improve national abilities to adequately perform essential healthcare functions (Malokoane et al 2020:2). For healthcare system delivery to be a success, Primary Healthcare (PHC) remains an essential element, particularly in developing countries. This is because most of the people in low- and middle-income countries live in rural areas, making them depend on PHC solemnly. Among other health programmes provided by the PHC, child healthcare is one of the programmes that are mainly provided in PHC facilities. This programme requires routine reporting of information, including immunisation, children's nutritional status and conditions causing morbidity. The data availability will contribute to the provision of adequate vaccines against common childhood diseases, greater chance of survival after improved nutrition and treatment of common aliments among children under five years (Vesoulis, Husain & Cole 2022:342). Therefore, nurses at PHC facilities are required to collect, collate, analyse and disseminate routine health information related to the services they are delivering (Sako, Gilano Chisha, Sewangizaw & Fekadu 2022:434). However, in many instances, utilisation of routine health data at the service delivery point has been low, especially in initiating activities which can potentially improve health service delivery at their PHC facilities (Asemanhagn 2017:2).

Health System Strengthening Model

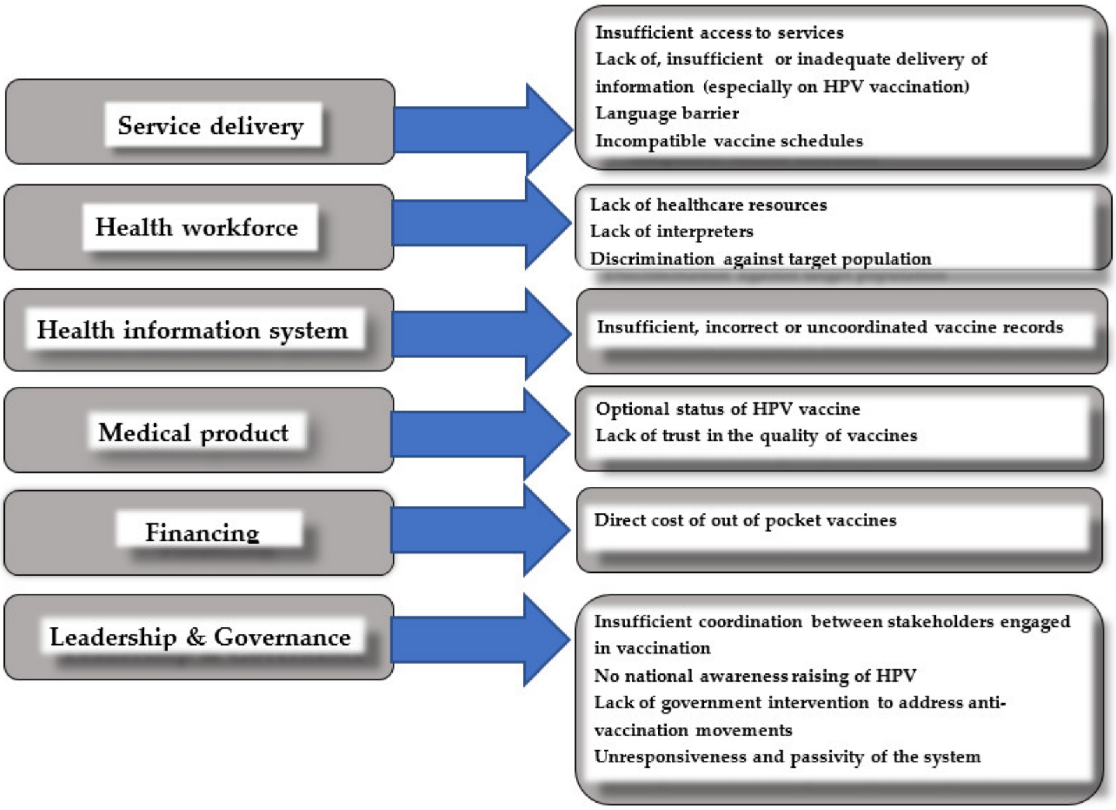

Figure 2.1: Health System Strengthening Model

Source: Ganczak, Kalinowski, Pasek, Duda-Duma, Sobieraj, Golawski et al 2023

The World Health Organization’s framework for strengthening health systems has identified six building blocks. These comprise health statistics and information systems, access to essential medical products, vaccines and technologies, health workforce, health financing, health service delivery, safety, leadership and governance (World Health Organization 2020:1). All these six blocks are interconnected to each other and can function efficiently if well-integrated (Manyazewal 2017:2). They are also essential in improving health systems and health outcomes. Therefore, there is a need to invest in all building blocks because an integrated response is required as all these building blocks are interdependent on each other. However, it must be noted that the health information system block is the foundation of the overall systems and informs decision-making in each of the other five building blocks (Koumamba, Bisvigou, Ngoungou & Diallo 2021:2). Nevertheless, the generated information should be complete, accurate and timely. If well managed, the continuous collection of data can assist in outbreak preparedness and response to disease outbreaks both in long and short-term epidemics (Fridell, Edwin, von Schreeb & Saulnier 2019:1). In addition, competent health workforce must be available to ensure that the provision of healthcare is of the highest standard and responsive to the needs (Barbazza, Langins, Kluge & Tello 2015:1648).

Further, information about disease burden, availability of infrastructure and population distribution in different geographical areas can aid in the training and deployment of health workforce for quality service delivery (Nutley & Reynolds 2013:2). Hence, the need to train health workforce on the data management process; this can empower them to generate reliable and timely data. For the same reason, health systems require quality data from routine health information systems to plan and ensure that the workforce is fully funded and equipped with adequate resources and policies for quality service delivery (Chanyalew, Yitayal, Atnafu & Tilahun 2021:2). Currently, HIS is faced with obstacles of poor data quality and irregular use of data among health professionals at various levels in various levels in the health system (Amouzou et al 2021:3).

As countries are moving toward implementing Universal Health Coverage, a reliable health information system is required to provide useful quality data. This is crucial in gathering empirical data estimates related to health, such as mortality, morbidity, risk factors, health system and health service coverage (WHO 2019:2). Additionally, the provision of essential medicine should also be informed by complete and reliable routine health information. This calls for quality surveillance of data to enable accurate prediction of emerging diseases that could affect the health system (Fridell et al 2020:12). Therefore, the strategies that will address challenges regarding data management processes, data quality to increase in the use of data in managing child health care. The ultimate goal is to strengthen the health system.

2.2.2 Healthcare systems in developing countries

Healthcare systems and Health Information Systems in developing nations struggle with quality information and evidence-based policy formulation (Kiberu, Matovu, Makumbi, Kyozira, Mukooyo & Wanyenze 2014:2). Even though the majority of developing countries sector has undergone or are going through health sector reforms, which advocate for a shift towards decentralisation of responsibilities from the national level to districts. Decentralisation has not often been accompanied by adequate management capacity, sufficient resources, and autonomy to have effective priority setting, planning, and implementation. Hence, the desired outcome of improved child health services has not been reached in many developing countries (Doherty, Tran, Sanders, Dalglish, Hipgrave, Rasanathan, Sundararaman, Ved, & Mason 2018:1). The majority of developing countries' public health systems cater for 70% or more of their population despite limited resources.

Botswana has around two million people, and it is a Middle-Income country like Namibia. It provides almost 60% of healthcare to the citizens. The public health system has a four-tiered hierarchy, with national, regional and district levels. Data is collected at the clinic and hospital level and are forwarded to the district, then to the region until the national level (Seitio-Kgokgwe, Gauld, Hill & Barnett 2014:180). Hence, decisions regarding service provision resource allocation in healthcare in Botswana are based on the information from the Health Information System. Botswana, as in many other low- and middle-income countries, has a considerable challenge in maintaining data quality within the health information system. The challenge is attributed to multiple factors, such as skilled human resources that can generate, analyse and use data at all levels of the health system. The other fact includes a lack of information technology infrastructures, which include computers, laptops, tablets and internet connectivity to reduce paper-based data collection burden by automating data aggregation reporting and timely reporting (Ledikwe, Grignon, Lebelonyane, Ludick, Matshediso, Sento, Sharma, & Semo 2014:10).

South Africa is also an upper-middle-income country with a population of approximately 59.62 million in the middle of 2020 (Department of Statistics South Africa 2020:1). The South African health system comprises both the public and private health sectors. The public health sector is divided into primary, secondary and tertiary health services provided through various health facilities within and managed by provincial departments, and the oversight role is done by the National Department of Health (Malakoane et al 2020:3).

South Africa uses DHIS2 for data collection and analysis of routine health data for Primary Health Care data and district hospitals in the public health sector. Health Information Systems are becoming tools for the efficient delivery of high-quality health services. However, the country still uses a hybrid approach of paper-based filling system in more than half of South Africa's public health system. This is despite the country's eHealth strategy that stated that patient-based information systems must be implemented in all health facilities where healthcare is provided. All data indicators used for decision-making should be derived electronically at the point of care where they are collected (Thulare, Herselman & Botha 2020:423).

Challenges of HIS in South Africa include poor alignment between measurement of Health Information System input, process, key indicators and health sector objectives and goals in the information system. There is also inadequate human resource expertise in health information systems with high turnover rates and limited availability of physical resources such as data collection tools, registers, computers and printers. The other challenge is that there is no integration between health information systems and other information systems, such as human resource information and financial and supply chain information (Wright, Mahony & Cilliers 2017:54).

Ghana's public healthcare system is organised, managed and delivered at five levels, mainly community, sub-district, district, regional and national. One key characteristic of the health system of Ghana is the introduction and reform of the National Health Insurance Scheme (NHIS) in 2003 and 2012, which scaled up the telemedicine programme, becoming the first innovators in Africa to integrate digital technologies in the mainstream healthcare system (Opoku, Edusei, Agyei-Baffour, Teddy, Polin, & Quentin 2021:1). Ghana has also embarked on HIS reforms to ensure data quality and effective data utilisation and evidence-based decision-making to guide policies and programmes in the health sector. Hence, Ghana rolled out DHIS2 to collect and compile health data in decision-making. The introduction of the DHIS2 platform led to improved information transmission timelines (Odei-Lartey et al 2020:2).

A study conducted in Ghana indicates that there are significant gaps in Health Information Systems due to a lack of skilled personnel and training for data systems personnel, poor record-keeping and filling reports, and poor utilisation of data. The implications of these challenges could lead to poor decision-making, poor prioritisation, and the design of unnecessary health interventions, which negatively affects efficient healthcare delivery (Rashida 2016:59).

2.2.2.1 The health system in Namibia

The Namibian healthcare system is organised in an administrative health hierarchy containing primary, secondary and tertiary care (Kapepo & Yashik 2018:200). PHC is an entry into the public health system in Namibia and provides preventative, health promotional activities treatment of common conditions and rehabilitative care (MoHSS 2010:5). With regard to management and data flow in public health system, health information is collected at health facility then sent to district health information office to regional office and national level. Namibia's healthcare system caters for both private and public healthcare, which aims to meet the needs of the Namibians; however, the public health system is dominated by more than 80% of Namibians relying on it, with less than 20% access to private healthcare. The government of Namibia is responsible for funding public health, while the private sector relies on medical aid funds (Cristians 2020:2).

The Namibian health system

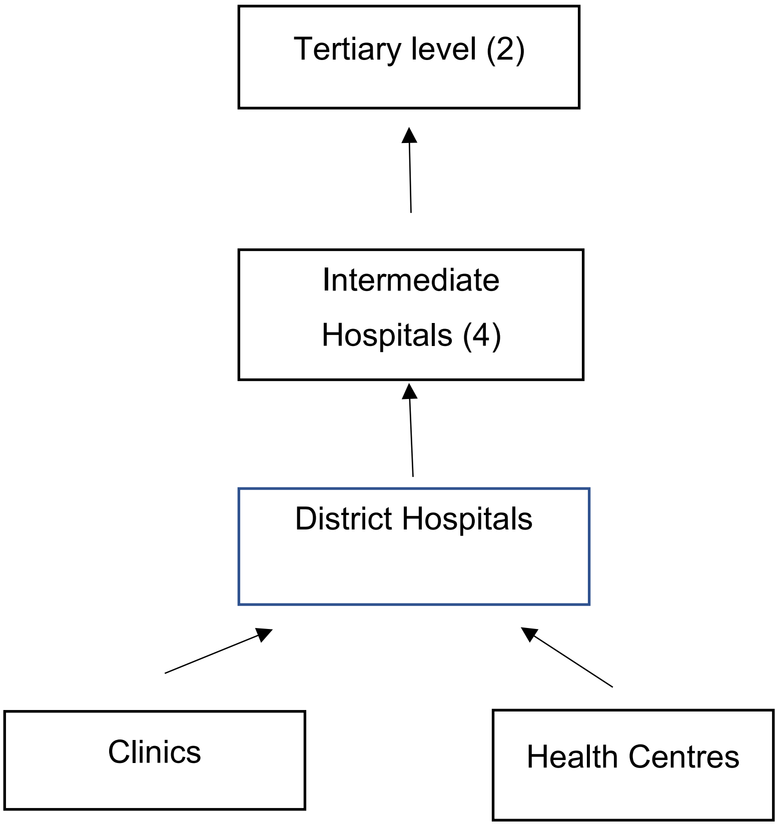

Figure 2.2: Namibian Health Systems

Even though the district level provides secondary health services, Primary Health Care is also provided there, while tertiary healthcare is provided at intermediate hospitals and national hospitals. Namibia has one national hospital, four intermediate hospitals, 34 district hospitals, 47 health centres, 295 clinics and 1 150 outreach points. There are 14 regional directorates with 35 health districts (Kapepo & Yashik 2018:200). Hence, data is collected at the primary healthcare level, where health services are provided, and at the secondary and tertiary levels. Data at the PHC and secondary level is sent to the district health information system to be captured electronically, while a Health Information System officer captures data at the tertiary level at the intermediate or national hospital. The study did not include the private sector although it plays a significant role in service delivery, because their data are not captured in Routine Health Information System. This is supported by Quedraogo et al 2019:9) who stated that private health facilities infrequently report their health data on health service attendance to the public health information system.

Health problems in Namibia for children under five years, such as undernutrition among under five years, low immunisation coverage and high infant mortality rate, continue to raise concern. The public health system relies heavily on government funding with support from developmental agencies such as United States Agency for International Development (USAID), Global Fund and US President's Emergency Plan for AIDS Relief PEPFAR. There is a need to utilise Routine Health Information Systems to identify gaps in child healthcare programmes and innovate ideas to address those health conditions and problems. Ministry of Health and Social Services embarked on reorganising to enable to improve service provision and management by intensifying disease prevention, prevention of ills, curative, and broadening of health financing; this can only be realised if the routine health information is complete, accurate and timely (MoHSS 2010:1).

2.3 HEALTH INFORMATION SYSTEM

The HIS is an organized combination of system components designed for collection, processing, analysis, use and dissemination of health-related data with aim improving health outcomes (Balgrosky 2020:12). The main goal of any HIS is to generate accurate, complete and timely information to enable evidence-based decision-making and implementation of health interventions (Nengomasha et al 2018:359).

HISs can be captured and managed as paper-based, electronic or hybrid. Paper-based records are the types of health information that are collected using hard copies and processed manually. Electronic health information is referred to as computerised software that is designed to fulfil the need for an automated health information management system. The system supports the healthcare system to accurately collect, aggregate, store, analyse and use health data in the healthcare system (Osiyo 2016:1). A web-based HIS enables and guides the automation of work processes and activities in the health system by capturing data electronically as opposed to a paper-based system (Karon 2016:170). HIS depends on multiple sources of data such as vital registration, census, and routine health data of health services (Ledikwe et al 2014:2).

There are three main categories of Health Information Systems:

(i) All health and health-related service information, which includes health services and disease surveillance. These can be classified as those handling individual data records, such as electronic health records and electronic patient management information systems; the other category is a system related to data collection for decision-making and information management, generally referred to as Health Management Information Systems.

(ii) Population-based information such as civil registration and surveys and

(iii) Management information in areas like supply chain management, finance, human resources, regulatory, and licensing. Currently, HIS in Namibia is clustered in many and generally separated databases that collect information on wider areas of health services and related programmes (Dehnavieh et al 2019:63). On the other hand, population-based information is administered by the Namibian Statistics Agency and Ministry of Home Affairs and Immigration (Khan & Edwards 2012:9).

2.3.1 District Health Information System/Software

District Health Information Software (DHIS) is a computerised health information system that captures routine health information systems from health facilities. DHIS is an HIS programme that has evolved from research from the University of Oslo in 1994. District Health Information 1.4 is a free and open-source database and application for collecting, processing and analysing health information whose development and implementation started in 1998 by the Health Information System Programme (HISP) (DHIS2 2020:1).

The purpose of the DHIS was to aggregate routinely collected data in public health facilities. The DHIS also facilitates analysis of health services provided in that country at the national level. The basic version of DHIS was based on Microsoft Access. In 2005, DHIS 1.3 was upgraded by HISP South Africa to the DHIS 1.4 version (Kiwanuka, Kimaro & Senyoni 2015:1). Data were sent through an attachment on an email or memory stick to the next level, such as regional or provincial as well as to national level. In 2005, District Health Information Software 2 was developed, coordinated and managed by the Health Information System Programme (HISP) at the University of Oslo (DHIS2 2020:1). In 2011, some countries such as Norway, India, Vietnam, Tanzania, Ireland and the United States of America is targeted to migrate from DHIS to DHIS2 (DHIS2 2020:2).

The DHIS2 is an open-source web-based, which has a core function which captures summaries of outpatient department and primary healthcare clinics monthly, as well as inpatient data, which captures information on discharges, deaths and referred diagnoses and average length of stay (ALOS) (Dlodlo & Hamunyela 2017:70). DHIS2 is global and used by 67 low- and middle-income countries and in more than 100 countries worldwide. Each country that uses DHIS2 platform has its stand with full ownership in collaboration with experts in the DHIS2 (DHIS2 2020). DHIS2 data are saved on a central server that is accessible via a web browser and on several platforms, both online and offline (Dehnavieh, Haghdoost, Khosravi, Hoseinabadi, Rahimi, Poursheikhali, Khajehpour, Khajeh, Mirshekar, Hasani, Radmerikhi, Haghighi, Mehrolhassani, Kazemi, & Agham 2019:64). Data can be entered into the system using a variety of devices such as desktops, computers, laptops, tablets and smartphones.

DHIS2 is designed to allow the generation of standard or customised reports to meet user requirements. District Health Information Software 2 have features that carry out data quality analysis and present a dashboard for monitoring and evaluation of health programmes (Karuri, Waiganjo, Orwa, & Manya 2014:45). The feature of DHIS2 has the ability to send text messages for consultation and exchange of ideas purpose among users, and it minimises the impact of distance between users in different parts of the country (Sahay, Rashidian & Doctor 2020:4). DHIS2 has a positive impact; however, the users are faced with obstacles which are mainly on infrastructure and systems. These obstacles include a lack of knowledge of DHIS2 and a lack of technical skills in adding variables for data collection and routine maintenance at the national level. Hence, ongoing training for health professionals, users and IT technicians is crucial in the successful implementation of DHIS2 (Dehnavieh et al 2019: 73).

2.3.2 Health Information Systems in low- and middle-income countries

The Health Information System in most of the middle- and low-income countries fails to deliver quality information for decision-making. This was influenced by the social, economic, geographical and political situation of these countries. The key factors affecting the use of HIS include low literacy of information technology and inadequate skills to analyse and interpret data. Health reporting in most middle- and low-income areas is dominated by paper-based data collection service delivery points. Evidence indicates that continuous use of paper-based systems contributes to poor data quality (Bagherian & Sattari 2022:8).

Furthermore, the overwhelming demand from sponsors for reports leads to parallel reporting systems that burden health workers with multiple and overlapping demands of vertical disease programmes (Karuri et al 2014:39). Hence, health information obtained from such facilities for decision-making could be unreliable, insufficient and not responding to the information needs of the decision-makers (Dehnavieh et al 2019:63). As sponsoring community commit to the importance of different programmes the government should redirect them to focus on strengthening Routine Health Information System in order to ensure that information collection is integrated into an existing system (Dlodlo & Hamunyela 2017:62)

Kenya has challenges with vertical reporting systems alongside DHIS2; there are disintegrated, uncoordinated data collection systems, particularly among specific disease-funded programmes (Karuri et al 2014:42). Furthermore, data collection stages also face problems related to insufficient human resources, lack of skills to collect, collate, analyse data, ICT infrastructure and poor feedback from higher levels (Sahay et al 2020: 3).

Botswana has similar challenges of lack of central coordination of HIS, as there are a lot of other HIS systems that capture data, which are disease-specific programmes, and NGOs fund them. Multiple tools for multiple programmes compromise data quality as health professionals are overburdened with different monitoring and evaluation tools (Seitio-Kgokgwe et al 2015:3).

Similar situations are also experienced in Nigeria, where there are multiple data sources that pose challenges to many health managers who have to make decisions.

However, DHIS2 is the common Health Information System used in Nigeria. In a study conducted in Gombe state, DHIS2 was used to monitor maternal healthcare services and the data was used to make decisions to improve access to maternal and neonatal health services (Bhattacharya et al 2019:16).

South Africa also does not have a single data repository that combines routine health data and population-based data (for example, vital statistics, census, and survey data). There is a lack of standardisation of data collection tools, and multiple registers have been developed for vertical data collection actions. The HIS is fragmented and has no integration with electronic patient records. In addition, the majority of public health facilities still use paper-based. These forms of record-keeping contribute to the long waiting times of patients in health facilities, poor infection control due to the exchange of papers with patients and lack of data integrity (Thulare et al 2020:423).

Rwanda’s Health Information System has been marked with progressive improvement in data quality for five years as completeness and internal consistency grew from 88% in 2008 to 95% in 2012 and timeliness from 90% in 2008 to 98% in 2012. On the other hand, data use in health facilities was inadequate; the health unit management data was only used for monitoring finances in health facilities, meaning managers were not able to link resources and health outcomes (Karengera et al 2016:12).

The study discovered limited literature regarding nurses’ and healthcare managers’ understanding of RHIS in general. However, some literature indicated that there were limited skills in data quality assessments. In a study by Getacheuw (2022:7) revealed that 65% of health workers check data for quality in Ethiopia. This is in line with a study conducted in South Africa by Tulare et al (2020:3) which stated that health facilities produce incomplete and inaccurate reports due to of lack of understanding of data management processes and inability to perform data quality checks as a result of inadequate or ineffective training on HIS.

The utilisation of RHIS among health workers varied in different countries, in Southern Ethiopia, the use of routine health data was 63.1 %, whereas Northwest Ethiopia revealed 45.8 % of health workers had good level of health information use (Sako et al 2022:441). The use of data was much lower in Younde-Cameroon with 16% (Tamfon,Ndongo, Bataliac, Ngoufack & Nguefack-Tsague 2020:9).

2.3.2.1 Health Information System in Namibia

Namibia's HIS was introduced in 1990, immediately after its independence. The main aim was to provide information on various numbers of indicators and to enhance healthcare service delivery (Karon 2016:170). In 2000, Namibia revised the HIS to the Health Information System 2000, also known as HIS2K. There was some addition of programmes that were not in previous HIS, such as dental health services and environmental health services (MoHSS 2000:2). In 2007, Namibia migrated from HIS2K to DHIS 1.4, which was later replaced by DHIS2 in 2017.

The aim was to monitor the performance of health indicators such as bed occupancy rate, outpatient visits, and top ten diseases causing morbidity and mortality, and immunisation coverage and provide data to inform decisions on resource allocation and budgeting (US Embassy in Namibia 2017).

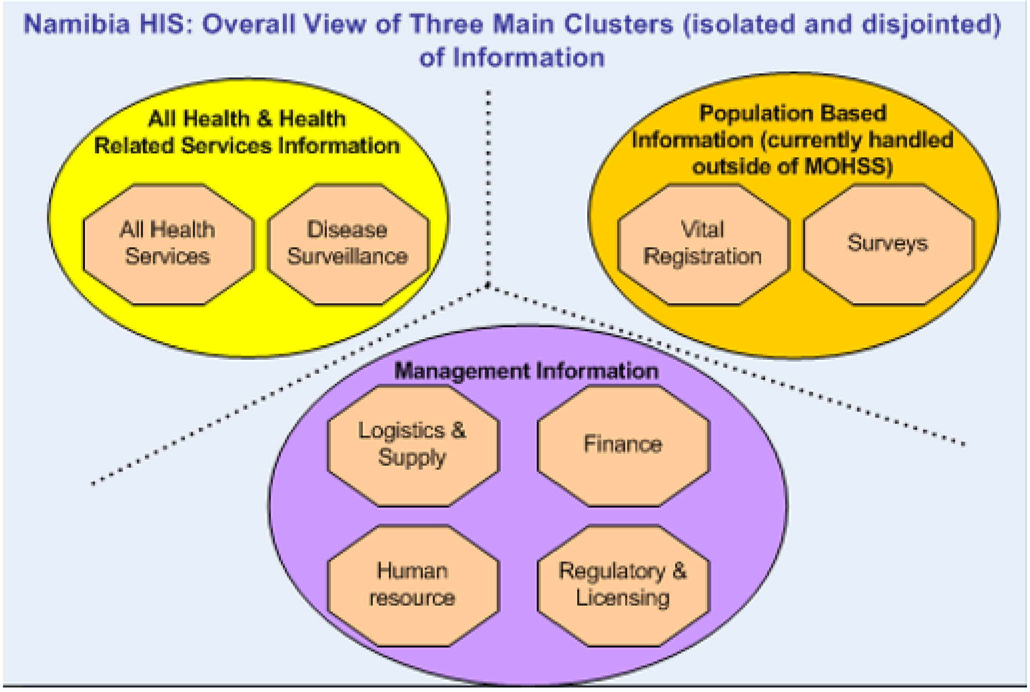

Figure 2.3: Namibia HIS—Overall View of the Three Main Clusters of Information (Khan & Edwards 2012:9).

2.3.2.1.1 Implementation of District Health Information System

Namibia has around 60 HISs (paper-based, electronic, hybrid) among various directorates in the MoHSS. The common system is District Health Information System 2 (DHIS2); it captures a wide spectrum of health service delivery, including child health programmes (Kapepo & Yashik 2018:201).

However, other systems running alongside DHIS2 include Epidemic Info (Epi Info), electronic TB register, Electronic Patient Management System (EPMS), store specific information for patients on treatment for HIV, pharmacy management information system (PMIS) captures indicators related to stock management of medicines and clinical suppliers (Dlodlo & Hamunyela 2017:69).

The fragmented Health Information Systems need to be addressed urgently in Namibia. This is because decision-makers find it difficult to use multiple sources as it requires time to fuse such information from different databases, which, in most cases, information lacks consistency (Mjelva 2017:37). Challenges faced in integrating different databases into one HIS include data interoperability and standardisations as data and technology incompatible due to lack of standards, data warehousing whereby some systems are outsourced and hence cannot be integrated such as an x-ray system. Other challenges include data security and privacy; each programme has its own privacy and security because it feels its health information is sensitive and lacks skilled personnel for user support and integration. Additionally, staff turnover is also high, especially among those with expertise in local system development and maintenance (Kapepo & Yashik 2018: 201).

In order to successfully integrate HIS, the interoperability and standards of HIS systems are crucial. Interoperability is the ability of different information technology systems and softwares to communicate, execute programmes or transfer data among various functional units in a meaningful way, meaning data exchanged from different sources can be understood by other computer systems (Balgrosky 2020:38).

The challenge of interoperability is due to service providers using different vendors in order to reduce costs, which leads to technical challenges and a lack of health information integration. The other challenge is poor data infrastructure with respect to internet connectivity in Namibia; only a few regions have good internet connectivity, meaning integration may be impossible with current internet infrastructure because it cannot handle such a large volume of data due to slow internet bandwidth (Nengomasha et al 2019:365).

2.4 ROUTINE HEALTH INFORMATION SYSTEM

The RHIS is a sub-system of a national Health Information Management System which captures, process, report, and use the information to support policymakers and programme implementation (Bhattacharya et al 2019:2). Routine health information remains the main source of data in most countries yet, it has a reputation of producing low quality and irrelevant data, particularly in low- and middle-income countries (Sako et al 2022:435).

Ministries of Health in low- and middle countries and health programme organisations have begun efforts to strengthen HIS, which multiple development partners often fund. These efforts led to positive and negative outcomes. On the positive side, these efforts have been spreading awareness of the importance and value of computerised HIS. On the negative side, the HIS strengthening efforts have led to an increase in multiple uncoordinated systems that do not support integrated health systems (Sahay, Rashidian & Doctor 2019:2).

Routine health information is a backbone of healthcare micro-planning at district, provincial, regional and national levels for decision-making on resource allocation and strategy development; MOH requires feasible, timely, reliable, and valid measures of implementation and overall progress monitoring of health programmes (Wude, Woldie, Melese, Lolaso & Balcha 2020:2).

Additionally, a Routine Health Information System does not provide all the information required for decision-making. Hence, RHIS is periodically being supplemented by surveys organised by international organisations (Wagenaar, Sherr, Fernandes & Wagenaar 2016:130). Therefore, continuous supportive supervision, data quality through quality assessments and capacity building were found to be factors that improve data quality. In addition, there is a need for continuous amendment of data elements in health information systems to correspond with functions of various services offered for decision-making (Getachew, Erkalo & Garedew 2022:8).

There are many HIS databases that capture routine health information in Namibia; child health data are captured through DHIS2, which is considered to be faster and aggregates data from health facilities to high levels (Bhattacharya et al 2019:2).

2.4.1 Data management processes

Routine health information data on child healthcare are collected at regular intervals at primary healthcare facilities. RHIS data management processes, including data collection, processing, analysis and presentation, the availability of RHIS data collection and reporting tools, evidence of data analysis and visual representation of data. Tulu et al (2021:3), the availability of resources such as DHIS2 paper-based monthly format are significant in the data management process as they capture child health data, and the legislative framework provides directions on how data is managed as the objective of this study is describe the routine health information process as well as explore nurses in routine health information system. These resources are the data sources of child health indicators that are utilised in decision-making. Therefore, these are regarded as inputs that are required to generate quality data that can be utilised in managing child health care. Data quality checks are also a component of the data management process, where there are data quality assurance tools, assigned roles and responsibilities for data entry and review, and regular internal data quality audits. These are activities/processes that are undertaken in order to attain an output of quality routine health information on child health care. Feedback is also part of the data management processes and involves formal feedback sent to health facilities. Performance monitoring and planning-related actions taken based on performance monitoring meetings and comparisons of district data over time and with national targets (USAID MEASURE Evaluation 2019:22). Feedback also part of activities, where data are disseminated to health facilities is a sign of visible leadership to support RHIS in managing child health care.

The data flow between levels in the Namibian health system starts with a nurse at the Primary Health Care level who fills out a register, which is paper-based and generates summary reports that are sent to the district level. At the district level, there is a Health Information System officer whose responsibility is to pre-validate summary forms and capture data in DHIS2, which is electronic and web-based. At the regional level, data is reflected in the regional database, where the regional Health Information System officer validates the reports and generates the regional summary. At the national level, reports from the regions are reviewed, and then national statistics/reports are generated (Kapepo & Yashik 2018:203).

Additionally, a number of variables being collected from patients/clients visiting public and mission health facilities can be used to formulate indicators. Indicators assist in measuring the global public health situation. Hence, only complete and accurate data can provide reliable estimates (MoHSS 2014:12). Indicators that provide the status of child healthcare in the national health system include immunisation coverage under five, wasting rates and stunting rates.

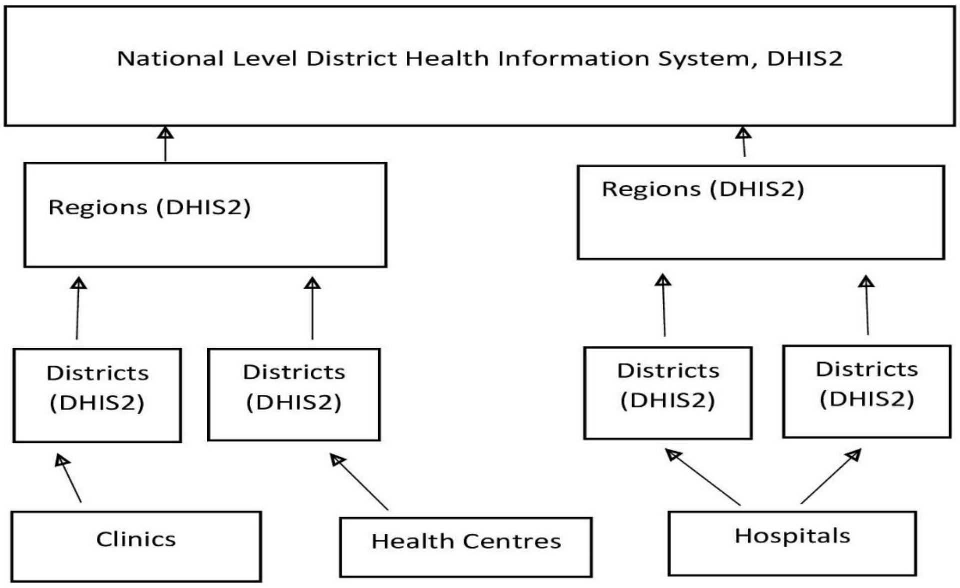

Figure 2.4: Primary Health Care data flow in Namibian healthcare systems
(Kapepo & Yashik 2018:200).

2.4.2 Performance of Routine Health Information System

Routine health data is still performing poorly in low- and middle-income countries. MEASURE Evaluation developed a Performance of Routine Information System (PRISM) Framework that aims to strengthen the data quality and information use in the healthcare system. The framework will assess the reliability and timeliness of RHIS in making evidence-based decisions, identify gaps in RHIS and strengthen the RHIS performance through a system-based approach that supports improvements in data quality and use (Chanyalew et al 2021:5).

RHISs provide a picture of health services delivery, the health status of the general population, and health resource availability. It is also a pillar for planning and management of various levels of the system as it can play a vital role in effective and efficient service delivery (Sako et al 2022:6). Hence, there is a need for improved data collection, analysis, availability and data use. This can potentially generate more demand for data use, which leads to increased accountability and health decision-making (MEASURE Evaluation 2020:3).

The utilisation of data in health facilities is relatively low in low- and middle-income countries. Study findings from South Africa 2014 indicate that the overall percentage of HMIS information use is 65%, and in Kenya, HMIS data utilisation was poor too, although it was not quantified, and Cote D'Ivoire using PRISM overall health information utilisation was 38% at healthcare facilities (Asemahgn 2017:2).

The study by Tilahun et al (2018:2) indicates that data at the district level are being processed to the next level without use or minimal use. However, Nwanko and Sambo (2018:4) indicated that during the baseline of their study, no health facility analysed and used their data; this was due to a lack of skills in data analysis by health professionals at the point of care. However, after training and sensitisation on data use, health facilities were able to analyse their data and use them for health education purposes, ordering vaccines and other drugs and monitoring patient attendance. A similar study conducted by Abera, Daniel, Leta and Hibstu (2016:107) has also indicated that the RHIS utilisation in the Amhara region in Ethiopia was low initially before training; however, six months later, there was an increment in data utilisation. This was realised due to frequent support supervision from upper structures in the healthcare system, periodic training and follow up at health facilities. Health facilities analysed and displayed their data on notice boards in the health facility using frequency tables and graphs. The information displayed on notice boards was found to be helpful to clients, health professionals and healthcare managers as they use it to manage their day-to-day activities (Abera et al 2016:107).

A study conducted in Uganda indicated that there is a gap in data use at the district and facility levels due to inadequate skills and competence to analyse and synthesise data in a meaningful way. Health professionals generating data pay little attention to the quality of data since they do not use them (Karengera et al 2016:13).

2.4.2.1 Factors that influence the performance of the Routine Health Information System

An assessment of routine health data in health facilities has identified problems with the health information system, which is completeness, accuracy and timeliness in low- and middle-income countries (LMIC). Other factors linked to poor data quality in LMIC are duplicates, parallel reporting channels and inadequate capacity to analyse and use data for decision-making (Mutale, Chintu, Amoroso, Awoonor-Williams, Phillips, Baynes, Michel, Taylor & Sherr 2013:2).

The Routine Health Information System is closely linked to health services organisations. Hence, the performance of RHIS can have a direct impact on service delivery. Routine health information needs to be responsive to the information needs of the data producers, particularly at the service delivery level where data are generated. Adequate data serves as a base for credible evidence on the health status of patients; policymakers make responsive and accurate interventions that are aimed at improving health service delivery. Hence, RHIS should be strengthened in order to build an information use culture whereby information is acknowledged and appreciated at all levels of the healthcare system (Lippenveld 2017:340).

2.4.2.1.1 Enablers of success

Routine health information provides an opportunity for health professionals at the facility level, district, regional and national levels to guide health service delivery, programme planning and management. Apart from the shortcomings related to data from Routine Health Information Systems, there were successes reported from RHIS in health programmes such as immunisation, child nutrition, antenatal care and outpatient visits in Mozambique with 100% data availability and 80% reliability of data (Wagenaar, Sherr, Fernandes & Wagenaar 2016:128). Additionally, RHIS related to maternal health in a case study from Gombe state in Nigeria demonstrated that routine health information could be utilised in monitoring maternal health-related indicators such as antenatal care visits, deliveries by skilled health professionals, early postnatal care, and HIV testing among pregnant women. This is because data was readily available in DHIS and can be used to improve maternal health service delivery (Bhattacharya et al 2019:7).

Routine health information system success can be enhanced if the health professionals are adequately trained in data management and health information use. Training will enable health professionals to make decisions at the point of care. There is also a need to provide adequate information, communication and technology infrastructure, such as computers or laptops for data capturing, support supervision and regular feedback to health professionals collecting data (Asemahagn 2017:3).

2.4.3.2 Barriers to the use of Routine Health Information System

The ultimate goal of RHIS is that information is used to solve problems and to improve access to the delivery of quality health services. However, the barriers that lead to poor use of data include poor data quality, poor access to data, lack of competencies on data use among providers and poor identification of information needs (Lippeveld 2017:339). Hence, the problem-solving and decision-making of data users can influence the use of routine health information for service delivery improvements.

Barriers to the use of RHIS can be divided into six categories: technical, organisational, economic, political, legal and data demand. Technical barriers such as restrictive data formats, lack of metadata and absence of proper data interoperability can hamper data sharing and use in health systems (Kumar, Gotz, Nutley & Smith 2018:5). In health care Interoperability enables of diverse systems to communicate and execute programmes and exchange data among various information systems in a meaningful way (Angula & Dlodlo 2018:2).

2.4.3.2.1 Technical factors

These technical barriers should be addressed during the data collection phase by improving the capacity to store information by expanding ICT infrastructure and organisational processes (Kumar et al 2018: 5). However, such improvements need competent system administrators to support the DHIS2, especially with data interoperability (Kapepo & Yashik 2018:203). There is a need to advance the web technology that can solve interoperability problems in RHIS. This can be attained through several processes, such as the agreement of information standards. If these standards are applied, it promotes the ability for systems to share information, and users can access various health data for decision-making (MoHSS 2020:18).

2.4.3.2.2 Organisational factors

With regard to organisational barriers, there is a lack of policies to guide and govern the HIS; hence, various donors' own systems parallel to DHIS2 (Kapepo & Yashik 2018: 205).

The lack of policies, guidelines, and legislation is not only unique to Namibia; a country like Botswana is also experiencing problems with the absence of HIS policies and legislation to enforce the generation of quality health information; hence, data, in many instances, are incomplete and inaccurate (Seito-Kgokgwe et al 2015:1).The practice is found in many African countries, that there are policies to guide health information management are lacking, except Health Professions Council of South Africa that has explicitly laid out procedure for medical records practice (Ojo 2018:143).The availability of policies, guidelines and legislation is regarded as crucial input because it guides the data management processes and the utilisation of data for decision-making, leading to improved HIS governance.

However, in Namibia, there is an HIS Technical Working Group responsible for the implementation and support of HIS with different stakeholders (MoHSS 2020:9). However, the finalisation of the HIS policy is still yet to be realised. Other organisational barriers to the use of RHIS include lack of management support to health professionals, inadequate ICT infrastructure and high staff turnover among trained HMIS health professionals at the health facility level (Asemahagn 2017:3). In order to continuously address these barriers, the Ethiopian government had prioritised the improvement of healthcare data quality and use at facility level.

There are negative organisational behaviours of pressurising senior health managers and health professionals to reach unrealistic targets of set health indicators, which has the potential to result in false reporting and mask the existing service (Lippenveld 2017:339). Support supervision is also another organisational barrier whereby feedback is not provided to lower structures when there is a need to improve data (Nwanko & Sambo 2018:6).

Economic barriers are when the health system cannot afford a system that enables data sharing and use. Political barriers apply when there is a lack of trust and a lack of guidelines and policies. At the same time, legal factors can include copyright, data privacy and ownership of how data can be shared and used (Kumar et al 2018:5).

2.4.3.2.3 Behavioural factors

The behavioural factors that can affect RHIS include a lack of information use culture among health professionals (Ndabarora, Chipps & Uys 2014:8).

Other challenges regarding RHIS are the ability to respond to specific information needs of potential users such as health professionals, healthcare managers and policymakers. There are some services provided, but information is not captured in RHIS. Hence, there is a need to ensure that RHIS focuses on meeting the information needs of all potential users so that the information collected is directly linked to decision-making. This is caused by a lack of involvement of information users in the design of data elements and systems used in generating routine information, which hinders the effective and efficient data management process (Cheburet & Odhiambo-Otieno 2016:192).

There is a need to build capacity among health professionals to generate quality routine health information at the PHC level. Furthermore, this need extends to the identification of information needs and regular quality checks.

2.5 HEALTH MANAGEMENT INFORMATION SYSTEMS

An essential component of any HIS is the Health Management Information System (HMIS) implemented in most healthcare systems globally to manage routine health data; the main aim of HMIS is generating quality data that the recipient can utilise at the right time in the right format (Asemahagn 2017:2). HMIS is designed to assist in management and planning of health programmes, however, it is also instrumental in monitoring service delivery (Abera et al 2016:99). If HMIS has structural problems such as lack of policy directives, overloading forms on the system for different parallel programmes and poor interactions between information technology experts and information users, the health data will be affected (Ndaborora et al 2014:110).

Data in healthcare will serve no use if it is not accurately processed and used to inform decisions regarding resource allocation, formulating policies, service delivery, supervision, and other components producing health actions (Karengera et al 2016:5).

Global interest is getting bigger in strengthening health information management systems, improving data quality, and promoting data use in developing countries in order to build these countries' capacity for decision-making. The goal of strengthening national HMIS is to improve health and health equity in a responsive way that is affordable and makes the best or most efficient use of available resources (Kumar et al 2017:7).

The manifold responsibilities of the district health are to allocate scarce resources; hence, the necessity of health management based on adequate information use becomes obvious and crucial. Additionally, healthcare system reforms can only be strengthened if there is a good information system that supports decisions taken at the district level (Aberu et al 2016:99). However, those decisions should be based on high-quality data between Primary Health Care facilities, district, and regional and national level (Daneshhkoan et al 2022:1).

Routine health information use should be at each level of the health system. At the national level, routine health information system is mainly used for policy formulation for disease prevention and control, human resource recruitment and requests for adequate budget allocation from the national treasury (Asemahagn 2017: 8). At the district level, routine health information can be used to monitor and evaluate the implementation of health programmes and optimal allocation of the resource among different health facilities. At health facilities, routine health information can be used to monitor patient attendance, the ordering of pharmaceuticals, and the monitoring of immunisation coverage among children under the age of five years (Mutale et al 2020:2).

A Health Management Information System is an information system specially designed to assist in the management and planning of health programmes. These focus mainly on policy formulation, strategic management, training and health professionals and support supervision (Abera et al 2016:3).

The Health Management Information System is strengthened using HIS processes. The HIS processes will direct inputs and activities that are expected to influence the outputs and outcomes of routine health information use in child health programme review, planning and policy and development (Nutley & Reynolds 2013:2).

Health Information System processes are influenced by technical factors, namely, lack of training, inadequate computer infrastructures, and lack of skills in HIS and data. Structural factors can also influence the HIS process, namely, lack of policy on health information systems, poor support supervision and feedback on HIS to the lower levels in the healthcare system, overloading of paper-based forms to complete different programmes and parallel reporting. Behavioural factors also influence HIS processes, particularly the lack of information use culture (Ndabarora et al 2014:8).

2.6 CHILD HEALTHCARE SERVICES IN NAMIBIA

Child health is an important public health issue for each population. Investment in children is an investment in the future of a nation. If young children are healthy, they are able to maximise their full developmental potential (World Health Organization 2020:1).

Child healthcare in Namibia is planned and managed at all levels of the healthcare system. This means that at the national level, child health programmes are initiated, and policies and guidelines related to child healthcare are formulated. The national level formulates child health indicators in partnership with developmental and technical agencies, not limited to the World Health Organization (WHO), United Nations Children Fund (UNICEF), and Centre of Disease Prevention and Control (CDC) (MoHSS 2010:10).

Child healthcare at the regional level in Namibia has a unit that supports districts in terms of training health professionals on child healthcare programmes and child health indicators, as well as support supervision and feedback on the implementation of child healthcare activities. Monitoring and evaluation of child healthcare are done by assessing routine health data on child health indicators. At the district level, healthcare managers have a role in ensuring that they provide resources to the health facilities to enable them to provide quality service delivery. Resources include human resources, pharmaceutical supply, and logistics used in managing child healthcare. The district also conducts support supervision of health facilities (MoHSS 2010:9).

At a Primary Health Care level, nurses provide child health interventions such as immunising children, growth monitoring and promotion of health in children, nutritional assessment, counselling and support. The nurses at primary healthcare collect information routinely for the services provided.

Hence, child healthcare can be improved if nurses at the point of care can generate quality data that they can utilise at their level and also be utilised by the upper structures to make decisions (Nwanko & Sambo 2018:2). Information on child health indicators (immunisation coverage, stunting rate, underweight rate and wasting rate) is important in assessing the performance of child healthcare services. Despite the importance of RHIS, challenges of data quality, lack of data demand and poor knowledge of the data management process can jeopardise the effectiveness of utilisation of routine health information in managing child healthcare programmes (Lasim, Ansah & Apaak 2022:2). Therefore, the study needed to establish the understanding of nurses regarding Routine Health Information Systems and understand their experiences using routine health information for the management of child healthcare.

In addition, there is a need to ensure that nurses and managers should be able to analyse and disseminate information. In that manner, information, in order to improve service delivery at the health facility level, inform the design and choice of policy, forecast the future and monitor programme implementation (Abera et al 2016:107). However, the majority of literature indicates that health professionals at the local level generate data and forward it to the district level without using it for decision-making at their point of care (Tilahun 2018:5). In another study conducted in Rwanda, which has indicated the low data use in immunisation of under five years, decisions at the health facility were mainly used in ordering vaccines for the health facility has yielded good outcomes as there was always an adequate number of vaccines at the health facility when children come for immunisation (Karengera et al 2016:11).

In some instances, RHIS data collected through Routine Health Information Systems do not address all information needs of policymakers and healthcare managers, which is why governments conduct intermitted surveys such as demographic health surveys to gather additional information that would enable to formulate policies (Wagenaar et al 2016:130). If RHIS responds adequately and supports the role of decision-making at all levels, then many expensive surveys can be eliminated. Therefore, resources that can be redirected in decision-making are generated in RHIS.

According to the Demographic Health Survey of 2012, mortality among children under five years 2008-2012 was diarrhoea at 18%, pneumonia at 13%, paediatric HIV at 3%, as well as malnutrition, particularly undernutrition at 12%. While the morbidity among children under five years old included diarrhoea 17%, Pneumonia 6%, Paediatric HIV 3%, and underweight 13% (MoHSS 2014:40).

There should be adequate data sources to capture routine health information at the health facility level. Data analysis should also be done, and data should be disseminated to the decision-makers. However, data should be complete, accurate and timely. In order to realise that, it is important to build capacities of healthcare workers, supervisors at health facilities and district managers on data management, thus enabling the use of these data in decision-making in child health (Daneshkohan et al 2022:6). The use of routine health information will result in decisions that will improve immunisation coverage and nutritional indicators as well as a reduced mother to child transmission of HIV and childhood morbidity.

2.6 SUMMARY

This chapter provided an in-depth discussion on health system strengthening building blocks, as well as health systems in developing countries as well as in Namibia. The chapter highlighted health information systems with a special focus on District Health Information Software Version 2, health management information systems and routine health information systems. A broader view related to factors that influence the performance of the routine health information system and its use in child healthcare, as well as enablers of success. The barriers to the using of routine health information such as technical, organisational and behavioural factors were discussed. The study also highlighted on the child healthcare services in Namibia.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter provides an overview of the methodology used in the study. The chapter outlines the design and method of data collection and data analysis procedures. Furthermore, it provides details of how trustworthiness was ensured. Ethical considerations are discussed in the last section of this chapter.

3.2 RESEARCH DESIGN

Research design is a plan of how to conduct the study and how to control factors that could interfere with the study's desired outcomes (Grove & Gray 2019:43). This study adopted a qualitative, collective case study design. The study was executed in three phases.

Phase 1 included focus group interviews with nurses at Primary Health Care facilities who were dealing with child healthcare.

Phase 2 was in-depth individual interviews with the healthcare managers at district, regional and national levels who were involved in the management of Health Information System and child health services. This phase also included the integration of data from both phases to derive common meanings, similarities, overlaps and differences between the cases.

Phase 3 consisted of the development of strategies to improve the utilisation of Routine Health Information Systems and validation by experts who participated in a modified Delphi technique.

3.2.1 Qualitative research

Qualitative design is based on constructivism, which recognises the existence of multiple realities (Adom, Yeboah & Ankrah 2016:5). This indicates that the study believes there is no single truth but multiple truths; each person has "truth" that they experience and produce in their context. Therefore, multiple realities were obtained through dialogue with nurses working at Primary Health Care facilities and managers at district, regional and national levels because their perspectives were regarded as truth on data management process and information use (Creswell & Creswell 2023:9). The constructivism paradigm assumes knowledge is maximised when there is a close interaction between researcher and participants (Polit & Beck 2018:8).

Qualitative focuses on aspects of meaning, experience and understanding and studies human experience from the viewpoint of research participants in order to discover new knowledge. The researcher was involved in the data collection process to gain a deep understanding of the study context (Brink et al 2018:104). The data collected from the participants were interpreted using the researcher's intuition and ensured that it reflected the participants' voices. This was done by bracketing and providing verbatim statements from the participants. Therefore, the truth was obtained through interaction between the inquirer, who was the researcher and the participants. This aligns with the constructivist paradigm adopted in this study, which recognises the unique individual reality.

The researcher used semi-structured interviews through a focus group discussion and individual interviews to collect data from nurses and healthcare managers. Therefore, the nurses' interpretation and understanding of RHIS is the social reality that was of interest to this study because they generated, analysed, and disseminated data at the point of care. With regard to healthcare managers, the focus was on how they used RHIS to plan, manage, allocate resources and capacitate nurses at health facilities. The participants also recommended measures to improve the quality of data and improve the culture of information use.

This research consists of a set of interpretive, naturalist and humanistic approaches and is focused on understanding the social interactions of the participants in the study (Creswell & Creswell 2023:191). The researcher obtained information from the participants through interacting with them in their natural settings. Therefore, the researcher was part of the co-construction of the meaning by interpreting their views and opinions.

The researcher analyses the words of the participants, discovers meaning in words, and offers a description of the experience that promotes a deeper understanding of the experience (Grove & Gray 2019:59). The researcher analysed the words of the participants from verbatim statements and highlighted key areas related to research questions and thick description were provided. Meanings were discovered by cross-comparisons of themes that emerged and were supported by related literature.

3.2.1.1 Features of qualitative research

The key features of qualitative research are as follows:

- Research is conducted in a real-life situation

Qualitative researchers often collect data in the field at the site where participants experience the problem under study and gather information by talking directly to people, seeing how they behave, and getting within their context (Brink et al 2018:104). In this study, the researcher gathered data by conducting face-to-face focus group interviews with nurses at primary healthcare facilities. Healthcare managers' interview sessions took place at their duty station, which is either a district, regional or national office because of their positions in the office they occupy, they use data to manage, plan and allocate resources at their level.

- The focus is more on the process, unlike on the product

In qualitative research, the researchers are focused on learning the meaning that the participants hold about the problem or an issue, knowing the meaning that researchers bring to the research or from the literature. The participants can suggest multiple perspectives on a topic and diverse views. Hence, the themes developed in a qualitative report should reflect multiple perspectives of the participants (Creswell & Creswell 2023:193). Participants articulated their understanding and experiences on data collection, collation, analysis, dissemination and use. Each nurse had their own unique views of the data management process, and they were from diverse settings, including rural and urban health facilities. Hence, the emphasis was on the uniqueness and authentic 'truth' of the participants. The process was on how they created those meanings in relation to the country's health information system.

- The researcher remains the main instrument and is subjectively involved in the process.

The qualitative approach acknowledges that the perspectives of the participants reflect subjective views of their social world, and researchers bring their subjective influences to the research process, especially during data collection and interpretation (Fouché et al 2021:290). In this study, the researcher interacted with participants during focus group interviews and individual in-depth interviews in such a way that each of them contributed to the construction of reality. The semi-structured approach, using interviews, allowed the interaction between the participants and the research at deeper levels. However, in order to enhance the trustworthiness of the study, the researcher bracketed their own views during data collection. The researcher also reflected on the shared views to get a sense of the meanings emerging.

- The cyclic nature of the qualitative approach

The qualitative approach is a cyclic process, which means data collection is recurring, where each data collection is followed by a period of analysis, reflection and refinement. This means that the initial plan evolves during the research. The period of analysis and reflection was used to inform further data collection. That could lead to modification of the questions in the interview guide (Creswell & Creswell 2023:194). In this study, focus group interviews involved reflection, preliminary analysis, and refinement of the interview guide in order to delve deeper into data management processes at the primary health facilities. This cyclic process was repeated after each focus group interview. After all focus group interviews, the individual in-depth interview guide for healthcare managers was refined to elicit their views on how they supported nurses to generate quality data, ensured adequate data collection tools and utilised data in decision-making to improve child healthcare.

- Data saturation versus sample size

The sample size in qualitative research is based on the information needs of the study. Hence, the emphasis is placed on collecting detailed, in-depth information. Therefore, the sample size depends on what the researcher wants to know; the purpose of the inquiry and focus is to gain deeper insight into a phenomenon (Fouché et al 2021:380). The researcher collected data until saturation was reached, which was realised through prolonged engagement with the participants. Data saturation involves gathering data until the point at which new data no longer emerge during the data collection process (Brink et al 2018:126).

3.2.2 Case study

A collective case study involves studying multiple cases simultaneously or sequentially to generate a broader appreciation of an issue (Yin 2018:47). The case study was the preferred approach because of the when, how and why questions that formed the core of this study. The qualitative case design is based on a constructivist paradigm that builds on participants' own experiences and subjective experiences of a phenomenon (Flick 2014:371). The study used a collective case study sequentially to elicit information regarding experiences and understanding of RHIS use from different key players who were nurses at primary healthcare responsible for data collection and analysis of child healthcare. The subsequent stage was healthcare managers who supported the data management process by building the capacity of nurses, supervising health facilities, allocating resources to PHC facilities, and utilising data for decision-making for child healthcare. Case study research can be qualitative, in which the researcher explores a real-life case or cases through in-depth data collection from multiple sources such as interviews, audio-visuals and reports. The unit of analysis in case study research can be a single study or multiple cases (Yin 2018:46). The study used a collective case study instead of a descriptive one because it aims to get data from diverse perspectives from different contexts and determine similarities and variations based on their unique experiences. Whereas descriptive case study, which is also called intrinsic, interpretative and holistic case study, aims to analyse and interpret a particular phenomenon, not necessarily drawing commonalities or variations from different cases (Doyle, McCabe, Keogh, Brady & McCann 2020:444). Case studies focus on understanding why an individual think and behaves in a particular manner rather than what the status or action portrayed is (Polit & Beck 2018: 190). Since a case study explores a bounded whole object of analysis. In this study, the main case was the implementation of RHIS for child healthcare. The unit of analysis refers to a level of wholeness (Brink et al 2018:138).

The unit of analysis in Phase 1 was nurses' understanding and interpretation of RHIS. This relates to how they implemented HIS at primary healthcare facilities. They provided services at the point of care where data is captured in registers, collated and disseminated. Whereas, in Phase 2, the unit of analysis was healthcare managers who had a role in supporting health facilities in ensuring that quality data was generated at the point of care. The healthcare managers also used data for decision-making to improve child healthcare.

The collective case studies approach offers an in-depth investigation by comparing different cases in the study to determine commonalities and differences. Even though these distinctions are made, there could also be an overlap between different types of cases (Fouché et al 2021:303). Therefore, the study explored if there were differences and extent of similarities among nurses regarding their insights on the health information system in Namibia. Several subcases were subsumed. In the first phase, nurses working in urban primary healthcare facilities would be a subcase, and another subcase would be nurses working in rural health facilities. These different perspectives from nurses from different facility settings provide unique experiences regarding skilled professionals and abilities to collect, collate and analyse data and demand data for information use. In addition, the availability of resources such as paper-based data collection tools differs from rural and urban areas. The second phase also had two subcases: managers whose main role was to supervise and manage child healthcare programmes and those who were mainly involved in health information management and working as health information officers. Collective case studies also enable the study to draw comparisons in understanding unique experiences in RHIS and the use of data among healthcare managers who supervise and manage child healthcare and those who manage health information systems.

The study also made comparisons of managers’ experiences using RHIS in planning for interventions to improve population health, allocation of resources, capacity building and budgeting at different levels in the health system. Hence, their experiences in the data management process enabled them to provide their perspective, which was regarded as their authentic truth. In constructivism, the truth is subjective because it is from individual perspectives (Adom et al 2016:1). Therefore, a collective case study was suitable for this study in order to get diverse perspectives of different tasks of routine health information system from both nurses from various facilities and healthcare managers at different levels in the healthcare system. The statements from participants were related to their contexts. The integration of diverse meanings about their professional routine, experiences and practices enabled the development of strategies to strengthen the use of routine health data to improve child healthcare programmes.

3.2.2.1 Key characteristics of collection case studies

According to Schoepf and Klimwow (2022:253), the design of a collective case study includes:

- Explore differences within and between cases, ideally to replicate findings across them.
- Explore individual cases to provide detail and an explanation regarding a situation, phenomenon or experience where individual studies.
- Provide information into “why” or “how” and provide elaborative data by comparing cases that allow a more expansive understanding of the issue.

The greatest strength of a collective case study is that it provides the researcher with the ability to explore phenomena through various lenses. This multiple-perspective approach is crucial for a very in-depth and comprehensive understanding of objects in real-life situations (Lucas, Fleming & Chosale 2018:216).

3.2.2.2 Research setting

The research setting is the location in which the study was conducted. The most common setting for conducting research is natural, partially controlled and highly controlled (Grove & Gray 2019:35). This study used a natural setting and the research did not manipulate or change the environment. Qualitative researcher normally collects their data in naturalistic settings. The researcher minimised the Hawthorne effect among nurses by being transparent and explaining the study’s aim so that participants provide responses based on their experiences but do not react and try to perform to the expectation of the researcher. Therefore, it means data was collected at the locations where participants experienced the routine health information system. Information is gathered by interacting directly with the participants, seeing their behaviours and how they are acting within their contexts (Polit & Beck 2018:184).

Figure 3.1: Map of Namibia (Courtesy of www.mapofworld.com)

The research setting in this study was a primary health facility in the ||Karas region. Since, ||Karas region has three health districts, namely, Keetmanshoop, Luderitz and Karasburg, where Keetmanshoop district has seven (7) primary healthcare facilities, Karasburg has five (5) healthcare facilities, and Luderitz district has four (4) primary healthcare facilities which sum up to sixteen (16) primary healthcare facilities. The primary healthcare facilities were found to be ideal for the study as they offered comprehensive child healthcare. Furthermore, the study also included district, regional and national healthcare managers involved in data management processes and managing child healthcare services. Figure 3.1 presents a map of Namibia and ||Karas region in Southern Namibia.

||Karas region was the region of proximity to the researcher, and observed poor information use. However, the structure and organisation of health information systems are similar in Namibia, with the same data collection tools and staff complement model used across Namibia. The views of different cases of nurses from different primary healthcare facilities and healthcare managers at different levels in health systems would

also reflect similar experiences in other regions. The private healthcare facilities were not considered because they do not use similar data collection tools used by RHIS in the public health sector.

Data were collected from two facilities from urban areas, which are in two different districts and two facilities from rural areas. The health facilities are in urban areas and provide comprehensive primary health services, including child health services. The services are offered eight hours a day and at least five weeks. Urban primary healthcare facilities have around ten nurses on staff, although not all were present during the interview. Furthermore, Urban health facilities are within two kilometres of the district health offices, meaning the proximity to district officers and logistics such as data collection tools and internet coverage.

The rural health facilities in villages with fixed structures and the same comprehensive primary healthcare are open for at least eight hours. However, those health facilities provide emergency and midwifery services. Rural health facilities staff establishments are usually six nurses and they are 10 to 150 kilometres away from the district office.

3.3 RESEARCH METHODS FOR PHASE ONE: FOCUS GROUP INTERVIEWS WITH NURSES AT PRIMARY HEALTH CARE

Research methods provide an outline of the techniques used in the collection of data or evidence for analysis in order to uncover new information or create a better understanding of a topic (Brink et al 2018:58). The research methods described in this phase include population, sampling, data collection approach, data collection processes, data analysis for Phase 1.

3.3.1 Research population

The population is all the elements that meet the inclusion criteria in the study (Burns, Gray & Grove 2015:46). Research population sets boundaries regarding the elements or participants (Brink et al 2018:116). In this study, the population were nurses working at primary healthcare facilities in ||Karas. Since this was a collective case study, the context was used to subdivide nurses into those working in rural and urban facilities. However, they all performed similar primary healthcare services, especially child healthcare. These nurses were expected to document, collate, analyse, disseminate and use routine health information to improve service delivery at their facility. The population size of nurses at Primary Health Care facilities in ||Karas region was sixty (60).

3.3.2 Sampling

Sampling is a process of selecting participants from the population in order to get information on a phenomenon in a way that represents the study population (Creswell & Creswell 2023:198).

The study used non-probability sampling, which is constructed from an objective judgement. The direction the sampling takes will be a decision made by the researcher as the study progresses (Brink et al 2018:124). In this study, non-probability sampling required the researcher to select participants who were knowledgeable about the topic under study. Participants were recruited using a homogenous purposeful sampling technique. Homogenous purposeful sampling focuses on one particular sub-group where all participants in the sample are similar, such as a certain occupation or level in the healthcare setting. The strength of homogenous purposeful sampling is that it allows the researcher to select the sample based on the knowledge and experience of the RHIS (Fouché et al 2021:382).

Homogenous sampling was selected for this study to gain nurses' perspectives on how they viewed, experienced, interpreted and understood RHIS. This is because they had a unique experience of providing services to clients as well as documenting them in various data collection tools. Therefore, their participation enriched the study on data management process and information use at the point of care. Homogenous sampling focuses on selecting participants who have experience and knowledge (Grove & Gray 2019:248). Participants were knowledgeable and willing to share rich and in-depth information about data management processes at the primary healthcare facility. Sampling continued until data saturation. Data saturation is the guiding principle for sampling in qualitative research, where the researcher collects data until a point is reached where no new information is generated and the responses of participants become repetitive (Fouché et al 2021:373). The focus was on understanding and describing the implementation of RHIS in order to get depth and richness of data to answer the research questions (Polit & Beck 2018:200). Phase 1 had 22 participants from four focus groups. Four PHC Facilities were purposively sampled as units of analysis, two from rural areas and two from urban areas. The rationale behind the stratification of urban and rural primary health facilities is to understand different perspectives of the experiences of nurses regarding the data management process and their use of data in managing child health. These primary healthcare facilities have unique experiences in terms of proximity to district offices and access to ICT and Internet services.

Inclusion criteria

Eligibility criteria included**:**

- Nurses directly involved in data management processes and child healthcare
- Nurses with experience of one year and more in primary healthcare facilities

Exclusion criteria

- Nurses not involved in child healthcare services.

3.3.3 Data collection approach

Data collection is a systematic way in which the researcher gathers relevant information to answer the research question (Brink et al 2018:133). Data collection in most qualitative research is related to the participants' thoughts, ideas and perceptions. Hence, most of the data collection methods used in qualitative data are interviews, which can either be individual in-depth interviews, focus group interviews or observing participants (Grove & Gray 2019:77).

In this study, data was gathered by interviewing the research participants. The researcher used focus group interviews designed to get the participants' understanding and experiences on generating, processing, analysing and using routine health information in decision-making. A Focus group interview is an interactive discussion between five to eight pre-selected participants led by a moderator and focusing on a specific set of issues. The aim is to gain a broad range of views on research topics in a group (Fouche et al 2021:361).

The use of a focus group can enhance people to help participants express and clarify their views with the assistance of others, unlike in the individual interview. Furthermore, focus group interviews can provide insight into multiple and different views and the dynamics of interaction within a group context, such as consensus, disagreement and power differences among participants. In focus group interviews, the group of people who are social beings construct meanings together; thus, ideas are developed by working together (McArdle, Foriester & Garret 2020: 1315). Focus group interviews were ideal for this study as they provided an opportunity for interaction and eliciting experiences, views, and perspectives on data management process and data use among nurses working together in one primary healthcare facility. Participants were able to complement each other by providing greater detail on data collection and collation at their health facilities (Gill & Bailie 2018: 671). The advantage of focused group interviews is that participants share their thoughts with - one another, generate ideas, and consider a range of views before answering (Brink et al 2018:144). The focus group interview used a semi-structured interview guide.

The semi-structured interview guide was developed based on the research purpose, objectives and questions of the study as well as literature on routine health information systems (Gill & Bailie 2018:669). A semi-structured interview contained pre-determined areas of questioning with the flexibility of probing more information from the participants about a particular aspect (Grove & Gray 2019:77). Semi-structured interview assisted the researcher to be focused on specific areas of RHIS implementation and allowed participants to express themselves freely (Brink et al 2018:144). The interview guide consisted of two sections. Section A collected data on the demographic information of the participants in focus groups, while section B elicited information on the understanding and experiences of nurses regarding the data management process and utilisation of RHIS in managing child healthcare and their perspective on how to produce reliable information for child healthcare. However, the researcher also probed into some aspects of data flow between levels of the health system, their understanding of the data they collect and the country reporting on morbidity rates and immunisation coverage, among others, to gain in-depth information from nurses based on their responses. The semi-structured interview schedule was submitted to the supervisor to comment on structure, writing style and comprehension. In addition, the guide was pre-tested with three nurses working at a primary healthcare facility from another region. Hardap Region. The participants were asked to comment on their understanding of the questions and content. In addition, the researcher also assessed the responses from participants to research questions. All the inputs were used to refine the final interview guide. The semi-structured interview guide for focus group interviews (Attached as Annexure C).

3.3.3.1 Data collection processes

The researcher identified a gatekeeper from each primary healthcare facility where interviews were conducted among nurses; the gatekeeper assisted in obtaining informed consent and first established rapport with participants a day before the interviews. The researcher explained the purpose and the title of the study to the gatekeeper. The proof of ethical clearance (Annexure D), letter of permission (Annexure G), information and informed form (Annexure B) and demographic form were sent in an envelope to the gatekeeper and observed COVID-19 precautionary social distancing, sanitising the hands before handling the envelope and wearing a mask to comply with the state of emergency regulations. The aim of performing some of these tasks a day before was to give participants a chance to think if they would participate or not.

The nurses who met the inclusion criteria and willingly participated signed the informed consent and demographic form by the gatekeeper who signed as a witness for both participating in the study and to be recorded. Data collection was conducted during the COVID-19 pandemic. Hence, the researcher discussed with the gatekeeper COVID-19 precautionary measures and compliance with the state of emergency regulations of COVID-19 of sanitising hands, social distancing and wearing masks when explaining the study and signing the informed consent.

Information was provided for each session. The researcher collaborated with the gatekeeper at each Primary Health Care facility in order to ensure were interview was conducted at a convenient time for the participants. Adequate arrangements were made regarding the venue and the time for each facility.

3.3.3.2 Facilitation of interviews

The researcher facilitated the focus group interview. The researcher introduced herself and gave participants an opportunity to introduce themselves, and were asked to put their phones on silent before the actual interview commenced. The focused group interviews were conducted face to face in a big room. Participants were one metre apart with face masks during the interview, and there was a notice put on the door written “Interview in session, do not disturb”. The facilitator also emphasised that one person should speak at a time and loudly. The researcher recorded the focus group interviews using an audio recorder. All participants were encouraged to participate in order to ensure that there was a balanced set of different views and opinions. An average focus group interview lasted for an hour and thirty minutes.

3.3.6 Data analysis

Data analysis involves categorising, ordering, manipulating and summarising the data and describe in a meaningful term (Brink et al 2018:165). The study used thematic analysis to analyse data. Thematic analysis is considered a foundational method for qualitative analysis that underlines core skills for conducting many forms of qualitative analysis (Fouché et al 2021:403).

3.3.6.1 Thematic analysis

Thematic Analysis is a method of analysing qualitative data that entails searching across a data set to identify and report patterns within data. Thematic Analysis describes data and as well as interprets the processes of selecting codes and constructing themes (Kiger & Varpio 2020:847). Thematic analysis was used in order to understand the meaning of the experiences of the participants and give an interpretation of the data collected from the nurses. The study used inductive thematic analysis using the six-phase process as proposed by Braun and Clarke 2006. The advantage of using inductive thematic analysis is that code categories are not pre-determined but identified and named as the researcher reads through the data. Hence, the researcher used inductive analysis in this study, where open coding was employed to identify and name concepts and patterns in the data (Bingham 2023:2).

Phase one: Familiarisation with data
This phase involved a transcribing interview, and transcription is critical in qualitative research because it is a verbatim transcript that captures participants' own words and language (Creswell & Creswell 2023:207). In this study, the researcher transcribed the interview recordings word by word of what each participant said, including all noises such as laughing, coughing and crying (Grove & Gray 2019:84). The researcher transcribed the interviews using otter.ai software. The researcher read all the transcripts carefully, highlighted all the interesting information, and cross-referenced with research questions. The main aim of going through all transcripts in such a way was to be fully immersed in the whole data set and collect initial points of interest (Dawidi 2020:67).
Inductive thematic analysis suits the case study as the researcher identified codes, categories, and themes, compared the data with various transcripts from different units of analysis and assessed similarities and variations in the data management process and the use of data.

- Phase two: Generating initial codes

The researcher allowed the richness of initial findings to emerge, and the researcher reread all transcripts before creating codes (Maguire & Delahunt 2017: 3355). Then, the researcher began with the coding of transcripts. Coding was done manually by the researcher with the assistance of the supervisor. Coding is a process of reading the data, breaking text down into parts providing a label for each part. The aim of coding and category construction was based on information characteristics in order to obtain a theme related to the phenomenon (Grove & Gray 2019:85).

In this study, the researcher reread one transcript at a time and highlighted the content-that relates to Health Information Systems, experiences in data management processes, data quality and information use of the nurses. The researcher developed initial codes based on sub cases which are nurses from rural and urban areas and then merged to assess similarities and variations. Then, the researcher wrote down thoughts on that information in relation to research objectives and questions.

- Phase three: Search themes

Themes are broad units of information that consist of several codes aggregated to form a common idea. The theme represents some level of patterned response or meaning with the data set. The themes represent some level of patterned response or meaning within in data set (Kiger & Varpio 2020:849). There are no set fast rules about what makes a theme. A theme is characterised by its significance. If there are small data sets, there can be an overlap between the coding stage and the stage of identifying themes (Maguire & Delhaunt 2017:3356).

In this study, the codes were organised into broader sub-themes, then themes that seemed to indicate something specific about the research question. The themes were mainly descriptive, meaning they described the patterns in the data relevant to the research question (Maguire & Delahunt 2017:3356). The researcher reread, and different codes were combined into potential sub-themes and then into themes. This is because this process is explorative in nature, it was crucial to reread all transcripts before clustering into sub-themes and themes. The researcher also reviewed the literature to validate if the identified themes were meaningful.

This study identified patterns and responses and assessed similarities and variations among responses to assemble them into categories and address research questions.

- Phase four: Review themes

During this phase, the researcher reviewed modified preliminary themes that were identified in phase 3. During this phase, all themes were brought together with the purpose of refining those themes which were initially grouped and assessing if the presentation of those themes was in a systematic way (Dawadi 2020:67). In this study, the researcher reread all the cluster themes and check whether they were coherent pattern in their themes and sub-theme that overlapped were re-arranged with assistance of the coder.

- Phase five: Define themes

Phase five commences when there is a satisfactory thematic map of the data. In this phase, a researcher defined and further refined the themes that will be presented for data analysis. In this stage, the research identified the essence of what each theme is about and determine what feature of the data each theme captures (Creswell & Creswell 2023:209). The researcher provided a detailed narrative analysis of each theme and provided interconnectedness among the themes to tell a meaningful story about the study in relation to research objectives and questions. In this study, the researcher also extracted each theme and organised them in an orderly and consistent way.

- Phase Six: Writing up

This is the final phase of analysis, where there is a set of fully worked-out themes. The researcher engaged in a narrative analysis of data beyond the description of data (Dawadi 2020:70). A comprehensive analysis of the themes was done, grounded with adequate evidence from the literature to give interpretations.

3.4 RESEARCH METHODS FOR PHASE TWO

3.4.1 Population

The study population was district, regional and national healthcare managers who were managing child healthcare services using data from the facilities. These were professionals who provided feedback on facility performance and ensured nurses were trained, and that adequate resources were available to be used are available at primary healthcare facilities where comprehensive child health is offered. There were 14 healthcare managers in the ||Karas region; however, other health managers from the national level were included to enrich the data. This phase had two sub-cases, namely, managers whose role is to oversee and manage child healthcare programmes, and the other sub-case is managers who were primarily involved in health information management.

3.4.2 Sampling

In this phase, non-probability purposive sampling was utilised to recruit district, regional, and national healthcare managers. Purposive sampling was chosen because the researcher believed that these participants had insights and rich information regarding the use of the Routine Health Information System in the management of child health care. In qualitative research, the sample size is normally based on the depth of data gathered. Hence, the researcher collected data until saturation (Polit & Beck 2018:201). Data saturation is when there is repetition in data collected and no new information emerges, rather than the same data that has already been collected (Grove & Gray 2019:251). This phase had 15 participants. Among these participants, eight (8) were from the subcase of healthcare managers responsible for health information systems, whereas seven (7) were managers responsible for managing child healthcare programmes.

The eligibility criteria were:

Inclusion criteria

- Healthcare managers at district, regional and national levels in ||Karas region and at national level using RHIS in managing child healthcare services.

Exclusion criteria

- District and regional managers not involved in child healthcare data.

3.4.3 Data collection approach

In this phase, the researcher used individual in-depth interviews. An in-depth interview is a one-on-one method of data collection that involves the interviewer and interviewee discussing specific topics in-depth (Gill & Bailie 2018:669). The in-depth interview was used to seek information on individual experiences of the data management process and how routine health information was utilised to make decisions on child healthcare. The study collected data from two subcases: healthcare managers who manage child healthcare through individual interviews (Annexure E) and healthcare managers responsible for health information systems (Annexure F).

The semi-structured interview guide was developed based on the literature on Health Information Systems and the research objectives and questions. In addition, the guide also contained questions based on key issues and inferences from Phase 1 findings. This approach was appropriate as it gave the researcher and participants much flexibility. The researcher was able to follow up on a particularly interesting avenue that emerged in the initial interview, and the participant was able to obtain a coherent picture regarding issues arising from nurses' experiences and views and related that to their roles (Polit & Beck 2018:204). The semi-structured interview was pre-tested with one manager from another region, Otjozondjupa. The participant was asked to comment on his understanding of questions and content. The researcher also assessed how the participant how participants responded to research questions. In addition, the supervisor also gave input on the interview guide and all inputs were incorporated into the final intervention guide.

The rationale behind interviewing healthcare managers individually was to obtain adequate information on health information systems, designs, infrastructures, data management processes, supervision, and management of child healthcare. The study used both Zoom calls and face-to-face interviews. The Zoom interview calls created a balanced distribution power between the interviewer and participants. A Zoom interview call provides the best source of information when the researcher has no direct access to individuals. It encourages the interviewee to talk openly and freely but, importantly, allows control of the interviewer, who can direct the conversation to the area (Faroog 2015:8). The Zoom calls were conducted for participants who were not available for face-to-face interviews because of their busy schedule, they often travelled outside their duty stations. The advantage of face-to-face interviews was the ability to additionally record emotional clues, such as discomfort or enthusiasm, with questions that could not be picked up with any other interview methods (Grove & Gray 2019:78). In this study, face-to-face interviews were conducted at the convenience of participants.

3.4.3.1 Data collection process

The researcher made appointments telephonically with interviewees a day before the interview and explained the purpose of the study. The ethical clearance letter, letter of permission to conduct research, biographic form, information letter and informed consent form were emailed to potential participants. The colleague signed as a witness. The researcher arranged individual interviews with the participants, which were scheduled at a time convenient to them.

3.4.3.2 Facilitation of the interviews

The researcher facilitated both face-to-face and Zoom interview calls. Seven (7) participants were interviewed through Zoom interview call, whereas eight (8) were interviewed face to face. The researcher asked the participants to complete the biographic form and sign the informed consent for participating in the interview and the audio tape recording (Annexure B) before the actual interview commenced. The researcher asked the participant a grand question and probed for more information. The researcher assured the participants that there were no wrong or right answers and that they should express themselves freely. The researcher generated information through interaction with the interviewees by asking an initial question in such a way as to encourage the participants to talk freely. Follow-up questions were done until no new data emerged (Gill & Baillie 2018:669). An average interview lasted for one hour and thirty minutes, and the researcher listened to the audio after each interview. Transcription was done after each interview using the otter.ai software. This assisted the researcher in modifying the interview guide for the next in order to obtain adequate data on the research problem (Creswell & Creswell 2023:194).

3.3.4 Data analysis

Data analysis is the process of bringing order, structure and meaning to the data collected (Fouché et al 2021:391). Qualitative researchers typically scrutinise data by reading data repeatedly in order to gain understanding. Hence, qualitative researchers are required to be proficient in identifying patterns and synthesising them together into an integrated report (Polit & Beck 2018:277). In this study, the researcher used thematic analysis.

3.3.4.1 Thematic analysis

This study used inductive thematic analysis using a six-step-by-step guide. Thematic analysis is a process of identifying patterns or themes in data collected through qualitative data (Maguire & Delahunt 2017:3352). The goal of thematic analysis is to identify themes, particularly the patterns in the data that are important or interesting and use these themes to address the research objectives. Inductive thematic analysis just guides, and there is no hard or fast rule to follow from one step to another. Thematic is more than summarising data; hence, a good thematic analysis interprets and makes sense of data (Kiger & Varprio 2020:847). The study adopted the thematic analysis used in Phase 1.

3.5 INTEGRATION OF PHASE 1 AND 2

Integration is described as combining or merging two data sets and connecting them by one building on the other (Creswell & Creswell 2023:233).

The integrations of Phase 1 and Phase 2 provided new insights that emanated from both data sets. As this study used a collective case study approach, the integration of Phase 1 and Phase 2 findings provided diverse perspectives. Therefore, the findings provided collective experiences that contributed to a comprehensive and in-depth understanding of the data management process and information use across different cases. Those multiple perspectives provided a rich and multi-dimensional picture of RHIS and how it is utilised to allocate resources, build capacities and make decisions for child healthcare.

3.6 RESEARCH METHODS FOR PHASE 3 (MODIFIED DELPHI)

The Delphi method is an iterative approach to research in which participants are presented with a report on the findings during each questionnaire round. This offers them the ability to confirm or revise their previous answers. The key feature of the Delphi method is specifically the use of a purposively selected panel of experts to attain consensus on a particular issue (Fletcher & Marchildon 2014:3).

In this study, a modified Delphi method was used in two rounds with controlled feedback because the researcher decided on feedback based on responses to the items and open comments (Nas et al 2021:119). The modified Delphi was chosen for this study because it allowed the experts to rate their responses and present opinions for each strategy or action plan (Eubank, Mohtandi, Lafare, Wiley, Bois, Boorman & Sheps 2016:2). Therefore, the feedback from experts was incorporated in the strategy statements as well in action plans.

3.6.1 Population

The modified Delphi population included district and regional managers from the ||Karas region as well as managers from the national level. These healthcare managers were regarded as experts based on their experiences and involvement in the Namibian Health Information System and the expected RHIS tasks.

3.6.2 Sampling method and procedure

The modified Delphi in this study used a non-probability, purposive sampling to select experts in Health Information Systems and child healthcare services. The researcher recruited the Health Information System managers from various levels in the health system, including healthcare managers such as the deputy director of Health Information System and child healthcare and managers responsible for Health Information Systems at regional and district levels. The choice of participants was based on their experience in the position of HIS and managing child healthcare for four years and above.

The researcher contacted the experts through phone calls to seek their participation. The questionnaire with proposed strategies (Annexure I) was sent through email to each expert, as well as the information and consent form (Annexure H). The sample consisted of ten members of the panel of experts. A questionnaire in modified Delphi was used to provide them with proposed strategy statements and rate their response. Participants can add feedback on structure and suggest modifications to the statements of proposed strategies and action plans,

3.6.2.1 Inclusion criteria

- The participants had to have four years of experience in health information systems or managing child healthcare.
- Be employed in the Ministry of Health and Social Services.

3.6.2.2 Exclusion criteria

- Managers not involved in health information systems or child healthcare.

3.6.3 Development of strategies

Evidence gathered from Phase 1 and Phase 2 of the study was used, and gaps were identified. These gaps and related provided evidence for the formulation of focus areas and strategies. The focus area included strategies to improve and strengthen the data management process, improve the legislative framework, enhance data quality and strengthen the use of routine health information in managing child healthcare.

3.6.3.1 Modified Delphi data collection and analysis

Modified Delphi methods can be defined as a formal group of a consensus process that systematically combines experts' opinions and asks panellists to rate, discuss, re-rate and give comments on a proposed framework or strategy (Nasa et al 2021:117). A questionnaire was sent to experts via email.

3.6.3.1.1 Round one

In round one, the questionnaire was sent to ten experts via email. The experts were given five days to complete and return the questionnaire. The questionnaire contained demographic questions and the proposed strategies. The proposed strategies included action plans and a responsible person. Likert scale questionnaire was presented to the experts to rate 1- agree, 2- neutral and 3-disagree. Furthermore, there was an opportunity for remarks/reasons for the lowest rating. The remarks were added to the new action plans. Phase one was conducted among experts from the Ministry of Health and Services at experts from district, regional and national levels. Round one was done in July 2023.

3.6.3.1.2 Round two

In round two, the researcher sent a revised questionnaire to the ten (10) experts via email. The experts were given five days to complete and return it. However, only eight experts responded. A validation tool was included to assess the scope and purpose, clarity, feasibility, importance, quality of the content, appropriateness, and value of the proposed strategies if the population is well described. Round two was done in August 2023.

3.6.3.1.3 Data analysis

The study used descriptive statistics to calculate the frequency of responses and percentages for both rounds one and two. Consensus was set to 70% or more of agreed statements. A study by Barrios, Guilera, Nuno and Gomez-Benito (2021:2) indicated that Delphi methods have no definite acceptable standards in terms of percentage of consensus, but (50%-59%) seemed to be as reasonable. However, the 70% consensus among participants was found to be the most suitable to use in the modified Delphi method. The detailed description of the modified Delphi method is discussed in Chapter 6.

The following diagram presents the steps that were used in developing the strategies.

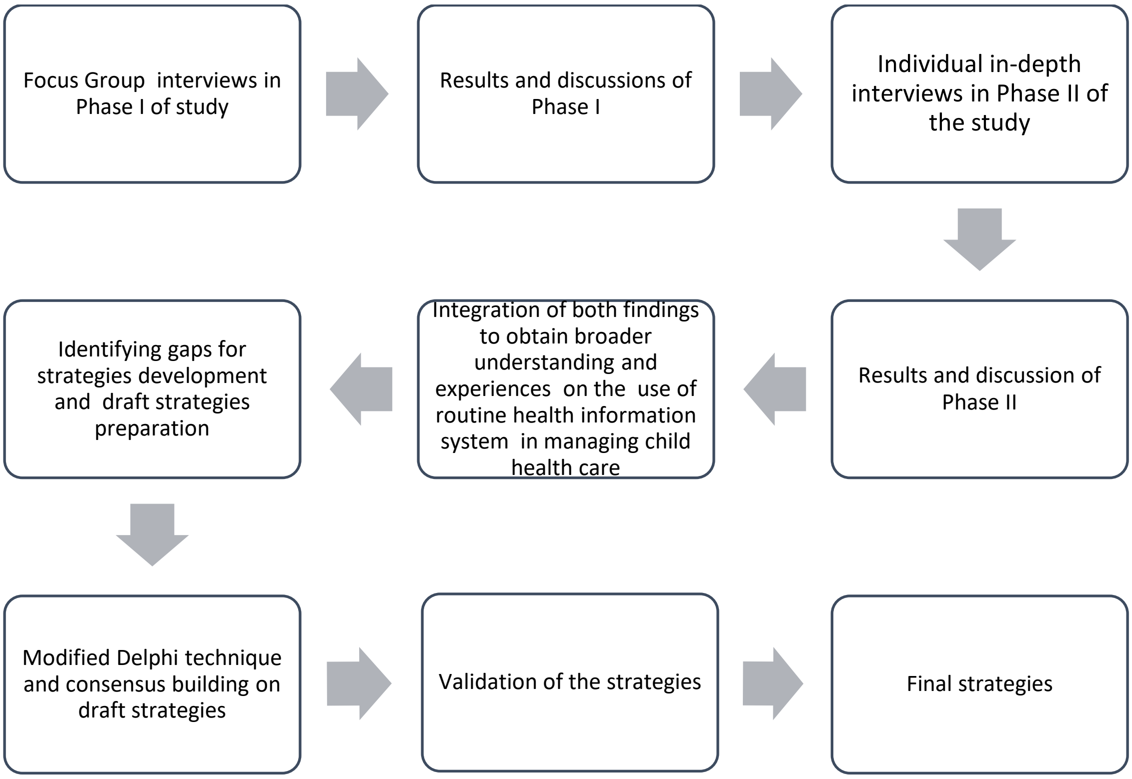

Figure 3.2: Steps for strategies development

3.7 TRUSTWORTHINESS OF THE STUDY

Trustworthiness is a concept used to ensure that there is reliability and validity of the research instruments in the qualitative study to ensure that there is consistency across studies and among researchers (Brink et al 2018:158).

In Phase 1, Phase 2 and Phase 3, the researcher enhanced the rigour of the research by ensuring that there is trustworthiness through credibility, conformability, transferability and dependability.

3.7.1 Credibility

Credibility alludes to confidence in the truth value of the data collected and interpreted (Polit & Beck 2018:295). The credibility of this study was enhanced through data collection until the saturation point; hence, there was prolonged engagement with participants. The researcher acquired an in-depth understanding of the phenomenon as perceptions or views, culture and experience (Brink et al 2018:159). The researcher spent enough time and interacted with the participants optimally to develop a trusting relationship with them during the interviews.

Furthermore, the researcher also enhanced credibility through member checks. This involved taking data, analyses, interpretations and conclusions back to the participants to ensure an accurate portrayal of participants' voices by allowing them an opportunity to confirm or deny the accuracy and interpretation of data, thus enhancing the credibility of the study (Creswell & Creswell 2023: 213).

In this study, a member check was performed by presenting coded transcripts of interviews to the participants in order to ensure that all information was captured. However, the majority of the participants did not give feedback on their coded transcripts provided to them. The researcher also got a co-coder who read the transcripts and listened to the recordings to compare the researcher's data analysis.

3.7.2 Conformability

Conformability refers to objectivity and the potential for congruence between two or more independent people regarding data accuracy, relevance or meaning (Polit & Beck 2018:296). Conformability deals with establishing whether data represent the information provided by the participants and that the researcher's imaginations did not drive the interpretations; hence, it must reflect the voice of the participants (Brink et al 2018:159).

In this study, conformability was ensured through an audit trail. An audit trail was created by way of recording, thus ensuring transparency. Therefore, data collected from the participants reflected participants' voices. This was achieved through bracketing and providing direct statements from the participants', meaning data was obtained from the interaction between the researcher and participants. Summaries, themes, sub-themes, and categories developed during the analysis will present the participants' views from the interview. Recording and transcripts were juxtaposed to enhance conformability.

3.7.3 Transferability

Transferability refers to the degree to which study findings fit in another context or setting (Brink et al 2018:111). The findings of the study should provide an adequate description that the findings of the study will be applicable in another context (Polit & Beck 2018:296). The researcher has a responsibility to provide a thick description of the research context and adequate data so that the reader can assess and evaluate the applicability to other contexts (Fouché et al 2021:393). In this study, purposive sampling was performed in order to get the participants who had experiences and knowledge in Health Information Systems, data management processes and information use, such as nurses working at primary healthcare facilities and healthcare managers involved in the data management process and utilising routine health information to decide on child healthcare. The researcher made sure that the data collected was rich and detailed descriptions obtained from participants in order to ensure the transferability of the findings to other similar contexts. The researcher also shared the transcripts and findings with the supervisor, who examined the findings, interpretations, and recommendations and verified that the data supported them.

3.7.4 Dependability

Dependability refers to the stability of data over time and conditions. The dependability question would be whether the study findings would be repeated if the inquiry were replaced with the same participants in the same context (Polit & Beck 2018:296). In this study dependability was enhanced by clear documentation of research design and implementation of the study. Data analysis was also done to indicate how the interpretation of the findings was made. In addition, data were collected from multiple sources in order to gain a broader understanding of the Health Information System and how routine health data was managed through different levels.

3.8 ETHICAL CONSIDERATIONS

Researchers are responsible for complying with the ethics of research. Failure to do so undermines the scientific process and may have negative consequences (Grove & Gray 2019:90).

3.8.1 Permission to conduct the study

The researcher obtained ethical clearance from the Health Studies Research Ethics Committee at the University of South Africa, ERC reference #HSDHDC/1012/2020, before commencing with the actual research (Attached Annexure D). The researcher requested permission from the Ministry of Health and Social Services (MoHSS) to conduct research (Annexure A). Permission was obtained from the Executive director of the Ministry of Health and Social Services (Annexure G).

3.8.2 Protecting the rights of the participants

The Belmont report articulated ethical principles in which standards of ethical research are conducted based on informed consent, the right to justice, the right to privacy and confidentiality and anonymity (Polit & Beck 2018:79).

3.8.2.1 Informed consent

Informed consent means that participants have adequate information about the study, comprehend the information and have the power of free of choice, enabling them to consent to or decline participation voluntarily (Creswell & Creswell 2023:97). The participation should always be voluntary, and no participants should be forced or coerced to participate in a study (Brink et al 2018:30). In this study, the participants participated voluntary basis and that they had a right to withdraw from the study at any time without penalties.

In this study, the participants were provided with detailed information with regard to their participation in the study and the Delphi process. Information and informed consent for participation in the study (Annexure B) and Information and consent form letter for modified Delphi (Annexure H).

3.8.2.2 Beneficence

Beneficence refers to the securing of the well-being of the participants and protecting them against discomfort and harm (Brink et al 2012:35). In research, discomfort and harm can be emotional, social, economic, or physical or combinations (Grove & Gray 2018:102).

In this study, no harm was anticipated from participation. The researcher used the principles of beneficence with the dimension of freedom from harm: no client-linking data was collected. Although the study will not offer immediate benefits to the participants, the findings will benefit nurses, healthcare managers and policymakers in understanding routine health information systems. The strategies developed can improve the use of data in decision-making, which ultimately leads to improved child healthcare.

3.8.2.3 The right to justice

This ethical principle implies that there should be fair selection and treatment of participants. The participants were fairly treated based on research questions and objectives (Grove & Gray 2018:103). Therefore, the selection of participants was based on research requirements and not on people's vulnerabilities. The right to fair treatment was observed, and those who declined to participate in a study were not penalised in any way (Polit & Beck 2018:81). Participants in this study were treated the same, and no incentives were provided for taking part in the study.

3.8.2.4 The right to privacy and confidentiality

These principles deal with an obligation to keep the personal information of the participants private, while confidentiality means that the participants' names were kept secret and information will not be released in such a way where it would be linked to a specific individual (Fouché et al 2021:124).

In this study, the researcher conducted Zoom interviews and face-to-face interviews in a private room with limited access. The researcher did not write the names of the participants on the field notes or the report. The names of the participants were not mentioned in the audio tape. Thus, there was no link between the information on the audio tape and the field notes with the participants.

3.8.2.4 Principle of anonymity

Anonymity refers to the most common means of protecting confidentiality when the researcher cannot link participants to their data. This means that no one, not even the researcher, should be able to identify the participants after the study (Grove & Gray 2018:84).

In this study, the researcher did not write the names of the participants on the transcripts or the questionnaires for the modified Delphi technique. In addition, the consent forms were not stapled together with transcripts or questionnaires. The audio recordings were kept in the safe cupboard, and access was limited to the researcher only.

However, complete anonymity was not possible because the researcher knew some of the participants in the study but assured them that confidentiality would be maintained throughout the study. This corresponds with Grove and Gray (2019:90), who stated that in most studies, researchers know the identity of their subjects; however, they should promise to keep the identity of the participants anonymous and that research data remains confidential.

3.8.3 Dissemination of the findings

There are various reasons why people disseminate the findings of the research. At its core, the main purpose of disseminating is to make a difference in practice services delivery or, in essence, to advance impact (Fouché et al 2021:139). The study findings will be disseminated to the MoHSS headquarters and ||Karas Health Directorate through a written report. In addition, the study findings will be disseminated globally through publication in accredited journals and presented at international conferences.

3.8.4 Scientific integrity of the study

The goal of each study is to generate sound scientific knowledge; however, it should be conducted in an ethical manner (Grove & Gray 2019:115). In this study, the researcher maintained all ethical principles and scientific research methods throughout the study. The information and findings reported in this study were the true reflection of the data obtained from the participants and were not fabricated.

3.9 Summary

The chapter described the research design and methods, the study population and techniques. The collective case study was the preferred research design as it assisted in drawing comparisons regarding data management processes, experiences of routine health information systems and use of data in managing child health among nurses working in rural and urban health facilities. In addition, the comparisons between healthcare managers in health information systems and child healthcare present unique experiences on how RHIS could be improved and address the information needs of the users in order to make decisions makings on child healthcare. The data collection approach, process and data analysis using inductive thematic analysis with six step-by-step guides were also discussed in detail for all phases. The trustworthiness of the research and ethical issues were also presented in detail. The next chapter presents the findings and literature control.

CHAPTER 4
PRESENTATION OF THE FINDINGS AND LITERATURE CONTROL

4.1 INTRODUCTION

This chapter gives an overview of the findings that emerged from the data analysis of focus group discussions with nurses working at Primary Health Care facilities in Namibia and in-depth interviews conducted with healthcare managers in the same locality. Themes, sub-themes and categories that emerged are presented, along with verbatim quotes from participants. Literature is used to control and provide context to the findings. The study utilised a collective case study method; therefore, context mattered; the primary health facilities represented the main real-life context where the Routine Health Information System was generated and utilised. District, regional and national offices of managers were the secondary real-life situations where RHIS was utilised (Polit & Beck 2021:720). The first section of this chapter presents Phase 1 findings, followed by Phase 2 findings.

4.2 PRESENTATION OF FINDINGS: PHASE 1

This phase presents data from focus group interviews held with nurses from primary healthcare facilities. The objectives of the phase were to explore and describe nurses understanding of Routine Health Information Systems and to explore nurses' experiences of Routine Health Information System utilisation in the management and planning of child healthcare services.

4.2.1 Participants' demographic information

Table 4.1 provides the demographic data that describe the specific attributes of the participants. It is a depiction of participants' gender, age, participant highest qualifications, years of experience as a nurse, professional category and location of the Primary Health Care facility. The following labels are used to indicate the groups and participants. FG1, FG2, FG3, FG4 and P1 to P6 for participants.

Table 4.1: Demographic Information of the participants

Parameter	Focus Group 1 N=6	Focus Group 2 N=5	Focus Group 3 N= 5	Focus Group 4 N= 6
Gender	Male: 0 Female: 6	Male: 0 Female: 5	Male: 2 Female: 3	Male: 2 Female: 4
Age Group	20-29 yrs:0 30-39 yrs: 4 40-49 yrs:1 50 yrs+:1	20-29 yrs:2 30-39 yrs: 2 40-49 yrs:1 50 yrs+ 0	20-29 yrs: 3 30-39 yrs: 2 40-49 yrs:0 50 yrs+: 0	20-29 yrs:4 30-39 yrs: 2 40-49 yrs:0 50 yrs+: 0
Highest Qualification	Master: 1 Bachelor Honours: 0 Diploma: 1 Certificate: 4	Master: 0 Bachelor Honours: 2 Diploma: 1 Certificate: 2	Masters: 0 Bachelor Honours: 1 Diploma: 2 Certificate: 2	Master: 0 Bachelor Honours: 1 Diploma: 3 Certificate: 2
Experience in Primary Healthcare	1-3 yrs: 1 4-6 yrs: 3 7-9 yrs: 0 10 yrs +: 2	1-3 yrs: 3 4-6 yrs: 1 7-9 yrs: 0 10 yrs +: 1	1-3 yrs: 2 4-6 yrs: 2 7-9 yrs: 1 10 yrs+ :0	1-3 yrs: 4 4-6 yrs: 0 7-9 yrs: 1 10 yrs +: 1
Location of Facility	Rural	Urban	Rural	Urban

Table 4.1 indicates that 22 nurses participated in the focus group interviews, of whom four were males and 18 were females. The average age range of the participants was between 30 to 39 years old. The majority of the participants' highest qualifications was a diploma, followed by those with a Bachelor of Nursing Honours. The table also indicated that the majority of the participants' average years of experience in primary healthcare is two years. Two primary health facilities were situated in urban areas, while the other two were in rural areas.

4.3 THEMES

A theme is defined as a patterned response or meaning derived from data that informs the research question (Kiger & Varpio 2020:848).

Two themes, seven (7) sub-themes and twenty-eight (28) categories emerged from the findings. The interrelatedness of content guided the grouping of themes, sub-themes and categories during thematic analysis.

The following themes emerged from the findings:

THEME 1: CHILD HEALTHCARE AND ROUTINE HEALTH INFORMATION SYSTEM IN NAMIBIA
THEME 2: CULTURE OF HEALTH INFORMATION USE

4.3.1 Theme 1: Child Healthcare and Routine Health Information System in Namibia

The Routine Health Information System (RHIS) is essential in planning and management; it is a sub-system of the country's Health Information System (HIS) that captures data utilised for policy formulation, monitoring and evaluation and programme planning (Bhattacharya et al 2019:1).

Four sub-themes emerged: Organisation of child healthcare programme in Namibia, Understanding of RHIS, routine data management processes and RHIS challenges. The sub-themes and categories are presented in Table 4.2

Table 4.2: Theme 1: Child Healthcare and Routine Health Information System in Namibia

Theme	Sub-theme	Category
Child healthcare and RHIS in Namibia	Organisation of child health programme in Namibia	• Nutritional services • HIV-exposed children • Expanded programme on immunisation • Childhood Illnesses (outlier)
	Understanding of RHIS	• Meaning of RHIS • Level of confidence in generating routine health information • Data elements and indicators

	Routine Data Management Processes	- HIS Guidelines and protocols - Data collection and sources - Information flow - Data analysis - Data quality checks
	RHIS challenges	- Availability of resources - Design of RHIS (multiple data sources) - Insufficient RHIS specialised skills - Mobility of mothers and child health data - Poor data quality

4.3.1.1 Sub-theme: Organisation of child health programme in Namibia

In Namibia, the Ministry of Health and Social Services (MoHSS) formulates programmes, policies and guidelines related to child healthcare. This study contends that the structure and organisation of a child health programme provide the platform for healthcare providers to render services and, therefore, produce data. Participants emphasised the child healthcare programme and demonstrated reasonable insights into linking a health service to the production of data. However, their key focus was to improve the health of the children, especially the under-fives. Three categories emerged from this sub-theme: nutritional services, HIV-exposed children, and expanded programmes on immunisation.

4.3.1.1.1 Category: Nutritional services

Participants indicated that the child healthcare programme in Namibia is mainly offered at the Primary Health Care level, where they function. They described the nutritional services as very important due to the widespread challenge of malnutrition. Therefore, the focus on the services in the facilities was mainly preventative. They conducted assessments and produced data on Mid-Upper Arm Circumference (MUAC) growth monitoring. This was to identify the nutritional needs of under-fives, enrol the children in the Nutritional Assessment Counselling and Support Programme (NACS) and provide other appropriate care. They acknowledged that these were the important indicators for the HIS. The emphasis was both on physical and social determinants of malnutrition.

The following statements support the findings:

> *NACS is a nutritional assessment programme, we gather data and check whether the children is overweight or underweight, normal weight or to see whether the baby is growing, or we need to give this child plump nuts. We do follow up on the weight, for instance, checking weight every month and see whether the baby is also reaching the targeted weight, that is how I understand it (FG3 P3).*
>
> *When it comes to growth monitoring, we do that every month. Whenever a child comes, be it only for vitamin A, we will also give them appointments for the next visits to see how they are doing. If we find that the child, either dropped in MUAC or something, we refer them to NACS programme (FG4 P5).*
>
> *If a patient or a child is coming back every time with the same problem of malnutrition, we provide therapeutic food, but what is the circumstances at home? so we can also use that not only the health side, but assess the social aspect of the client (FG1 P2).*

Malnutrition remains a major problem in Namibia, especially undernutrition, with 24% of children <5 years stunted and 8% severely stunted. About 13% of Namibian children are underweight, and 5% are wasted (Mulenga, Amukugo & David 2018:655).

Bauleth, Mitonga and Pinehas (2020:24) indicated that unequal distribution of resources in Namibia and poor feeding practices among children under the age of five years are the contributing factors to undernutrition. Namibia uses anthropometric measurements to measure the nutritional status of children under the age of five years, weight for age, height for age and weight for height. Infant and young child guidelines recommend that mothers or caretakers bring their children for growth monitoring. The aim is to assess the growth pattern of children under five years old (MoHSS 2011:13).

4.3.1.1.2 Category: HIV-exposed children

HIV/AIDS preventative measures are an important component of child healthcare in Namibia. Programmes such as the elimination of Mother-To-Child Transmission (eMTCT) have been established, including prophylactic care for HIV-exposed babies. Participants indicated that at this level, the nurses' role includes capturing data on the number and outcomes of HIV-exposed children, and therefore, it is very important to ensure early identification of HIV-positive mothers, enrolment and adherence to treatment, and protection of babies from HIV infection. Screening and tests were conducted, in addition to health education and counselling.

The participants made the following assertions:

> *We capture Data on eMTCT programme which allows us to check number of children exposed to HIV and the rate of infections over a period of time, such as the months where more babies test positive, and the periods we have no positive* PCR *(FG1 P4).*
>
> *The nursing sister ensures adherence by checking the register constantly to identify mothers who did not come for follow up the person in charge will always initiate a follow up by calling the mothers to bring their children for HIV prophlyaxis FG4 P3).*
>
> *HIV exposed children come at six weeks, you need to make sure that DNA-PCR is done, if the mother is breastfeeding, you give health education to explain why we are giving nevirapine, why the CTX, why the multivites, why is it important for exclusive breast feeding. We explain to the mother to bring the child for screening three times, at six weeks, nine months ,and eighteen months all the interventions are documented (FG4 P2).*

Agabu, Baughman, Fischer-Walker, De Klerk, Muntenda, Rusberg et al (2020:8) revealed that Namibia has lower maternal-to-child transmission of HIV prevalence 1.7% due to high Antiretroviral Treatment (ART) maternal coverage of 96.8%. In addition, the study indicated that Prevention of Mother to Child Transmission (PMTCT) interventions such as periodic tests among pregnant and breastfeeding mothers, ARV prophylaxis to HIV-exposed babies, monitoring of maternal viral load and ensuring that there is viral suppression are undertaken.

According to Namibia National Guidelines on Antiretroviral Therapy, Namibia has adopted the elimination of mother-to-child transmission of HIV. The strategies are to intensify HIV screening among pregnant women where HIV-positive are put on ART, whereas HIV-negative pregnant women are tested every three months until they cease breastfeeding. The HIV-exposed infants are managed according to risk stratification. Elimination of mother-to-child transmission is monitored through assessing data collected routinely at the health facility (MoHSS 2019:18).

4.3.1.1.3 Category: Expanded programme on immunisation

The immunisation programme is one of the preventative measures taken by the government of Namibia in line with UN SDGs. Participants indicated that immunisation coverage is one of the key indicators used in assessing the performance of a child healthcare programme. Primary Health- Care, including community-based care was perceived as the most appropriate approach to increase coverage. Nurses demonstrated an understanding of preventing loss to follow up and indicated that their role was to make sure that mothers adhered to the schedule; they also involved community-based workers such as health extension workers to go out to the community to identify children who were not immunised.

Quotes from the participants:

> *Data help us to assess immunization programme, see our coverage, did we meet our targets, did we manage to immunize these number of children in order to protect children from childhood illness (FG3 P2).*

> *We need to make sure the mothers bring their children on time for immunization in order to complete their schedule (FG1 P4).*

> *When we realize that there are children in the community that are not immunized*, *we send out health extension workers to do house to house campaign to encourage the community to bring the children for immunization (FG1 P4).*

National level formulates child health indicators in partnership with developmental and technical agencies, not limited to the World Health Organization (WHO), United Nations Children's Fund (UNICEF), Centers for Disease Control and Prevention (CDC) (MoHSS 2010:10). Routine health information regarding child healthcare is mainly collected at primary healthcare clinics includes immunisation coverage, growth monitoring data, nutritional indicators such as underweight rate, wasting rate and stunting rate of children under five (MoHSS 2014:24).

Nurses play an important role in immunisation as they administer and generate data at the point of care. Furthermore, nurses also engage parents to ensure that they make informed decisions on the immunisation of their children and dispel myths and misconceptions related to immunisation in the community (Hill, Salmon, Chuldheigh & Altken 2021:954).

4.3.1.1.3 Category: Childhood illnesses (outlier)

A few participants participant highlighted that they generated data and required information on the top five diseases causing illnesses among children under the age of five years. The information was important in understanding the number of children with major illnesses such as diarrhoea, pneumonia and other diseases.

The following statements support the findings:

We need information on the top five diseases causing illnesses which is very important in decision-making of treatment of diarrhoea, pneumonia and other diseases (FG 2 P6).

The quality of data generated on child healthcare remains crucial for all decision-makers in determining the health needs of the community and monitoring unusual disease trends among children under the age of five years with an aim to improve case management of those diseases (Kabakama et al 2016:90).

4.3.1.2 Sub-theme: Understanding of Routine Health Information System

One of the objectives of this study was to describe nurses' understanding of routine health information tasks. Under sub-theme two, three categories emerged: the meaning of RHIS, the level of confidence in generating RHIS and data elements and indicators.

4.3.1.2.1 Meaning of Routine Health Information System

The majority of the participants seemed to be struggling with the concept 'Routine Health Information System'. However, their responses showed some understanding of the RHIS tasks. They interpreted RHIS as mainly about recording correct data at stipulated intervals. They described the data sources from the community level, data collection tools used in RHIS and the frequency or intervals of data collection. Furthermore, they were also aware of the need to maintain the quality of data by ensuring the accuracy and completeness of data. Some of the participants were aware of the software used in data capturing; however, they still used paper-based data collection tools. There were no differences in understanding of RHIS between nurses in rural and urban areas. The central theme that emerged from the majority of the discussion was what they used to collect routine data and how they summarised and forwarded the information to the next level.

The participants made the following statements:

> *It is all about data collection*, *there is recording of data that we do on a daily basis like writing in the outpatient registers*, *immunization register and the tally sheets (FG2 P4).*

> *Routine health information system is about statistics that we regularly*, *collect*, *either daily*, *weekly and monthly basis*, *we also compile monthly summary report every month (FG1 P4).*

> *Here, we are generating our data manually, using hard copies, then send those summarized monthly data, every month to the district, at that level, they are using a software to enter data from all health facilities in the district (FG2 P1).*
>
> *This is the system whereby data is captured from community level to a facility level and the sent to a district, regional and to national level, depending on what the information entails (FG2 P2).*
> *Like just he said, we ensure data that we do put in our registers and tally sheet are correct information and they are entered in the correct register (FG3 P3).*

There were gaps in literature regarding the understanding of Routine Health Information System. However, the majority of the literature indicated that the majority of healthcare workers lack knowledge about procedures for collecting and recording data, and that leads to poor data quality (Daneshkohan et al 2022 3). This shows variations between the study findings and previous studies. It also raises the question, why does poor data quality persist if nurses understand routine health information systems?

4.3.1.2.2 Category: Level of confidence in generating data

It was important for the study to establish the confidence level of participants as this would have an impact on the quality of routine information produced from the system. The majority of the participants indicated that they were competent in capturing and generating data at their health facility by documenting the information in appropriate registers according to the services rendered. They felt confident as this was part of their routine work. Nevertheless, some participants said that they sought assistance from their colleagues whenever they were in doubt about which data should be captured in order to compile data correctly and accurately.

Verbatim statements made by the participants:

> *I am very confident and competent in data that we are capturing and we record information in appropriate data collection tools (FG3 P1).*

> *As nurses, I can say, we are confident in generating data, I mean, this is something we do everyday, when we see patients or clients, we record in different registers and tally sheets (FG1 P4).*

> *Sometimes, we consult each other when we are unsure of which data to collect in order to capture correct information (FG2 P2).*

The findings contradict a study by Kapepo and Yashik (20180:205), which indicated that health workers were not very confident and knowledgeable about RHIS; hence, data generated at the health facility level was mainly incomplete and repeatedly inconsistent. This means that although participants indicated they were confident in generating data, they did not generate quality data.

4.3.1.2.3 Category: Data elements and indicators

Data elements and indicators are part of the HIS prescribed by the national government. The majority of the participants demonstrated an understanding of these indicators for child healthcare as well as data elements they use at the facility level. These indicators included growth monitoring, nutritional status and immunisation coverage. All participants could readily describe the link between the health services they rendered, the data elements they used to collect data as well as the health needs of the clients under five. They understood the importance of capturing the correct data elements at the entry point to the healthcare system.

The participants made the following assertions:

> *During nutritional assessments for children under five, we collect data elements regarding underweight, stunted or overweight or normal weight and this will help us to measure indicators such as stunting rate, underweight rate (FG3 P3).*

> *We have data on children who have received different vaccines, this assists us to assess the indicator, immunization coverage of children under age of five years in our catchment area (FG1 P1).*

> *The information on child health that we get on monthly basis indicate our performance, number of cases of specific disease, number and outcomes of HIV exposed babies and coverage of various programmes such as immunization. This information would help us to know what interventions we need to embark on to prevent diseases and improve service delivery (FG2 P1).*

Data elements and indicators are considered as inputs that are required to determine if child health programmes have reached their target. The achievement of the Sustainable Development Goals (SDG) targets rely on the effectiveness and efficiency of the HIS. It is important for healthcare providers to have data element definitions in their service areas to enable them to link service, data production and fit for use information. Lack of knowledge and skills in data generation contribute to poor quality data (Wright, Mahony & Cilliers 2017:51).

The child health data elements capture information on child health data on a monthly basis, and key indicators in child healthcare include immunisation coverage, and other child health indicators are crucial in measuring the performance of child health programmes (Lasim et al 2022:12).

4.3.1.3 Sub-theme: routine data management processes

The data management process is a critical aspect of a RHIS that deals with the collection, processing, analysis and dissemination of health-related data (Asemahagn 2017:2). In this sub-theme, four categories emerged: HIS Guidelines and protocols, data sources and collection and information flow, data analysis and data quality checks.

4.3.1.3.1 Category: Health Information System guidelines and protocols

Few participants indicated that policies and guidelines could provide direction for the data management process and give guidance on the implementation of RHIS. However, there appeared to be some level of hesitancy regarding existing guidelines. It appeared that the majority of the participants were not aware of policies and guidelines guiding the implementation of RHIS in Namibia. Lack of awareness regarding policies and guidelines was among nurses in rural and urban areas. They seemed more focused on service provision and indicated that people who are mostly working with data might know. They became knowledgeable on data generation at the health facility through in-service training. This implies the lack of polices and guidelines in multiple data collection tools, poor data quality and lack of information use.

The following statements support the findings:

> *If they are available*, *policies, guidelines can help us to improve our way of analyzing and use of data, in order to improve service delivery (FG1 P3).*
>
> *Umm, honestly, for me I have never seen a manual or a guide written on how this information should be recorded. Maybe people that are working mostly data, they will really have knowledge about this (FG2 P1).*
>
> *I know how to complete various registers and tally sheets through in services training from a person in charge of the facility, they taught me (FG2 P1).*

English et al (2011:86) stated that there will be a gap in the implementation of the HIS if there is no guiding document. Furthermore, the literature shows that policies and guidelines aim to standardise the implementation of District Health Management Information Systems (DHMIS) with the purpose of strengthening monitoring and evaluation. In addition, the use of information on policy formulation, programme planning and decision-making that will lead to improvement of service delivery could be covered in HIS.

4.3.1.3.2 Category: Data collection and sources

Participants described that routine data is collected from day-to-day healthcare activities such as screening. They highlighted that data from patient health passports are transferred to various registers depending on the services provided. They also indicated that they collect data using paper-based data tools, which are captured at the health facility level, and each nurse uses different tally sheets, which are collated and entered into monthly summary sheets. Adequate data collection tools will enable nurses to capture all child health data to inform decisions that assessing if targets are met. These data are then verified with the HIS officer.

Quotes from the participants:

> *If the patient comes here, we gather information from the patient and enter them in the health passports and from there, we record data in different type of books such as outpatient department registers, growth monitoring registers, baby mother friendly registers (FG2 P3).*

> *Once I screen my patient, I have to tally, this is where it starts, from tallying it goes to monthly reports. I will get the tally sheets from each nurse, when they have tallied from their registers, then they will bring to me, the I will compile the summary reports for all services at health facility (FG4 P2).*

> *When they give me the tally sheets, I have to compare and check whether the tally sheets are making sense, after I am done, I bring to the HIS officer, to also check together, to make sure is it making sense, what I have compiled (FG4 P2).*

The study findings are in alignment with the literature by Kapepo and Yashik (2018:204), which indicated that paper-based registers, tally sheets and monthly summary reports are sources of data at the health facility level, which are designed depending on services rendered to patients. These sources of data at the health facility are collated and forwarded to the district to be captured in District Health Information Software Two (DHIS2).

4.3.1.3.3 Category: Information flow

In any HIS, information flow is predetermined and follows a specific path. Participants described the health information flow as a process where completed monthly summary forms from health facilities are forwarded to the district in order to be entered into the system using specific software. Once data is entered in DHIS2 it will reflect at regional and national levels. Some participants also indicated that health information can also be

provided from the national level to the regional, district and health facility in terms of a feedback loop.
The following statements support the findings:

> *After collating data at health facility into monthly summary reports which goes into the health information system at the district level then it goes to the regional office and national level (FG4 P5).*

> *There are times when information may come from national level, to the region and to district then to facility, that is when you get feedback (FG2 P1).*

> *So, from my own understanding information in the health sector data flows in a way that is from a community level. For example, our health extension workers, they report from the community to the health facility, then it from the health facility, you report a to the district (FG2 P1).*

The registers are compiled into paper-based summary forms by a facility manager and are passed on to the district on a monthly basis; they are then electronically captured on DHIS2 by data clerks and transferred from the district level to the regional and then to the national level (Kapepo & Yashik 2018:204).

Furthermore, Ledikwe et al (2014:8) indicated that on some occasions, the national level provides feedback to the region, districts and health facilities on the performance of programmes and with regard to data quality.

4.3.3.1.4 Category: Data Analysis

Data analysis is a crucial aspect of any data management process. It requires skills and some basic knowledge. A few participants indicated that data analysis is done at the health facility level by grouping data according to different child health programmes. The analysed data are displayed on the notice boards in the health facility using graphs and tables. It appears that supervisors were more knowledgeable about data analysis as

opposed to the rest of the nurses. There were no variations between nurses from rural and urban areas. However, there were variations in the responses as some participants indicated that they were not able to analyse data at facilities due lack of skills.
The participants made the following assertions:

> *After collecting data, we make graphs, which indicate top five diseases of under five years children, for specific quarter and also a graph on the number of children suffering from malnutrition (FG3 P 3).*
>
> *We do statistics, from the data we collect. Then, we send the statistics to the regional office, to be processed there (FG1 P1).*
>
> *We can collect data, but to analyse this information, very challenging to us, we don't know how to do it (FG3 P2).*

Kanfe, Debele, Berhanu, Ngusie and Ahmed (2021:4) indicated that fewer health professionals are able to analyse data at their health facilities. Data analysis is associated with the skills of health professionals to be able to perform such roles, the health professionals who had sufficient skills and related knowledge of RHIS were more likely to analyse data accurately as compared to health professionals with insufficient skills.

4.3.3.1.5 Category: Data quality checks

The majority of the participants stated that supervisors' role is to ensure that data generated at the health facility is of quality. Supervisors validate data by reviewing data collection tools for completeness and accuracy on a regular basis. However, some participants also indicated that nurses also need to ensure that they generate complete and accurate data.

Furthermore, participants indicated that the supervisors conduct regular on-the-job training on data quality in order to ensure that all nurses collecting data are generating useful data.

The following statements support the findings:

> *The supervisors check registers, every second week whereby they validate the information from their health facility, if they are complete and accurate before they will submit to the next level (FG3 P3).*
>
> *As supervisors we do in service training, in order to ensure that all staff can accurately collect data and data elements required (FG1 P3).*

Although the study findings revealed that supervisors at the clinic level verify the reports before being submitted, the literature indicates that poor data quality still persists in developing countries like Namibia (Dagnew, Woreta & Shiferaw 2018:2). On the other hand, Ledikwe et al (2014:7) argued that a manual data quality check may not be accurate, hence suggested for a simple and regular inbuilt system in DHIS2 of data quality check that may be more cost-effective and reliable in the current context.

4.3.3.2 Sub-theme: Routine Health Information System challenges

This sub-theme, Routine Health Information System, has five categories: availability of resources, Design of RHIS (multiple data sources), insufficient specialised skills on RHIS, Mobility of mothers and child health data and poor data quality.

Mothers' mobility and poor data quality were identified as outliers because few participants highlighted them; however, the researcher found them to be useful to the study as they highlighted factors that needed to be addressed to strengthen the use of routine health information to improve child healthcare.

4.3.3.2.1 Category: Availability of resources

The majority of participants indicated that resources such as data collection tools and human resources negatively influenced data management processes. The unavailability of data collection tools was cited as a challenge, leading to incomplete data and an inability to utilise the data for decision-making. However, participants from urban facilities seemed to have adequate tools as compared to those in rural areas. High patient load with subsequent increased workload for nurses undermined the quality of documentation. The shortage of nurses gave rise to long waiting times and disgruntled patients.

The following statements support the findings;

Sometimes there is not enough copies of data collection tools, we have to buy from the public library, using own money, in order to complete our statistics and send them to the next level (FG3 P1).

> *We, really do not have a problem with data collection tools, they are available at all time in our health facilities (FG2 P3).*
>
> *Sometimes clients are a lot and you have to try to assist them in the shortest period, because others that are waiting outside become impatient and complain, this will make you to not document the data properly (FG1 P2).*

Various organisational factors can influence routine health data; one of them is the high workload among nurses, which could lead to incomplete and inaccurate data that can affect decision-making (Lippenveld 2017:338).

Although the study identified the lack of paper-based data collection tools as a barrier, previous literature did not identify it as a challenge but only highlighted the lack of computers and poor internet connectivity as challenges in generating data at the health facility level (Kapepo & Yashik 2018:205).

4.3.3.2.2 Category: Design of Routine Health Information System (Multiple data sources)

As already indicated, Namibia uses a hybrid system, with paper-based reporting at facilities and DHIS2 at higher levels. The majority of the participants indicated that routine health data is affected by the use of multiple data sources, such as different registers in health facilities. These multiple data sources overwhelm health professionals, resulting in data loss due to the inability to document all required data elements. The responses were similar from the nurses in urban and rural areas Hence, the accuracy and timeliness of data may be compromised because of the multiplicity of registers and the time taken to document those registers.

The following statements support the information:

> *Other thing is that there too many registers, that we are expected to complete at the end of the day, I find myself unable to enter all data in those books (FG3 P3).*

> *There is a mother coming with baby nee, then I have to write in both the mother and baby especially the six weeks and the six days, not all of us really write things there, this takes up much of our time and information that are entered in those books may not be correct (FG2 P4).*

DHIS2 is the main software that captures RHIS in Namibia. However, there are multiple parallel systems and data collection tools that have been created to address information coverage, particularly in donor-funded programmes, the multiple registers, and tally sheets at the point of care leading to duplications of data, which is time-consuming to health professions (Odei-Lartey et al 2020:11). Multiple entry sources may result in poor data quality as a result of multiple entries.

4.3.3.2.3 Category: Insufficient specialised skills in Routine Health Information System

Some participants indicated that there are insufficient skills among health professionals to accurately analyse and display data that they generate at the health facility, hence, training is needed to capacitate them in some advanced HIS tasks. However, some believed that it was the role of supervisors to analyse and interpret data. Hence, supervisors were more skilled in data analysis as compared to their juniors in the health facility. Analysed data were shared with other nurses and the community.

Verbatim statements made by the participants:

> *We don't have capacity, because, we are not really trained in data analysis, so we can collect data but we cannot really use them up to our fully capacity (FG3 P1).*

> *I am able analyze data at my health facility and interpret and share data with my staff members and the community (FG4 P2).*

Poor data analysis skills could limit health professionals to transform routine data into meaningful information as health information utilisation depends on data analysis skills, and organisational factors also play a role in using their skills (Shiferaw et al 2017:6).

A study conducted in Ethiopia indicated that although health facilities have low utilisation of data, health facilities use routine health information to determine the workload of staff and identify the training needs of healthcare workers (Assemahagn 2017:9).

4.3.3.2.4 Category: Mobility of mothers and impact on child health data

Participants from urban health facilities lamented the mobility of mothers as it affected their data as well as targets. Seasonal workers move from one point to another and change the population demographic profile of the facility's catchment area. This is particularly concerning among HIV-exposed babies and immunisation schedules. There is also an influx of patients from other catchment areas in search of employment opportunities. Therefore, population movement posed challenges to proper planning.

The following statements support the findings:

> *The child movements affect our data as we may not reach our target, for example, the clinic was supposed to immunize 36 children every month, due to seasonal work, children move to the north with their mothers, it means last month statistics show less children, that were immunized, that affects our performance (FG4 P2).*
>
> *We have a lot of visitors nee, that comes to Keetmanshoop, in search of work and they come with their children at we get more children, sometimes our performance is double than the set target, so it is so challenging to really know how you performed and how to budget for more resources for these mobile populations (FG3 P4).*

Brown, Benzeval, Gayle, Macintyre, Reilly and Leyland (2012:947) indicated that increased children's residential mobility was associated with elevated poor overall health. This is due to parental mobilities in search of greener pastures. The percentage of mobilities would most be likely to disadvantage them in terms of access to care, and the mothers and their children could move to a where there are no health facilities nearer to them and have to travel long distances (Randall 2017:1).

4.3.3.2.5 Category: Poor data quality

Few participants alluded that if there are incomplete and inaccurate data, that could affect the use of routine health data, because the information captured is not a true representative of actual services provided in the health facility. This could lead to poor supply chain management of pharmaceuticals and poor allocation of resources.

> *Completeness of data is something we are actually struggling with because you come across registers that are incomplete or either one or two indicators are missed. So you need to start searching for missing information by asking the nurse who generated data (FG3 P2).*
>
> *Sometimes, staff members just give client medication but did not indicate in registers or staff have immunized and do not enter in the register nor tally on the immunization tally sheet, at end you will not get true picture of immunizations at clinic and it affects ordering of vaccines a poor allocation of resources (FG1 P4).*

Health systems need routine health quality data from HIS in order to plan for the services delivery at their health facilities. In that sense, health professionals will be adequately funded and equipped with the necessary commodities, infrastructures, policies and resources to deliver services to clients (Nutley & Reynolds 2013:2).

If data quality is poor, the reported health outcomes in different programmes and surveillance coverage could actually be lower than what is obtained in routine health statistics, resulting in compromised decision-making and allocation of scarce resources (Tilahun et al 2018:2).

4.4.2 THEME 2: CULTURE OF HEALTH INFORMATION USE

The value of routine health data is determined by its utilisation in decision-making (Tilahun et al 2018:5). Data generated at the health facility level are crucial in day-to-day client management and health education.

In this theme, three sub-themes emerged: promoting the culture of information use, use of child health information and recommendations to enhance health information use.

The sub-themes and categories are presented in Table 4.3.

Table 4.3: Culture of health information use

Theme	Sub-theme	Category
Culture of health information use	Promoting the culture of information use	• Data demand • Training on RHIS • Staff motivation
	Use of child health information	• Monitoring diseases trends • Monitoring the performance of child health programme • Health promotion and interventions • Allocation of facility resources
	Recommendations to enhance health information use	• Feedback on the performance of RHIS • Integrate data from multiple sources • Capacity building among health professionals • Introduce electronic health record at point of care • Develop policies and guidelines on HIS

4.4.2.1 Sub-theme: Promoting a culture of information use

Routine health data generated at a health facility level should be regarded as a doorway to utilising health information. Hence, data should be utilised at the point of care where it was generated in order to continuously monitor health services in their health facilities (Shiferaw et al 2017:7).

The sub-theme, promoting the culture of information use, has three categories, which are data demand, training on RHIS and staff motivation.

4.4.2.1.1 Category: Data demand

This study defines data demand as the ability of health professionals, managers at district regions and policymakers to specify and actively seek information from routine health information to inform the decisions that strengthen child healthcare (Geers, Nghui, Ekirapa, Mbuyuta, Patrick & Kusekwa 2017:28).

Some participants indicated that at this level, they required health information such as socio-demographic data of the child; age, gender and physical address in order to make decisions related to the specific care. Others indicated that they are always checking for information regarding immunisation status in their health facility documents in order to assess immunisation coverage. There were no differences between nurses from urban areas and rural health facilities. A few were silent on seeking information for decision-making. The participants also examined information on the rate of exposed infants who tested positive for HIV PCR.

The following statements support the findings:

> *In order to make decisions on child health, we need to know the age, sex, current complains, we also need to know the weight, MUAC ,height and immunization status of the children (FG2 P1).*
>
> *At the end of the month after compiling the data, I look for information on how many children completed their immunization schedule in their Immunization registers in order to assess the coverage of immunization in my health centre catchment area (FG1 P4).*
>
> *If you realize that in the past three months, your data show you that you have 15 babies tested positive for HIV ,then I require date assess the HIV treatment regimens, the child attendance to follow-up and data on their mothers if they are taking their ART as required (FG3 P2).*

Data demand among various health professionals is low because of multiple factors such as lack of clear expectations related to information systems and lack of knowledge and skills various health indicators use in routine health information; hence, it is difficult for health professionals to actively and openly request for health information (MEASURE Evaluation 2020:8).

Hence, if the skills of health professionals regarding RHIS are enhanced, then it will improve data demand, and continued data use generates a pattern of increased information use that leads to improved health programmes and policies (Nutley & Reynold 2013:2).

4.4.2.1.2 Category: Training on Routine Health Information System

Some of the participants indicated that they were given in-service training on generating data when they started working at the health facility. The participants were trained by the supervisors mainly, but some also indicated that the senior nurses at the health facility mentored them. However, it seemed there was no training on the use of data. On the other hand, few stated that HIS content was covered in their undergraduate nursing programme. Hence, they could generate and use data.

Participants have made the following assertion:

> *I was given in service training by the supervisor at the clinic on how to complete tally sheets and monthly summary forms (FG2 P3).*
>
> *I got to know how to collect data by nurses I found at this clinic, they taught me different data collection tools and how to complete all HIS forms, then I was able to complete the books at the clinic (FG3 P2).*
>
> *One starts from the university, in our nursing course, we were trained on data collection and data analysis and when we have been going to practical during our training, hence we were exposed already, how to collect data and how data should be utilized (FG1 P3).*

Training on RHIS is very crucial in the utilisation of data; a study conducted among health workers at health centres in Oromia special zone Ethiopia, have concluded that training of health professionals was found to prepare them to be able to better utilise RHIS. The same literature highlighted that the training of health workers had a positive association with the utilisation of RHIS, as the trained staff who had training were more likely to utilise RHIS better than health professionals who were not trained (Seid et al 2021:1195).

4.4.2.1.3 Category: Staff motivation

The motivation of users is one of the behavioural indicators for the performance of the RHIS. Participants indicated that they are motivated to generate data to improve and provide quality healthcare to clients and the community. They further stated that data assisted them in identifying needs at the health facility and sent data to higher levels that will provide resources such as medication for patients. These processes and seeing positive health outcomes were the drivers for motivation for them.

The following statements support the findings:

> *The biggest motivation, I should say from this is to the provide quality health care to our community and our clients because with this data we can analyse and see what are we doing wrong, with the kind of data we can have, we can improve health of our community (FG1 P2).*
>
> *We are also motivated generate data, so that data is used to determine different needs in our health facilities and decisions are made to be provided with resources to provide quality health nursing care to our patients (FG1 P4).*

There are various motivating factors among health workers that could improve the ability to utilise routine health information, such as regular supervision and regular feedback (Wude et al 202:8). Hence, the existence of motivated staff and commitment among health facility leaders increases the utilisation of RHIS (Yarinbab & Assefa 2018:8).

4.4.3.1 Sub-theme: Use of child health information

Public health decisions rely on quality routine health information which is generated by the healthcare system. These routine data will be utilised in managerial decisions such as planning and managing health programmes, detecting and responding to disease outbreaks, as well as the overall performance of the healthcare system (Shiferaw et al 2017:2).

In this sub-theme use of child health information, four categories emerged: monitoring of diseases, monitoring of performance of child health programmes, health promotion interventions and allocation of resources.

4.4.3.1.1 Category: Monitoring of diseases trends

Some participants indicated they use routine health data to monitor diseases and condition trends in their health facilities. This is done by assessing the number of cases recorded for diseases and conditions in a specific area. Participants further stated that routine health data assist the nurses in identifying the rise in the numbers of certain diseases, enabling them to conduct disease outbreak investigations, and level of preparedness and response. They use routine health information to identify the possible causes of different diseases.

However, there were variations among responses as some participants indicated that they do not use the data because they are not aware if it is expected of them to use data at the health facility level.

The participants made the following assertions:

> *Data inform us on which diseases are causing ill-health in the community. It makes us alert on a rise in numbers in a disease which could lead to an outbreak, so that we investigate and prepare to respond to the outbreak accurately (FG1 P5).*

> *Information that we collect assist us to identify what are the possible causes of the diseases in the community, and will give us an opportunity to plan on how to prevent them in future (FG1 P4).*

> *Honestly, we hardly use data because I do not think I am expected to use data at this level, I simply collect it and send to the next level (FG3 P1).*

Even though the majority of literature highlighted that there is poor utilisation of routine health data, there were successful reports of routine health information use as well that indicated that diseases such as HIV and Tuberculosis, amongst other programmes, were implemented and evaluated using routine health data to curb the spread of those diseases (Wagenaar et al 2015:131).

4.4.3.1.2 Category: Monitor performance of child health programmes

Participants showed an understanding of the importance of indicators in monitoring the performance of the programme. This will be done to assess the programme targets against its performance, such as the number of immunised children. The vaccines that have been administered if there is strict adherence to the expanded immunisation schedule. They acknowledged that the RHIS generates useful data to support monitoring. However, they also indicated that these data must be of good quality and timely to enable them to identify problem areas in the programme, such as lost to follow up cases. They also assess the performance of the elimination of mother-to-child transmission of HIV by determining the HIV status of the HIV-exposed children enrolled in the programme.

The following statements support the findings:

> *Data we collect data helps our health facility to check how many children are supposed to be immunized with this vaccine, in a month if they were supposed to be 13, the says only immunized six children immunized what happened to others? you go in your cohort registers and check which children did not turn up (FG3 P2).*

> *Data will show us the status of children who were born by HIV positive mothers and if there is an increase in the number of children tested HIV positive, we have to dig down and identify what could be the cause (FG1 P4).*

International efforts in monitoring and evaluating programmes of child health programmes in reducing child morbidity and mortality worldwide. Various donor and technical agencies have assisted governing support in order to improve the country's capacity to provide and use health information and increase data needs among all decision-makers regarding child health (Ouedraogo et al 2019:10). In a study by Simani, Coehen, Voss and Jung-Sierer (2021:12) there are various tools for monitoring and evaluating child health programmes, and they require routine health data. Hence, routine health data of solid quality are necessary for both single indicators and composite indices in order to effectively monitor and evaluate child healthcare.

4.4.3.1.3 Category: Health promotion and interventions

Routine health data was found to be useful by the majority of the participants in conducting health promotion activities related to child health. These activities included educating the community on adherence to antiretroviral therapy among pregnant women, hand hygiene and educating parents and caretakers on how to treat diarrhoea among children under five years to prevent complications. They also do home visits to trace lost to follow up clients who missed immunisations, antigens or prophylactic for HIV for children. Some participants also indicated that routine health data assisted the health facility to organise and conduct health campaigns to create awareness on various issues.

Verbatim statements made by the participants:

> *We check in our registers the adherence of HIV positive pregnant women on ART if they are non-adherent we educate them to continue with ART treatment in order to prevent the HIV transmission to unborn babies (FG4 P3).*

> *Once we noticed that there is high number of diarhhoeal cases coming to our health facility, we go to community and educate them on how to wash their*

> *hands properly and how to prepare oral rehydration solution inorder to treat diarrhea at home, this will help to prevent severe dehydration (FG2 P2).*

> *In case of immunization, if we see this month, number of children who their missed immunization schedule, we formulate a plan to go out into the community and trace all the lost to follow-up and encourage their parents or caretakers to bring them to the health facility and educate them on importance of immunization, we can also conduct mini campaigns to increase our immunization coverage (FG1 P3).*

Wagenaar et al (2015:130) indicated that there was success in the use of routine health information to evaluate interventions focused on the immunisation fight against HIV, especially the elimination of mother-to-child transmission of HIV programmes in developing countries and enabled them to carry out acceleration activities to improve child healthcare programmes.

4.4.3.1.4 Category: Allocation of facility resources

Some participants stated that they are required to collect data in order to request more funds from the higher authorities to fund the health facility utilities. Furthermore, some participants indicated that generating accurate and complete data enables them to be provided with adequate human resources that will render services for the community. One participant further alluded that routine health data assisted them in delegating the available staff that will be performing various duties in the health facility.

Some participants indicated that routine health data enabled the nurses to order sufficient medications and vaccines to render services to the patients, thus improving the quality of healthcare service care as no stock of medication would hinder service provision.

The following statements support the findings:

> *We try to generate quality data to send to the district and region to show the needs of the health facility and enable proper budget and adequate staff to provide services to our clients (FG3 P5).*

> *Data also guide us on how to do our delegation for example on how to compile our off-duties at the health facility, so that me, as a supervisor know how many staffs to put in different departments, how many in the immunizations room, how many in ante natal care room and so on (FG1 P4).*
>
> *We use data to guide us on ordering various clinical and pharmaceutical commodities such as medicines, vaccines, cottons, etc because data will tell us how many people come to health facility, then that is how stock out is avoided (FG1 P3).*

According to Seid et al (2012:1193), routine health data was utilised by some health workers at the facility level for their day-to-day patient management, planning and budgeting for the health services and allocation of scarce resources at their disposal. Furthermore, routine health data was used in procuring needed drugs and mosquito nets that addressed the needs of the population.

A study by Asemahagn (2017:6) indicated that routine utilisation of data was found to be low among health workers at the health facility level. This was also supported by Tulu et al (2021:3), who indicated that information use was weak at the health facility level, even though health workers spend 40% or more of their time filling out routine health information forms but may have little or no use in decision-making.

4.4.4.1 Sub-theme: Recommendations to enhance health information use

In this sub-theme, recommendations to enhance information use have five themes that have emerged, which include feedback on performance of RHIS, Integrate data from multiple sources, Capacity building among health professionals, Introduce electronic health record at point of care and developing policies and guidelines on HIS.

4.4.4.1.1 Category: Feedback on performance of Routine Health Information System

Health facilities produce data on disease patterns, health intervention coverage and service delivery as part of their routine activities. Hence, the majority of the participants acknowledged the importance of receiving feedback on their RHIS task performance, especially on the top five diseases on an annual basis. They believed that feedback would motivate them to perform better on various indicators and strengthen data management processes.

The participants shared their thoughts as follows:

> *The upper levels should give us regularly feedback at least top five diseases for under 5 years in this quarter or how was our data at least on annual basis, their feedback will guide us and motivate us to say we are doing and did we reach our targets (FG1 P4).*
>
> *Feedback will make us to know how we are performing in terms of immunizations coverage, growth monitoring and nutrition and on elimination of mother to child transmission of HIV and how can we improve on our programmes (FG2 P3).*

Health workers who had regular feedback have an increased chance of utilising RHISs as compared to those who had no feedback. Hence, feedback may lead to increased data use as health workers are motivated to generate quality data and use them. If routine data is used at the level it generated, it can lead to improved service delivery (Shiferaw et al 2017:4). Shama, Roma, Abaerei, Gebremeskel & Baraki (2021:12) stated that regular feedback on data quality yields desired positive results.

4.4.4.1.2 Category: Integrate data from multiple sources

The majority of participants suggested that integration of data from multiple sources will reduce the time spent by health professionals performing data entries of the same patient in different paper-based registers. A single register that would capture all different data elements was proposed. In addition, data collection tools need to be reviewed and consolidated. This will enable health professionals to effectively monitor data quality and enhance the performance of the child health programme.

The following statements support the information:

> *I suggest that we should capture all the child health data in one register, that will reduce time that is spent on multiple entries in different registers (FG2 P4).*
>
> *If multiple data sources are integrated in one register, it will be very easy to identify gaps in data quality and have one source of data to monitor performance of child health (FG3 P3).*

Integration of various data tools can lead to smooth data flow within the health system. Health professionals recommend combining data at health facility data as entered at the point of care to avoid paper-based registers. Furthermore, vertical programmes need to be integrated into HIS (Kapepo & Yashik 2018:208).

A review conducted in five Sub-Saharan African countries indicated that simplified data registers that have been collated and integrated into one register halted the cumbersome and complex books used in data collection at the health facility level (Mutale et al 2013:4).

4.4.4.1.3 Category: Capacity building among health professionals

Formal and in-service training programmes need to be established, with an emphasis on data management processes, especially data analysis and information use. They acknowledged that the facilities were the first entry point to the health system; therefore, data generated at this level will impact decisions at various levels of the system. They need to be empowered to increase their skills and confidence in RHIS tasks. The participants believed that this may improve healthcare service delivery and health outcomes in their catchment areas.

A need was identified for all nurses to be trained and be involved in collating monthly summaries and aggregating data so that they develop a sense of ownership and get motivated to collect quality data to enable them to use them to make decision-making at their health facilities.

The following statements support the findings:

> *I suggest that we get a workshop that will be specifically be trained on how to analyze data and effectively use data so that we can improve service delivery (FG3 P1).*

> *I think all nurses should be trained and get involved in data collation so that the get sense of ownership and realize the importance collecting quality data that will aid in making decisions (FG3 P3).*

Skills related to Health Information Systems could be determined by the health professionals' utilisation of routine health information for their decision-making (Kanfe, Debele, Berhanu, Ngusie & Ahmed 2021:4). Hence, RHIS utilisation was found to be higher among health professionals who trained on HMIS compared to health professionals with insufficient skills (Shiferaw et al 2017:7). Therefore, in order to strengthen the use of routine health information system, health professionals’ capacity needs to build so that they will be able to analyse and use their data at all levels (Ledikwe et al 2014:5).

4.4.4.1.4 Category: Introduction of Electronic Health Record at the point care

The introduction of Electronic Health Records at health facilities will strengthen the data quality and availability of data at the health facility level. Some participants suggested that computerised electronic software where each patient is captured at each visit will assist health professionals in obtaining the patient’s past medical history for comprehensive patient management.

Furthermore, others also stated that the Electronic Health Record will reduce costs in terms of paperwork and create efficiency in data capturing. The system will aggregate data into monthly summaries at the end of the month, leading to timely reporting of data to the next level.

The following statements support the findings:

> *We can be provided with computers and they introduce a patient software, where by information of children and other patients are captured, it will be easy to get patient medical history and make an informed patient management decision (FG3 P1).*

> *The introduction of a software that captures patients' details will eliminate paper used as data collection tools, as data will be collated automatically during patient visits and summarized monthly, leading to the reduction in time spend on summarizing data and costs incurred in printing data collection tools (FG2 P1).*

Health professionals appreciate electronic Health Record for providing the patient with a full past medical history and enabling data sharing for clinical support and referral. Patient information is automated by information and communication technology software, leading to faster access to individual patient records for decision-making by clinicians (Karon & Dlodlo 2017:2).

4.4.4.1.5 Category: Develop and disseminate policies and guidelines on HIS

The narrative of the majority of the participants suggested that the MoHSS needs to formulate policies and guidelines on the implementation of health information systems and disseminate such documents to all structures in the healthcare system. The documents can guide health professionals on data collection tools, data use and data quality. The availability of policies and guidelines will improve HIS governance.

The following statements endorse this:

> *There is a need to have guidelines and policies in the ministry of health and social services than will inform on what information to be collected, what time, how to fill various registers and how to use data at our level (FG2 P3).*

> *If there are policies and guidelines on HIS, we need them or nay circular at our health facility, it will probably also help us to improve our way of collecting, analysing data, our way of compiling and sending data, how to check if data is of quality as stipulated in those documents (FG1 P4).*

A well-functional HIS should be based on a strong legislative framework, with policies and guidelines that guide the implementation of RHIS. The guiding documents will contain detailed information on how to complete different data collection tools, the frequency of data collection tools, data analysis, data dissemination and information use (Nutley & Reynolds 2013:6).

Policies and guidelines promote good HIS governance which assures sound guidance, interdisciplinary communication and collaboration, oversight and accountability. In addition, policies and guidelines clarify the roles and responsibilities of each staff category at each level of the health system in order to promote increased ownership and data quality (Balgrosky 2020 :5).

4.5 PRESENTATION OF FINDINGS FOR PHASE 2

This section presents findings from fifteen (15) health managers located at various levels of the healthcare system. The aim was to obtain in-depth information regarding their experiences in the utilisation of RHIS in the planning and management of child healthcare services. The focus was on managerial activities. Data from the first phase were used to follow up on uncertainties that emerged.

4.5.1 DEMOGRAPHIC PROFILE OF PARTICIPANTS

Table 4.4 presents the demographic data of the managers who participated in the in-depth interview with variables including gender, age group, highest qualification and professional category and years of experience as a manager.

Table 4.4: Demographic profile of participants

Variables	Number
Gender	
Female	9
Male	6
Age group	
20-29 years	2
30-39 years	5
40-49 years	3
50-59 years	5
60+ years	0
Highest qualification	
Masters	4
Bachelor (Honours)	7
Bachelor	1
Diploma	3
Job category	
District Healthcare Manager	9
Regional Healthcare Manager	3
National Healthcare Manager Deputy director of HIS	1
Technical Adviser	1
National System Analyst	1
Years of experience in healthcare management	
1-3 years	7
4-6 years	3
7-9 years	3
10+ years	2

Table 4.4 shows that the majority of participants were females as compared to males. Furthermore, the majority of the participants' age range is between 30-39 years old and 50-59 years old. With regards to the qualifications, the majority of the participants have a Bachelor (Honours). Most were district healthcare managers. The years of experience as managers varied, but for the majority, it was between 1 and 3 years.

4.5.2 THEMES

The following themes emerged from the findings:

Theme 1: Implementation of Health Information System in Namibia
Theme 2: Using the Routine Health Information System

Theme 3: Performance of the RHIS

4.5.2.1. Theme 1: Implementation of Health Information System in Namibia

The managers were keen to share their experiences of the evolution of HIS in Namibia to give context to their activities.

In Theme 1, implementation of Health Information System in Namibia, two sub-themes, which are structure and organisation of HIS and Design of DHIS2 in Namibia and six categories emerged in Table 4.5

Table 4.5: Implementation of Health Information System in Namibia

Theme	Sub-theme	Category
Implementation of HIS in Namibia	Structure and organisation of HIS	• Historical background of HIS in Namibia
		• External Agencies
		• Policies and guidelines on HIS
	Design of DHIS2 in Namibia	• Functionality of DHIS2
		• Security features of DHIS2
		• eHealth Standards

4.5.2.1.1. Sub-theme: Structure and organisation of Health Information System

The structure and organisation of HIS provided a good background for understanding the evolution of HIS in Namibia.

In the sub-theme, structure and organisation of Health Information System, three categories emerged: the historical background of HIS in Namibia, External Agencies and policies and guidelines on HIS.

4.5.2.1.1.1 Category: Historical background of HIS in Namibia

Participants described the initiation of HIS in Namibia, from paper-based reporting to Health Information System 2000 (HIS2K), and later upgraded to DHIS 1.4 and currently

DHIS2, which is a web-based system implemented only from the districts to the national level to enhance efficiency in data management. Primary Health Care facilities are still using the manual system. The national level coordinated the implementation of different systems and DHIS2 was introduced in phases to allow users to be familiar with different functionalities. Officers from the national level provided training on data capturing and reporting.

The following statements support the findings:

> *We had HIS2K in 2000, which was an electronic system, and migrated to DHIS 1.4 in 2008. And then we changed to the current DHIS2, the health facilities are using paper-based data capturing (P2).*
>
> *The ministry implemented monthly summary forms at PHC facilities for outpatient data, when users became fully vested with managing outpatient data, they integrated the inpatient system, then DHIS2, so you will see that it was done in phases, in an organized manner (P3).*
>
> *DHIS2 was created mainly for developing countries which are largely operating on paper-based system to allow them to improve efficiency in reporting, because paper-based reporting is time consuming and DHIS2 allows the reporting to be much easier and faster (P15).*
>
> *The aim of introducing the DHIS2 was to create a platform where data could be entered faster, and reports were produced timely. Once national level introduces new data elements, training is conducted on how to capture, report the data in the system (P3).*

The Health Information System in Namibia operates in hybrid mode, where data are captured manually at the health facility level and then electronically in DHIS2 at the district level. The MoHSS coordinates the HIS at the national level (Nengomasha 2018:372). In low- and middle-income countries, HIS exists with many parallel central programmes, which leads to fragmentation of the HIS (Kumar et al 2017:85).

4.5.2.1.1.2 Category: External agencies

Participants from the national level described the financial and non-financial support from external agencies and donors for the implementation of the HIS in Namibia. Donors provided technical expertise in customising DHIS2 in the Namibian context. Healthcare managers in HIS were exposed to training and mentorship from external agencies compared to managers managing child healthcare. Hence, this means managers for HIS cascaded training to the rest of the staff. The experts also advise the local Namibian team on data quality by mentoring the data producers and users and developing operating procedures. Participants further indicated that these agencies also provided funding to procure various equipment used in Health Information Systems as well as training to build capacity for the local team. However, they also had reservations about continuity when donor funding comes to an end.

The following statements support the findings:

> *The support on Health Information System has been overwhelming, majority of donors included health information system in their work plan with a budget to support the strengthening of health systems (P14).*
>
> *Technical agencies and donors assist us in ensuring that data is of high quality, also ensure that staffs in the country are capacitated and strengthen the health systems by putting standard operating procedures, they also have a supportive, advisory and mentorship role (P15).*
>
> *The donors provide technical support through funding, capacity building of staff through training or procuring equipment such as computers and other ICT equipment (P14).*

There are a number of external agencies and developmental partners that provide technical and financial support for a wide range of activities, such as service delivery, collection and dissemination of health-related information (Khan & Edwards 2018:9).

In addition, the Health Information System Programme (HISP) has a global success story in terms of supporting the implementation of District Health Information Software (DHIS) in developing countries, including Namibia (Karuri et al 2014:44). HISP has coordinated DHIS2 in Namibia and developed local knowledge on design, data collection, user participation and customise health information software (Kapepo & Yashik 2018:201).

4.5.2.1.1.3 Category: Health Information System policies and guidelines

Some of the participants indicated that they were not aware of any specific policies guiding data management processes. However, the participant from the national indicated that there was a draft HIS strategy which has not yet been promulgated into a policy or law. In addition, they were not aware of any policy or directives that addressed data quality. However, a few acknowledged the existence of an outdated guideline which outlines different forms used in collecting routine health data, which was based on the previous HIS2K. Others referred to a manual embedded in DHIS2, which gives some directives on data management. Healthcare managers responsible for HIS were more aware of documents related to HIS compared to healthcare managers whose main focus is managing child healthcare. However, health information use was missing from the manual. Participants lamented the lack of legislation that compels different health information software developers to exchange data with the ministry. The ministry uses World Health Organization guidelines for general HIS implementation in Namibia. Nevertheless, there are specific programme-based guidelines for data management processes not for the entire RHIS.

The following statements support the findings:

> *There are no policies, protocols that guides us on how to analyse and utilize data, or how to generate quality data unless you just analyse data based on set indicators (P9).*
>
> *We have what we call HIS2K reference manual that is the only official document or guiding document for HIS operation in the ministry it provides directions on how to collect data per services and it is silent on data analysis*

> *and using data, it is really outdated, but we do have a strategy that is in a draft mode (P5).*
>
> *There is in built manual in DHIS2 that guides users on how to enter data into the software, search for data and analyse data using pivot tables but not the use of data (P12).*
>
> *So those running other health information systems do not have an obligation to integrate into DHIS 2 or exchange their data with the government, in fact the ministry of health was supposed to organize a mechanism where by all the systems link up with national reporting system which is DHIS 2, yet it is not happening (P15).*
>
> *With regards to legislation, policies and guidelines, I think it is a domain which is lagging behind, Namibia does not have a specific policy on HIS, but of course we do have some guidelines you know, only addressing specific areas and program specific SOPs. All along we were utilizing the WHO frameworks and guidelines on HIS that were given to countries (P14).*

Kapepo and Yashik (2018:205) indicate that Namibia lacks policies and frameworks to guide the implementation of Health Information Systems. The lack of policies, guidelines, and legislation is not only unique to Namibia; a country like Botswana is also experiencing similar problems; hence, data, in many instances, are incomplete and inaccurate (Seito-Kgokgwe et al 2015:1).

A study conducted in Rwanda found that a lack of protocols and standard operating procedures was a barrier to good data management. Guidelines, protocols and SOPs for data management at all levels have been found to be helpful in improving routine health data quality and data use (Mboera et al 2021:5).

4.5.2.1.2 Sub-theme design of Namibian District Health Information Software Two

This sub-theme describes the design of the electronic version of HIS currently used by district, regional and national healthcare systems.

In this sub-theme, three categories have emerged: functionality of DHIS2, security features of DHIS2 and electronic health standards.

4.5.2.1.2.1 Category: Functionality of District Health Information Software Two

The effectiveness of an HIS depends on collecting, collating, analysing and using information correctly at all levels. The majority of the participants described the DHIS2 as a free, web-based open software. Some emphasised its functionality; emphasis seemed to be on how the system generated data, which is routinely captured from a variety of sources in the health facilities. DHIS2 has two types of modules, aggregated and tracker module; the aggregated module captures monthly summary forms collated from health facilities, while the tracker module is a client-based monitoring system that supports direct monitoring and follow-up and data analysis within a health programme. However, the tracker module does not generate data for chronic conditions, only on outcome-based diseases that are less than two years old.

The participants reported their ideas as follows:

> *System is web-based and free, requires one to have access to internet,* once data is entered, *the regional and national level can access it at once. There is no need to export the data to upper levels (P2).*
>
> *DHIS 2 has two modules which is aggregated as well as tracker module, DHIS 2 aggregated is at district level and it collects mostly summary primary health care programme such maternal and child health programme, while tracker is more like surveillance tool that is client based monitoring system, it provides adequate information on diseases occurrence, distribution by sex and age but it does not have capacity of capturing individual patient over a long time, but confined in outcome of less than 2 years (P15).*

The DHIS2 is configured to allow the generation of reports, which is either standard or customised to meet the users' needs and requirements (Dlodlo & Hamunyela 2017:70). DHIS2 application runs on any web-based that supports Java-server and can accessed via a web browser over internet (DHIS2 Documentation Team 2016:13). Additionally, web-based DHIS2 permits data to be available at all levels once its entered, as long as the users have internet, this promote use of data for decision-making, as data is available instantly.

4.5.2.1.2.2 Category: Security features of District Health Information Software Two

DHIS2 has advanced features for data visualisation. The dashboard enables a high-level overview of data. Any eHealth system raises questions about the privacy and security of data. The majority of the participants expressed that the system has built-in security features for data security and confidentiality. Information that is captured in the system is transmitted in real time to all users, and they can access it at different points. Participants further indicated that only authorised users can have access to data, some have viewing responsibilities, others do the analysis on the system, and only the national users can effect changes on the system. Thus, DHIS2 allows management to control access per user, per role and set expiration dates for user access.

The following quotes capture the findings:

> *Let me say the security measures, we have in place for the system is that data are protected and cannot be accessed by anyone only those authorized after captured in system (P5).*
>
> *With regards to DHIS security, we assigning roles to different users. At the district level the DHIS officer enters data, at the regional level, they analyse data, they cannot change data in the system. At the national level, they can add indicators, change the design and rectify errors (P3).*

DHIS2 data are saved on a central server, which is accessible via a web browser and available online or offline. However, users are required to be registered with user names and passwords in order to access data (Dehnavieh et al 2019:64).
DHIS2 has security features that only allow users who are authorised to access DHIS2 with specified roles regarding the usage of the system (Karuri et al 2014:45).

4.5.2.1.2.3 Category: Electronic Health Standards in Namibia

Participants pointed out that there are no general eHealth standards in the MoHSS. What they currently use is customised according to the programme or user needs.

The participants also indicated that other Health Information System, such as electronic patient management systems, uses eHealth standards that are designed to serve for day-to-day activities of patients in HIV care.
The following statements support the findings:

> *According to my knowledge, we do not have general standards of e health, we utilize a common pool of standards, the development and implementation of health information system is flexible to match the users' needs. Currently in Namibia, we are more leaning to re-using standards particularly from World Health Organization, Office of Prime Minister and Namibia Standards Institute (P1).*

> *What I know, other health information systems like Electronic Patient Monitoring Information System for HIV patients (EPMIS) are designed to capture each patients on HIV care on day to day visits (P6).*

Health standards are regarded as important inputs in HIS as they can enable interoperability of different information systems. Electronic health standards in Namibia are guided by the National eHealth Strategy, which was only formulated in 2021 but not yet implemented. Electronic health is about users, who generate who use health information systems productively, and it is applications must meet these users' needs. The eHealth strategy aims to establish Namibia eHealth standards and interoperability framework, which will have unique identifiers and incorporate international standards such as International Classification Diseases (ICD) 10, TC D11 and High Level Seven 7 (HL7), which includes Fast Healthcare Interoperability Resources 1 (FHIR) for data and information exchange (MoHSS 2020:19).

There are various standards in the healthcare systems, such as DICOM, short for Digital Imaging and Communications in Medicines, which is a set of specifications dedicated to the standardisation of medical images. Other HL7 electronic health information system standards are specifically developed for the practice related to the exchange, storage and use of electronic health information, such as clinical data ISO/TC215 for electronic health records (ITU-T Technology Watch 2012:19).

4.5.2.2 Theme 2: Using Routine Health Information System

An RHIS is a main source of information for continuous monitoring of health services delivery, as it is used for decision-making (Seid et al 2021:1190). However, the effectiveness of RHIS relies on collecting, analysing, interpreting and utilising the information accurately at all levels (Mboera, Rumisha, Mbata, Mremi, Lyimo & Joachim 2021:2).

In Theme 2, using Routine Health Information System, five sub-themes and 16 categories emerged: support for data processes, data management processes, data quality monitoring, data demand and information use.

Table 4.6: Using the Routine Health Information System

Theme	Sub-theme	Category
Using the RHIS	Support for data processes	• Need for accurate and timeous data • Feedback loop • Supervisory visits
	Data management processes	• Data capturing and collation • Data analysis • Data Dissemination
	Data quality monitoring	• Data verification by supervisor • DHIS2 data validation functionalities • Data Review Meeting
	Data demand	• Data on Child health indicators • Real-time access to RHIS • Adequacy of Child Health Information

	Information Use	- Allocation of resources - Monitoring the implementation of child healthcare programmes - Monitoring of disease trends - Corrective measures

4.5.2.2.1 Sub-theme: Support for data processes

In the sub-theme, three categories emerged: need for accurate and timeous data, feedback loop and support supervisory visits.

4.5.2.2.1.1 Category: Need for accurate and timeous data

The majority of the participants acknowledged that to use the Routine Health Information System effectively; data must be complete and accurate for decision-making in child healthcare. Quality data is critical in accurately planning and budgeting for child healthcare services. The dimensions of data quality that were emphasised were timeliness and accuracy. These were seen as crucial for identifying health needs and gaps in child health data in order to provide quicker resolutions which lead to better child health outcomes.

The following statements support the findings:

> *I need complete and accurate data that will enable me to identify the needs or weakness of any child health programme, in order to make appropriate decision (P12).*
>
> *We need quality data in order to plan and budget properly for the child health care services we are offering in our districts and regions, if these data are not accurate and complete, we will either over budget or under budget (P10).*
>
> *Timely data is important in order to identify issues affecting child health promptly and make decisions to improve children's health (P13).*

Quality of data is a key element in generating reliable health information that enables monitoring progress and making decisions for continuous improvement. The need for organised, accessible, timely and accurate data for health decision-making has become a point of attention at national and international levels (Yarinbab & Assefa 2018:5).
Nutley and Reynolds (2013:6) also argue that for continuous data use to occur, data need to be of good quality so that the data users are confident that they are utilising data that will inform their decision-making and improve the performance of various health programmes. Additionally, routine health data is of no use unless it is accurate, processed and used for decision-making. If data quality is poor, it may result in poor decision-making as data are not reliable. Therefore, poor data quality is a cause of non-use of information in many healthcare settings (Karengera et al 2016:6).

4.5.2.2.1.2 Category: Feedback loop

A good feedback system should be interactive and connect all stakeholders at different levels of the health system. The information flows from facilities through all levels until the national. It also flows from the national to the health facility level. A moderate number of participants expressed that national and regional levels provide feedback to the district level and then to the facility level on performance against targets of child health programmes. They acknowledged the significance of feedback in improving data management processes. Community leaders are also given feedback on disease trends as well as conducting interventions in order to address the challenges. However, there were variations as one participant had different experiences; they expressed that information on performance did not flow from higher levels at desired frequencies.

The following statements support the findings:

> *So, we constantly provide feedback on monthly basis and quarterly basis, so that activities can be planned and you need to go back to the community leaders, so that they know where they are standing in terms of health outcomes and we perform activities to attend to those problems (P7).*

> *Once, we analyse data, we try to see what are the challenges, if there are any discrepancies, they are communicated to health facilities to verify if data is accurate (P11).*
>
> *There is not really feedback from national level, on the quality of data that are entered into HIS software (P13).*

A study conducted in Hadiya Zone Health Centres, Southern Ethiopia, revealed that 87.4% of health facilities had received feedback from the district on a monthly and quarterly basis. The feedback was on their performance on data quality performance of coverage for essential services (Abera, Daniel, Letta & Tsegaw 2016:103). Effective feedback is vital to keep up with the needs of HIS users.

4.5.2.2.1.3 Category: Supervisory visits

Supportive supervision fosters programme improvement by facilitating basic knowledge and skills at all levels. The majority of the participants indicated that they conduct support supervisory visits on a yearly basis or twice a year to lower structures with the aim of assessing data quality and performance of different health programmes using data. Participants further indicated that support supervisory visit gives an opportunity to review if data in paper-based registers at the health facility level corresponds with data entered into DHIS2 and harmonise data.

The participants reported their ideas as follows:

> *We conduct support supervisory visits in the health facilities at least twice a year or once a year and assess how different health programmes are being implemented using data, and assess how data are generate at those health facilities (P12).*
>
> *We normally go down to the facility to check in the data in the registers, tally sheets and summary reports and compare with what is in DHIS 2 and whether it's the same and if not we harmonization data (P4).*

The study findings correspond with the study by Tulu et al (2021:14), who indicated that the use of routine health information among managers who got support supervision was four times more likely as compared to the managers who did not get support supervision. In addition, the support supervision instils a culture of data-driven decision-making, data produced, and users have a better understanding of the value of health data hence, data produced are often of higher quality.

4.5.2.2.2. Sub-theme: Data management processes

Data management processes are a foundation of health management information systems as they enable the collection, storing, analysis and use of routine health data that support planning, management and decision-making in the healthcare system (Seid 2021:1190).
In this sub-theme, data management processes, three categories emerged: data capturing and collation, data analysis and data dissemination.

4.5.2.2.2.1 Category: Data capturing and collation

Participants acknowledged that using the correct tools for data capturing is critical for producing useful data. They indicated that data from facilities are entered into DHIS2 at the district level. Once data is entered in DHIS2, it becomes available to all those who have access. After that, they extract data using various data elements to run comparisons using different formats across different facilities. Dashboards allow them to pull out any report share with the team.

The following statements support the findings:

> *We are actually having a system called DHIS2 where we capture our information and process data. It is important to have good data collection tools, and DHIS2 seems well adapted (P2).*
>
> *In the capacity where I am now, I receive monthly reports from various health facilities then enter in DHIS2 and once data is entered, they become available*

> *at the regional level. I then, extract such data and run reports based on different data element (P3).*

Dlodlo and Hamunyela (2017:70) also indicated that data flows from primary healthcare levels and then passed on to the district level on a monthly basis, which is captured on DHIS2. Namibia's flow of routine health information is the same as the flow of routine health data in Tanzania. Data from health facility registers are aggregated into monthly summary forms, which are sent to the district level were uploaded to DHIS2 (Kabakama, Ngallaba, Musto, Montesanti, Konje & Kishimawe 2016:86).

4.5.2.2.2.2 Category: Data Analysis

Data analysis is a basic skill that all professionals using HIS should acquire. Some participants indicated that they obtained data from DHIS2 using Excel pivot tables. The standard reports can be shared in the form of an Excel spreadsheet or PDF format and shared with the team for decision-making. Participants further stated that they analyse routine data using standard reports whereby data can be aggregated by data elements, which can be either on a monthly basis, quarterly or annually.

The majority expressed confidence in data analysis and making decisions regarding child healthcare programmes. They use key performance indicators such as immunisation coverage, nutritional indicators for children under five years old and HIV-negative among HIV-exposed babies.

However, other participants, who were mainly district medical managers, indicated that they did not have access to DHIS2 and were not trained on how to use the software. Therefore, they obtain information from primary healthcare supervisors and health information system officers.

The following statements support the information:

> *I obtain the data from DHIS2, using indicators that I will require to make decisions ,then I view per organizational unit, using standard reports where*

> *data is aggregated per data elements and can be shared as Excel or pdf format (P13).*
>
> *As a manager, I analyze my data by looking at the key performance indicators such as immunization coverage, underweight rate, stunting rate and HIV negative among HIV exposed babies, I am able to interpret my data (P12).*
>
> *Another problem is that we have realized actually is that we lack knowledge on analyzing of routine health information system and some of us do not have access to DHIS2 as I was not trained on using that software (P11).*
>
> *Some of us are not trained in using DHIS2 ,hence I cannot say much but I do receive analysed data from PHC Supervisor and HIS office through pivot table that I request for (P9).*

The lack of knowledge and skills is not only unique to the Namibian Health Information System; similar findings are comparable to a study conducted in Ethiopia that indicates that managers who have not been trained in computer skills and data analysis and use (Karuri et al 2014:56). A study conducted in Uganda also indicated that lack of training among managers affected data generation, analysis and use (Kiberu et al 2014:5).

In addition, DHIS2 has customised data analysis, thus encouraging data use for decision-making. The standard reports and visualiser are popular with DHIS2, with users making graphs and reports (Karuri et al 2014:56).

4.5.2.2.2.3 Category: Data dissemination

The majority of participants indicated that there are specific times as per protocols for reporting routine health data. Various levels for reporting were described, as well as the reason for these intervals. The main reason cited was to ensure that data reaches the different levels at a reasonable time and that they have adequate time for analyses and interpretation of data. Information is communicated through graphs to health facilities under their care. Data is also disseminated during district management and regional management meetings on a monthly basis. During such meetings, gaps in service delivery are identified, and strategies are developed to improve health programme implementations.

Verbatim statements made by participants:

> *There are cut off dates for reporting, beginning of new month, every 3rd of every month, then after its summarized, it must the district and entered in the DHIS2, it must be finalized by the 5th, it must reach the regional office on the 7th (P10).*
>
> *It is important that the staff members forward their reports as stipulated under the cut off dates to enable data to reach different levels timely for analysis and interpretation (P13).*
> *We disseminate data to health facilities on quarterly basis in a form of graphs, so that they see how they are performing in terms of different services they are offering (P12).*
>
> *On monthly basis, HIS officer present data that was generated in that month to district management and regional management team, gaps are identified and proposal of improvement to health programme are done (P11).*

According to USAID MEASURE Evaluation (2018:15), the majority of developing countries are conducting review meetings that are dedicated to reviewing data quality, programme performance, programme achievements and gaps. Review meetings give an opportunity for different health professionals to discuss appropriate actions for using data for decision-making. Regular review of data generates future demand for data and improves attitudes about data use.

4.5.2.2.3 Sub-theme: Data quality monitoring

Quality health data is a prerequisite to improving health systems. Hence, there is a need to strengthen the quality and relevance of data to improve data utilisation and data-driven decision-making (Nutley & Reynolds 2013:1).

In the sub-theme, data quality monitoring, three categories emerged: data verification by supervisors, DHIS2 built-in validation features and review meetings.

4.5.2.2.3.1 Category: Data verification by supervisors

Some participants indicated that data are verified by supervisors from different levels in the health system. The focus is on assessing for completeness and data consistency by comparing similar variables from different data sets. This means data verifications are mainly performed by healthcare managers responsible for Health Information System as compared to those managing child healthcare programmes.

However, others indicated that due to the high workload on some supervisors, the data are sent directly to HIS officers at the district without the verification process. The assumption is that HIS officers will do data verification before being entered into the system.
Verbatim statements made by the participants:

> *The supervisors at the clinic, ward at department level, need to verify the statistics which are compiled by registered nurses or from department. And when it comes to District, the Primary Health Care Supervisor or the matron, also have to verify it (P*6).

> *At most times PHC Supervisor are so busy, then as HIS officer, I verify the variables which are on the monthly summary form to ensure that the data is of good quality, in addition, I compare similar data to other reports, once that is done, I then enter data in the DHIS2 software (P3).*

The study findings are aligned with the study by Kapepo and Yashik (2018), who indicated that primary healthcare supervisors perform quality checks on monthly summary forms from health facilities before they are entered in DHIS2. Even though the primary healthcare supervisors perform quality checks, it does not eliminate errors but was found to be aiding in enhancing data quality.

4.5.2.2.3.2 Category: DHIS2 data validation functionalities

Participants indicated that DHIS2 has built-in validation functionalities that enhance data quality. DHIS2 gives alert messages if there are huge variations between previously captured data elements; the system is able to pick up specific data element and their minimum and maximum ranges (accuracy). This ensures consistency and errors are picked up on time. In addition, some participants mentioned that DHIS2 has built-in features that enable the users to assess the completeness and timeliness of data in the system. Hence, they are able to determine which data are entered and, the status of completeness and the time they were entered. However, some of the participants were not aware of DHIS2 functionalities.

The following statements support the findings:

> *The system identifies errors or outliers. If you enter the information, a pop up window will warn you that the data entered is out of range because there are maximum and minimum numbers embedded in DHIS2, to allow you to review and rectify the errors (P4).*
>
> *There are validation rules, when you capture the data, so if you capture the data which supposed to be equal or which is mostly higher than normal, the computer will alert you (P6).*
>
> *DHIS2 has a feature that checks the data set, shows which data is not completed, as well as the time the data were entered and when all reports were completed (P1).*

The study findings concurred with Dehnavieh et al (2019:69) that DHIS2 facilitate the improvement of the quality, timeliness and completeness of data by providing tools for checking data quality, facilitating feedback and self-assessment for reports and identifying health facilities that do not report timely. The importance of the inbuilt data validation tools is to generate data quality summary reports of data entered in DHIS2 and inform the users on the status of data quality dimensions (Karuri et 2021:445).

4.5.2.2.3.3 Category: Data review meetings

Participants stated that they hold regular meetings with health professionals and health information system offices from facilities. These meetings are coordinated at the regional or national level. The purpose is to engage health programme managers in data quality initiatives such as the verification of data in DHIS2. In this instance, data is compared with the data in the various data sources at the health facility, and if there are variations, data harmonisation is conducted. Furthermore, the meetings offer the opportunity to build capacity on data quality processes and data use. However, one participant lamented that the review meetings had not yielded positive outcomes regarding information use.

The participants reported their ideas as follows:

> *We also do regular review meetings where whereby we invite health professionals from the health facilities, district and regional on monthly, quarterly or annual basis for data quality checks and identify gaps in knowledge regarding data management and provide training to capacitate the health professionals to generate quality data and use their own data (P5).*
>
> *During the review meetings we compare whether the data which is in the system, it's the same as the data which were recorded at health facility and then do data harmonization (P4).*
>
> *We invite programme managers to participate at our data review workshops, where we engage them on use of DHIS2, however, this platform did not yield positive outcomes (P14).*

USAID MEASURE Evaluation (2018:15) indicates that meetings dedicated to reviewing and providing guidance to DHIS2 users were found to enhance data use through engagement. During review meetings, data are communicated through honest conversations about programme performance and improvement. Furthermore, the outcome of the data review meetings creates demand for data and improves attitudes toward data use among health professionals (Nutley & Reynolds 2013: 45).

4.5.2.2.4 Sub-theme: data demand

Health Information Systems are designed to meet the needs of multiple data users in the health system. Information needs vary among different data users that access the system, and different health professionals have diverse needs; in some instances data may not be responding to the specific health information needs of all data users (Nutley & Reynolds 2013:7).

In the sub-theme, data demand, three categories emerged: data on child health indicators, real-time access to RHIS and adequacy of child health information.

4.5.2.2.4.1 Category: Data on child health indicators

Child health indicators were cited as the main mechanism for seeking specific data. Some participants indicated that they required information on the head counts for various services provided to children, nutritional status, the status of HIV among HIV-exposed children, immunisation status of children and diseases causing ill-health among children under five years. This will enable them to plan and make decisions regarding child health in that catchment area.

Verbatim statements made by the participants:

> *In order for me to make decision regarding nutrition of the children under age of five years, I look for information on such as undernutrition, stunting and overweight of children under five year (P9).*
>
> *We need information such as children born by HIV positive mothers and top five diseases causing illness which is very important, which is helpful for us because it will show us how child health is progressing (P11).*
>
> *We need information on immunization, to see how many children are immunized in that are, what is the immunization coverage in that specific catchment population (P10).*

An assessment report by USAID MEASURE Evaluation (2018:15) indicated that health professionals should be trained in data use; then, there will be an increased demand for data use. If health professionals become empowered to interpret data and identify priorities in health facilities, thus will increase demand for data use at all levels for planning, disease monitoring and budgeting.

4.5.2.2.4.2 Real-time access to Routine Health Information System

The majority of participants expressed that once data is entered into DHIS2, it becomes readily available for use. However, they also lamented the lack of real-time access after data are entered into DHIS2. They indicated it takes around 24 hours to reflect on DHIS2 in order to be viewed and analysed. Only after 24 hours do data become accessible to the decision-makers anywhere along the chain, as long as they have a computer, laptop or tablet and the internet.

The following statements support the findings:

> *Once data is entered in DHIS2 it first goes to the central server, data is not available that time, and you can only run reports, analyse reports after 24 hours when its computed at the central point (P10).*

> *With DHIS 2, I can access health information anywhere as long as I have internet and computer, laptop or tablet, when I want to use it (P13).*

A cache for DHIS2 is set at a central server, which controls how long reports will be stored. The majority of countries schedule it every night; this is because that data is in reports at a specific time, all data loaded on Data Mart is updated, and data becomes available (DHIS2 2020:2). Dehnavieh et al (2019:72) indicated that DHIS2 increases data access as the DHIS users can access data anywhere provided that there is a computer, laptop and internet access.

4.5.2.2.4.3 Adequacy of child health information

Some participants stated that data obtained from Routine Health Information Systems are not sufficient to meet the information needs of managers, as there are some services provided to the patients, but data on those services are not captured, making it difficult to determine the outcome of the interventions. These data include a number of children who were provided with albendazole for deworming and zinc supplements.

However, other participants stated that routine health data provide them with sufficient information that enables them to assess the performance of child health programmes.

The following statements support the information:

> *Health information needs are not 100% addressed, because not all variables are captured on RHIS like the deworming of children with albendazole, zinc supplements of children under 5 years, and services are provided routinely, now how do we assess our performance in that regard (P9).*

> *Yes, data we produce is really helping us and is adequate, because we can get the data for EPI ,and determine how is the coverage, we can also get information from our data, how many babies are exposed to HIV tested positive or negative (P7).*

Nutley and Reynolds (2013:7) have highlighted that there is a vast amount of information in routine health information systems; however, some data users are unable to link routine health data to the planning and allocation of resources. Hence, there is a need to identify the information needs of all the users and incorporate them into routine health information systems.

Wagenaar et al (2016:130) has indicated that routine health information was found to be useful in evaluating interventions for child health programmes such as immunisation and elimination of mother-to-child transmission of HIV programmes.

4.5.2.2.5 Sub-theme: Information use

In this sub-theme, information use, five categories emerged: Allocation of resources, monitoring the implementation of children's healthcare programmes, monitoring of disease trends, Data used in plans and reports and corrective interventions.

4.5.2.2.5.1 Category: Allocation of resources

Participants used routine health data to ensure an adequate supply of appropriate resources such as vaccines. A number of immunisations give them an estimate of what will be needed to prevent stockouts. This is to enhance quality service delivery through the provision of uninterrupted services.

Participants also stated that they use routine health data to distribute resources, such as the deployment of health workforce according to workload in different health facilities. Routine health data is also utilised to motivate the procurement of various equipment.

The following statements support the information:

> *We use our immunization data to order different vaccines for our health facilities, they enable us to know how many children do we get per month for immunization per vaccine antigen and we use that information to estimate how much doses for immunization we require and order accurately, in order to prevent stock outs (P9).*

> *We use data for staff distribution around the health facilities and in the districts, and also determine which services require more staffs than the other by the data that are generated, this also helps us to motivate for additional staffs (P10).*

> *Data also help us identify gaps in order to allocate resources such as computers, weighing scales and other medical equipment to different health facilities (P8).*

Tulu et al (2021:14) indicate that routine health information was useful for decision-making, particularly in terms of human resource deployment. In addition, Karengera et al (2016:9) point out that routine health data assist managers in deciding on the amount of pharmaceuticals to be ordered and distributed equitably to each health facility.

4.5.2.2.5.2 Category: Monitoring of child healthcare programmes

The majority of the participants indicated that they utilise routine health data in monitoring the implementation of various child health programmes. Data are also used to determine if the health facilities or district are reaching their immunisation coverage targets and also identify the causes of underperformance in different health facilities.

In addition, they use data to monitor the growth and nutritional status of children under five years old. They identify the percentages of children who were seen at health facilities with different nutritional statuses.

The majority of the participants also use data to monitor the elimination of Mother-To-Child Transmission (eMTCT) of the HIV programme, as well as the outcome of the prophylactic treatment given to babies born by HIV-positive mothers. The health managers assess data to identify gaps in the implementation of the eMTCT programme.

The participants shared their thoughts as follows:

> *I monitor the immunization coverage, by looking at Expanded programme on immunization, using data and check if children have completed their immunization schedule (P12).*

> *The information collected can give us an idea of how healthy the children under age of five years, by monitoring their growth or how stunted they are or how unhealthy in terms of nutrition (P8).*

> *We can also get information from our data, how many babies are exposed, born by exposed mothers tested, how is the outcome, how many turn negative,*

> *how many turn positive. If there are still children infected with HIV at end of the prophylactic treatment and identify causes in order to prevent HIV transmission among children born by HIV positive mothers (P7).*

Karengera et al (2016:11) indicated that managers use data to monitor immunisation coverage and order vaccines. This could be because immunisation is of national and international interest. District, national and international programmes frequently support immunisation activities.

A study conducted by Wagenaar et al (2016:134) has cemented the study findings by indicating that routine health data was successfully used to evaluate immunisation coverage for children under five years and global fund activities around HIV response, particularly area of prevention of mother-to-child transmission of HIV. Hence, routine health data was found helpful in monitoring and evaluating the performance of children's health.

4.5.2.2.5.3 Category: Monitoring disease trends

The majority of the participants indicated that routine health data is mainly utilised in monitoring disease trends in order to be on alert for the possibility of disease outbreaks. If the numbers of a specific diseases are exponentially high in the health facilities, they investigate and plan for interventions. They expressed that routine health data is also critical when compiling quarterly and annual plans.

The following statements support the findings:

> *Data collected in health facilities can alert us on possible or may be possible outbreak or already outbreak of disease by monitoring the trends (P9).*

> *Data enables me to concentrate on interventions such as the stocking of purification tablets for the water if there is an outbreak of diarrhea (P7).*

> *We use mainly for planning purposes especially in strategic ,annual and quarterly plans (P13).*

Seid et al (2021:1192) indicated that managers use routine health information to treat patients as well as to monitor the disease trends in their districts or provinces, this leads to response to disease outbreaks and improves service delivery. On the other hand, there were variations from various studies that there was poor data use in regards to health facilities were not able to monitor disease trends promptly (Wagenaar et al 2016:130).

Nutley and Reynolds (2013:2) stated that routine health information data were underutilised in decision-making, particularly in developing countries, as the health professionals sit with data reports on shelves but are not sufficiently used in programme development, improvement and strategic planning.

4.5.2.2.5.4 Category: Corrective interventions

The majority of the participants stated that routine health data is utilised in planning and conducting interventions to improve service delivery. Participants indicated they identify the gaps in underperforming health facilities or districts with regard to immunisation coverage and conduct activities to improve the service.

Furthermore, data were utilised in planning and implementing community interventions on nutrition and providing health education.

Some participants also stated that they utilise data to initiate counselling sessions in the community for HIV-positive mothers. Other interventions included educating the community on water purification.

The following statements support the findings:

> *We look at our data, and when we notice that there is a low coverage of especially Measles-Rubella, we compile the list and trace all the lost to follow-up babies, we also plan for a campaign, so that we can reach those children, so that's how we use the data, to develop health promotion activities, yaa (P10).*

> *What I use the data at the district level for is to see which health facilities are performing, whether they are underperforming or performing and then identify what causes those facilities not to perform (P9).*

> *If you have those children who are malnourished who are wasted we give mothers health education on safe food preparation, as well we have to connect them to local NGOs, if they are available, especially for food programme, in order to address issues regarding food security (P9).*

> *We use our data to develop like a counseling sessions for HIV mothers who tested positive….so that we can support them to adhere to ART treatment as well as give their babies prophylactic treatment to eliminate the chances of the mother transmitting HIV to their children (P12).*

> *I can give an example of diarrhea in the community for under 5 years old, the health facility really concentrates order adequate purification tablets for the water, and distribute in the community in order to reduce number of diarrhea cases (P7).*

Routine health data was found to be most useful in estimating interventions effects on outputs and outcomes rather than population or community-level impact (Wagenaar et al 2016:134).

However, there were variations as the majority of the literature shows a limited culture of using information for decision -making, where only 37% of the facilities make decisions using findings from routine health information (Tilahun et al 2018:3). In addition, Mboera et al (2021:2) indicated that Sub-Sahara African countries data utilisation at all healthcare systems is low, despite some notable’s success, the impact of HMIS on the decision-making process within Africa health systems is limited.

4.5.2.3 Theme 3: Performance of the Routine Health Information System

The performance of routine health information has been a concern in many developing countries as there is poor data quality, and the utilisation of information remains unsatisfactory in the public health sector (Tilahun et al 2018:2).

In this theme, four sub-themes and 14 categories emerged: Supportive role of HIS officers, factors that impact the implementation of HIS, road map for HIS in Namibia and measures for improvement of RHIS.

Table 4.7: Performance of the RHIS

Theme	Sub-theme	Category
Performance of the RHIS	Supportive role of HIS officers	• Strategic direction for HIS programme • Capacity building • Data management at the district level
	Factors that impact the implementation of HIS	• Weakness in data use • Technical issues • Fragmented health information system • Poor data quality • Lack of specialised skills in HIS
	Road map for RHIS in Namibia	• Digitisation of health information system • Integrate different health information systems • Capacity building for health workers • Develop policies and guidelines
	Measures for improvement	• Regular supervision and feedback • Review data elements on DHIS2

4.5.2.3.1 Sub-theme: Supportive role of Health Information System officers

In the sub-theme, supportive role of HIS officers, three categories emerged: strategic direction for HIS programme, capacity building and data management at the district level.

4.5.2.3.1.1 Category: Strategic direction for Health Information Systems

Some participants indicated that the national level managed and provided a plan of action for HIS in the country. This level of government also coordinates the technical working committee that guides the implementation of HIS in Namibia. According to participants from the national level, the DHIS2 database is managed at a central warehouse, a function under the national level. The HIS officers and system analysts run backup on the DHIS2 database regularly in order to ensure that the data captured are retrievable. They have the authority to configure DHIS2 settings by adding new data sets and elements.
In collaboration with technical working groups and other lower levels of the health system, policies, guidelines and standard operating procedures are developed. Currently, the technical working group is supporting the development of a regulatory framework for HIS.

Participants made the following statements:

> *National level is more strategic in terms of managing and providing directions for HIS, national level coordinates technical working group which is comprised of different stakeholders, the are representatives from key partners that support the Ministry of Health and Social Services in the domain of health information system (P14).*
>
> *We run continuous back up to ensure that data is not lost, in fact this is a central system, and its easily manage the data is at central point at national (P5).*
>
> *DHIS 2 is managed centrally and there is a central server at headquarters, our staffs at headquarters have power to change settings, add or remove variables based on users need (P4).*
>
> *We have a technical working group and sub-group that is responsible for developing different documents including HIS policies, strategies, in consultation with the our technical agencies and lower structures HIS (P5).*

Nengomasha et al (2018:359) confirm that the national level in Namibia is responsible for policy formulation, regulation, and planning for service provision to the entire health sector.

Dehnavieh et al (2019:64) indicated that DHIS2 software information is stored on the central server, where data backups are done on a routine basis. The aim of hosting DHIS2 on a central server is to improve ownership in the country and provide centralised technical support at a single point (Kiberu et al 2014:3).

4.5.2.3.1.2 Category: Capacity building

Some participants highlighted that the regional level has a role in coordinating the HIS programme and ensuring that HIS is implemented in all the districts under their jurisdiction. Training was described as an important activity to enhance the quality of routine health information. Therefore, they conducted quarterly supervisory visits to identify gaps in the implementation of RHIS and give necessary support. Officers from the regional level conduct data analysis to ensure that data are correct and ready for use. Based on the findings, corrective initiatives are recommended to the districts.

The participants shared their thoughts as follows:

> *At regional level, there are people coordinating HIS program and ensuring that HIS activities are up and functional across all the districts in their territory ,they also have a responsibility to make sure health workers are trained on HIS so that they are able to generate quality data (P14).*

> *We do record audits at the facility during our quarterly supervisory visits, we compare what is in the system with what is in the registers or tally sheet or monthly report (P5).*

> *Regional level conducts support supervision visit is to assess the implementation of health information system at health facility and give necessary support to the nurses (P1).*

> *Regional level analyzes data and provide feedback to the lower structures regarding the performance of health programmes and data quality (P5).*

Nengomasha et al (2018:359) stated that the regional level plays a role in the oversight of service delivery and data management through the support supervisory role. RHIS success can be enhanced if the health professionals are adequately supported by the upper structures that will enable them to generate quality data and use their data to make decisions at the point of care (Asemahagn 2017:3).

4.5.2.3.1.3 Category: Data Management at district level

The majority of participants indicated that in the current structure of the health system in Namibia, the district has a mandate to ensure effective implementation of HIS. They also articulated the other role of the district in data capturing. Officers at this level enter data from paper-based summary forms from various health facilities into DHIS2.

These DHIS officers also analyse data and disseminate the information to the management through presentations on health programme performance and data quality. District HIS officers also provide feedback on disease trends programme performance in order to improve service delivery in their catchment area.

The participants shared their thoughts as follows:

> *At the district level, we have district health information system officers, these are staff who are mandated to ensure that HIS activities are implemented, they are the actual implementers of strategies and various data collection tools, and coordinate HIS at the district level (P14).*
>
> *When data from various health facilities come to the district level, the district health information system officer have to enter the data into DHIS2 (P1).*
>
> *We support the sharing of data between levels whereby we present the analysed data in the management meeting at district level as well as give*

> *feedback to health facilities on their health programme performance and data quality (P6).*

A study by Kapepo and Yashik (2018:204) also found that data entries into DHIS2 in Namibia are entered at the district level, meaning electronic data entry is not yet cascaded to the health facilities. Additionally, the district data are disseminated to various health professionals and used in the formulation of district plans and for monitoring their implementation (Karuri et al 2014: 47).

4.5.2.3.2 Sub-theme: Factors that impact the implementation of Health Information System

In this sub-theme, five categories emerged: weakness in data use, technical issues, fragmented Health Information Systems and poor data quality.

4.5.2.3.2.1 Category: Weaknesses in data use

Some participants indicated that there is weak use of data in Namibia, especially at higher critical levels. Programme managers were trained on DHIS2, indicators, and data use and also supported by creating profiles on DHIS2 for them to access data. In addition, a few participants stated that routine health data is not adequately used for decision-making and budgeting in the MoHSS. The key issue seemed to be the political influences on financial management. The interference appeared to be a historical issue in Namibia.

The following statements support the findings:

> *I can say with confidence, that the use of data is one area that is lagging behind, we created usernames and passwords for the programme managers to access their data and help them to customize their dashboards on the computer and ask them to get involved their data but the usage is still poor (P14).*
>
> *Data is not well used, especially routinely generated data to guide service delivery or resource allocation, it appears that decision makers and policy*

> *makers do not need data because the budgeting is not based on data but on past expenditures, political influence or availability of resources, so the use of information is weak in Namibia (P15).*

Wude et al (2020:3) revealed that the use of information for decision-making is weak, especially by health facilities. Findings from various African countries indicate that routine health information use among managers remains low at 39.9% in Nigeria, 55.6% in Kenya, 42% in Tanzania, and 59% in Uganda, while in South Africa data use was 65%.

Asemahagn (2017:7) also showed that routine health information use at the healthcare level was poor; hence, the effectiveness and service quality might be significantly affected in Western Amhara, Ethiopia. However, the use is influenced by various factors such as poor data management skills, lack of management support, lack of infrastructures and fragmented health information systems.

4.5.2.3.2.2 Category: Technical issues

Some of the participants indicated that there is limited health information equipment, such as laptops, computers and internet connectivity, to generate and analyse data at the health facility level. Hence, the use of data is weak and the level where they are generated. In addition, there is poor internet connectivity in some districts, which delays routine health information flow. These challenges result in late reporting, which is also exacerbated by staff shortages and lack of transport to bring paper-based systems to the DHIS Office, where it will be captured into DHIS2. Other participants cited DHIS2 technical glitches, especially towards the end of the month.

The following statements support the findings:

> *Like now, we there are no laptops, computer at health facility, hence, data cannot be entered electronically and analyzed at the point of care, where they are generated (P7).*

> *We experience poor internet connectivity in our district and because DHIS2 is a web based system we are unable to capture data when the internet is poor, so data will not be available for the next level (P1).*
>
> *The late reporting of routine health data varies from month to month, sometimes reports are late for 3 to 5 days this is result of staff shortages, and lack of transport to bring monthly summary forms to DHIS office, especially peripheral health facilities (P7).*
> *We are experiencing problems with the DHIS2 system especially towards reporting time. End of the month, when the system is down from the main server and during that time we are unable to enter or analyse data P4*

Begherian and Sattari (2022:8) indicated that inequity in the access and use of information, communication and technology services and lack of digital literacy in many low- and middle-income countries are key factors affecting the use of data in these countries.

Dlodlo and Hamunyela (2017:72) support the findings and argue that there is a constant inability to access DHIS2. In some instances, there are computers but no internet connectivity, and when there is an exchange of high volume of data, the central server fails to handle big data.

This challenge is not unique to Namibia but to other developing countries such as Kenya, where the literature indicates that lack of computers and poor access to the internet hinders the implementation of RHIS (Karuri et al 2014:43).

4.5.2.3.2.3 Category: Fragmented Health Information System

The majority of participants indicated that HIS in Namibia is fragmented. They indicated that there are multiple Health Information Systems that are running parallel to DHIS2.

The challenge with such systems is interoperability, and the privately-owned information systems have high annual licensing fees. The standalone programmes were preferred as they generated relevant information according to their needs. Participants lamented these donor-funded systems as they had their own agenda, which might not necessarily be in congruence with the ministry’s.

The participants indicated they find it time-consuming to gather information from various systems and consolidate them manually in order to make decisions in terms of child health. The data regarding children that are obtained from other systems other than DHIS2 includes a number for children with Tuberculosis (TB) and HIV as that information is obtained from the Electronic Patient Management Information System (EPMIS) and Electronic Tuberculosis Register (ETR).

The following statements support the findings:

> *Health information system in Namibia is fragmented, programmes such as TB are captured on ETR, HIV patients are captured on EPMIS and the pharmacy also have their own system PMIS m which are mainly funded by the donors based on their goal, and all these systems are not interoperable with DHIS2 (P13).*
>
> *The systems that operate parallel to DHIS2 are proprietary systems, that means, the owner has a key for the system. The owner of the system charge license fee on annual basis, hence the ministry of health spent huge amount of money which is not sustainable. Of course, the proprietary is a better and efficient system than DHIS2 which is free open source (P15).*
>
> *You need to understand that majority of these systems are funded by donors, and they have to design something that will address their objectives and their programme goals (P15).*
>
> *We have to obtain information from those multiple systems to make decisions specifically children with TB or HIV, its time consuming to consolidate these data manually to make decisions (P7).*

The Health Information Systems in Namibia are fragmented, and data are collected from different systems managed by different divisions from disparate directorates in the

MoHSS. These systems are not integrated, and managers have limited access to those systems because they are captured by donor-funded data clerks (Kapepo & Yashik 2018:205). In addition, Nengomasha et al (2018:359) indicated that a fragmented Health Information System is making it difficult to consolidate and analyse data for planning and decision-making.

A study conducted by Koumamba et al (2021:6) revealed that lack of coordination among different programmes promotes fragmentation of HIS. The fragmentation of HIS is promoted by funding agencies which prioritise their own programme information systems to support their objectives as opposed to the global needs of integrated HIS.

4.5.2.3.2.4 Category : Poor data quality

Some of the participants indicated that they often receive poor-quality data from health facilities. Most data are incomplete and inaccurate. This makes it difficult for managers to make informed decisions. As mentioned previously, there are also challenges with the timeliness of data. In addition, others said that late reporting is not only experienced at the health facility level but at all levels, including the national office. National health statistics report is generated on a seventh year as opposed to a yearly basis. That makes routinely generated data extremely important to make decisions, rather than outdated national health statistical reports.

The following statements support the findings:

> *Sometimes, you will find it that, there is a huge difference, when you compare figures from one month to another month, it make its difficult to use those data with some variables missing (P1).*
>
> *Challenges with the data I would just say, its like is not timely reporting from facilities, not on time, sometimes, data is late with three to five days to the District (P3).*
>
> *The health statistics report for me is shocking, the last one was in 2013, so if you use information to guide decision making, resource allocation, how can*

> *the ministry of health be behind seven years in generating annual health statistical report, this means decisions used are not accurate because they are based on old data (P14).*

The study findings are inconsistent with a study conducted by Daneshkom et al (2022:1) stated that poor data quality decreases the quality of care, increases costs, reduces the satisfaction of patients, lowers the performance of healthcare workers and causes inefficient and ineffective decision-making. Hence, comprehensive quality data is required to make informed decisions.

Seid et al (2021:1190) also agreed that inconsistency of data completeness affects the utilisation of routine health information. Even though there was an attempt to improve RHIS use, the quality remains unsatisfactory hence, decisions are often made from inaccurate data.

4.5.2.3.2.5 Category: Lack of specialised skills in Health Information Systems

Some participants indicated that there is a lack of capacity in advanced software operations of DHIS2. One participant lamented the dependency of the public health sector in Namibia, with a tendency to outsource technical expertise for HIS. Participants further indicated that it is costly and not sustainable.

Other participants indicated that Routine Health Information System use is hindered by the inadequacy of various resources, such as human resources; in this instance, the high staff turnover among Health Information System officers causes delays in the submission of data to higher levels and compromises quality.

Participants lamented the shortage of skilled manpower at both the district and national levels. Staff had to cover many aspects dealing with the national database and support the HIS officers at the lower structures.

The following statements support the findings:

> *We have developed a dependency syndrome because there was no capacity built locally in terms of advanced skills on DHIS2, maybe it is from our side that we were not smart enough to ensure that capacity is built, but there is a tendency of calling a consultant and outsourcing HIS expertise without ensuring that internal capacity is built (P14).*
>
> *There is a very high turnover rate of health information system officers, the incentive is very low, hence, data may not be generated accurately and timely when they resign (P7).*
>
> *There is high work load among HIS officers at district level as they are also engaged with other duties such as doing disease surveillance (P5).*
>
> *There is only one clinical staff who is a registered nurse, and trained on DHIS2, at same time, works as disease surveillance focal person for their district. If that staff is away to a workshop or leave, the data will not be entered for that period or untrained staffs will stand in to capture data which may result in poor quality (P11).*
>
> *We also have shortages of skilled technical staffs at national level, that can support the district health information system officers, they are less than five at the national level (P5).*

The study findings correspond with the literature by Dlodlo and Hamunyela (2017:72), who stated that even though staff are regularly trained in Health Information Systems, staff turnover is high, meaning that training continuously has to be done to replace those who left. This affects routine health data use as there is no continuity in data management processes.

4.5.2.3.3 Sub-theme: Road map for Routine Health Information System in Namibia

In this sub-theme, road map of RHIS in Namibia, four categories have emerged, which include digitisation of the HIS, integrate different Health Information Systems, capacity building for health workers and development of policies and guidelines,

4.5.2.3.3.1 Category: Digitisation of the Health Information System

Some participants mentioned that there are plans underway to establish a digital platform where patient data will be captured. The Ministry of Health in Namibia has developed an Electronic Health Strategy (eHealth Strategy) for guiding the implementation of a digital health platform. According to the plan, they will start with a billing module, which is currently piloted in two hospitals.

The majority of the participants from the district and region supported the introduction of the Electronic Health Record for child health programmes data capturing during each visit; however, they were not aware of plans for a digitised platform.

Participants also indicated a need to introduce DHIS2 at the point of care to support data entry and analysis at the health facility level.

The following statements support the findings:

> *There is a digital health information platform that the ministry of health is piloting now at two hospitals, Katutura hospital and Windhoek Central Hospital, meaning that it's going to be paperless (P15).*
>
> *Recently, we developed eHealth Strategy, with specific focus on guiding the implementation of the E-Health project, a digital platform in the ministry of health P14).*
>
> *I would like them to introduce a system that captures information from individual patient, like that has been previously used at central hospital. The system called electronic Health Record , where you can have all the patient information in the system, so that you can easily access the history for every client that comes (P8).*
>
> *If we can really make provision for network and also computers or laptops at health facility level, where it starts with the gathering of the information or data*

> *then introduce DHIS2 at point of care so that data can be captured and analysed at the point of care, it will encourage them to use information (P1).*

The study findings agree with the findings of Bagherian and Sattari (2021:3), which suggested that in order to improve data availability and use. There is a need to improve data infrastructures with respect to information and, communication, and technology at the point of care. The use of computerised data management tools in DHIS2 enhances the health workers at all levels to analyse, interpret data and use it for decision-making.

On the other hand, Ledikwe et al (2014: 6) have suggested that health systems can be improved through introducing electronic patient information systems. An electronic patient system can be used at the point of care as the system will automatically aggregate data and summarise them into DHIS2. This can lead to increased health reporting, minimising errors and reducing bureaucratic delays that are associated with paper-based systems if data are entered at all primary levels (Kiberu et al 2014:5).

However, the Electronic Health Record should be interoperable with DHIS2. Electronic Health Record can be more effective in generating reliable information and phasing out the hybrid system.

4.5.2.3.3.2 Category: Integrate different Health Information Systems

Some participants indicated that various Health Information Systems should be integrated into HIS so that DHIS2 users can log in to only one system and generate data. This will reduce the time of DHIS2 users when searching information from different sources.

On the other hand, system integration is in future plans in the MoHSS. Participants from the national level indicated that there was a company contracted to explore the prospect and later integrate all health information systems into DHIS2.

HIS national level embarked on a work plan to create a data warehouse which will enable data to be accessed at a central point, to enable systems to share information. However, other participants lamented the slowness of the process.

The following statements support the findings:

> *If systems such as EPMIS, ETR can be integrated in DHIS2, and be under one system it makes it easier and reduces my time for searching data from different systems (P7).*
>
> *Information systems that will be introduced in Namibia should be interoperable with DHIS2, and data can be viewed and analyzed using one platform (P13).*
>
> *There are plans underway to integrate all systems in Namibia and we are currently engaging a company to explore the possibilities and eventuality to integrate those different systems into DHIS2 (P14).*
>
> *In our workplan, there are plans to create data warehouse which will enable us to have access to data at central point, this will enable systems to share information between each other, encapsulated under the concept of interoperability (P5).*
>
> *The process of integrating different systems is a bit slow, cannot really say when it will be implemented (P14).*

Resource-intensive investments are required to strengthen information use, which calls for the improvement of data quality by strengthening electronic health systems to harmonise data collection systems (Ledikwe et al 2014:7). World Health Organization (2012:6) suggested that electronic health systems must be built in a way to facilitate the exchange of data. Real-time access to data is much easier if all health information systems are integrated and the exchange of health-related information and data among different Health Information Systems (Angula & Dlodlo 2018:6). Since DHIS2 is flexible and web-based, other Health Information Systems can be integrated with DHIS2 (Kiwaruka et al 2015:7).

4.5.2.3.3.3 Category: capacity building for health professionals

Some participants indicated that there are future plans for MoHSS in Namibia to build capacity among Namibian staff members by establishing a local DHIS2 Academy.

The majority of the participants indicated that there is a need for training for health professionals at all levels on data generation and use of child health data; this will aid in generating quality data and use data at health facilities. DHIS2 Academy, with the support of external agencies will support the health workers with knowledge and skills in advanced software. Training of health professionals is an input that could facilitate data management processes. This will enhance sustainability, reduce dependency on external institutions for technical expertise and save funds.

On the other hand, a few participants suggested the incorporation of Health Information Systems in the curriculum of institutions of higher learning that train health professionals.

Verbatim statements made by the participants:

> *We have engaged with departmental partners to ensure that we built a local training academy for DHIS2, so when we built a local capacity for sustainability purposes and not always depend on external institution to (P14).*
>
> *We will need to train and to capacitate nurses and other health professionals in terms of information, on how to collect this information, extend this to everyone who is dealing with child care, not only at the district level but at facility level (P8)*
>
> *The training package should include data entry, generation, analysis, data collation and how to disseminate and interpret data (P10).*
> *I think the training institutions need to include it in their curriculum so that health professionals understand how to generate and use data at point of care (P12).*

Nengomasha et al (2019:372) recommended training of health professionals on data management process and information use as this will enable them to generate complete, reliable and timely data. An assessment conducted by USAID MEASURE Evaluation (2018:13) found that capacity building activities such as data analysis, data mining, and interpretation enhance the use of data in monitoring the performance of child health programmes. Furthermore, health professionals become motivated and change their attitudes towards data generation and use.

Seid et al (2021:1194) pointed out that health professionals who were trained in Health Information Systems were more likely to utilise routine health information data as compared to those who had no training. Hence, capacity building is essential in strengthening routine health information use.

4.5.2.3.3.4 Category: Develop policies and guidelines

Participants from the national level indicate that there are plans to formulate an HIS policy that will guide the implementation of the health information system in Namibia. There was no specific time frame indicated as to when HIS policy will be finalised. Participants emphasised the need for a regulatory framework for HIS in Namibia. Therefore, protocols and policies should clarify the roles and functions of different key players.

The participants made the following assertion:

> *As we speak, I am coming from a planning meeting, to develop an overall HIS policy which will guide the implementation of HIS in Namibia (P14).*
>
> *Yeah, we should have clear guideline that is updated regularly and policy that guides on how to collect child health information, data analysis and how to use them (P8).*
>
> *When you have a document in place, it will provide roles and functions of different professions such as users and those producing data in health sector and motivate health workers to analyse and use data (P7).*

Kapepo and Yashik (2018:207) suggested that there should be clear policies and guidelines that guide the implementation of RHIS to enable DHIS users to understand the functions of data entry, identify information needs, data analysis and information use at the point of care.

English et al (2011:86) affirmed that the DHMIS clarifies the roles and responsibilities of data users and highlights data security and integrity. Furthermore, the policy also explains data collection tools, data flow, data quality, data analysis and data use at all levels of the health system.

4.5.2.3.4 Sub-theme: Measures for improvement of Routine Health Information System

In sub-theme measures for improvement for RHIS, two categories emerged: regular support supervision and feedback and review data elements on DHIS2.

4.5.2.3.4.1 Category: Regular support supervision and feedback

Participants suggested initiatives to strengthen regular support supervision to lower structures in the health system, including constructive feedback based on the performance of the child healthcare programme. Emphasis needs to be on data management processes, including information use. Community leaders should also be updated on the performance of child health in their catchment areas. This will encourage their communities to access health services. This will increase the visibility of leadership to support data management processes and information use.

The participants shared their thoughts as follows:

> *We still need to do our regular supervisory visits, so we can support them and also give them on the spot in-service training on how, to go collect quality data, data analysis, how to use their data (P7).*
>
> *We should provide feedback with emphasis on how to they performed in terms of child health data and how to use data for decision making from the national to the regional and then to the district (P9).*

> *We need to give feedback to the local community leaders so that they know what is going on regarding child health and appreciate the importance of child health services and increase awareness in their communities on importance of taking children regularly to child health services (P13).*

The study findings are aligned with the study conducted in health facilities in Western Amhara, Ethiopia, which stated that health professionals who get regular support supervision from higher structures were found to be able to analyse, interpret, and use their routine data as compared to those who do not get support supervision and feedback (Asemahagn 2017:9).

According to Mboera et al (2021:5), adequate supportive supervision and health facility performance reviews are significantly associated with good performance in routine health information. Additionally, feedback on data quality, programme performance and discussing appropriate actions for using data for decision-making were regarded as effective activities to foster data use (USAID MEASURE Evaluation 2018:15).

4.5.2.3.4.2 Category: Review data elements on District Health Information Software two

One participant indicated that there is a need to improve routine data collection tools on child health in order to add more data elements on child health for services provided in health facilities in order to address the information needs of the DHIS2 users.

These data elements include information to capture the zinc supplements and information on deworming of children under five years old.

The participant shared their thoughts as follows:

> *We need Zinc and de worming with albendazole information to be captured in routine health data, for under five years old because there are places like in northern regions we have problems with worm infestations, so that we able to know how many children were provided with those supplements (P12).*

A study by Nutley et al (2013:7) has indicated that there is a need for Health Information Systems designers to be in consultations with all potential data users in order to know which information they require for decision-making. This is because, in many instances, data users have access to information, but the data available does not respond to all their information needs.

In addition, USAID MEASURE Evaluation (2018:13) indicated that there is a need for all data producers and potential data users to always review all their monitoring and evaluation tools when they introduce a new service and inform the HIS system analysts to add their data elements into DHIS2. This will facilitate data use by focusing on collecting information that is directly linked to decision-making.

4.6 SUMMARY

This chapter provided detailed findings from phase 1, and two themes emerged: child healthcare and RHIS in Namibia and the culture of information use among nurses in primary healthcare. Phase 2 findings were presented in detail, and three themes emerged: the implementation of HIS in Namibia, using RHIS and the performance of RHIS.

The next chapter outlines an integration, interpretation and discussion of findings from Phases 1 and 2. Key findings are discussed together, with emphasis on new meanings that are unfolding from both data sets.

CHAPTER 5
INTEGRATION, INTERPRETATIONS AND DISCUSSIONS OF THE FINDINGS

5.1 INTRODUCTION

This chapter presents the integration, interpretations and discussion of Phase 1 and Phase 2 findings of the study. The study employed a qualitative approach to elicit information regarding the understanding of experiences and Routine Health Information Systems. Phase 1 data were collected from nurses at the health facilities using a semi-structured interview schedule through a focus group interview. Whereas in Phase 2 data were collected from the managers responsible for data management and supportive role in managing child healthcare using individual in-depth interviews. The results from Phase 1 and Phase 2 are integrated in this chapter.

Furthermore, the conceptual framework applied in the study was the logic model, which informed the interpretation of the integrated results. Key findings from both phases are discussed as new insights that emanate from both data sets.

5.2 THE LOGIC MODEL FRAMEWORK

The logic model framework uses key concepts, which are activities (processes) and indicators of output (direct products of programme activities), outcomes (specific changes in the participants' behaviour, knowledge, skills and level of functioning) and inputs (available resources used to collect and process data including data elements) (Nutley & Reynolds 2013:2).

The logic model proposes that the inputs, processes, and outputs lead to desired outcomes. Routine health information will be utilised optimally if there is availability of resources to collect and process data. These resources include data collection tools such as paper-based tools, computers, and DHIS2, as well as data elements and child health indicators. The process focuses on activities influencing the demand for and use of data, and RHIS processes involved are data collection and collation, data analysis, data dissemination, data quality checks and identifying information needs among health professionals, healthcare managers and policymakers. The outputs embrace routine health information plans, visible leadership and quality routine health information on child healthcare.

The logic model presents a sketch of relationships among the resources that influence the programme, the planned activities and the results anticipated.

5.2.1 Inputs

The assessments of inputs focused on the resources utilised in generating and processing data. The available resources were determined in both phases. In Phase 1, the focus was on the assessment of the availability of data collection tools used at health facilities for the data management process. Furthermore, training nurses in the generation and use of data, data elements and child health indicators were also part of the resources required for decision-making. Whereas in Phase 2, it was to assess the availability of information, communication technology infrastructures such as computers, internet connectivity and DHIS2 software used to generate routine health information. In addition, the areas of interest were the HIS design and legislative framework in Namibia, capacity building in performing advanced functions on DHIS2, and the ability to deal with big data

5.2.2 Processes

Processes of Routine Health Information Systems were explored in all the phases. This was done to describe and explore nurses' understanding of their role in data collection, data collation, data processing, data analysis and data dissemination. For managers, the focus was on the utilisation of child health information for decision-making.

In addition, the assessment of data demand and assessment of information needs were also determined in both phases. The study also assessed data quality checks used in RHIS, including the culture of routine health information use in managing and planning child healthcare services.

5.2.3 Outputs

Output refers to an evaluation of interventions used in the data management process. Hence, improved HIS governance which includes visible leadership, effective HIS plans and quality routine health information on child health care were predicted. The purpose of the study was to develop strategies to enhance the use of routine health information in managing child healthcare in Namibia.

5.2.4 Outcomes

The outcomes anticipated were improved child healthcare programmes such as increased immunisation coverage, improved nutritional indicators, reduced maternal-to-child transmission of HIV and reduced childhood illnesses.

5.3 INTERPRETATION AND DISCUSSION OF THE INTEGRATED FINDINGS

The focus was on how routine health information was utilised to generate useful data for managing child healthcare in Namibia. Data from both phases are integrated, interpreted and discussed. The purpose of the study was to develop strategies to enhance the use of Routine Health Information Systems (RHIS) in managing child healthcare.

5.3.1 Inputs

5.3.1.1 Design of Health Information System in Namibia

It was evident from the findings that the Health Information System in Namibia has gone through various stages from paper-based to hybrid systems with DHIS2 a web-based, free open software. DHIS2, as the aggregate routine reporting system, enabled the users at the district, regional and national levels to produce child health data from the system for comparisons across facilities and generating reports. Whereas the health facilities still used paper-based data collection tools to capture and collate data. Findings revealed the existence of other information systems such as Pharmacy Management Information Systems (PMIS) Electronic Tuberculosis (ETR) that were running parallel to DHIS2. It was important to gain in-depth understanding of the evolution of the Health Information System (HIS) in Namibia.

The use of free and open software is well suited for Namibia as a middle-income country as it is associated with low costs, and there is no need to pay yearly licence fees for RHIS software. In addition, it allows the sector to change data elements based on the information needs of various users. According to the DHIS2 Manual, free and open software allows users to run, modify and customise software to suit their needs. The term "free" in this context refers to the freedom to run and adopt the programmes not in a monetary sense (DHIS2 Documentation Team 2016:8).

The design of HIS in Namibia appeared to be similar to many low- and middle-income countries, where data is generated using paper-based systems at health facilities and electronic software to capture data at the district, regional and national levels. This aligns with a study by Thulare et al (2020:424) that data were collected electronically at the point of care. However, over half of South African public health centres still use paper-based filling systems. These data are sent to the districts where they will be captured on DHIS2. However, this practice shows a shortfall of requirements recommended by the World Health Organization Health Metrics Network, which indicates that countries should consider implementing emerging technologies that will help to increase their storage and performance capacities and accelerate the processing of data timely (World Health Organization 2008:42). Contrary, to study findings a study by Mekebo, Gobena, Hawlete, Tamiru, Debella, Yadeta and Eyeberu (2022:8) showed that the level of implementation of DHIS2 in public health facilities was 75% in Eastern Ethiopia.

The absence of electronic software to capture data at the health facility level appeared to hinder nurses' ability to realise the full potential benefits of routine health information. The study revealed that Namibia did not have general HIS standards; they currently customise the systems according to the programme or user needs. Information standards are significant in order to allow the sharing of health data between various information systems. The pooling of data from a number of sources reveals the bigger picture and allows comparisons across the health services. The adoption of standards is essential in improving the quality and usefulness of information for all stakeholders (ITU-T Technology Watch Report 2012:18).

The absence of standards in the Health Information System in Namibia has impeded the exchange of data between different health information systems such as EPMIS, PMIS and MEDITECH. This might limit data users from comparing various data from different information systems to make data-driven decisions. Sahay et al (2019:2) state that the limited use of standardised approaches to design, build and implement HIS contributes to the creation of a fragmented array of systems not capable of sharing information. ITU Technology Watch Report (2012:16) indicate that the majority of developing countries are experiencing challenges with advanced capability in standardisation, mainly due to a lack of understanding of the national importance of standards, inadequate funding and insufficient involvement in the international standards development process.

There are security features embedded in DHIS2, and these are necessary for data security. Data revealed that access was through authorisation. The user management interface allowed the system administrators and analysts access to specific fields, healthcare managers also had access to various modules. These security features enabled different users to execute their functions in line with their roles, such as data quality checks, supervision and management functions. Users appeared to be satisfied with the available features to enhance data security and privacy. However, the level of awareness of security features differed between managers from national, regional and district. Those managers from the district and region were only aware of one feature called user management. Whereas, those from national, regional and district could articulate all key security features of DHIS2. It is not known how this shortcoming impacted their ability to secure the data. According to the literature, the security functions include; user management, sharing setting, audit log, and programme access level (DHIS2 Documentation Team 2016:611).

Kanfe et al (2022:7) also stated that it is not unusual to find a discordance between users having knowledge of utilising DHIS2 to entering, analysing and extracting data for decision-making but have limited knowledge of data security features embedded in the system.

As stated in section 5.8.1, the majority of the participants raised concerns about multiple data sources. Each service or programme had it is own register, tally sheet and monthly summary form. Data entry overwhelmed the nurses, which could also lead to data entry errors. There was a potential risk of presenting incomplete and inaccurate data. Botha et al (2020:2) indicate that the multiplicity of data sources and reports contributes to a duplication of efforts and untimely, incorrectness, and incompleteness of data at health facilities.

Multiple data sources were not only experienced at the health facility level but at the district, regional and national levels as well. This could have resulted from different organisations/donors and private health facilities' preferences to build their own Health Information Systems. The absence of health information protocols and standards, as mentioned in section 5.3.3, might have exacerbated the situation. This might lead to a lack of trust in data generated at the public health facilities. In addition, those organisations might want specific information which is directed towards a specific programme.

Dlodlo and Hamunyela (2017:62) confirmed that Namibia's health sector has a large number of systems operating in silos in different departments and not integrated with DHIS2. These systems running parallel to DHIS2 could be using information technology systems and software applications that cannot communicate and exchange data with DHIS2 due to their design (section 5.3.1). The study assumed that donors opt to use their own information system as opposed to using DHIS2 because they prefer to use proprietary systems which are better and efficient as compared to open and free software such as DHIS2. However, governments are reluctant to choose proprietary information systems because they are expensive due to the requirements of subscription fees and annual licence fees.

This was confirmed by Mjelva (2017:35) that various non-governmental organisation, donors and various international aid providing health services to low- and middle-income develop their own Health Information Systems if they are not satisfied with the quality, content and availability of the information in the national HIS. Multiple data sources are not only unique to Namibia, but to the majority of developing countries. In Ethiopia, the health information system is cumbersome and fragmented, with various information systems operating parallel to DHIS2. Hence, the Health Information Systems in districts were weak and led to poor quality data (Shiferaw 2017: 2). Botswana is another middle-income country that has fragmented systems with Tuberculosis, pharmacy, and medical laboratories have information systems running parallel to DHIS2 (Seito-Kgokgwe et al 2016:1).

Experiences in this study related to how nurses and managers encounter and are involved in Health Information Systems. Nurses and health managers viewed routine health information systems as data collected on a routine basis. There were some variations in the two cases; nurses perceived RHIS as a system where data are collected from patients during clinical encounters. They understood their role mainly as generators of data that would be collated as described earlier to be sent to the next level on routine intervals. Much as they showed some understanding of information use, they, however, seemed to align their role as producers of data with less emphasis on data use. Their experiences were articulated differently from healthcare managers, who regarded RHIS as data generated at the health facility, exported to the district to be entered in DHIS2, where they access data and utilise it in managing child healthcare. The managers expressed positive experiences of the routine data reaching them and their use of it in managing child healthcare programmes. The emphasis was on timeliness and accuracy of data from the system. They acknowledged the usefulness of HIS in the planning and mobilisation of resources.

Understanding how nurses experienced the RHIS is based on their perceptions and views of the tasks they were involved in. Although, they did not have a full grasp of RHIS, their experiences were related to the data elements they were capturing on a routine basis and reporting. Much as there was a 24-hour delay in the transmission of data captured in DHIS2, managers acknowledged the importance of data in planning child healthcare. There appeared to be a kind of surety in the data generated from DHIS2, and they expressed that it provided them with useful information for decision-making in managing child healthcare. A study by Begum, Khan, Adamou, Ferdous, Parvez, Islam et al (2020:5) stated that healthcare managers expressed a strong, positive preference towards using DHIS2 for routine health information. They described it as a dynamic system that has improved the data management process and accountability of data reporting. This study intends to develop strategies that would strengthen the use of RHIS so that every user has a positive experience of the system.

5.3.1.2 Skills of personnel on HIS

5.3.1.2.1 Understanding of Routine Health Information System

On average, nurses at health facilities were not overly familiar with the term routine health information system; however, they had a good understanding of the processes and tasks involved in the whole cycle of data management. However, the study found that they could not relate these tasks to the broader concepts of a Health Information System (HIS). There were no variations noted across rural and urban subcases. The study assumed that understanding of HIS design and data management process is important to enable the nurses to develop a broader understanding of their roles and contribution to the use of a national HIS. This will enable them to take ownership and generate quality data, collate, analyse, disseminate and use data for decision-making in planning and managing child health services at their level of care. They would also see the significance of quality data for regional and national planning, evaluating and monitoring of healthcare. Sied, Bayou, Ayel and Zerga (2021:1196) confirmed that health professionals who are knowledgeable in data management processes are more likely to generate quality data, analyse and utilise data for evidence-based decision-making. They have the potential to perform HIS activities in a standardised and appropriate way.

As expected in their role, healthcare managers reflected a higher understanding of the organisation of the Health Information System. They fully comprehended functionality and data management processes. Healthcare managers who operated at a national level and mainly dealt with Health Information Systems were found to be more knowledgeable about health information system design and data management processes. Some variations were noted among some managers who had a limited understanding of the DHIS2; these were mainly medical superintendents involved in managing child health. This study contends that limited awareness of the key functionalities of the system and how to perform various data quality checks might lead to lower utilisation of data emanating from the inability to transform data into useful information. A good understanding of the data management process is associated with good data quality. Mboera et al (2021:5) also found that health workers at the health facility level did not fully understand the functionality and design of HIS and methods to synthesise information for decision-making. Health professionals need to have a good understanding of all data management process aspects in order to generate quality, and useful data for monitoring and evaluation of programme performance (Amouzou, Faye, Wys and Boerma 2021:1).

5.3.1.2.2 Capacity building

Building capacity among users of the HIS is critical. Training needs vary among different categories of health professionals and at different levels in the health system. Nurses at health facilities were capacitated through in-service training by their peers and supervisors, as described earlier. The training mainly focused on data collection and collation. The training seemed to exclude data analysis, data quality assurance and information use. This is because the majority of nurses were found not able to explain data analysis, perform data quality assurance or explain the process followed in using evidence for decision-making on a specific health issue.

Whereas some healthcare managers at district, regional and national were capacitated through formal training by a national authority in collaboration with external agencies on data capturing in DHIS2, the use of validation tools to check the quality of data, data analysis and dissemination. Healthcare managers appeared to be satisfied with the type of training they received on data management processes.

The consequences of a lack of comprehensive training in HIS tasks could be weak decision-making as a result of poor child health data quality. Asemahagn (2017:9) indicated that health workers who were not capacitated in the data management process are associated with generating incomplete, inaccurate data that has the potential to mislead decision-making in the allocation of resources and interventions to improve child health.

There seemed to be a mismatch in the deployment of personnel in HIS positions, with the majority of managers using HIS, primarily clinical staff with less technical skills in health information system design. The study revealed that health information system graduates were recruited in junior and non-technical positions such as data entry, and only a few managed the DHIS2 database. Health Information System graduates appeared to be underutilised and did not fully support the data management processes as expected. Health information system experts are expected to manage health information systems by ensuring that quality data are available for decision-making in healthcare. They also have a role in designing health information systems, managing databases and supporting the technical operation of health information systems. They should be in charge of managing the data management process as well as supporting the health professionals in terms of training and equipping clinicians with knowledge and skills to generate and utilise data. The availability of qualified human resources with technical with technical skills is the supporting RHIS (Chebueret & Odhiambo-Otieno 2016:1984).

This finding creates an opportunity to design strategies for capacity building across all levels. Managers, in particular, need skills in data cleaning, identifying bottlenecks and ensuring data quality. Once the interoperability is established, they need training on how to import data from other systems into the DHIS2.

The high workload among nurses at health facilities was stated as a challenge in the data management process. Nurses were overwhelmed with clinical duties and HIS tasks; therefore, their priority seemed to be more tuned to patient care, data capturing became secondary, then, at times not performed accurately. This was confirmed by Lippenveld (2017:338) that routine health information is influenced negatively by the high burden of clinical duties among nurses at health facilities, leading to incomplete, inaccurate data.

In addition, there is a lack of specialised skills and capacity in HIS, and this can impede the successful implementation of HIS. The personnel appeared to struggle with the lack of standards to enable various stakeholders with different information systems to adopt standards leading to data exchange. The lack of capacity might affect the quality of data and reporting times. Kapepo and Yashik (2018:206) indicate that the Ministry of Health and Social Services in Namibia has a shortage of skilled technical personnel who are able to establish standards, maintain databases and support data management processes.

5.3.1.3 Understanding child healthcare indicators

The majority of the nurses and healthcare managers showed a fair understanding of child health data elements and were able to link services rendered in child health services to the production of routine health data. In this study, child health indicators are regarded as important resources (input) that are derived from the national HIS. All users of the information system need to be familiar with the definitions of the indicators to enhance data management processes. This means utilisation of information requires adequate knowledge of indicators. Both nurses and managers were able to verbalise main child health indicators such as immunisation coverage, nutrition indicators (stunting rate, underweight rate and wasting rate), elimination of mother-to-child transmission of HIV indicators and child morbidity. Nurses were aware of what was expected of them in terms of data elements they were supposed to use when collecting data. This means that they could collect required data that would be utilised to monitor the performance of child health services. Sako, Gilano, Chisa, Shewangiz, and Fikadu (2022:440) argue that health professionals who were aware of indicators were motivated to generate quality data and utilise data to monitor the status of the implementation of child health development intervention.

However, both nurses and healthcare managers did not indicate all the indicators used in child health such as child mortality. Therefore, it was not clear as to how they measured child-related deaths. This raised questions as to how case management of children using Integrated Management of Neonatal and Childhood Illness (IMNCI) was monitored when caring for and treating common ailments and assessing the treatment outcomes. There is a general consensus that if children are managed according to IMNCI principles, there will be low morbidity and mortality. Daneshkohan et al (2022:5) also confirmed that poor understanding of data elements and indicators among healthcare workers can hinder the use of routine health data to assess the performance of various child health services.

Nutritional indicators such as the underweight rate and stunting rate are the main focus in Namibia due to the prevalence of malnutrition in the country. The main contributors are poor infant feeding practices as well as poor food security. This is consistent with Bauleth, Mitonga and Pinehas (2020:24), who argue that malnutrition remains a public health challenge, specifically undernutrition in Namibia; hence, the effort to improve the nutritional status of children under the age of five years remains a priority.

The significance of child health indicators in Namibia is to assess the status of the implementation of various interventions related to child healthcare programmes and monitor targets. If not met, this would signal a need for capacity building to equip healthcare providers with skills to improve child healthcare services. Even though the nurses and managers stated that they use child health indicators in monitoring immunisation coverage and nutritional indicators, the extent of identifying training needs and formulating policies could not be established. Daneshkohan et al (2022:5) also confirm that poor understanding of data elements and indicators among healthcare workers can hinder the use of routine health data. This study assumes that understanding of indicators should not only be limited to the expression of what they measure but also the ability to utilise the indicators in formulating policies and plans and strengthening existing interventions to improve child health outcomes.

5.3.1.4 Guidelines, policies and legislative framework for Health Information System in Namibia

The study refers to policies and guidelines regulating a Routine Health Information System (RHIS) as an input. This means the policies, guidelines and regulatory framework are the backbone for effective and efficient implementation and the governance of the health information system. Both data sets showed that nurses and managers acknowledged the significance of the regulatory framework. Not all managers were aware of these guidelines, especially those functioning at the district level. Nevertheless, they indicated that these regulations could provide directives in terms of roles and responsibilities for each key user, as well as the data elements that will be used in the data management processes. Policies and guidelines standardise the implementation of health information systems with the purpose of strengthening the monitoring and evaluation of RHIS (Katutura et al 2018:4).

Study findings revealed that there were no policies and legislative frameworks to guide the implementation of HIS in Namibia. However, there was only a draft of HIS strategy without a timeline attached to it. In addition, there was an eHealth Strategy that provided a guide on how information, communication and technology contribute to the health system transformation agenda and how to strengthen service delivery through using electronic solutions (Ministry of Health and Social Services 2020:8). As mentioned earlier, the lack of HIS regulatory framework created a situation where various health information systems were running parallel to DHIS2. Dlodlo and Hamunyela (2017:62) also indicate that the lack of a legislative framework to compel various organisations to exchange their data with the main data source DHIS2 led to multiple, disparate information sources and repositories operating in silos and not exchange data with the Ministry of Health and Social Services.

In addition, the lack of policies and guidelines resulted in non-uniformity in performing data management processes, and there were no directives on how to analyse, disseminate and use routine health information. Similarly, in Botswana, a lack of standards impedes the ability to maintain, store data source documents, analyse, disseminate and use data (Ledikwe et al 2014:4). Khan and Edwards (2012:6) stated that the absence of operational processes such as data submission protocols, lack of clarity about roles and responsibilities causes problems relating to data collection, quality and ownership, planning and managing health information systems in Namibia.

The findings showed that Namibia was lagging behind the World Health Organization Health Metrics Network recommendations for countries to have legal and policy frameworks which are consistent with international standards. Legislation and regulations are significant in creating an enabling environment that will ensure data availability, data exchange and sharing. Additionally, the legal framework defines the ethical parameters of data collection, information dissemination and use (World Health Organization 2008:16).

This study identified this shortcoming as a serious gap in HIS leadership and governance. Any HIS that lacks benchmarks to monitor performance and support data generation and use is problematic. There seemed to be a need to develop strategies to ensure health professionals have access to the HIS policies.

5.3.1.5 Data collections tools

The study findings revealed that health facilities faced intermittent unavailability of data collection tools such as registers, tally sheets and monthly summary forms. Intermitted stock out of data collection tools was associated with a lack of funds to print the tools or a poor supply chain whereby data collection tools were not ordered timely. Disparities between rural and urban areas were observed, with rural health facilities having frequent stock of data collection tools. This could cause delays in submitting reports to the next level. The data might be incomplete as nurses could only submit data on forms that were available. This could create unreliable information that could mislead decision-making on child healthcare.

Adane, Adege, Ahmed, Anteneh, Ayalew, Berhau et al (2021:6) also confirmed that a shortage of supplies such as registration books, tally sheets and other forms causes incomplete data, delays in generating quality data and late reporting. Timely reporting is one of the dimensions of data quality. The districts had their own unique challenges as they were using electronic platforms. Managers lamented poor internet connectivity and technical glitches, especially towards the end of the month. Poor internet connectivity was mainly caused by slow bandwidth, whereas technical glitches could have resulted from the heavy traffic of data flow when all health facilities were submitting their reports. This might be associated with the capacity and speed of internet infrastructure installed at the district and regional level and the size of the memory. Nielsen (2012:4) indicated that issues of weak connectivity, lack of power backup up and a generally insecure server environment cause technical difficulties when huge amounts of data are being entered into the system.

5.3.2 Processes

The data management process embeds all aspects of data handling from data collection, storage, quality assurance and flow to processing, compilation and analysis (World Health Organization 2018:17). The data management processes involved in this study included the use of the RHIS for data collection, collation, analysis, dissemination and data quality checks. According to the study's theoretical framework, data management processes influence the demand for child health data.

5.3.2.1. Data collection

Subsection 5.3.1.1 describes the hybrid format of HIS used in Namibia. The majority of nurses could generate data at facilities by entering patient information onto paper-based registers. After that, data are tallied onto the tally sheets. Tally sheets are being collated onto monthly summary forms and sent to the district level end of the month for capturing for DHIS2. Therefore, the data collection process was similar across the board. This was probably due to reporting requirements.

Minimum standards for data collection by the World Health Organization Metrics Network indicated that data from health facilities are service generated and derived from patient-provider interactions covering care provided (World Health Organization 2007:33).

The study revealed that the data are captured using multiple registers, depending on the services offered. This might require a lot of time for nurses to do multiple entries, which may result in errors in data entry. In addition, the paper-based registers occupy a lot of physical space; hence, nurses complained that it was always difficult to store them or obtain data from previous years. Amouzou et al (2021:1) also posit that paper-based data collection tools at the health facility level have some shortcomings that compromise data quality. Time taken to document, lack of backup, limited data security and a requirement for a huge physical space. Kapepo and Yashik (2018:205) have also identified similar challenges, a slow process of data collection which led to inaccurate and untimely data in Namibia. It is evident that certain dimensions of data quality, such as timeliness, may be compromised, thus affecting its usefulness to the management of child healthcare services.

However, not all nurses expressed confidence in data collection; a few indicated that they struggled to generate the required data and often sought support from senior nurses in health facilities who are mainly supervisors at health facilities. There were no differences observed between rural and urban subcases. It is important for the facilities to ensure that all nurses are adequately oriented to the minimum requirements in data generating and collating data. Daniel et al (2016:107) highlighted that there were healthcare workers who were not able to fill data elements in the paper-based data collection tools at the health facility level, and they did not generate quality data as compared to those who knew how to fill the data correctly.

Managers at the district, regional and national levels use District Health Information Software Two (2). It captures routine health information from monthly summary forms from health facilities. P-Tracker is an application of DHIS2 at the health facility level to capture data for the elimination of child-to-mother transmission of HIV. Tracker (individual-level) data packages aim at capturing data to enhance a patient-centred approach to programme management. Tracker is used to uniquely identify and track a person or entity over time (World Health Organization 2022:52). However, the P-Tracker has not been optimally functioning due to a lack of information, communication and technology (ICT) devices. Tracker supports direct monitoring and follow up on those babies that are exposed to HIV, tracking them during the duration of prophylaxis and breastfeeding. P-Tracker data automatically aggregate with in DHIS2 to support national and international reporting requirements (DHIS2 Documentation Team 2016:274). Karuri et al (2014:44) stated that a web-based DHIS2 is intended to capture a monthly summary of healthcare services delivery and allow analysis at all levels, promoting data use at all levels for decision-making. To strengthen data management processes, there might be a need for Namibia to consider introducing DHIS2 at the facility level or any form of electronic data capturing that would alleviate the documentation burden.

5.3.2.2 Data collation

Nurses in health facilities indicated that they collate data from various tally sheets based on services offered and enter them onto monthly summary forms on a monthly basis. This is practised in the majority of low- and middle-income countries where collated data are sent to the district to be entered into DHIS2 (Karuri et al 2014:45).

This might be a result of poor HIS infrastructures and a lack of capacity among health professionals to operate computer software. Many health facilities have only one computer whose software is outdated. Namibia is a developing country and might have similar financial constraints to provide information and technology infrastructure and equipment such as computers and internet connectivity. Hence, manual data collation is still performed at health facilities. Kiberu et al (2014:2) stated that paper-based data collection tools had dominated most developing countries in Sub-Sahara Africa reporting; hence collation of data is manual.

Although manual data collation is practised widely, it requires a lot of time for nurses to manage registers and organise various tally sheets and monthly summary forms. In addition, validation of data might be difficult due to various reasons and perhaps illegible handwriting. This may result in generating incomplete and inaccurate data, leading to poor decision-making and inadequate resource allocation. Getachew, Erkalo and Garedew (2022:2) state that paper-based data collation is associated with incomplete and inaccurate data, and it affects to strategic planning of health programmes through insufficient resource allocation due to poor data quality.

5.3.2.3 Data analysis

Data analysis is an important aspect of data management as it enables users to understand the burden of diseases and the number of people providing service delivery and assess the performance of various health programmes.

This study showed that data analysis is performed manually at the health facilities by supervisors using monthly summary forms, whereas managers accessed data from DHIS2. This is done by grouping data according to different child health programmes and turning them into graphs. The majority of healthcare managers and supervisors expressed confidence in analysing child healthcare data, whereas the majority of nurses lacked data analysis skills. Therefore, this gap in data analysis skills among nurses could be a result of their role priorities in data management processes. The gaps in data analysis skills were seen across nurses in rural and urban areas, meaning the context did not appear to have any significant influence on knowledge of data analysis. They seemed to focus on data generation and collation, and this study could not establish the reasons for this shortcoming.

Nevertheless, it was assumed that the data analysis was not emphasised at this level. It also seems that various factors, such as multiple paper-based data collection tools, time it takes to be aggregated, and poor knowledge and skills to analyse data could be a cause of poor data analysis skills at the point of care. Yarinbab and Assefa (2018:5) argue that the majority of healthcare workers are overwhelmed with generating a lot of data but do not actually analyse data. Health facilities are expected to be self-contained segments of a national health system with a well-defined population within their clearly delineated administrative and geographic areas; hence, data analysis is also crucial at the health facility level where data is generated. There is a clear need to develop mechanisms that would strengthen every component of data management processes, especially data analysis for nurses.

5.3.2.4 Data dissemination

The majority of healthcare managers and supervisors indicated that there is an occasional display of data on the notice boards in the health facilities and district offices, consistent with international guidelines. Displayed data was immunisation coverage charts and top five diseases causing morbidity among children under the age of five years. However, there were some omissions in the information displayed because the elimination of mother-to-child transmission of HIV data and nutritional indicators were not reflected. The lack of required information at each level impedes data use, as decision-makers at the system level prefer segmented data per indicator to support the interventions they would like to undertake (USAID MEASURE Evaluation 2018:10).

On the other hand, an omission could be a result of priorities in indicators to disseminate information among the users. Khan and Edwards (2012:16) state that there are various stakeholders, especially development partners, who provide technical and financial support involving a wide range of health activities. These donors have their priorities henceforth, the emphasis is on supporting their programmes.

It could be that the display of data was influenced by programmes receiving national and global interest, such as immunisation programmes. The donors and technical agencies will support activities related to immunisation, including data management related to immunisation coverage. The absence of disseminated information or untimely information influence the use of data among health professionals to assess their day-to-day activities at health facility (Daniel et al 2016:11).

The sharing of data also happens during district and regional management meetings. Nurses from facilities are not represented in these meetings. The quality of feedback from these meetings is unknown. The exclusion from these meetings disempowers nurses in the data management process; they are not exposed to the discussion surrounding their data. The exclusion of nurses is regarded as a weakness that needs to be addressed to empower them. It is important for nurses to know how they are performing in terms of the quality of data and areas for improvement. This is consistent with Seitio-Kgokgwe et al (2016:7) findings that only a small proportion (5.3%) of health workers receive feedback from district and regional levels. In addition, Mboera et al (2021:4) also revealed that administrative and management meetings at the district level discuss issues related to the health information system; however, there was no evidence of managers providing feedback to subordinates.

In addition, managers stated that the national authority was supposed to produce a National Health Information Report on a yearly basis and share it with all stakeholders in the health system. However, there was a delay in producing such a report, with the last one developed and disseminated seven years ago. This study could not establish the reasons behind the delay. However, assumed that this could be related to various factors such as lack of trust in data as a result of incomplete, inaccurate data, poor knowledge and skills to deal with big data or lack of funding to print the documents. Ahnhanzo, Ouedraogo, Kpozehouen, Coppieters, Makoutode, and Wilmet-Dramaix (2014:2) argued that most developing countries, data are not disseminated timely because of factors such as poor data quality and lack of competencies among healthcare workers associated with RHIS tasks.

5.3.2.5 Data quality

Data quality is defined as data fitness to serve its purpose in a given context. The data should be reliable, valid and trusted in an integrated public health information system (Getachew et al 2021:2). Decisions to improve the health system are linked with the quality of data used; hence, routine health data will have no importance unless it is accurate, complete and timely to inform decisions that are response to are responsive to users (Shama, Roba, Abaerei, Gebremeskei & Baraki 2021:2). Both data sets showed there was consensus that routine health data should be complete and accurate in order to be utilised for decision-making in child healthcare. They were aware that decisions made from inaccurate and incomplete data could result in poor planning and budgeting of child health services. From the point of care, nurses need to ensure that the data generated are reliable, consistent, accurate and submitted timeously. Therefore, they need skills in the verification of data quality. In this study, nurses did not have sufficient skills to perform appropriate data quality checks. This could be attributed to a lack of policies, guidelines and support supervision of health facilities. In addition, high client workload was cited to be contributing to poor data quality.

As revealed earlier, there are potential risks to poor data quality at facilities; factors such as multiple data collection tools, inadequate data management skills among nurses and scarcity of human resources increase the likelihood of incomplete, inaccurate and untimely data. Ahanhanzo et al (2014:4) cited the unavailability of resources such as data collection tools, the technical factors such as the complexity of the collection tools and absent technologies and behavioural factors such as staff motivation and competencies associated with the data management process as contributing to poor data quality. It was evident that nurses were overwhelmed with clinical duties to perform these tasks diligently; the majority did not feel confident to do data quality checks and as reported earlier, this did not appear to be their key role.

It could be that data quality assurance, which is an important aspect of the data management process, was omitted in the training of nurses. Hence, gaps in the completeness, accuracy and timeliness of data. The challenges with data quality could render data less useful for decision-making. This is viewed as an undesirable state, and requires urgent intervention to strengthen data quality that would contribute to improved child health outcomes. USAID MEASURE Evaluation (2017:13) stated that the majority of developing countries do not implement adequate data quality assurance mechanisms at the point of care. The nurses at health facilities are required to recount results from source documents, compare the verified numbers to the monthly summary numbers and explain discrepancies if there are any. However, nurses at the facilities seemed to not follow these recommendations.

The weaknesses in the validation of data were echoed by supervisors who cited high workload, and in such instances, they just forwarded monthly summary forms to the HIS officer with the assumption that they would verify before data entry. This finding raises critical questions regarding the reliability of data, as well as the impact thereof on decisions for resource allocations and planning for the child healthcare programme.

On the other hand, healthcare managers used DHIS2 inbuilt validation functionality to assess data quality. This included assessments of completeness, timeliness, data outliers and comparing indicators to identify a predictable relationship. This implies that DHIS2 has good functionality for ensuring data quality if it is correctly and consistently utilised. Healthcare managers took corrective measures and alerted nurses on data errors and discrepancies. This provided an opportunity for data capturers and managers to revisit data sources and rectify errors. The study revealed that if inbuilt validation features are utilised frequently, it can improve the data management process as there is communication between the levels regarding data quality.

The findings showed that healthcare managers do not use other data sources to assess data consistency. Healthcare managers did not check for external consistency by comparing the routine health data with population-based statistics such as census, population survey and civil registration. The comparison is significant because it provides information on the population numbers, distribution by age, sex, estimate and target population. Thus, providing a holistic understanding of service coverage rates and future needs. USAID MEASURE Evaluation (2017:8) indicated that the majority of data users are not aware of data quality measurements for external consistency with other data sources. Therefore, they could not compare two different sources, which are routine health data and other data sources. The comparisons would allow data users to ascertain the level of congruence between other data sources measuring the same indicator.

Therefore, the lack of standardised approaches to ensure data quality at health facilities and documented procedures on how to verify various data sources and perform data audits at all levels created a gap in the data management process. This raises concerns regarding the veracity of interventions to monitor disease trends and monitoring of children's health programmes.

5.3.5 Support for the implementation of Routine Health Information System

In this study, support entails the provision of various resources that will be used in generating and processing data.

The support for the implementation of RHIS was varied. At health facilities, nurses' main role was service provision, documentation and capturing of the routine health data from the service provided. Nurses were supported mainly through mentorship by senior nurses and supervisors in the form of in-service training, which was focused mainly on data collection and collation. This support appeared to not have addressed other tasks in the data management processes, creating a need for capacity building in those essential HIS tasks. This was also confirmed by Lemma, Janson, Persson, Wickremasingh and Kallestal (2020:11), who stated that health workers at health facilities lack crucial skills in data management processes such as data analysis, performing data quality checks and problem-solving capabilities.

District and regional authorities played an important role in ensuring the effective implementation of RHIS. Therefore, the district was required to support the health facilities through supportive supervision and feedback. However, supportive supervision and feedback were infrequent. Some variations were noted in terms of support supervision, where the rural facilities were least visited as opposite to urban health facilities. It appeared that inadequate resources to travel to the health facilities, lack of supervisory guidelines, and large span of control among managers could have contributed to infrequent support supervision visits. It is acknowledged that this could further weaken the generation of quality data and use to assess the performance of child health services. Nguefack-Tsague et al (2023:6) also pointed out that there were few health facilities in the districts in Yaoundé that were supervised authorities, and the main cause was lack of resources; they found that infrequent support supervision was associated with poor performance.

Districts are provided with resources such as computers and the capacity to capture and generate data for managers. In addition, the regions receive support from the national authority. Similarly, regions are expected to support the districts.

National authority provides leadership and governance for the implementation of HIS in the country. Therefore, it provides strategic direction and oversight through regulatory frameworks and appointing Technical Working Groups on HIS. This is in accordance with the World Health Organization Metrics Network, that the national level in any country is responsible for designing, strengthening, and providing direction for health information in a country. The national authority has a role in establishing a national committee compromising key stakeholders from health and statistics departments who guide the development and maintenance of health information systems and share strategies across programmes and institutions (USAID MEASURE Evaluation 2018:16).

The study established that international experts offered technical support through training and mentoring data producers and users on HIS design, data management processes and development of standard operating procedures. However, the participants at a very senior level expressed concerns that the technical support created dependency as experts performed advanced functions on HIS software and did not fully capacitate the local team. Meaning that the local team was only empowered and tasked with less complex functions and continued to rely on external technical expertise, a phenomenon that is costly and not sustainable. Mjelva (2017:35) stated that some agencies sponsor consultants for a stipulated contract time frame for the project. Once the project comes to an end, the system deteriorates with software and hardware maintenance problems, leading to incomplete, delayed reporting and a lack of continuity of local staff to manage the central data repository.

This study believes that local system analysts and administrators should be able to maintain the database and support data management processes, especially after the technical experts' contracts have ended. External agencies also fund the HIS equipment, such as computers, laptops and internet infrastructure. This equipment strengthens the implementation of routine health information systems. However, they still fund health information systems for vertical programmes running parallel to DHIS2. Hence, their support for a unified and integrated HIS could not be established. The funding of vertical programmes that have information systems running parallel to DHIS2 is a challenge in low- and middle-income countries, according to Begherian and Sattari (2022:8). The authors indicated that low- and middle-income countries have multiple data sources due to foreign donors.

5.3.2.6 Use of health information

A Routine Health Information System is part of a Health Information System that generates data at regular intervals and is collected at public and private health facilities, institutions as well as at community -level health posts. Therefore, data needs to be accessible and utilised for decision-making at all levels in health system (Chanyalew et al 2021:3).

5.3.2.6.1 Accessibility of data and information needs of the users

It was evident from the findings that data were available to perform their roles in managing child healthcare. The health information needs vary according to roles and responsibilities. These responsibilities also determine access to information. The majority of healthcare managers had access to DHIS2 and as mentioned earlier, had good skills for manipulating data on the platform. However, it should be noted that not all managers had this access. Healthcare managers who were not authorised to use DHIS2 requested reports from HIS officers. The study believed that this was not an ideal situation because they had no access and could not monitor performance at their convenience. Nengomasha et al (2018:365) indicated that 15% of managers in Namibian hospitals were unable to keep access data readily as they were not linked to DHIS2. This would limit what they could do with data and, most probably, the use of information. The study could not establish the rationale for this selective access. It should be noted that those who did not have access were medical superintendents.

DHIS2 captures indicators as prescribed by the national authority. Healthcare managers used DHIS2 to monitor progress on indicators in terms of regional and national targets and check the completeness of data. They could not make changes or corrections to the system; health information system officers were mandated to do that. This study assumed that there was a symbiotic relationship between healthcare managers and health information system officers.

Data showed that it took 24 hours for data to reflect data entered into the DHIS2. This meant the data transmission was not real-time. This could be a source of frustration for data users, especially if there is urgent demand for data. Nurses at health facilities had access to data in copies of monthly summary forms, which they sent to the district on a monthly basis (reporting requirements). This meant they had only raw data in their possession. Hence, it was difficult for most nurses to comprehend the flow of data and its uses at the national level. Some participants mentioned that sometimes, these forms got misplaced because of storage problems in health facilities and lack of backups. This study contends that an electronic data-capturing system could be beneficial at the facilities. The aggregated data on DHIS2 is more efficient and effective because it enables the users to view data from previous months and quarters easily as opposed to manual data (Koumamba et al 2021:8).

Healthcare managers also raised an important issue regarding the comprehensiveness of data elements. They indicated that there were variables that were not captured in routine health information systems, but services were rendered. This raised questions about their health information needs and the fulfilment thereof. A mechanism had to be designed to address their information needs. It is not known if system designers involved data users in formulating data elements. The participation of users in decisions regarding the design of the system is critical. This would address various data demands. Nutley and Reynolds (2012:6) confirm that in Sub-Sahara Africa, a lack of interaction between system designers, researchers, as well as data producers and users in formulating health information system elements and variables led to the omission of some important data elements in routine health information systems.

Findings showed specific information needs for all participants. Demographic data such as gender, age, physical address, type of services provided, immunisation, HIV-exposed children and nutritional indicators of children under five years old were significant. This information is required to determine the services provided and the profile of the clients. This will enable to use of the data to organise interventions to improve service delivery, motivate for increase in staff and increase the pharmaceutical supply chain.

MEASURE Evaluation (2016:3) affirmed that stakeholders who actively request information and use information in decision-making to allocate adequate resources and plan for interventions to prevent and control diseases.

Data demand was more prevalent among supervisors and healthcare managers. This is because of a better understanding of routine health information systems; thus, they could actively seek information for use in decision-making as compared to nurses who mainly generate and collate data.

5.3.2.6.2 Data-driven decision-making

It is well known that health systems generate massive amounts of data from different health units, including child health services. This implies that data needs to be managed well to improve healthcare services. The use of health information needs to happen at every level of the health system. There are various ways nurses at health facilities can use information to improve functioning and service delivery at their level. Data showed that supervisors at health facilities understood how to use data for decision-making. They mentioned several data-driven decisions that they had taken, such as monitoring diseases and the performance of child health programmes and health promotion interventions. This was to ensure that they allocated resources appropriately in order to improve service delivery at the health facilities. Hence, clinical practice and patient care were driven by targets. They used headcount for certain conditions and provided needed care. This study is aligned with a study conducted in the Amhara region, Ethiopia, which stated that even though the study indicated that the overall proportion of information use for evidence-based decision-making at the health facility was observed, it was low compared to district and regional level (Chanyelew et al 2021:10).

It is critical for nurses to understand how data is used at higher levels, such as staffing facilities, establishment of new health facilities and expanding existing ones. In addition, organisations need to support a culture of information use. It does not just happen; there must be a deliberate effort to raise awareness of information use., otherwise nurses might not generate quality and useful data if they do not value the importance of data. This study identified this gap and developed strategies to strengthen the use of information at all levels, including at the point of care. The study assumed that when nurse's consciousness is raised regarding data quality and the significance of routine health data, they would be in a better position to use data for effective clinical care.

Evidence from the literature indicates that health facilities in developing countries generate data at other levels and submit it to the next level without adequate use. Health workers spend time filling endless registers compiling information every week or month reports, assuming data are collected for reporting for the next level (Shiferaw et al 2017:2; Kabede, Adeba & Chego 2020:2).

A study by Lansim, Ansah and Apaak (2022:14) stated that the level of child health data quality in Cape Coast Metropolis, Ghana, available in DHIS2 were complete, timely and consistent and corresponded with data in registers at a health facility. This means these data can be used in day-to-day health decision-making. However, in other facilities in Ghana, data were inaccurate, incomplete and untimely. Therefore, child health services cannot be adequately monitored as data are of poor quality. Those decisions could affect health system performance and mislead decisions.

There was a clear demarcation of roles in health information use. Healthcare managers utilise routine health data for the distribution of resources, such as human resources, that will provide quality services to clients and reduce waiting time in health facilities. In addition, managers monitored the performance of immunisations, elimination of mother-to-child transmission of HIV and nutritional indicators against the targets. If targets were not met, they identified root causes and employed corrective measures. Daniel et al (2016:107) stated that routine health information assisted managers in Hadiya Zone, Ethiopia, in developing a culture of evidence-based policymaking to identify issues and information on the design and choice of policy, forecast the future, monitor policy and implementation and evaluate policy impact.

5.3.2.6.3 Promoting culture of information use

Culture of information use refers to the capacity and control to promote the generation of quality data, analysis and use of routine health information to make decisions that will lead to improved service delivery (Vota 2019:1). Therefore, it is critical that management and decision-makers promote a culture of information use in the lower ranks of the system. There must be an accountability system to support evidence-based decision-making. Data from participants showed that the national level was promoting the use of routine health information by capacitating the managers and giving them access to DHIS2 so that they are able to analyse, share and utilise data. However, it is unknown whether this training was adequate to promote the use of routine health information. In addition, this training appeared to be not inclusive as some healthcare managers revealed that they were not trained on DHIS2 and relied on health information system officers.

Review meetings conducted by regional and national authorities were seen as mechanisms to promote a culture of information use, as discussed in Chapter 5. However, there was no evidence of monitoring and evaluation of strategies used in review meetings. Amouzou et al (2021:2) showed an association between data review meetings and decision-making at the district level in India. Nutley and Reynolds (2013:8) supported and posit that review meetings create an avenue for interaction among data designers and producers. The clarification of roles and responsibilities related to the data management process in order to improve decision-making in child healthcare was also missing among nurses.

5.3.3 Outputs

5.3.3.1 Quality routine health data

In order to attain the outputs of quality routine health data, feedback is cited as the most important enabler of data quality. Both data sets showed the need for regular feedback from senior management to be strengthened. Feedback and support supervision should emphasise the data management process and monitoring of the performance of child healthcare. This suggestion appeared feasible because feedback allows health professionals to reflect on their performance and use data to improve service delivery. In addition, regular feedback would enable them to examine their data about child healthcare performance and see how they can change to improve the quality of data and service delivery. Asemahagn (2017:9) also argues that health professionals who are provided with regular feedback have an increased chance of generating quality data and utilising their data for decision-making compared to those who have not received feedback.

Support supervision enables supervisors to visit health facilities and validate the data at the health facilities. This will identify gaps and create rapport between supervisors, data producers and decision-makers. It further motivates them to generate quality data and strengthen the data management process to optimally utilise routine health information in decision-making in child health programmes. This will increase visibility leadership in supporting data management processes and improve the use of data in managing child healthcare.

Health professionals might be motivated to perform HIS activities if they get sufficient support on the data management process. This was validated by Ndabarora et al (2014:111), that some districts in South Africa overcame problems associated with poor quality data management through formative supervision. Furthermore, support supervision is important in motivating health workers to identify gaps and improve health workers' performance. A study by Wude et al (2020:6) in Hadiya Zone, Southern Ethiopia, revealed that support supervision fosters a collaborative approach to strengthening health worker performance.

Both nurses and managers recommended an Electronic Health Record (EHR) at the health facility level to strengthen data quality, availability of data and information use. Electronic health records will enable staff members to capture data at the point of care. The health professionals will have a comprehensive history of patients and support their decisions regarding patient treatment and referrals. Electronic health records aid in ensuring data quality because of the embedded clinical decision support system. Lidikwe et al (2014:6) suggest that to improve the data management process, there is an urgency to introduce an electronic patient information system at the point of care. This will minimise poor data quality in child healthcare data and improve timeliness by reducing delays associated with the transportation of paper-based systems. Nutley and Reynolds (2013:7) also stated that computerised patient health records increase data quality improved storage and management, service delivery and programme monitoring and reporting.

Data from national level participants indicated there were intentions to introduce EHR at all the health facilities. Thus, an electronic health strategy was developed and launched to guide the implementation of electronic health records in the country. The eHealth system can address the challenges of providing health services spanning the entire country by having healthcare workers enter individualised data at the point of care (Ministry of Health and Social Services 2021:5). However, so far it is only two hospitals that have started piloting EHR with a billing module. The study observed that this road map is still in the infancy stage, and the acceleration of rolling out EHR at the point of care needs to be prioritised. Health professionals will have the patient's full history and support decision-making regarding treatment and referral. Nengomasha et al (2018:362) stated that EHR includes a range of data such as demographics, medical history, medication, immunisation status, diagnosis, laboratory tests and results, radiological images, vital signs and billing information. This will enable safer movements of patients in terms of referrals from one hospital to another. In addition, it will allow all aspects of patient information and related services to be managed in an integrated manner.

The introduction of DHIS2 at the health facility level could be more beneficial than paper-based data monthly summary reports, which are mainly associated with errors, lack of backups and sometimes inadequate data collection tools to compile these monthly summary forms. This was confirmed by Kiberu et al (2014:2), that evidence shows that continued use of paper-based systems contributes to poor data quality regarding reliability, availability, timeliness and completeness of data. Hence, there is a call to deploy a web-based health information system to reduce errors and improve the precision and usability of health data.

This study contends that the functionality of DHIS2 will need to be re-configured as currently, it deals with aggregated data, not patient-centric data.

5.3.3.2 Improved HIS governance

Policies, regulatory frameworks, protocols and guidelines on HIS are crucial as they clarify the roles and responsibilities of health workers and healthcare managers at various levels in different categories. Healthcare workers at all levels will know their HIS tasks and execute them optimally in managing child healthcare. This will enable various health workers to perform RHIS tasks accurately, thus leading to improved HIS governance.

Another aspect that would improve HIS governance is the availability of HIS standards for all health information systems, enabling them to exchange data with DHIS2. Thus reducing fragmented and disparate information systems in HIS in Namibia and increasing access to all routine health data on child healthcare.

5.3.4 Outcomes

Findings from phases one and two revealed that if there are adequate resources to generate data, such as data collections(paper-based tools and ICT infrastructures), skilled health professionals, HIS standards and adequate child health indicators, it will drive the RHIS processes (data collection, collation, analysis, dissemination, data quality checks, data demand and information use in order to attain the quality routine health data and improved HIS governance). The study will develop strategies to enhance the use of RHIS in managing child healthcare. Thus, anticipated outcomes for the inputs and processes for the study include increased immunisation coverage, improved nutritional indicators (stunting rate, underweight rate, wasting rate), Reduced childhood illnesses and reduced mother-to-child transmission of HIV.

5.7 SUMMARY

This chapter presented new insights that emerged from Phase 1 and Phase 2. The conceptual framework guides the integration. Then, interpretation and discussion of the integrated findings concerning inputs, which are resources that should be secured to deliver an intervention, and the RHIS processes, which are activities or components of the intervention that reflect what is being delivered. The output was also discussed regarding what was produced from specific activities implementations. The chapter also highlighted the anticipated outcomes of the study. The new insights will be utilised to develop strategies that will be utilised to develop strategies that will enable increased utilisation of RHIS in managing and planning child healthcare.

CHAPTER 6

DEVELOPMENT AND VALIDATION OF STRATEGIES

6.1 INTRODUCTION

The previous chapter discussed the integration, interpretation and discussions of Phase 1 and Phase 2 findings. This chapter presents the strategies developed to enhance the use of Routine Health Information System (RHIS) in managing child healthcare.

This chapter begins with a summary of evidence from integrated findings (Phase 1 and Phase 2), then strategy development and the validation process using a modified Delphi, and lastly, describes the strategies in detail.

6.2 SUMMARY OF EVIDENCE

A strategy is a plan method or series of actions designed to achieve a specific goal or effort (Louw & Venter 2013:10). For this study, the development of a plan is to enhance the utilisation of a RHIS in managing child healthcare in Namibia. The strategies development was informed by evidence from the integrated findings from Phase 1 and Phase 2 and reviewed literature. The areas of focus emerged from combined data sets: strategies for strengthening the data management process, improving the legislative framework to guide the implementation of RHIS, enhancing data quality and strengthening the use of a RHIS in managing child healthcare.

Table 6.1: Identified gaps from the study and focus area

Gaps identified	Focus area.
Challenges with data collection tools. Lack of adequate resources	Strategies to strengthen data management processes.
Absence of policy guidelines, and legislative framework for the implementation of RHIS. Multiple and disparate health information systems.	Strategies to improve the legislative framework to guide the implementation of RHIS.
Insufficient knowledge to perform data quality checks.	Strategies to enhance data quality.

Lack of mechanisms for data quality monitoring. Infrequent feedback and supervision to lower structures.	
Unequal access to DHIS2. Difficulty in implementing DHIS2 at health facility Mobility of the mothers Weak planning No real-time data access to DHIS2. Limited child health indicators. Limited information use at health facility level.	Strategies to strengthen the use of RHIS in managing child healthcare.

6.3 THE STRATEGY DEVELOPMENT PROCESS-MODIFIED DELPHI TECHNIQUE

The study gathered evidence from Phase 1 and Phase 2 of the study, identified gaps from the combined data sets and then drafted the strategies. A modified Delphi technique was utilised to obtain expert opinion and validate the draft strategies. The purpose of validation was to seek expert reflections, interpretations and consensus on the strategies. A modified Delphi technique used a selected panel of experts involved in RHIS as well as child healthcare in order to validate the strategies and achieve consensus on proposed strategies (Fletcher & Marchildon 2014 :3). The modified Delphi method was chosen because it allowed experts to give the comments on strategies and action plans in the first and final round, thus allowing experts to provide clarification on some matters through comments in order to justify their viewpoints (Eubank et al 2016:3).

6.3.1 Preliminary stage

The study recruited a group of experts in Health Information Systems from various levels, who are policy makers at national level, such as deputy directors of Health Information Systems and child healthcare, managers and officers responsible for HIS and child health information systems at regional and district level.

The study undertook two rounds of modified Delphi to determine the level of agreement among the experts. They were asked to rate their level of agreement or disagreement for each strategy, and action plans using a three-point Likert scale, agree, neutral and disagree options. In the case of a neutral or disagree response, they were requested to provide comments.

The researcher contacted the experts telephonically to seek their participation. The questionnaire and proposed strategies were sent via email to each expert, along the information and informed consent form. The researcher indicated the expected date of feedback and followed up with a phone call, text message and email reminder to the experts who did not respond timeously.

The aim was to determine the level of consensus among the experts who were child healthcare programme managers, officers and policy makers involved in RHIS and child healthcare.

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

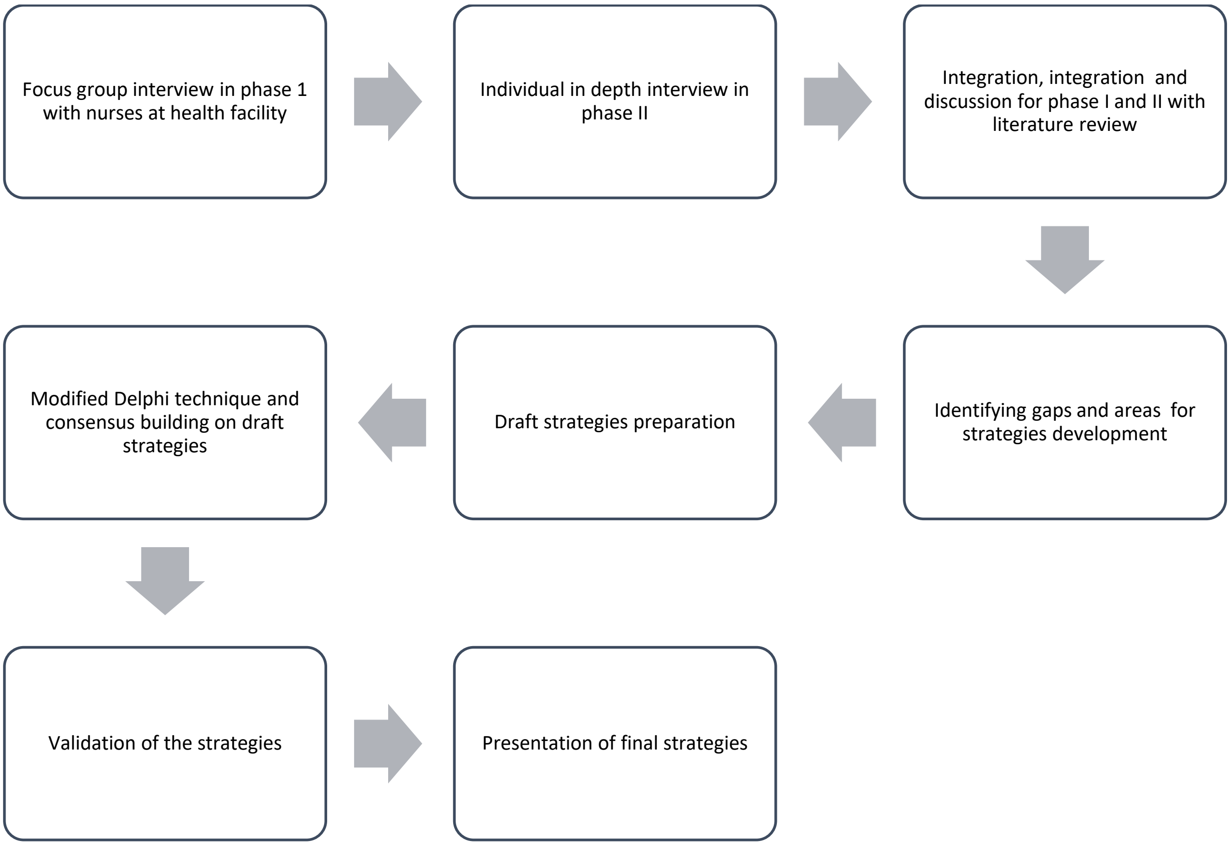

Figure 6.1: Procedure for development and validation of strategies

6.3.2 Round one

In round one, the study used non-probability, purposively sampling to identify twelve members of the panel of experts based on their expertise and experience. However, only 10 (ten) have agreed to participate in the modified Delphi technique. The researcher contacted the experts telephonically to explain the research objectives, the modified Delphi process, ethical clearance certificate information and consent, and the questionnaire for validation of strategies was sent via email.

Round one was conducted after obtaining the experts consent (Annexure H). The researcher developed a questionnaire for validating strategies that consisted of two major sections. Section A contained socio-demographic information and section B was the proposed strategies (Annexure I).

Although the study was qualitative, a modified Delphi was chosen to allow the participants to complete a rating system on the questionnaire, comment on some matters, and provide further clarification.

Section B contained 22 (twenty-two) strategies that addressed identified gaps from combined data sets, and seventy-seven (77) actions to improve data management process, enhance data quality, improve the legislative framework for the implementation of RHIS, and strengthen the use of routine health information for management of child healthcare. There was a space for the participants to provide comments on strategies and action plans, and present arguments in order to justify their view points.

Table 6.2: Demographic data of experts

Expert	Gender	Age	Qualification	Position	Organisation	Experience in health information system or Child Healthcare Management
1.	F	50-59	Bachelor's Degree (Hons) Public Health	Chief Health Programme Officer - Maternal and Child Health	Ministry of Health and Social Services - Regional level	16 years
2.	F	30-39	Master of Public Health	Health Information System and Disease Surveillance Officer	Ministry of Health and Social Services - District level	7 years
3.	F	30-39	Bachelor of Nursing Science (Hons)	Senior Health Programme Officer - Maternal and Child Health	Ministry of Health and Social Services - Regional level	7 Years
4.	F	30-39	Bachelor of Nursing Science (Hons)	District Manager: Primary Healthcare Services	Ministry of Health and Social Services - District level	5 years
5.	F	40-49	Master of Field Epidemiology	Deputy Director: Epidemiology and Surveillance	Ministry of Health and Social Services - National level	6 years
6.	F	50-59	Master of Nursing Science	Chief Registered Nurse -Paediatric Nursing	Ministry of Health and Social Services - Regional level	4 years
7.	F	30-39	Bachelor of Nursing Science & Postgraduate Diploma in Monitoring and Evaluation	Chief Health Programme Officer - Management Information System	Ministry of Health and Social Services - Regional level	5 years
8.	F	30-39	Bachelor of Epidemiology and Biostatistics (Hons)	Senior Health Programme Officer: Health Information System and Disease Surveillance	Ministry of Health and Social Services - Regional level	6 years
9.	M	30-39	Master of Public Health	Chief Health Programme Officer - Management Information System	Ministry of Health and Social Services - Regional level	6 years
10	M	40-49	Master in Public Health	Health Information System Officer	Ministry of Health and Social Services - Regional level	7 Years

6.3.2.1 Demographic information

In round one, of the ten (10) experts, two (2) were males and eight (8) were females. The majority of the participants were aged between 30-39 years (n=6), while 40-49 years and 50-59 were (n=2) each. Four (4) experts had qualifications in public health, three (3) were masters of public health and one (1) held a Bachelor of Science in Public Health. Three (3) experts held qualifications in Nursing Science, two held a Bachelor Degree of Nursing (Hons) while one held a Masters in Nursing Science. Two held qualifications in Epidemiology and Biostatistics, of which one was a Bachelor Degree in Epidemiology and Biostatistics, and the one Masters in Epidemiology and Biostatistics. One expert held a postgraduate diploma in Monitoring and Evaluation All the participants had a minimum of four years' experience in health information system, or planning and managing child healthcare. One participant had a wealth of experience (sixteen years) in managing maternal and child healthcare programmes, followed by six participants, three each, with six- and seven-years' experience. There were two participants who had five years' experience, and one who had four years' experience. The experts were mainly employed at a regional or district level, and one at a national level. Table 6.3 provides the number of experts, percentages of consensus and the decision.

Table 6.3: Strategies to enhance the use of RHIS for managing child healthcare

1.Strengthening data management processes						
Strategy	Expected Outcome	Action plans	Responsible authority	Number of participants in agreement	Percentage	Decision
1.1 Integration of various child health elements in one register	Child health elements integrated	1.1.1 Create platforms to discuss the grouping of various child healthcare elements	Policy makers	10	100%	Accepted
		1.1.2 Develop a register that captures all data elements on child healthcare register	Policy makers, managers at regional level	10	100%	Accepted
		1.1.3 Provide in-service training to all nurses and orient them on a new revised register	Managers at regional and district level	7	70%	Accepted
		1.1.4 Implement the comprehensive child healthcare register	Managers at regional/ district level, and supervisors at health facility level	10	100%	Accepted
		1.1.5 Evaluate the implementation of a comprehensive child healthcare register	Policy makers	10	100%	Accepted
1.2 Increase budget allocation for data collection resources	Increased budget allocation for data collection resources	1.2.1 Review the usage of the data collection resources	Managers at regional and district level	7	70%	Accepted with amendment instead of review “indicate” change to “ review”
		1.2.2 Make an inventory of existing data collection tools	Manager at regional and district level	7	70%	Accepted with amendment to add health facility

						supervisors
		1.2.3 Determine the maximum and minimum of data collection stock required for health facilities	Managers at regional/ district levels, and supervisors at health facilities	10	100%	Accepted
		1.2.4 Procure data collection tools timeously and ensure adequate resources	Managers at regional and district level	10	100%	Accepted but responsible authority should be national level general store
		1.2.5 Develop mechanism for resource control	Managers at regional and district level	10	100%	Accepted with amendment of responsible authority to national level
1.3 Provide adequate infrastructure for information, communication and technology	Increased budget allocation for data collection resources	1.3.1 Develop a plan to introduce the DHIS2 and electronic records at the health facilities	Policy makers	8	80%	Accepted instead of “develop a plan” amend to “strengthen the implementation of DHIS2 at health facilities and

						introduce patient information system at health facilities”
		1.3.2 Review the budget for Information, Communication and Technology (ICT) and increase funding for ICT	Policy makers	10	100%	Accepted
		1.3.3 Increase the internet bandwidth at health facilities	Managers at regional and district level	8	80%	Accepted but amended the action plan to “Install fibre internet cable to increase internet bandwidth”
		1.3.4 Train all staff at health facilities on digital literacy	Managers at regional and district level	10	100%	Accepted
		1.3.5 Incorporate DHIS2 in curriculum of all health-related courses	Institution of higher learning policy makers	4	40%	Suggestion by four experts
		1.3.6 Support staff in implementation of eHealth platforms and electronic patient records	Managers at regional and district level	9	90%	Accepted

1.4 Formulate plans to support data management processes at health facility and district level	HIS plans available	1.4.1 Share a national strategy implementation plan with regional and district level	Policy makers	7	70%	Accepted with amendment to “strengthen the implementation of national strategy”
		1.4.2 Cascade and customise plan to region and district level to guide the implementation of Health Information System (HIS)	Policy makers, managers from regional and district level	8	80%	Accepted with amendment to cascade to the health facilities
		1.4.4 Evaluate the implementations of HIS plans at all levels	Policy makers	9	90%	Accepted
1.5 Capacity building on data management process	Improved skills and competencies in data management processes	1.5.1 Review roles and responsibilities in terms of HIS	Policy makers, managers at regional and district level	10	100%	Accepted
		1.5.2 Identify skills and competencies of various health workers	Policy makers, managers at regional and district level	10	100%	Accepted
		1.5.3 Align the skills of various health information system to their tasks	Policy makers, managers at regional and district level	10	100%	Accepted
		1.5.4 Recruit HIS undergraduate as data capturers or data managers at district level and assist at health facilities	Policy makers, managers at regional and district level	4	40%	New suggestion from experts

		1.5.5 Design a comprehensive training programme	Policy makers, managers at regional and district level	6	60%	Not Accepted. Suggested by experts, and it was reformulated to "Increase the amount of training at district level and health facilities".
		1.5.5.1 Identify objectives of the training	Policy makers and managers at regional levels	9	90%	Accepted
		1.5.5.2 Budget for the training	Policy makers and managers at regional and national level	9	90%	Accepted
		1.5.5.3 Conduct training on use of data sources and reporting tools, data analysis, data visualisation, data dissemination and information use	Managers at regional level, and technical agencies	8	80%	Accepted with amendment "strengthen training on use of data"
		1.5.5.4 Monitor post training skills of the participants	Policy managers, managers at regional level, technical agencies	9	90%	Accepted

		1.5.5.5 Evaluate the impact of training on data management process	Policy makers and managers at regional level	10	100%	Accepted
1.6 Improve data dissemination at levels	Improved data dissemination at all levels in health care systems	1.6.1 Develop a framework for data dissemination at health facilities and all levels, and provide adequate resources	Managers at district level and supervisors at health facilities	9	90%	Accepted with amendment to "review the mechanisms"
		1.6.2 Establish mechanisms for effective integrated data review meeting	Managers at regional and district level	10	100%	Accepted
		1.6.3 Identify stakeholders such as nurses and other health workers at health facility level to be part of the review level	Managers at regional and district level	10	100%	Accepted
		1.6.4 Establish a framework on national health information reports annually	Policy makers	9	90%	Accepted
		1.6.5 Disseminate national health information reports	Policy makers	10	100%	Accepted

2. Strategies to improve the legislative framework for the implementation of Routine Health Information System

Strategies	Expected outcome	Action plans	Responsible Authority	Number of experts in agreement	Percentage	Decision
2.1 Develop HIS policies, guidelines and legislative framework to guide the implementation of RHIS in Namibia	Availability of HIS policies, guidelines and strong legislative framework	2.1.1 Provide technical and financial support to formulate HIS policies, guidelines and legislative framework	Policy makers	10	100%	Accepted
		2.1.2 Develop policies to guide the implementation of RHIS	Policy makers	10	100%	Accepted
		2.1.3 Develop a legislative framework to regulate the operations and data management for various health information systems	Policy makers	9	90%	Accepted
2.2 Integrate various Health Information Systems	Integrated Health Information Systems	2.2.1 Develop a standard operating procedure for stakeholders to adopt set interoperability standards that will enable the exchange of data	Policy makers	9	90%	Accepted

		2.2.2 Create awareness among managers on interoperability	Policy makers and managers at regional level	10	100%	Accepted
		2.2.3 Evaluate the implementation of the interoperability standards of all health information systems used in Namibia	Policy makers and managers at regional level	10	100%	Accepted

3. Strategies to enhance data quality						
Strategies	Expected Outcome	Action plans	Responsible authority	Number of experts in agreement	Percentage	Decision
3.1 Improve data quality assurance practices	Improved data quality	3.1.1 Develop a standard operating procedure (SOP) for assessing data quality at all levels	Policy makers	8	80%	Accepted but amended to “Strengthen the implementation of SOP for assessing data quality at all levels”
		3.1.2 Conduct training of dimensions of data quality for all nurses and managers involved in data management process	Policy- makers, managers at regional and district level and technical agencies	9	90%	Accepted
		3.1.3 Share the quality assessment SOP with all the nurses and managers involved in data management	Managers at regional and district level	8	80%	Accepted
		3.1.4 Conduct data quality assessment monthly before submitting data to the next level	Nurses at health facility level,	10	100%	Accepted

			managers at regional and district level			
		3.1.5 Incorporate data management in curriculum of health professionals' courses with practical components for students to acquire relevant competencies	Institution of higher learning and policy makers	5	50%	Suggestion by the experts
		3.1.6 Evaluate the implementation of quality assessment through data quality audit	Policy makers, managers at regional and district level	10	100%	Accepted
3.2 Establish feedback mechanisms on data quality to lower structures	Improved data quality	3.2.1 Develop a reporting format for providing feedback to lower structures	Policy makers and technical agencies	10	100%	Accepted
		3.2.2 Review the support supervision checklist on data management process	Policy makers and technical advisers of HIS	8	80%	Accepted with amendment to "implement the revised support supervision checklist on data management process"
		3.2.3 Develop a bi-annual data management support supervisory visits schedule	Managers at regional and district level	8	80%	Accepted with amendment to "strengthen bi-annual data management support superviso

						ry visits schedule”
		3.2.4 Conduct support supervisory visits focusing on the assessment of completeness, timeliness and accuracy of data, data analysis, dissemination, and information use	Managers at regional and district level	9	90%	Accepted with amendment to “Strengthen the support supervisory visits focusing on the assessment of completeness, timeliness and accuracy of data, data analysis, dissemination, and information use”
		3.2.5 Identify action points from support supervisory report and develop corrective mechanisms	Managers at regional and district level	10	100%	Accepted

4. Strengthen the use of routine health information system for the management of child healthcare						
Strategies	Expected Outcome	Action plans	Responsible authority	Number of experts in agreement	Percentage	Decision
4.1 Improve access to DHIS2 for all managers	Improved access to Routine Health Information System	4.1.1 Make DHIS2 available at all levels	Policy makers	10	100%	Accepted
		4.1.2 Develop an inventory of new and existing managers	Managers at region and district level	5	50%	New suggestions from experts
		4.1.3 Train all new managers on DHIS2	Managers at regional and district level, advisers from technical agencies	8	80%	Accepted
		4.1.4 Create profiles for managers and assign them roles befitting to their functions in data management process	Managers at regional and district level	9	100%	Accepted
4.2 Improve DHIS2 architecture to enable real-time data access	Improved access to Routine Health Information System	4.2.1 Plan and budget for subscription to external host commercial cloud company	Policy makers	10	10%	Accepted
		4.2.2 Use that cloud-based central server to ensure data entered or changes made are available immediately to all users	Policy makers	10	100%	Accepted
		4.2.3 Execute DHIS2 server upgrades	Policy makers	10	100%	Accepted
4.3 Review and revise existing child health indicators	Improved child health indicators	4.3.1 Identify information needs of decision-makers on child healthcare	Policy makers, managers at regional and district level	10	100%	Accepted
		4.3.2 Review and revise existing data elements in relation to child health indicators	Policy makers, managers at regional and district level	10	100%	Accepted
		4.3.3 Involve health workers and managers in revising data elements and child healthcare indicators	Policy makers, managers at regional and district level	10	100%	Accepted
		4.3.4 Implement the revised data elements and child health indicators	Managers at regional and district level,	10	100%	Accepted

			nurses at facility level			
		4.3.5 Support the implementation of the revised data elements and child indicators	Policy makers, managers at regional and district level	10	100%	Accepted

Strategy	Expected outcome	Action plans	Responsible authority	Number of participants in agreement	Percentage	Decision
4.4 Enhance the culture of information use at the health facility level	Enhanced culture of information use	4.4.1 Increase awareness and capacity on information use of child healthcare	Managers at regional and district level	10	100%	Accepted
		4.4.2 Develop a performance-based incentive system for HIS programme at all levels to encourage information use	Managers at regional and district level	10	100%	Accepted
		4.4.2.1 Recognising good performance	Managers at regional and district level	10	100%	Accepted
		4.4.2.2 Awarding excellent performers in information use with certificates of appreciation	Managers at regional level	10	100%	Accepted
		4.4.2.3 Sharing best practices	Managers at regional and district level	10	100%	Accepted
		4.4.2.4 Planning for monthly meeting and discuss performance of child health indicators	Managers at regional and district level	10	100%	Accepted

		4.4.2.5 Establishing a reporting format for all health facilities on child health indicators	Managers at regional and district level	10	100%	Accepted
		4.4.2.6 Developing an action plan from discussions in the meeting	Managers at regional and district level	10	100%	Accepted
4.5 Establish an information use audit at all levels	Enhanced culture of information use	4.5.1 Develop an information use audit checklist	Policy makers, advisers from technical agencies, managers at regional and district level	10	100%	Accepted
		4.5.2 Provide technical and financial support for audit	Policy makers, advisers from technical agencies, managers at regional and district level	10	100%	Accepted
		4.5.3 Conduct information use audit	Policy makers, advisers from technical agencies, managers at regional and district level	10	100%	Accepted
		4.5.4 Prepare and share feedback with all the data users	Policy makers, advisers from technical agencies, managers at regional and district level	10	100%	Accepted

4.6 Publish data on child health indicators on brochures	Enhanced culture of information use	4.6.1 Provide financial and technical support for publication and secure funding for publication of child health indicators	Managers at regional and district level	10	100%	Accepted
		4.6.2 Identify information which will be on brochures and leaflets	Managers at regional and district level	10	100%	Accepted
		4.6.3 Distribute the brochures and leaflets to nurses at health facilities through paper-based systems and social media such WhatsApp	Managers at regional and district level	10	100%	Accepted
		4.6.4 Evaluate the use of published information in planning and managing child healthcare	Managers at regional and district level	10	100%	Accepted

6.3.2.2 Methodology

- Analysis and feedback

In round one, the responses of each statement were calculated and entered on an excel sheet. Statements required an 80% agreement from the panel in order to be accepted or omit the statement during the formulation of the final strategies. Comments from experts were summarised based on specific action plans.

Experts agreed to the twenty-two strategies, however, there were differences on action plans. Out of the seventy-seven (77) action plans, fifty-one (51) had 100% level of consensus, whereas twenty-five (25) were between 70 - 90 %. There was one (1) which was unqualified with sixty percent (60%) level of agreement. There were also six (6) new action plans suggested by experts to strengthen the strategies.

For some action plans the experts provided remarks/reasons for the low ratings.

Table 6.4: Remarks on the strategic action plans with low ratings and required adjustments.

Disqualified action plans	Remarks from experts
Design a comprehensive training programme	“Reformulate to increase the amount of training at the district and health facility level” Panel expert #9, 6 and 4
Qualified action plans but requested for amendment	Remarks from experts
Review the usage of data collection resources	Rather say “Strengthen the review of the usage of the data collection resources” Panel expert #4. The amendment was suggested because the review of data collection tools was done, however for it to be effective, it needs to be strengthened.
Conduct training on use of data sources and reporting tools, data analysis,data visualisation, data dissemination and information use	Instead say “strengthen the training on the use of data sources and reporting tools, data analysis, data visualisation, data dissemination and information use” Panel expert #4,6 & 8
Develop a framework for data dissemination at the health facilities and all levels and provide adequate resources	Amend to “review mechanisms for data dissemination at health facilities and at all levels and provide adequate resources”
“Develop an SOP for assessing data quality at all levels	“Strengthen the implementation of an SOP for assessing data quality at all levels”

	Panel expert #4,6 & 9
Review the support supervision checklist on data management process	“Implement the revised support supervision checklist on data management process” Panel expert # 3,4 & 8
Develop a bi-annual data management supervisory visits schedule	Amend to “strengthen bi-annual data management supervisory visits schedule” Panel expert # 2 & 4
Conduct support supervisory visits focusing on the assessment of completeness, timeliness and accuracy of data, data analysis, dissemination and information use	Amend to “Intensify the support supervisory visits focusing on the assessment of completeness, timeliness and accuracy of data, data analysis, dissemination and information use” Panel expert # 4 & 8

Table 6.4 indicated the action plan with lowest consensus percentage which was “Design a comprehensive training programme” under strategy of capacity building of data management process. The experts suggested the action plan be reformulated to “Increase the amount of training at the district and health facility level” Panel experts # 9,6 and 4. Other action plans reached 80% consensus but suggested re-phrasing as some activities were previously undertaken.

Table 6.5: Additional action plans

Strategy	Proposed action plans by experts	Responsible authority
Provide adequate infrastructure for information, communication and technology	“Incorporate DHIS2 in curriculum of health-related courses” Panel experts #2, 4, 6 and 8	Institution of higher learning and policy makers
Improve data quality assurance practices	“Recruit HIS graduate as data-capturer or data managers at district level and assist health facilities”. Panel experts # 1, 2, 4 and 6	Policy makers and managers at regional and district level
	“Incorporate data management in the curriculum of health professionals’ courses with practical components in order for students to acquire relevant competencies”	Institutions of higher learning and policy makers
Improved access of DHIS2 by all managers	Develop an inventory of new and existing managers. Panel experts #2, 4, 8 and 9	Managers at regional and district level
	Train all new managers on DHIS2 Panel experts #4, 8 & 9	Managers at regional and district level
Review and revise existing child health indicators	“Evaluate the implementation of data elements of child healthcare”. Panel experts #5, 7, 8 and 10	Managers at regional and district level

Table 6.5 illustrated the additional action plans that were proposed by experts to strengthen the strategies for enhancing utilisation of an RHIS in managing child healthcare. The new action plans were incorporated in the strategies that were validated in round two.

6.3.3 Second round

- Shared revised strategies with validation

The revised strategies were shared again with the experts via email. The researcher included the final revised strategies for the second round with clear instructions and description of the rating process with the adopted AGREE I Manual (Annexure H). The researcher only invited experts who had completed the questionnaire in round 1 to participate in round 2.

- Collection and data analysis

The response rate was 80% (n=8). Descriptive statistics were used to score percentage for responses. The criteria for rating were adopted from the AGREE II Manual.

Table 6.6: Analysis and results

Criteria Domains	Disagree	Neutral	Agree
A. **Scope and purpose** A1. The overall objectives of the strategies are adequately covered			100% (n=8)
A2. The population to whom the strategies are meant is well described			100% (n=8)
B. **Clarity** The strategies are coherent, clear and simple for all responsible individuals and groups			100% (n=8)
C. **Feasibility** The strategies are attainable and easily implementable			100% (n=8)
D. **Importance** The strategies will enhance the utilisation of an RHIS in managing child healthcare		25% (n=2)	75% (n=6)
E. **Quality of the content** The strategies display the expected value that will lead to data quality			100% (n=8)
F. **Appropriateness**			100% (n=8)

The strategies are suitable and relevant in improving the use of data in managing child healthcare			
G. **Valuable** The strategies are beneficial to the health system and worth being implemented by policy makers, managers and healthcare workers			100% (n=8)

Table 6.6 shows that the level of consensus among experts was good, except for one item. The item on importance of the strategies had a low domain score of 75% compared to the rest which were 100%. Even so, the revised strategies can still be implemented.

The “importance” strategies had a low score, and experts indicated that these strategies are not only important for the management of child healthcare, but also significant to improve service delivery in public healthcare through enhancing data quality, and improving the use of data in decision-making. Although the study was mainly focused on the use of data for the management of child healthcare, the researcher will recommend strategies to be utilised in managing all other health programmes.

The “scope and purpose” domain had 100% score which means the strategies are highly acceptable. The overall score for clarity domain was also 100%. This domain described the strategies as coherent and clear to the policy makers, managers and nurses involved in data management process. The “feasibility” domain confirms the strategies are achievable in improving data management process, legislative framework for the implementation of routine health information, enhancing data quality and strengthening the use of routine health information in managing child healthcare. The overall score for the feasibility domain was 100%. With regards to the “quality” domain, the experts rating was 100%. This domain deals with the quality of the content of the strategies displayed, the expected value of the strategies leading to good data quality, and the use of routine health information for the management of child healthcare.

The “appropriate” domain focuses on whether strategies are suitable and relevant in improving data quality, and the use of an RHIS for the management of child healthcare, and obtained 100% agreement. The domain of “valuable” obtained 100% agreement, and focused on whether the strategies are beneficial to the healthcare system and worth being implemented in improving the utilisation of an RHIS by policy makers, managers and healthcare workers.

6.4 PRESENTATION OF FINAL STRATEGIES

For this study, the strategies were developed to improve the utilisation of an RHIS in managing child healthcare services. The strategies presented are based on expert opinions. The presentation is guided by the theoretical framework and objectives of the study.

The strategies are categorised into five focus areas which include; strengthening data management process, Improve the legislative framework for the implementation of an RHIS, enhance data quality and strengthening the use of routine health information in managing child healthcare. A summary of strategies is provided. Detailed final strategies (Annexure K) are attached to this report.

Table 6.7: Focus area and validated strategies

Focus area	Strategies	Expected Outcomes
Strengthening data management process	Integration of various child health elements in one register	Child health elements integrated in one register
	Increase budget allocation for data collection resources	Increased funding for data collection resources
	Provide adequate infrastructure for ICT	Adequate ICT for data management
	Formulate plans to support data management processes at health facility and district level	HIS plans available
	Capacity building on data management process	Improved skills and competencies in data management processes
	Improve data dissemination at all levels	Improved data dissemination at all levels in health care systems

Strategies to improve the legislative framework for the implementation of an RHIS	Develop HIS policies, guidelines and legislative framework to guide the implementation of RHIS in Namibia	Availability HIS policies, guidelines and strong legislative framework
	Integrate various health information systems	Integrated Health Information Systems
Strategies to enhance data quality	Improve data quality assurance practices Establish mechanisms on data quality to lower structures	Improved data quality
Strengthen the use of routine health information for management of child healthcare	Improve access of DHIS2 by all managers Improve DHIS2 architecture to enable real-time data access	Improved access to Routine Health Information System
	Review and revise existing child health indicators	Improved child health indicators
	Enhance the culture of information use at the health facility level Establish an information use audit at all levels Publish data on child health indicators in the brochures	Enhanced culture of information use

6.4.1 Focus area: Strengthening data management process

The data management process drives the process of data generation, processing, analysis, presentation as well as ensuring there is availability of data collection tools. Therefore, this focus area covers two concepts in the theoretical framework namely; inputs and processes. With regards to the inputs, there is a need to support the use of routine health data by ensuring that there are sufficient data collection tools and legislative framework that are utilised for data management process. While processes, are to improve data collection, collation, processing, analysis and disseminating routine health information.

Therefore, data management process is an important aspect that enables the general utilisation of the RHIS.

6.4.1.1 Strategy 1: Integration of various child health elements in one register

The study revealed that for data management to be strengthened, there is a need to consolidate various child healthcare elements. A consolidated register will reduce time associated with data entry in different data collection tools, and alleviate the burden of papers, registers and storage. These are inputs in the logic framework that are required to collect and process data. The following action plans were seen applicable to accomplish the integration of various child health elements in one register.

- *Create a platform to discuss the grouping of various child healthcare elements*

Creating a platform to discuss how various child healthcare elements should be grouped is an important step in attaining integration of child health elements. The platform will provide an opportunity for all healthcare professionals involved in child healthcare to give their inputs on how said indicators could be grouped. This will also give a clear direction to designers on how to consolidate paper-based tools. The design team should ensure participation of key actors in the process of grouping data elements, as it will foster their understanding and support during the implementation. Thus, will assist the designers to accurately design the database, design the recording formats and reporting strategies with inputs of healthcare professionals at point of care and programme staff (Ngafeeson 2014:8).

- *Develop a register that capturers all data elements on child healthcare register*

This action plan is to enable the policy makers and managers at regional level to consolidate the inputs from various health professionals in child healthcare to develop a register that can capture comprehensive data on child healthcare. This register will contain data elements that will capture data on immunisations, elimination of mother-to-child transmission, growth monitoring and nutritional surveillance and integrated management of child healthcare. The register will reduce workload associated with entering data in multiple registers and time to collate information in a timely manner (Dlodlo & Hamunyela 2017:61).

- *Provide in-service training to all nurses and orient them to a new revised register*

The study acknowledges the importance of orientation of new revised register through in-service training to all nurses who will be generating data on child healthcare. It is important for nurses to be acquainted with this new skill and knowledge in order to complete their register and monthly summary forms accurately. This exercise is to avoid incomplete and inaccurate data as a result of unclear data elements. That will improve the reliability, timeous data generated at the point of care (Getachew et al 2022:2).

- *Implement the comprehensive child healthcare register*

After a comprehensive child healthcare register is developed all nurses and health professionals involved in child healthcare are oriented. A comprehensive child healthcare register can be distributed to all health facilities for implementations. It is expected that all child health data elements will be entered in that register. The integrated child healthcare register would increase the efficiency of data capturing by covering a comprehensive scope of clinical and health-related services in one register (Dlodlo & Hamunyela 2017:62).

- *Evaluate the implementation of a comprehensive child healthcare register*

The study recognised the importance of evaluating the implementation of a comprehensive child healthcare register. The purpose is to assess how nurses and other health professionals are completing a comprehensive child healthcare register. The evaluation will also provide an opportunity to identify gaps in the child healthcare register and make necessary adjustments to improve the data collection tools.
Evaluation of interventions enables healthcare teams to learn to improve services, hence if there is an intervention that is implemented without evaluation, it may not be efficient or effective (Clarke, Conti,Wolters & Steventon 2019:1).

6.4.1.2 Strategy 2: Increase budget allocation for resources (data collection tools)

The study acknowledged that data collection tools are essential in data management processes. Findings revealed a shortage of data collection tools, which may lead to delays in capturing and collation of data. Hence, policy makers and managers at national level should ensure that budget for data resources are adequate to cater to all health facilities country wide. Ndaborora et al (2014:116) stated that the majority of low-and middle-income countries face challenges in generating and utilising Health Information Systems due to inadequate financial resources to purchase data collection tools. Hence, more work needs to be done to overcome barriers of inadequate funding of data collection tools.

In this instance, it is the provision of paper-based tools such as paper-based registers, tally sheets and monthly summary forms. This strategy involves the following action plans.

- *Strengthen the review of the usage and make inventory of existing of data collection tools*

The first step in ensuring that there are adequate data collection tools is to make sure that the usage of said tools is reviewed periodically. This enables managers to be aware of how many data collection tools are utilised at each health facility. Thus, creating an accurate estimate of data collection tools, so that they are ordered timeously. In addition, an inventory of existing data collection tools is necessary to determine the availability at each health facility. It will help to keep track of all data collection tools and avoid lack of stock. Hence, supervisors at health facility level have a responsibility to ensure that inventory is done to avoid interruption in the availability of data collection tools.

- *Determine the maximum and minimum of data collection stock required for health facilities*

After keeping track of existing data, the findings revealed that supervisors have a responsibility to ensure that there are adequate data collection tools. Once the minimum data collection stock level is reached, a flag will be raised to the supervisors and managers that the data collection tools stock is at its lowest level, and there is a need to order additional stock to reach to the maximum stock level so that a lack of stock is prevented.

- *Procure data collection tools timeously and ensure adequate resources*

Managers at national level general store should ensure that all data collection tools are procured timeously, because the procurement of data collection tools is centralised. Using maximum and minimum stock levels, the general store has a responsibility to monitor the stock levels and order before data collections tools are completely are out of stock.

- *Develop mechanism for resource control*

The policy makers and managers at the regional and district levels should develop mechanisms for resource control to ensure that the processes of acquiring and distribution of data collections tools is done in an efficient and effective manner. Ledikwe et al (2014:3) indicated that there is a need to provide and ensure that data sources such as registers, tally sheets and monthly reports are available and controlled in order to ensure data is collected timeously, thus, strengthening the data management process.

6.4.1.3 Strategy 3: Provide adequate infrastructure for Information, Communication and Technology (ICT)

The study identified a lack of ICT at health facilities to capture data. Hence, ICT plays a significant role in data management process as data is captured, analysed and disseminated using electronic means for decision-making (Bagherian and Sattari 2022:9). If ICT infrastructure is considered to be the backbone of any HIS, then hardware and software should be considered as vital resources. Therefore, health systems should ensure that any system that forms part of an HIS should conform to a minimum set of ICT requirements (Khan & Edwards 2012:67). It is therefore recommended that the Ministry of Health and Social Services policy makers and managers should continue to provide infrastructure for ICT to enable the data producers and users to utilise the system effectively.

The following action plans were proposed to attain the strategy;

- *Strengthen the implementation of DHIS2 and introduce Electronic Health Records.*

The study revealed limited use of DHIS2. However, the experts confirmed that the expansion of the software has commenced, albeit still in the infancy stage. They indicated that training was conducted for some nurses at the health facilities on capturing data on DHIS2. However, this is not fully implemented as the majority of health facilities still compile paper-based monthly summary forms which is sent to the district level where it is captured. Therefore, a need to strengthen the implementation of DHIS2, as the use of a paper-based system contributes to poor data quality in terms of completeness and timeliness, and DHIS2 can reduce errors in the reports and improve data accuracy, to increase usability (Kiberu et al 2014: 2). In addition, DHIS2 improves timeliness as it eliminates the aggregation responsibilities, and their only role will be to capture data and it will automatically be available at the next level.

With regards to the Electronic Health Records, the actual implementation had not yet commenced, so the eHealth Strategy was launched to guide the implementation of eHealth platforms. To date the electronic patient information system was piloted in two hospitals, Windhoek central hospital and Katutura intermediate hospital, with an oracle web-based application, however there was no expansion to other public health facilities. Thus, there is a need for the digitisation of the patient information such as demographics, medical history, medication and allergies, immunisation status, vital signs and diagnosis to be fully captured. This allows all aspects of patient information and related services to be managed in an integrated manner (Nengomasha et al 2018:4).

Another important benefit of an electronic patient information system is that with emerging technologies, data can be automatically captured in the same system and synthesised in DHIS2 (Ministry of Health and Social Services 2020: 29).

- *Review the budget and increase funding for ICT*

The use of ICT in data management process improves data capturing mechanisms by benefiting health service providers in capturing data at point of care, and all levels in the healthcare system have an opportunity to own, manage, disseminate and use data in decision-making (Nengomasha et al 2018:5). The study highlighted a lack of computer equipment at health facility level, whereby some computers are not functioning properly. A resource intensive investment that can improve data quality including strengthening electronic health information systems at point of care is required. A web-based computer information system has a potential to reduce the data collection burden by automating data aggregation and reporting (Ledikwe et al 2014:13). Therefore, policy makers should source funding to provide adequate infrastructure for ICT at all levels in the healthcare system.

- *Install fibre internet cable to increase the internet bandwidth at health facilities*

The study revealed that there was limited internet connectivity at the health facilities and some districts that would delay the data entry, thus impacting the timeliness of data. It is therefore suggested that a fibre internet cable be installed as it increases the internet bandwidth at health facilities, district and regional level. A good internet network reception facilitates an effective electronic data capturing system which improves data management process (Lemma et al 2020:8).

- *Train all staff at health facility on digital literacy*

The study revealed that the majority of staff at health facility level are using paper-based tools and were not exposed to electronic health software used to capture data. According to Asemahagn (2017:8), health workers who have computer skills and access to computers at health facilities, were more likely to collect, process and use routine health information through their application of skills, compared to those with no computer skills. Thus, there is a need to build capacities in digital literacy, so that nurses at health facility level are familiar with communication technology software utilised in capturing and managing routine health information (Shama et al 2021:10).

- *Incorporate DHIS2 in curriculum of health-related courses*

The study revealed that the majority of graduates of health-related courses are not well acquainted with DHIS2. Hence, the experts suggested that a strong base of knowledge be attained during formal training, and, therefore, recommended that DHIS2 be embedded in curricula of all health professional courses. This will enable them to gain competencies in data management and be familiar with the software utilised in order to be able to capture data after completing their studies. Begum et al (2020:11) suggested that DHIS2 training curricula should be tailored to the needs of each profession in the undergraduate courses, so that new graduates contribute to the country's progress towards the use of DHIS2 in identification of health problems, informed planning and design of health interventions, to address public health problems.

- *Support staffs in the implementation of eHealth platforms and electronic patient records*

In order to successfully implement eHealth platforms and electronic patient records, managers at the regional level should support the health facilities to assess how they transition from paper-based tools to eHealth platforms. The support has a potential to build confidence among health professionals utilising eHealth and to give them an opportunity to present their challenges to be addressed. According Getachew et al (2022:7), supported health workers are likely to implement an intervention when they are supported compared to those who were not.

6.4.1.4 Strategy 4: Formulate plans to support data management processes at health facility and district level

The study recognised that for an effective implementation of RHIS, there is a need for strong plans that support data management plans at the health facility and district level. The study acknowledged that there is a national implementation plan for 2021-2025, that cascades to the regional level, however, the district and health facilities do not have implementation plans. A study by Denhavieh et al (2019:73) highlighted a critical role of plans in data management process. Lack of appropriate planning can affect the successful implementation of RHIS. Therefore, managers at all levels should ensure that there is accurate planning and participation in health systems in order to ensure data management process is strengthened, thus, increasing the availability and use of health information to support their decision-making.

In order to strengthen data management process, HIS plans to support health facilities are crucial. Therefore, the following action plans will enable policy makers, managers from the regional and district level to formulate their plans.

- *Strengthen the implementation of the national strategy implementation plan at regional and district level*

The Ministry of Health and Social Services has a national strategy implementation plan which is based on strategic objectives and interventions, and for each intervention activities have been identified and linked to an accountable officer or entity (Ministry of Health and Social Services 2020:31). Thus, there is a need to ensure that regional and district levels devise interventions and activities that they can implement to support the overall national strategy implementation plan, that can only be realised if policy makers orient managers at the regional and district level on the plan. Once, the implementation of national strategy is enhanced, it will improve data management processes.

- *Cascade and customise the plan to the district and health facility level to guide the implementation of HIS*

For the national strategy to be implemented optimally and yield desired outcomes, the policy makers and managers at regional level needs to cascade and customise the national strategy implementation plan to the district and health facility level. A study conducted in Botswana indicated that HIS plans outline coordination structures, roles and responsibilities of key actors, setting core indicators and strengthening the data use. This will assist the leadership to monitor and evaluate the implementation of HIS (Seitio-Kgokgwe et al 2015:12). This effort is to strengthen and support data collection, analysis and enhance data quality at all levels.

- *Monitor the implementation of HIS plans for regional, district and health facility level*

Monitoring informs the policy makers and managers whether activities in the HIS plans are being executed according to the plan, and at what costs. Monitoring further determines how well the Health Information System is functioning at the regional, district and health facility levels (Gage, Ali & Suzuki 2005:6). Therefore, the study recognises the importance of assessing the implementation of HIS plans in order to have an effective data collection, processing, analysis and dissemination of data that can be utilised for decision-making in the health system.

- *Evaluate the implementation of HIS plans*

The evaluation of the implementation of HIS plans seeks to assess the system performance by investigating whether the HIS plans were executed. In addition, if the defined objectives of the programme were achieved, strategic interventions and activities were carried out as indicated in the plan (USAID MEASURE Evaluation 2015:88).

Evaluation also provides an opportunity to re-assess the strategic interventions and activities, and identify barriers and constraints experienced during the implementation of the plans.

6.4.1.5 Strategy 5: Capacity building on data management process

The study has identified capacity building as one of the most important inputs in the data management process. This is an activity that drives the data management process and influences data through capacity building. Training can enrich the health workers with skills to perform data management functions such as data collection, processing, analysis and dissemination of routine health information (Kapepo & Yashik 2018:2023).

Capacity building was found to be effective if it was a combination of training and on-site mentoring. Hence, a routine investment in capacity building and regular quality assessment was found to be useful (Lemma et al 2020:11). The strategy encompasses the following action plans:

- *Review roles and responsibilities in terms of HIS, and identify competencies of various health workers*

Typically, various health professionals at different levels of health systems have different functions in the health system. However, all efforts are made to ensure that the data generated is accurate, reliable and timely. Main functions include data collection, analysis, synthesis, interpretation and use of data for decision-making needs. Hence, by understanding who the data users and producers are, and linking them to their job functions, ownership of data is clarified, information cycle is strengthened, data informed decisions are made, and the value of data is appreciated (Nutley & Reynolds 2013:6). In addition, there is a need to identify existing skills and competencies among various health workers to determine the level of knowledge in terms of data management skills. Therefore, the review of roles, responsibilities and determining skills and competencies of various health workers will enable policy makers, and managers at regional and district levels to build capacities of various health professionals, so that they are able to execute their duties effectively and efficiently in terms of data management process.

- *Align the skills of various health information to their tasks*

After determining various skills and competencies among various healthcare workers, there is a need to align those with specific skills to their tasks. The study revealed that there seems to be a mismatch in the deployment of staff members in HIS positions as the majority of HIS managers are clinical staff with less technical skills in HIS. Although the Ministry of Health and Social Services had appointed ICT personnel with the required skills for supporting HIS analysis and system administrators (Ministry of Health and Social Services 2020: 4), there is still a need to recruit staff with technical skills in the design of health information systems and to manage databases.

- *Recruit HIS graduates as data capturers or data managers at district and assist health facilities*

The experts expressed the need to recruit HIS graduates as data capturers or data managers at district level while supporting health facilities in terms of data management processes like data capturing, analysis and dissemination. A study conducted in Botswana suggested that task shifting of data entry duties in DHIS2 to data entry clerks, as they would do a better job than health professionals who are already burdened with clinical duties. The nurse's roles would focus on entering patients socio-demographic data and diagnosis, as well as to interpret and use data for decision-making (Ledikwe et al 2014:12). In addition, HIS graduates should also perform advanced data management functions such as database management. This could improve the quality of data at all levels.

- *Increase the number of trainings at the district and health facility level*

The study acknowledged that training for staff and end users on skills required to use the eHealth system has commenced (Ministry of Health and Social Services 2020:20). However, there is a need to increase the amount of training to ensure that all health workers involved in data management are capacitated with appropriate skills and competencies. On-the-job training for healthcare workers at lower levels can boost their knowledge and skills as well as their motivation (Adane et al 2021:8). In addition, Chen et al (2020:677) stated that such training should be mandated by higher authorities instead of on a voluntary basis. Therefore, policy makers and managers at all levels should set objectives for training so that it is aligned to each health worker's roles and responsibilities, then, avail of the budget to cater for such training.

In order to improve demand for and use of data for decision-making, individual capacity in core competencies to actively request data and use data must exist at all levels. Hence, training to build competencies in data analysis, interpretation, synthesis and presentation, and development of data informed programmatic recommendations is required (Nutley & Reynolds 2013:6). Therefore, managers at regional level and technical agencies involved in HIS have a responsibility to ensure that training is conducted. The study also emphasised that monitoring post training is necessary in order to assess how the health workers involved in data management process are using data sources and reporting tools, analysing data, disseminating data, and using data for decision-making. Periodic evaluation of the training on data management should also be conducted.

6.4.1.6 Strategy 6: Improve data dissemination at all levels

The study recognised that data dissemination must be improved, and identified a gap in sharing of data. Routine health information can be shared with data producers at lower levels in the form of feedback (USAID MEASURE Evaluation 2015:51). Information generated by the RHIS should be disseminated will all those who would use it for decision-making. Information products should be developed using visual aids such as charts and maps. This can be disseminated through mechanisms such as display boards and web portals (Health Metrics Network 2009:64). In order to attain this strategy the following action plans should be performed:

- *Review the mechanism for data dissemination at health facilities at all levels and provide adequate resources*

There should be an effective mechanism for sharing information to various stakeholders in the health system. Therefore, there should be platforms, adequate resources and dissemination of data. A well-designed Health Information System should include information technology infrastructures, policies and reporting templates targeted to support communication of data (Nutley & Reynolds 2013:6).

Quality information products should be developed including visual aids such as charts, graphs through web portals, notice boards, and regular bulletining. This is where analysed where analysed data and indicators used in monitoring the performance against targets of child health indicators are shared (USAID MEASURE Evaluation 2020:52).

This information should be done regularly in the form of monthly, quarterly and annual reports at each level. In addition, routine feedback containing analysed data from higher levels to lower levels on specific performance to the facility or district.

- *Identify stakeholders at the health facility level to participate in the reviews*

The study identified a gap in participation of stakeholders during data review meetings as cadres such as nurses at health facility level do not form part of the review meeting. Therefore, there is a need to extend the invitation and participation to nurses and health workers at the health facility level. Their participation will determine their ability to engage with data and improve their attitudes towards their data, and discuss solutions to address any programmatic issues. Amouzou et al (2021:2) found evidence of an association between data review meetings, data related to decision-making and service coverage at health level in India.

- *Establish a framework and disseminate national health information reports annually*

Efforts are required to improve the collection of quality assured, timely routine data, hence, new interventions are essential in order to ensure that quality health information reports are disseminated to stakeholders (Lee, Lynch, Hashiguchi, Snow, Herz, Webster, Parkhurst, & Erondu 2021:8). The study realised that these national reports were not disseminated annually. Therefore, a framework needs to be established to support the National Health Information Report on an annual basis. The study appreciates the need for the dissemination of national information reports on an annual basis. The annual health statistics reports should be available to a variety of users. This is to be used for monitoring and evaluation of specific disease programmes and also include information on the budgeting process in health systems (MEASURE Evaluation 2017:4).

6.4.2 Focus area: Improve the legislative framework for the implementation of Routine Health Information System

For an effective implementation of routine health information, policy, guidelines and legislative framework are required. Policy and legislative framework enhance coordination and collaboration among stakeholders and ensure compliance to the health information system. Therefore, policies and legislative framework addresses challenges of the implementation of HIS and compliance to set standards (Ministry of

Health and Social Services 2020:20). Thus, the following strategies were developed to improve the legislative framework:

6.4.2.1 Strategy 7: Develop HIS policies, guidelines and legislative framework to guide implementation of RHIS in Namibia

The implementation of RHIS rely on the availability of a strong legislative, regulatory framework. Thus, a need for a legal framework that provides an enabling environment for data availability, data exchange and sharing, as well defining an ethical parameter of data collection, dissemination and use (World Health Organization 2008:16). Health Information System guidelines are important inputs, and their availability will enable users to apply the concepts contained in documents in order to apply their knowledge and skills for processing and information use (Asemahagn 2017:9).

The following actions plans were deemed necessary:

- *Provide technical and financial support to formulate HIS policies, guidelines and legislative framework*

Legal and regulatory aspects are among most challenges in Health Information Systems, especially in terms of privacy, design of various HIS, liability and data protection (Ministry of Health and Social Services 2020:21). In many instances, lack of legal framework is a result of a lack of capacity to formulate these frameworks. Therefore, there is a need for policy makers to source technical and financial support to formulate policies, guidelines and legislative framework of HIS.

This support can be provided by technical agencies such as the World Health Organization (WHO), the Centre for Disease Control and Prevention (CDC), and the United States Agency for International Development (USAID) to be involved in the data management process through hiring consultants to support local technical working committee groups in development of and finalising policies, guidelines and legislative frameworks on HIS.

- *Develop policies to guide the implementation of RHIS*

The study identified lack of policies to guide the implementation of HIS, which correspond with guidelines for RHIS data management standards USAID MEASURE Evaluation (2015:85), which stated that most of the countries still lack policies that bring together various components of RHIS under one unifying framework that provides clear lines of responsibility and functionality.

In addition, policies should provide details on how to monitor and evaluate, as well as the use of information in programme planning and decision-making through standardisation of the data management process (English et al 2011:86). Thus, the current strategy, that is in draft form, should be expedited into formal policy. This will enable RHIS to be strengthened as policy will provide clear direction in terms of governance process roles and responsibilities of various staff categories and promote quality.

- *Develop a legislative framework to regulate the operations and data management for various health information systems*

Legislation and regulation frameworks are particularly meaningful in relation to their ability to regulate Health Information Systems from both the private and public health services. Legal and regulatory framework are required to ensure that all Health Information Systems are part of the country health information system (World Health Organization 2008:18). Hence, a regulatory framework is necessary to ensure that data reported from health service delivery, both public and private, are available to the national health information system. In addition, the regulatory framework prescribes standards to be utilised by various health information systems in order exchange data with DHIS2, which is the main tool used in capturing and managing routine health information in Namibia.

6.4.2.2 Strategy 8: Integrate various Health Information Systems

The study suggested that RHIS should provide information in an integrated manner, whereby various health information systems should be able to exchange data and share information with various stakeholders for decision-making. There must be standards in place that can create the necessary interoperability among Health Information Systems (ITU-T Technology Watch 2012:3).

The standards that are commonly utilised in eHealth includes Digital Imaging and Communications in Medicine (DICOM), Comite Europeaun de Normalisation with Technical Committee (CEN/TC251), Health Level Seven (HL7), and ISOLTC 215,ISO/IEEE (Dlodlo & Hamunyela 2017:64). The following action plans were deemed necessary to integrate various health information system.

- *Involve various system developers in establishing HIS interoperability standard framework*

This action recognised the need to involve all system developers of various HIS in establishing interoperability standards. The involvement of system developers is to promote a stronger coordination among key players in eHealth standardisation and agree upon convenient standards for all health information systems, as well as the standards that ensure interoperability with DHIS2 (ITU-T Technology Watch 2012:9).

The Namibian health sector has duplications of functionality and a large number of systems that are operating in silos in different departments and organisations (Dlodlo & Hamunyela 2017:62). Therefore, a consensus among Health Information System developers on which HIS interoperability standards framework should be adopted is necessary.

- *Develop a Standard Operating Procedure (SOP) for exchange of data*

Interoperability between different health information systems is a critical requirement for these systems to provide a comprehensive view of health programmes. It can be achieved after an agreement of interoperability standards is reached (Ministry of Health and Social Services 2020:18). Therefore, there is a need to develop a SOP for stakeholders to guide them on how to implement a set of interoperability standards. This can be supported by establishing an interoperability architect that simplifies the complexity of interfaces that need to be built among different health information systems (Dlodlo & Hamunyela 2017:52).

A set of interoperability standards will enable integration so that information systems are able to talk to each other, and are able to exchange and share information with different stakeholders especially decision-makers. The information will then be generated by various Health Information Systems which will be accessible at one central repository.

- *Evaluate the implementation of the interoperability standards of all health information systems*

The study acknowledged the evaluation of the impact of the implementation of interoperability standards among various health information systems. This is to assess if all the stakeholders utilising various health information systems are complying with the agreed upon and set interoperability standards. The policy makers and managers at regional and district level should also assess if data captured by various Health Information Systems is accessible for decision-making.

6.4.3 Focus area: strategies to enhance data quality

The aim of health information systems is to routinely generate quality health data that gives evidence to support decisions on health issues (Shama et al 2021:2). This focus deals with strengthening processes, which will ensure mechanisms are in place to ensure data generated is of good quality. Routine health information will not be useful if it is not accurate, complete and timely to inform decisions. Hence, the focus on complete and comprehensive data that guide programme improvement and resource allocation is increasingly gaining momentum given a high burden of diseases and limited resources in the majority of low- and middle-income countries (Getachew et al 2022:2).

6.4.3.1 Strategy 9: Improve data quality assurance practices

Decision-makers require accurate, complete and timely data in order to accurately allocate resources for effective management health systems. Therefore, data should be subjected to formal data quality procedures to ensure that it is fit to serve its purpose in a given context of accuracy, completeness and timelines (USAID MEASURE Evaluation 2017:23). The study revealed that there was no formal approach to data quality checks at the health facility. The following action plans are deemed necessary to improve data quality assurance practices.

- *Strengthen the implementation of Standard Operating Procedure (SOP)*

The study acknowledged the need to ensure that SOP for data quality are implemented as proposed. Thus, procedures need to be clear and staff should be aware of their existence. The SOP should then have quality assessment elements for each indicator and data element, availability of data collection tools and standardised reporting forms (World Health Organization 2017:25).

Nurses and managers are expected to perform data quality assessments to ensure that data is complete, accurate and timely. In addition, data quality assessment help improves data quality by uncovering invisible problems in data collection, aggregation and transmission of priority data (World Health Organization 2017:27)

- *Conduct data quality assessments*

The study suggests that monthly data quality assessments be conducted before submitting to the next level. The data quality assessments should use the Routine Data Quality Assessment (RDQA) tool, which facilitates the assessment of data quality for selected indicators, thorough data verification and strength of the overall data management (USAID MEASURE Evaluation SIFSA 2017:11). The nurses and managers should verify data by recounting reported data and review timeliness, completeness and availability of the reports. The aim is to check service delivery and that intermediate aggregation sites are collecting and reporting data accurately, completely and on time, and whether data is consistent with other data sources. At health facility level, staff responsible for reporting should review the monthly reports for completeness and internal consistency. They should ensure that data elements have expected numerical relations before submitting the reports to the district level (Bhattacharya et al 2019:16).

- *Incorporate data management in curriculum of health professionals' course*

The study has acknowledged that the majority of new health professionals are not fully competent in skills such as data analysis, interpretation and data quality checks. This corresponds with Nutley and Reynolds (2013:7), who revealed that newly trained professionals do not have core competencies in data management skills. Hence, they often struggle with data analysis, data interpretation, data quality check and use. Therefore, there is a need to incorporate data management in curriculum of health professionals using software for capturing routine health information as well as to analyse, critically review and understand what their information needs are, and when they can demand data.

Muhoza et al (2022:8) suggest that stakeholders should also consider approaches to strengthen preservice training in data use to complement in-service capacity building strategies. The need to review curriculum of health training institutions to emphasise RHIS data use and tools is required.

- *Evaluate the implementation of quality assessment through data quality audit*

The study recognised the importance of evaluating the implementation of quality assessments. During the evaluation, quality audits are performed using a data quality audit tool which has indicator-specific audit templates and guidelines that can be used by an external audit team. The aim is to assess programme or project ability to report on good quality data, which can be done using random sampling at the health facilities (USAID MEASURE Evaluation SIFA 2017:2). Thus, the data quality audit verifies the quality of reported data and assesses how effective the quality assessment checks conducted were in ensuring that data produced is complete, accurate and timely.

6.4.3.2 Strategy 10: Establish feedback mechanisms on data quality

Giving feedback on data quality to lower levels is an important aspect of the data management process. The health professionals are made aware of their strengths and short comings in order for them to generate quality data to improve the quality of patient care. Sako et al (2021:10) revealed that health professionals who received feedback regarding quality of their data were three times as likely to produce quality data and use it for decision-making. Therefore, the establishment of feedback mechanisms on data quality to lower levels will enable health professionals to receive constructive and relevant advise to utilise their data to enhance data quality.

The following action plans were regarded necessary in ensuring that there is an established feedback mechanism on data quality.

- *Develop a reporting format for providing feedback to lower structures*

A well-established reporting format for giving feedback to lower levels is essential to ensure that there is a guiding template for managers at all levels. This will provide regular feedback to lower structures on the performance of the programme indicators and data quality of their health facilities, districts or region. Nguefack-Tsague et al (2020:6) indicated that 75% of facilities received periodic feedback reports from their superiors in Ethiopia. However, the same study noticed that those health facilities who received feedback regularly have presented good performance compared to those health facilities who received periodic to no feedback. Hence, there is an association between feedback on data quality and frequency of the feedback. Therefore, a reporting format for providing feedback enables immediate discussion and resolution of the problem in order to strengthen RHIS.

- *Strengthen bi-annual support supervisory visits*

Regular support supervision is considered to be an important aspect in enhancing data quality. A study by Getachew et al (2022:7) revealed that health workers that are regularly supervised have reported higher data quality than those who were not supervised. The experts indicated that a support supervision checklist was revised in the Ministry of Health and Social Services. Hence, there is a need to implement a revised checklist that includes all aspects of RHIS. A support supervision checklist should focus on assessing data quality dimensions such as completeness, timeliness and accuracy of data. This will ensure that decisions are derived from quality data. The support supervisory visit should also support healthcare workers in data analysis, data dissemination and provide constructive and pertinent guidance to health workers to utilise their information to improve their service delivery.

Therefore, the study indicated that there is a need to have a bi-annual support supervisory schedule for managers at regional and district levels. A bi-annual support supervisory visit would enable managers to mentor health workers in order to identify gaps, improve health workers performance and utilise their data for decision-making (Seid et al 2021:1196).

The study further suggested that after each support supervisory visit, challenges need to be highlighted and corrective measures developed to address those challenges. These action points would mainly be on training and mentoring to build competencies in data management process, as well as provide technical and functional support to develop and maintain infrastructural capacity at various levels in the health system (Mutale et al 2013:5).

6.4.4 Focus area: Strengthen the use of Routine Health Information

The study findings revealed that RHIS is utilised for decision-making in child healthcare at regional and district levels. This focus area aims to strengthen the processes of routine health information by assessing data demand and address the information needs of the users. In addition, it provides mechanisms to create a culture of using data for decision-making. However, health facility level use of data is weak because some nurses feel it is not their responsibility. Therefore, the following strategies were developed to strengthen data-driven decisions.

6.4.4.1 Strategy 11: Improve access of District Health Information Software Two by all managers

The study acknowledged access to DHIS2 is important in supporting the use of information decision-making. Therefore, all data users need access to DHIS2 in order to make prompt decisions to improve service delivery (Nutley & Reynolds 2013:6). The following action plans were deemed necessary to improve access of DHIS2 by all managers to increase the use of data for decision-making.

- *Make DHIS2 available at all levels*

For the use of information to increase, data availability needs to be improved. Therefore, DHIS2 should be available at each level, then health workers would only require an electronic device such as mobile phones, laptops or computers to access data. This will provide instant data to health workers at all levels to use data for decision-making. Access to electronic Health Information Systems such as DHIS2 to make data available by increasing access and expanding the use of that data is imperative (Nutley & Reynolds 2013:6).

- *Train all new managers on DHIS2*

The study acknowledges the high staff turnover of staff, including managers, in the health systems, therefore, the need to train new managers in order for them to acquire skills to utilise DHIS2 to access RHIS for use in planning and managing child healthcare. Nguefack-Tsague et al (2020:6) stated that training will enable staff to acquire competencies in using DHIS2 to analyse, interpret and use data for decision-making. Literature further suggested that due to limited financial resources to train staff face to face, a less costly training such as online courses and video recorded sessions can be utilised for self-training for managers.

- *Create profiles for managers and assign them roles*

The study suggested that all managers should have profiles on DHIS2 with roles related to their functions in data management process. Thus, profiles on DHIS2 will address information needs for all managers so that relevant data is available to them to use in decision-making, at their convenience, wherever they are, as long as they have access to ICT infrastructure and an internet connection. Access of routine health information through electronic information systems increases the data availability and expands the use of data among various users at their convenience (Nutley & Reynolds 2013:6).

6.4.4.2 Strategy 12: Improve District Health Information Software Two architecture to enable real-time data access

The study recognised the importance of improving DHIS2 architecture in order to make data available as soon as they are entered in DHIS2. Readily available DHIS2 data will enable decision-makers to make decisions timeously (Angula & Dlodlo 2018:3), thus, the following action plans will enable real-time data access.

- *Plan and budget subscription to external host commercial cloud company*

In order to enable real-time data access, there is a need to subscribe, and for an external host that will manage the server that will enable real-time data access at an affordable price. Thus, the annual plan of division of HIS should include a yearly fund for the subscription fee to service providers that can host the server to enable real-time data access.

Chen et al (2020:677) stated that good leadership should be able to provide sufficient funding in the implementation of electronic systems, especially a subscription to up to date ICT infrastructures and network that will enable real-time data access. Funding an external host commercial cloud company can improve data quality.

- *Use the cloud-based central server*

The study acknowledged that the use of a cloud-based server which is hosted externally would enable real-time data access to the users. The external host would provide a transaction system to enable data be available as soon as they are entered. Then, the country will not be concerned about bandwidth constraints as an external provider will manage the server. Meanwhile, the local server continues to host services such as data analysis and dissemination that can be accessed over the intranet (DHIS2 Documentation Team 2016:7).

- *Execute DHIS2 server upgrades*

The policy makers have a role to ensure that the local servers are updated periodically. Server upgrades includes moving to newer versions with new features or interface upgrades that are useful in maximising the software durability, enhance interoperability, keep the DHIS2 up to date with maximum security upgrades, and new ways to fix glitches in the operating system (DHIS2 Documentation Team 2023).

6.4.4.3 Strategy 13: Review and revise existing child health indicators

In order to strengthen the use of RHIS, there is a need to start identifying information needed by data generators and users at all levels in the healthcare system. A study by Bagheian & Sattari (2022:8) indicated that health information systems are failing in some developing countries because data collected was not adequate to make decisions. Hence, the managers reported that the data they had was not sufficient to support their goals in planning to prevent and control diseases, as well as allocation of resources. Data generators and users are expected to identify child healthcare indicators used and therefore, a need for decision-makers to reach a consensus for information users and useful data for planning and managing child healthcare. The following action plans are deemed necessary to attain the strategy.

- *Identify information needs of decision-makers on child healthcare*

The study suggests that there is a need to list various child health data elements and link them to different activities on which decisions are made to improve child healthcare. Then, identify what other problems are affecting child health and which information is required to plan and manage that child health programme. Lippeveld & Sapririre (2000:247) stated that designers of Health Information Systems need to support data users by listing various data elements, and breakdown functions and activities into a list of decisions for which information needs are defined. This will aid in identifying which data is most useful for decision-making and incorporate these data elements into RHIS. Therefore, there is a need to identify and address information needs of decision-makers to improve child healthcare.

- *Review and revise existing data elements in relation to child healthcare indicators*

Health Information Systems are required to meet the needs of data users in the health system. Thus, the focus should be on collecting information that is linked to decision-making. Hence, the revision of data elements in registers and forms at health facilities will improve the relevance and usefulness of information generated at the point of care (Nutley & Reynold 2013:8). Therefore, policy makers need to revise data elements of child healthcare regularly based on their information needs and services provided in order to ensure that data collected is useful for decision-making.

- *Involve health workers and managers in revising and implementation of data elements and child healthcare indicators*

For the child health data elements and indicators to be useful and address the information needs, there is a need for the data generators and users to be involved in the process of reviewing those data elements. The involvement of end users is important as they will utilise data sources to generate data and use the information in decision-making in child healthcare. The involvement of data generators and users is important to properly identify information needs in order to amend data elements, and focus on improving the relevance and usefulness of information generated to support managers and health workers in decision-making (Lippeveld & Sapirire 2000:246).

Once, health workers provide their inputs on actual implementation of the revised documents, the study suggests that staff should be oriented well on these data collection tools, so that there is an effective and efficient implementation of all revised tools.

- *Support the implementation of the revised data elements and child health indicators*

On-going support is an important aspect in the implementation of any programme. In this instance the implementation of revised child health data elements and child healthcare indicators will assist in motivating health workers, identifying gaps and improve the data elements and child health indicators (Wude et al 2020:8). Therefore, when supporting revised data elements on child healthcare, the emphasis should be on fostering a collaborative approach that will strengthen the implementation of revised child data elements and child health indicators.

- *Evaluate the implementation of data elements of child healthcare and involve all health workers.*

Evaluations can be designed for health facility, district, provincial or national level using a check list to allow the assessment of how data elements are captured at the point of care, and assess if the data generators fully understand the concepts (Wagenaar et al 2015:131). Therefore, an evaluation process provides an opportunity to assess if revised child health data elements and indicators are implemented optimally, as well as identify gaps and address them to improve the revised child health data elements and child health indicators.

6.4.4.4 Strategy 14: Enhance the culture of information use at the health facility level

The culture of information use has been increasing in health systems. However, it is required to better understand the user needs and involve them early on in designing their solutions. Organisational behavioural intervention is one of the methods that could be applied in establishing a culture of information use when organisational systems are in place to support a culture of data informed decision-making. Data producers and users are better able to understand the value of data in the health system. These include competencies to understand and interpret data stemmed from RHIS through training and mentoring, improving perception of culture of information use, regular support supervision and feedback (Wude et al 2020:9). In addition, other interventions such as role modelling by senior managers also promotes use of data at the district level (Lippenveld 2017:338).

The following action plans were deemed necessary to attain this strategy.

- *Increase awareness and capacity on information use of child healthcare*

Capacity building on information use can assist the producers and users to value health information ultimately to produce high quality data, that can be communicated and shared through the health system. This will result in the increase of information use decision-making.

Tulu et al (2021:14) stated that the presence of health workers who have good knowledge and skills on how to generate, analyse, disseminate and use routine health information for decision-making could motivate other health workers to do the same. Therefore, the users with adequate knowledge and skills on how to manage, process, communicate and use health information can include their skills on data use more easily into their daily activities to plan and make decisions. This has the potential to improve the culture of information use among health workers at health facility level.

- *Develop a performance-based incentive system for HIS programme at all levels to encourage information use*

In order to encourage a culture in which information is demanded and used, there is a need to establish institutional mechanisms and incentives to create a culture of evidence-based decision-making. Experiences from literature indicated that incentives are the most effective mechanisms in linking data/information to actual resource allocation and develop an indicator driven planning (Mboera et al 2021:4).

Therefore, when developing a performance-based incentive system for HIS programme, there is a need to recognise good performance on data use. This will create a culture of information use as it supports the generation of quality information and promotes participation, and those employees who are committed to the organisation’s collective objectives and utilise data. Teklegiorgis et al (2014:74) indicated that the availability of incentives to reward those who performed well on data use can motivate health workers to produce quality data and use it, thus promoting information use. Therefore, leaders can support the excellent performers in information use with certificates of appreciation, thus motivating their teams to continue to seek, use and share data.

The excellent performers can also be used to share best practices. The sharing of best practices can empower health workers so that they value data leading to a change of attitude about data use at facility level (USAID MEASURE Evaluation 2018:15). Therefore, there is a need to plan for monthly meetings to discuss the performance of child health indicators. This will bring together actors from all levels of the health system that can stimulate gradual changes in mindsets and practices by encouraging RHIS data use. The meeting will allow data users to improve their problem-solving skills and confidence in utilising their data for decision-making of child healthcare (Muhoza et al 2022:8). The study suggested that a reporting format should be established for all health facilities on child health indicators. The benefits of the reporting format on child health indicators is to make those responsible for collecting data to use data for managing and planning child healthcare. This will enable the development of a culture of evidence-based decision-making so that those users can benefit RHIS in line with their own information needs and requirements.

Hence, the reporting format for all health facilities on child health indicators can link between data and decision-making (World Health Organization 2008:44). After the discussions at the monthly meeting, there is a need to develop an action plan that will create an opportunity to address barriers to data use and improve sharing of information.

6.6.4.5 Strategy 15: Establish an information use audit at all levels

The study suggested an information use audit at all levels. The aim is to assess if providers use information they collect in improving service delivery, managers use data to enhance efficiency and effectiveness of service delivery, and policy makers utilise information to prioritise and allocate resources. Therefore, the audit will assess if there is a link between data and decision-making (World Health Organization 2008:45).

The following action plans are envisaged to attain the strategy to establish an information use audit at all levels.

- *Develop an information use audit checklist and provide support*

In order to conduct an effective information use audit, there is a need for a checklist. An information use audit checklist will provide details for all steps that will be undertaken when assessing the use of child healthcare information. A checklist is easy to use and very convenient in completing all steps. Therefore, policy makers, advisers from technical agencies, and managers from both regional and district level have a role to provide technical and financial support to enable the success of an information use audit. Therefore, an audit exercise requires attention to be given training and mentoring, remuneration of a skilled epidemiologist, statisticians and demographers to support the information use audit exercise.

- *Conduct information use audit*

The study acknowledged that an information use audit will promote culture of information use at the health facility, district and regional levels, and they are assessed on how they link their data to decision-making. Such an exercise will enable them to identify their shortcomings, information needs and demand data, and use them to improve child healthcare services. It will could strengthen health facility management and managing health systems with in their budgetary allocation (Hut-Mossel, Ahaus, Welker & Gans 2021:12).

- *Prepare and share feedback with all data users*

After conducting an information use audit exercise, it is required to provide detailed feedback to the users. Feedback will give an opportunity to the users to reflect on their performance of information use when planning and managing child healthcare. Thus, leading them to identify gaps and acknowledge usefulness of generating quality data, and use data for improving service delivery, rather than considering data collecting and use as a burden (Begun et al 2020:10).

6.4.4.6 Strategy 16: Publish data on child health indicators in brochures

Information generated by RHIS should be disseminated or published with all stakeholders who can use it to improve service delivery, planning and managing child healthcare services. In order to attain this, there is a need to create networks for sharing information at health facility level. This information can be formulated in visual aids such as graphs and frequency tables (Bagherian & Sattari 2022:9). The strategy proposes that child health indicators be published in brochures, if there is adequate financial and technical support to produce and distribute brochures, and there is a need to evaluate the use of published information when managing child healthcare.

- *Provide financial and technical support for publication*

The publication of child health indicators, requires financial resources to fund the resources that will be utilised in publication. The funds could be used to recruit technical experts who can mentor the health workers to be able to analyse data and develop graphs, and frequency tables for child health indicators. This includes graphic designing of brochures. Other resources that require funding includes papers, printers and ink cartridges to print brochures with child health indicators.

- *Identify information which will be in brochures and leaflets*

Managers at regional and district level have to engage the data producers and users at health facilities in order to check all child health indicators, and collectively indicate which information is appropriate to be published in brochures and leaflets. The contents should be useful to address the information needs of the users. This could enable local staff to use their data in decision-making (USAID MEASURE Evaluation 2018:16).

- *Distribute the brochures and leaflets to nurses at health facilities*

The distribution of brochures and leaflets to nurses at health facilities can raise awareness on the importance of data so that they better understand the link between data use and effective decisions in child healthcare. A study by Wude et al (2020:9) has stated that health workers who had access to their standard health information indicators utilised their data two times more than those who did not have their data on standard health indicators. Therefore, the distribution of brochures and leaflets will change their attitudes about data and motivate them to take decisions that are based on data leading to improved child healthcare services in Namibia.

- *Evaluate the use of published information in planning and managing child health care*

The study recognised that there is a need to evaluate how data published in brochures and leaflets was utilised. That can be done by assessing which decisions were taken regarding child healthcare linked to the data that was published in the brochures. In addition, evaluation will assess the perceptions of health workers towards the published information in brochures and leaflets, and confirm if it addresses their information needs, thus leading to improved culture of information use.

6.5 Summary

This chapter outlines how the strategies for enhancing the utilisation of routine health information for managing child healthcare in Namibia was developed and validated by experts. The strategies had four focus areas: strengthening data management processes, improving the legislative framework to guide the implementation of RHIS, enhancing data quality and strengthening the use of RHIS in managing child healthcare. Successful implementation of strategies could improve the quality of data that can be utilised for managing child healthcare.

CHAPTER 7
CONTRIBUTIONS, RECOMMENDATIONS AND CONCLUSION

7.1 INTRODUCTION

This chapter presents the summary of key findings and the development of strategies for the utilisation of Routine Health Information Systems (RHIS) for the management of child healthcare in Namibia. This chapter also discusses the contributions, recommendations, and conclusion and acknowledges the limitations of the study.

The purpose of the study was to develop strategies to enhance the use of RHIS in managing child healthcare. The study envisages that the proposed strategies will create a platform for a discourse on mechanisms that would prepare the infrastructure for the effective use of the RHIS in Namibia.

7.2 RESEARCH DESIGN

The study consisted of three phases. Phase 1 used semi-structured focus group interviews with nurses working at primary healthcare facilities in the ||Karas region. The data were analysed using the Braun and Clarke approach. Phase 2 used individual in-depth interviews with fifteen (15) managers at district, regional and national levels. Data from Phase 1 and Phase 2 were integrated, and new insights emerged from combined data sets. The integrated findings were utilised to develop strategies and control with related literature. A two-round modified Delphi was used to seek consensus from experts to validate the strategies.

7.3 CONTRIBUTIONS OF THE STUDY

The study made an important contribution to research in two areas: identified areas for improving data management processes and the culture of information use in managing child healthcare. These areas informed the study in developing a strategy for managing child healthcare services.

Routine health information systems play a crucial role in effective and efficient service delivery and serve as a pillar for the planning and management of health services at various levels to make decisions that could lead to improving child health programmes (Sako et al 2022:434).

The theoretical framework was applied consistently throughout the study, highlighting the relationships between inputs, processes, output and outcomes. The findings revealed the interrelationships between inputs, which were resources required to generate and process quality data, processes or activities influencing demand and use of data and expected outcomes. The study confirmed that inputs such as ICT infrastructures, skilled health professionals and policies, guidelines and legislative framework, standards and data collection elements are required to undertake RHIS tasks. The findings are consistent with Tulu et al (2021:3), who stated that the competency of health workers in the data management process, data infrastructure concerning ICT application, and availability of HMIS guidelines and formats affect the use of routine health information.

Adequate resources are a critical input in any health information system. The inadequate data collection tools affect the completeness and timeliness of data, leading to delays in decision-making.

The study highlighted a need for a strong legislative framework for HIS that will guide the processes of RHIS, such as data collection, collation, analysis and data quality checks for both nurses and managers. Policies and legislative frameworks can also prescribe HIS standards, leading to integrating various HIS systems. Thus improving HIS governance and data quality.

The availability of ICT infrastructures and strengthening the implementation of DHIS2 and Electronic Health Records (EHR) at point of care to address issues of completeness, timeliness and data accuracy (Katutura & Cilliers 2018:6). Recommendations were made to distribute resources evenly and appropriately between rural and urban health facilities. This will result in quality data on child healthcare.

The study also acknowledged the influence of behavioural factors, such as the direct relationship between understanding and performance of RHIS. Nurses were found to have limited awareness and knowledge of basic concepts of RHIS even though they can perform some RHIS tasks such as data collection, collation and reporting. Whereas healthcare managers had a good understanding of RHIS.The study revealed a mismatch in deploying HIS personnel in key HIS positions. The study recognised the efforts of improving the culture of information, although capacity building initiatives were found to be inadequate. This appeared to affect the appropriate use of information, especially at health facilities. Hence, health professionals must build capacity and align their skills and competencies to their functions. The skills would improve the abilities of different health professionals and healthcare managers in data generation, analysis and use.

In addition, skills are also required in performing data quality assessments at all levels because the study revealed that most nurses and some healthcare managers do not perform data quality checks. Therefore, strengthening data quality checks through orientations to Standard Operating Procedures of data quality assessments and data quality audits. This will ensure that all data generated and entered in DHIS2 are of good quality. Good quality data can contribute to reliable estimates of service delivery coverage and effective clinical management at the health facility level and monitor and evaluate programmes (Bhattacharya et al 2019:2). The study also identified weaknesses in the composition of data review meetings. Nurses from health facilities were excluded, and it is during these meetings that all issues of RHIS are discussed, including performance reviews, data quality and information use. A need was highlighted to have equity representation of all healthcare managers and representatives of nurses from each primary healthcare in the district. The aim is to engage data producers, users and designers of HIS and clarify the roles and responsibilities of various health professionals in terms of the data management process, ultimately using data for decision-making on child healthcare.

The study identified a lack of data collection tools, both paper-based tools and ICT infrastructures. The stock out of paper-based tools was more prominent in rural health facilities. However, both urban and rural health facilities had insufficient ICT equipment, which could be the reason for the unavailability of DHIS2 at the point of care. The study also highlighted the unequal access to DHIS2 at the managerial level and the lack of real-time data access.

Therefore, the study recommended adequate ICT infrastructure at all levels and increased access to DHIS2. Hence, healthcare managers and the entire workforce should be involved in promoting using data from DHIS2. DHIS2 is considered an innovator for transmitting and aggregating data faster than paper-based information systems and for improving data quality by limiting errors in how data are transmitted and aggregated from the facility to upper levels of the health system (Bhattacharya et al 2019:3). In addition, the study developed a strategy to ensure the accessibility of DHIS2 at all levels and review the configuration of DHIS2 to make data available in real-time as it will enable timely decision-making. Thus, improving data production (quality and accessible data) and data use (the capacity and process for effective data-informed decision-making) would achieve a strong RHIS (Leon, Balakrinshna, Hohlfield, Odendaal, Schmidt, Zwelgenthal, Watkin & Daniels 2020:19).

In addition, the study revealed discrepancies in child health services provided and the capturing of data in RHIS. It was not clear how the missing data elements were reported to higher levels. In addition, there were no incentives to motivate nurses to use data. Therefore, the suggestions were made to identify the information needs of all levels and revise the existing data elements in relation to child healthcare indicators so that the data generated meets the needs of the users. In addition, there is a need to award individuals and health facilities that have performed well in generating quality data and use of data in decision-making on child healthcare in order to improve the culture of information use.

Hence, the proposed strategies highlighted the need for adequate resources to support the routine health information system processes which are;data collection, collation, analysis, data quality checks and demand to be easier. Thus, leading to improved child health care as evidenced by increased immunisation coverage, improved nutritional indicators of children under age of five years, reduced maternal to child transmission of HIV and reduced childhood illnesses. RHIS becomes a vehicle for HMIS which is a managerial practice.

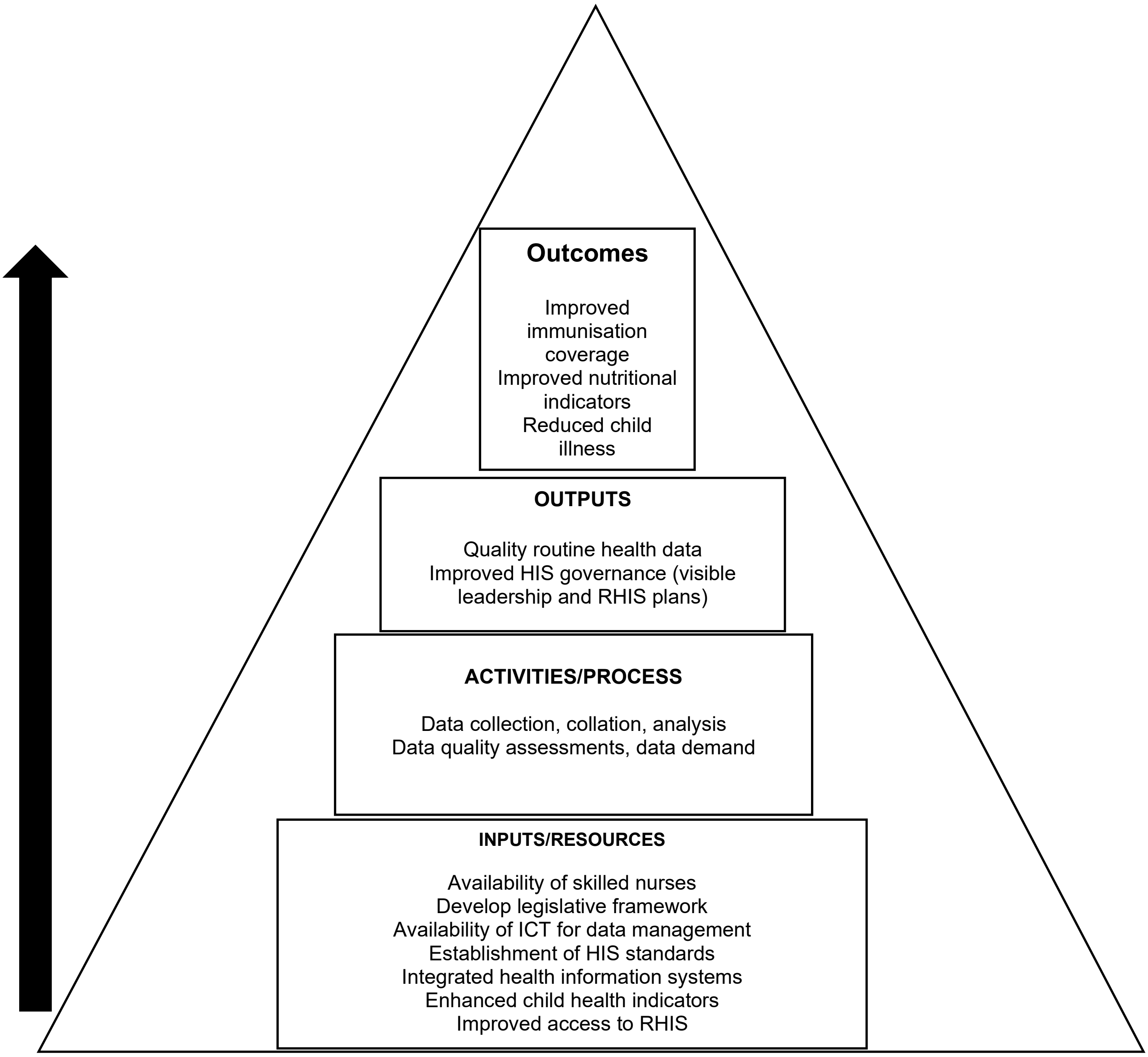

Figure 7.1 Logic framework presentation

7.4 RECOMMENDATIONS

Based on the study findings, the researcher makes the following recommendations.

7.4.1 Nurses

It was evident that nurses' competencies, confidence and motivation are essential in producing complete, accurate and timely data for decision-making to improve service delivery. They require technical support in terms of training, mentorship and appropriate data collection resources to enhance their competencies and confidence in data management processes.

7.4.2 District and regional health managers

The study highlighted the need for managers to support nurses at a health facility level to generate quality data and use data for decision-making.

7.4.3 Health information and research directorate

The directorate officers have a role to provide leadership in terms of RHIS. This can be done by formulating a legislative framework to provide directives for HIS initiatives. There must be policies and guidelines to guide the implementation of HIS and ensure compliance. There must be open communication between different levels of the health system. A monitoring and evaluation framework must be developed and made accessible to all healthcare professionals.

7.4.4 Capacity building

A capacity building framework must be in place, including related resources. Appropriate supervisory visits must follow certain standards. All managers should have access to DHIS2

This should be followed up by post-training monitoring to assess the outcomes.

7.4.5 Institution of higher education and training of health professionals

Health Information Systems and all their components, such as RHIS, HMIS, DHIS2, electronic health records, and health information management, should be incorporated into the curriculum of all health professional courses.

7.4.6 Technical agencies and non-governmental organisation

The technical agencies need to work jointly with the Ministry of Health and Social Services in all matters pertaining to the nation's HIS. This will reduce the cost associated with hiring consultants.

Furthermore, international NGOs should also collaborate with the Ministry of Health and Social Services to identify the need for resources and offer financial assistance.

7.4.7 Ministry of Health and Social Services

There is a need to revise data elements and child health indicators in order to address the information needs of decision-makers. Budgets should be allocated evenly and appropriately or according to needs to ensure that funds are sufficient to procure resources and improvement of ICT infrastructures countrywide to prepare the environment for the introduction of the electronic patient record as per the eHealth Strategy.

The Ministry of Health and Social Services to ensure that regional, district and facility levels have implementation plans for HIS to improve data management process and information use. HIS Roles and responsibilities of various staff are to be clarified and aligned to their skills and competencies.

The strategic decision to be made of recruiting HIS graduates for data capturing and data management at various levels of the healthcare system.

7.4.8 Further research

Further research on the following aspects is recommended:

- Evaluate the challenges listed in this study and the relationship between data quality and information use.
- Replicate the same study in other regions or districts.
- Conduct predictive studies to assess the readiness of Namibia to implement the Electronic Health Record and DHIS2 at health facilities.
- Evaluate the efficacy of the proposed strategies for utilisation of RHIS for the management of child healthcare in Namibia.

7.5 LIMITATIONS OF THE STUDY

The study was limited to assessing the understanding and experiences of nurses and healthcare managers on RHIS and the use of information on child healthcare. It was conducted in one context, ||Karas region, with healthcare managers, but some were from national authority. Therefore, the findings could not be generalised to other settings. The limitation could have been reduced if participants were recruited from different regions. However, the study assumes that the findings would be similar in contexts that have similar characteristics.

7.6 CONCLUSIONS

The study showed nurses who were working at health facilities, carried out their clinical care and documentation tasks to the best of their ability, with the resources at their disposal. Their practices were mainly guided by the reporting requirements, such as, the type of data elements to collect, tools they used to collect data, collating data and reporting to the next level of authority. It appeared that these factors also influenced their data demands. The study believes that the Health Information system needs to respond to the needs of the users and generate useful data. This requires nurses and managers to possess specialised skills in HIS tasks, especially, data analysis and use.

The study revealed limited support for nurses in terms of the data management process in Primary Health Care. Hence, the emphasis in the strategies was placed on increasing support supervisory visits, regular feedback and inclusion of nurses in data review meetings to ensure that there is a well-functioning HIS and RHIS in Namibia. As much as the nurses did not understanding the broader concepts used in RHIS, they understood the routine health data elements they were expected to collect at the point of care. In addition, some nurses, specifically the supervisors of the clinics utilised data for evidence-based care and management while other nurses did not think data use was part of the scope of work.

On the other hand, managers understood broader concepts of RHIS, had good insights of their health information needs, and appeared confident in using data for decision-making. The managers at national level demonstrated high level of understanding of HIS governance as compared to the regional and district managers. The health information needs between managers who were mainly responsible for supervision and management of health facilities and those who mainly performed HIS tasks. However, managers who were medical superintendents seemed to be more focused on clinical duties than managerial role.

Namibia still uses a hybrid approach in generating routine health data, where paper-based is being utilised at the health facility level while DHIS2 is used at regional, regional and national levels. The use of paper-based reporting comes with the challenges of inadequate data collection tools, especially in rural health facilities. Thus, impedes the completeness and timeliness of routine health data. Inadequate Information, Communication and Technology (ICT) and lack of digital literacy skills at health facilities were found to be challenges requiring the implementation of DHIS2 at health facilities, or some form of electronic data capturing. Hence, the proposed strategies include focused training on DHIS2 for all nurses in all health facilities and an increased budget for ICT equipment to cater for all the health facilities. The availability and access of ICT infrastructures are critical in effective and efficient monitoring and evaluation of health service delivery and child health programmes. However, the developers may need to re-configure DHIS2 to ensure real-time data access to routine health data from facilities. The existing experts could be beneficial in that regard.

The study showed that the Namibian government has limited guidelines, policies and regulatory framework to guide the implementation of RHIS. In addition, the absence of HIS standards hinders the exchange of data between different Health Information Systems. However, there is an eHealth strategy that guides how ICT will contribute to Namibia's agenda and strengthen health service delivery by using electronic means. Therefore, the study contends that this initiative needs to be strengthened, mechanisms put in place to build digital skills among the users and regulate its implementation. The policies, guidelines and regulatory framework will clarify the roles of data producers and users. It will further provide an understanding of the steps in data management processes, including data quality checks. This will address the challenges of limited understanding of RHIS concepts, inability to perform data quality checks at the health facility level, as well the suboptimal use of routine health data at the point of care where it is generated.

The study has also revealed the general absence of technical skills to design HIS and perform advanced functions on DHIS2 in the country. Data showed a dependency on expatriate consultants to design HIS and manage DHIS2 and the server. Hence, there were occasional technical glitches end of the month due to heavy traffic of data. Emphasis should be placed on capacitating the staff in the Ministry of Health and Social Services with skills and competencies, as well as accelerating the implementation of DHIS2 Academy. This would enable the local team to acquire the necessary expertise to manage the database and central server. The study believes that mentorship of the local team by experts should be an obligatory clause in the contracts between the government and foreign donors and experts. This would strengthen the ability of system analysts and Health Information Systems officers to design HIS and manage the database efficiently and effectively. Hence, there is a need to align the different health professionals to their skills and competencies. In addition, design and maintain some inexpensive electronic data capturing systems at the point of care.

The study recognised that the understanding of RHIS functionality and experiencing its usability will contribute to a high performance RHIS and child healthcare service.

The conceptual framework used provided a clear direction for identifying the links between inputs, processes, outputs and outcomes. The findings from both phases highlighted the significant inputs such as resources, collection tools, such as ICT, the legislative framework, skilled health workers and child health indicators. The inputs required to drive data management tasks such as data collection, collection, analysis and data quality checks will result in improved data quality, governance, availability of HIS plans and use of information for decision-making. Namibia appears to be lagging in implementing a well-regulated health information system. Overal, Namibia appears to be lagging behind in terms of implementation of a well-regulated Health Information System. This is because the majority of health facilities still use paper-based data collection tools, the pilot Electronic Health Record did not yield desired results at the two sites. However, the study contends that the eHealth Strategy might provide some strategic direction regarding generation of quality data and fostering the culture of information use among healthcare professionals.

Therefore, the researcher assumes that the focus areas and formulated strategies, which are: strengthening the data management process, improving the legislative framework to guide the implementation of RHIS, and ensuring data quality, would strengthen the use of RHIS in managing child healthcare in Namibia.

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ANNEXURE A: APPLICATION TO CONDUCT RESEARCH

Ms.Rauna.N.Namukwambi

P.O. Box 1898

Keetmanshoop

20 November 2019

ndali@hotmail.com

Mr.Ben Nangombe

Executive Director

Ministry of Health and Social Services

Private Bag 13189

Harvey Street

Windhoek

Namibia

Dear Sir

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH

I, Rauna.N.Namukwambi currently studying towards Doctor of Philosophy in Nursing at University of South Africa would like to request for permission to conduct a research on strategies for utilization of Routine Health Information System (RHIS) for management of child health care in Namibia. The study is intended to be conducted in primary health care facilities and with district and regional health care managers in //Karas region.

The research will be conducted using an interview schedule where virtual focus group interview will be conducted among health professionals from primary health care facilities in phase 1 using zoom app.The zoom ID and password will only be accessible to participants who are part of that focus group and a semi-structured telephonically individual interview will be conducted among health care manager at district and regional level in phase 2 of the study. These measures are put in place to prevent exposing the participants to COVID-19.

The results of the research will be provided to you and recommendations based on the findings. I, therefore appreciate your permission in conducting research in your health facilities.

Yours sincerely

……………………………..

Ms.Rauna.N.Namukwambi

Student Number : 56228325

University of South Africa

ANNEXURE B: INFORMATION AND INFORMED CONSENT FORM

Title of the research: Strategies for utilization of Routine Health information system (RHIS) for management of child healthcare in Namibia

Investigator: Ms.Rauna.N.Namukwambi, PhD student, University of South Africa

Dear……………..

I hereby invite you to participate in my study.

The purpose of the study is to develop strategies to enhance the use of Routine Health Information System (RHIS) in the managing of child health care.

Although the study will not benefit you directly, the information obtained may help to strengthen the capacity of health professionals at all levels of the system, to generate quality data that can be transformed into useful information. The useful information can used in decision making that could improve child health care.

There are no risks involved in sharing your understanding and experience. You will be required to meet me for a voice recorded interview lasting approximately an hour, or in the group interview session that may also last for 1 to 2 hours.

I shall keep a record of the study's participants as well as recording of the interview confidential. Your name will not appear on the recording or transcription and that information will not be linked to you. All data will be stored in a secure place and no one except the research team will have access to it. In addition, your identity will not be revealed when the study is reported or published.

Your participation in this study is voluntary. You can withdraw at any time without any penalty.

This study and its procedures have been approved by Ethics Committee of University of South Africa and permission was obtained from Executive Director in Ministry of Health and Social Services. Should you have any questions regarding ethical aspects of the study, you can contact the supervisor of the study UNISA ,Prof. Margaret Ramukumba, during office hours at telephone number 012 4296719 or email me on 56228325@mylife.unisa.ac.za If you have questions about the study or about participating in the study, please feel free to contact me on 0814077316 (mobile phone).

I have discussed the points above with the participant, and it is my opinion that they understand risks, benefits and obligation involved in participating in this study.

……………………………………	…………………………..
Gatekeeper/Investigator	Date

I understand that audio recording will be taken during the study. (Please choose yes or no by inserting your initials in the relevant box).

I agree to being audio recorded	Yes
	No

I understand that my participation in this study is voluntary, I know that I can refuse to participate and/or withdraw my consent at any time without penalty.

……………………………………….	…………………………………..
Signature of the participant	Signature of the witness

Date:……………………………….

ANNEXURE C: INTERVIEW SCHEDULE: FOCUS GROUP INTERVIEW

SECTION A: DEMOGRAPHIC INFORMATION

1. What is your gender?

Male	Female

2. What is your age group?

Age	
20 - 29	
30 - 39	
40 - 49	
50- 59	
60+	

3. What is your highest qualification?

Level of education	
Masters	
Bachelor (Honours)	
Bachelor	
Diploma	
Certificate	

4. What is your professional category

Enrolled Nurse	
Registered Nurse	
Others .. specify	

5. What are your years of experience in Primary Health Care?

Years of experience	
1 – 3years	
4 -6 years	
7-9 years	
10 + years	

6. Location of the Primary Healthcare Facility

Location of Primary Healthcare facility	
Urban	
Rural	

SECTION B: GRAND TOUR QUESTIONS

1) Please tell me about the Health Information system used in Namibia

Probing areas:

- How it is implemented
- Legislative framework, policies and guidelines
    - Experiences regarding - Design of data collection tools,
    - sources of information
    - Data management processes,
    - Feedback

2) Please explain the Routine health information system

Probing will be on the following areas:

- District health information Software2
- Health Management Information System
- Inter-relationships

3) Please tell me more about Information flows in the health system,

Probing areas

- Availability of HIS resources
- Confidence in data generation/reporting
- Motivation
- Task competence
- Level of data demand
- Level of data quality

4) What are your views of continuous health information use? How is that related to data quality?

   Probing areas:

- Culture of information use
- Organisational support
  Child health indicators

5) What challenges do you experience in using routine health information?

   Probing areas:

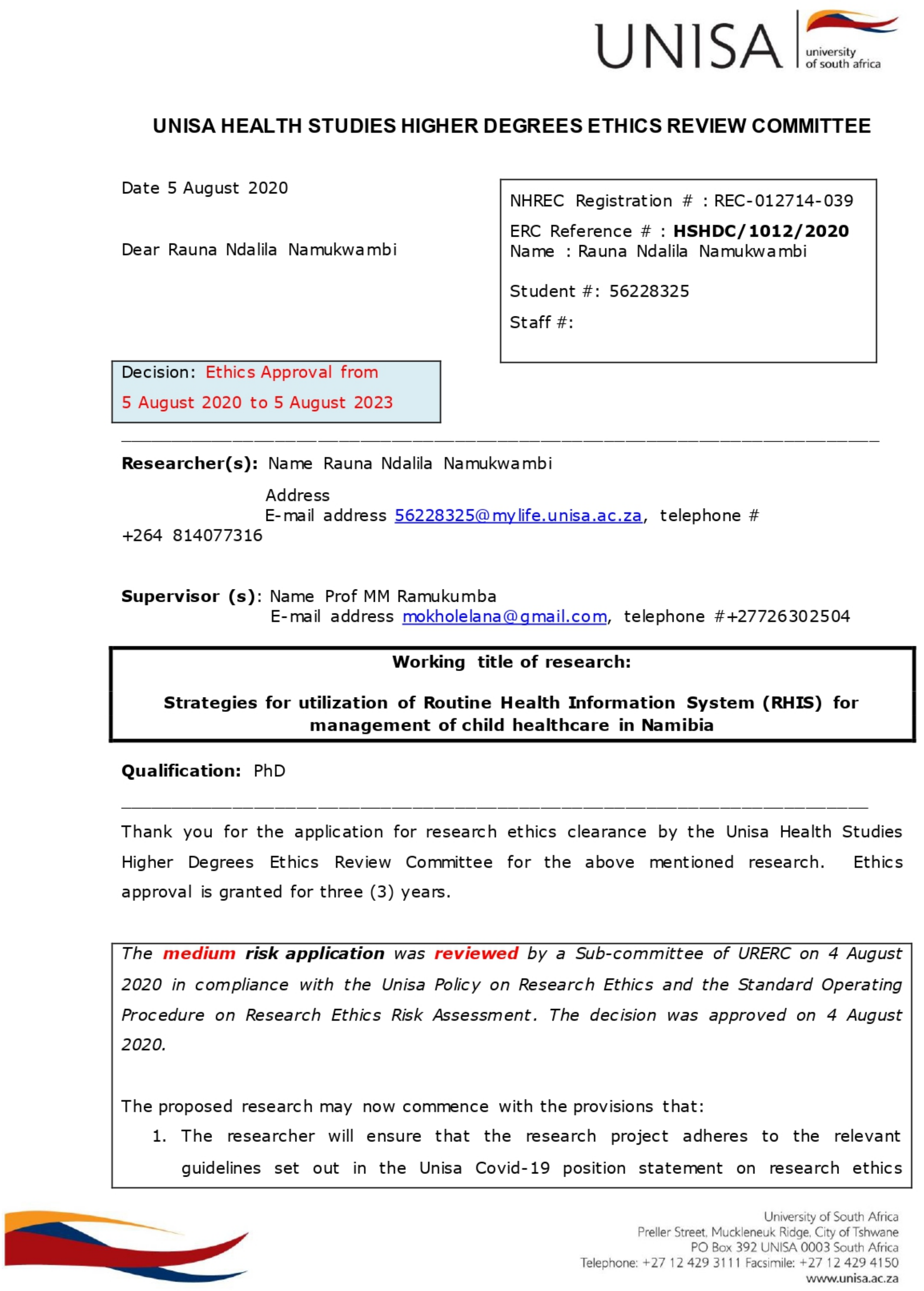
   - Health Information System infrastructure
   - Skills and capacity

6) What solutions do you suggest to enhance the use of routine health information in managing child health care services?

   Probing areas:

- Policy/Guidelines/Protocols
- Health information infrastructure
- Capacity building
- Information needs

ANNEXURE D: ETHICAL CLEARANCE CERTIFICATE



UNISA HEALTH STUDIES HIGHER DEGREES ETHICS REVIEW COMMITTEE

Date 5 August 2020

Dear Rauna Ndalila Namukwambi

NHREC Registration # : REC-012714-039

ERC Reference # : **HSHDC/1012/2020**
Name : Rauna Ndalila Namukwambi

Student #: 56228325

Staff #:

Decision: Ethics Approval from

5 August 2020 to 5 August 2023

Researcher(s): Name Rauna Ndalila Namukwambi

Address
E-mail address 56228325@mylife.unisa.ac.za, telephone #
+264 814077316

Supervisor (s): Name Prof MM Ramukumba
E-mail address mokholelana@gmail.com, telephone #+27726302504

Working title of research:

Strategies for utilization of Routine Health Information System (RHIS) for management of child healthcare in Namibia

Qualification: PhD

Thank you for the application for research ethics clearance by the Unisa Health Studies Higher Degrees Ethics Review Committee for the above mentioned research. Ethics approval is granted for three (3) years.

The ***medium risk application*** *was* ***reviewed*** *by a Sub-committee of URERC on 4 August 2020 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment. The decision was approved on 4 August 2020.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics

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

attached.

2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Health Studies Research Ethics Committee HSREC@unisa.ac.za.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
6. 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. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
8. No field work activities may continue after the expiry date (5 August 2023). Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number ***HSHDC/1012/2020*** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Signatures :

pp

Chair of HSREC : Prof JM Mathibe-Neke
E-mail: mathijm@unisa.ac.za
Tel: (012) 429-6443

Executive Dean : Prof K Masemola
E-mail: masemk@unisa.ac.za
Tel: (012) 429-6825

ANNEXURE E: INTERVIEW SCHEDULE: INDEPTH INDIVIDUAL INTERVIEW: HEALTHCARE INTERVIEW MANAGER

SECTION A: DEMOGRAPHIC INFORMATION

1. What is your gender?

Male	Female

2. What is your age group?

Age	
20 - 29	
30 - 39	
40 - 49	
50- 59	
60+	

3. What is your highest qualification?

Level of education	
Masters	
Bachelor (Honours)	
Bachelor	
Diploma	
Certificate	

4. What is your professional category?

District Healthcare Manager	
Regional Healthcare Manager	
National Healthcare Manager	
Others .. specify	

5. What are your years of experience in Healthcare Management

Years of experience in Management	
1 – 3years	
4 -6 years	
7-9 years	
10+ years	

SECTION B: GRAND TOUR QUESTIONS

1) Could you share with me the structure and organisation of HMIS/RHIS in Namibia?

Probing will focus on the following areas

- Current status of the HIS/RHIS
- Sources of data
- Data capturing and processes in facilities under their care
- Data reports in the facilities under their care
- Own information needs

2) Tell me about the current legislation/policies/guidelines that guide the implementation of the health management information system

probing areas

  - Uptake of HMIS

2.2 How do ensure that data you are receiving are of quality?

3) Tell me your experiences using DHIS ?

4) Tell me how do you use data from the routine health information system?

Probing areas

- Feedback to lower/higher structures
- Monitoring of performance
- Training of staff
- Allocation of resources
- District and regional annual report
- Child health program

5) Can you please explain the barriers to the use of routine health information system?

Probing areas

- DHIS2
- Skills and capacity to interpret data
- Level of demand
- Information need

6) What can be done to improve the use of routine health information system in managing child health care?

Probing areas:

- Policy/guidelines/ protocols
- Health information system infrastructure
- Capacity building
- Culture of information use

ANNEXURE F: INDIVIDUAL IN-DEPTH INTERVIEW: HEALTH CARE MANAGER HEALTH INFORMATION SYSTEM

SECTION A: DEMOGRAPHIC INFORMATION

1. What is your gender?

Male	Female

2. What is your age group?

Age	
20 - 29	
30 - 39	
40 - 49	
50- 59	
60+	

3. What are your highest qualifications?

Level of education	
Masters	
Bachelor (Honours)	
Bachelor	
Diploma	
Certificate	

4. What is your professional category?

District Health Information System Manager	
Regional Health Information System manager	
National Health Information System Manager	
Others .. specify	

5. What are your years of experience in Health Information System

Years of experience in Health Information System	
1 – 3years	
4 -6 years	
7-9 years	
10+ years	

SECTION B: GRAND TOUR QUESTIONS

6. Could you share with me the structure and organisation of HMIS/RHIS in Namibia?

Probing will focus on the following areas

- Current status of the HIS/RHIS
- Sources of data
- Data capturing and processes

7. Tell me about the current legislation/policies/guidelines that guide the implementation of the health management information system

probing areas

- Uptake of HMIS

- Data quality

8. Tell me how does HIS support the exchange of data between health care levels in Namibian Health System ?

Probing areas

- Data interoperability
- Capacity to deal with data

9. Can you please explain the challenges in data management processes?

Probing areas

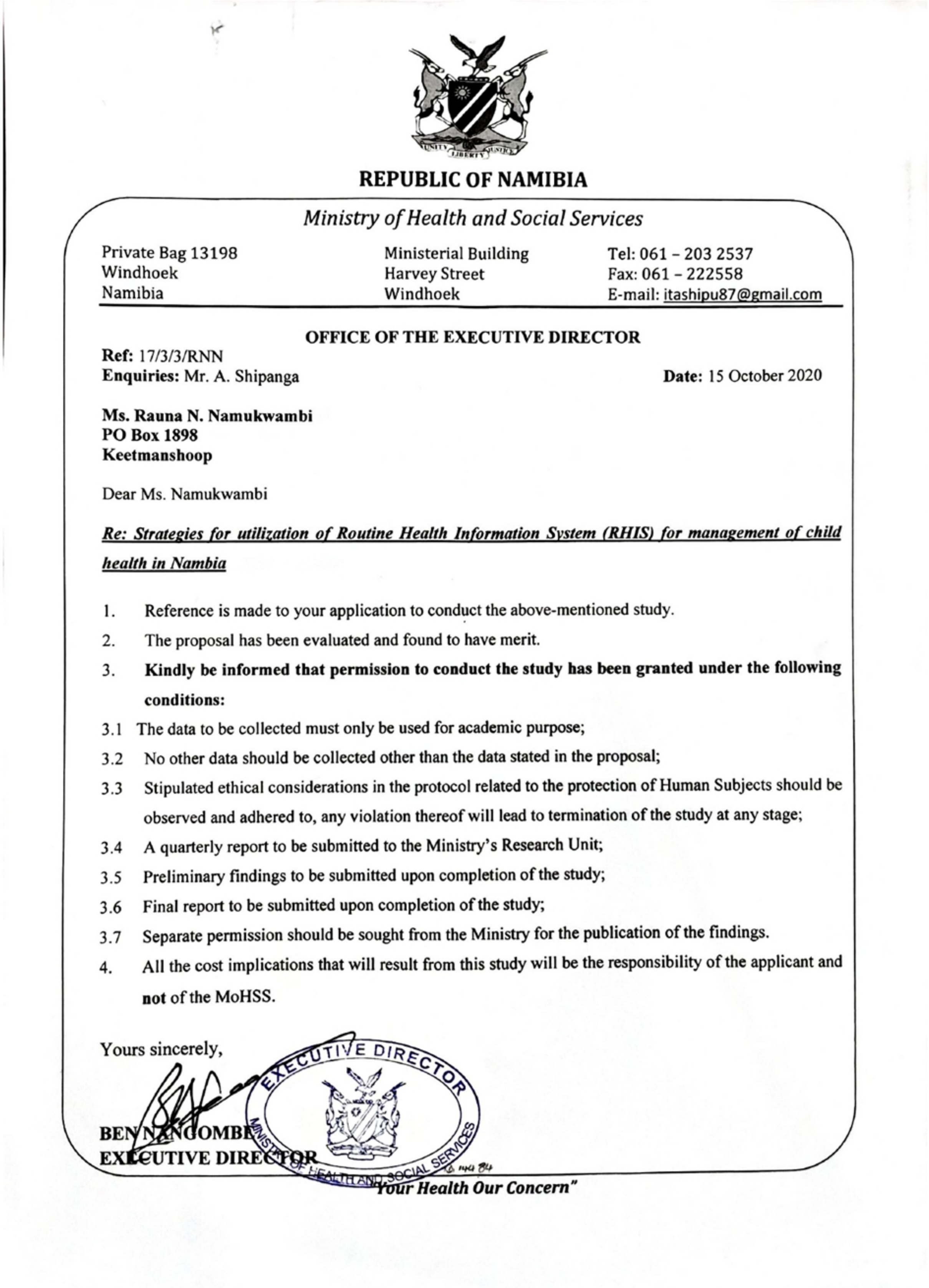
- Health information System structures
- Skills and capacity to manage DHIS

10. What can be done to improve challenges related to HIS

Probing areas:

- Policy/guidelines/ protocols
- Health information system infrastructure
- Capacity building

ANNEXURE G: PERMISSION TO CONDUCT RESEARCH FROM MoHSS



REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 203 2537
Fax: 061 – 222558
E-mail: itashipu87@gmail.com

OFFICE OF THE EXECUTIVE DIRECTOR

Ref: 17/3/3/RNN
Enquiries: Mr. A. Shipanga

Date: 15 October 2020

Ms. Rauna N. Namukwambi
PO Box 1898
Keetmanshoop

Dear Ms. Namukwambi

Re: Strategies for utilization of Routine Health Information System (RHIS) for management of child health in Nambia

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**

3.1 The data to be collected must only be used for academic purpose;
3.2 No other data should be collected other than the data stated in the proposal;
3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;
3.4 A quarterly report to be submitted to the Ministry's Research Unit;
3.5 Preliminary findings to be submitted upon completion of the study;
3.6 Final report to be submitted upon completion of the study;
3.7 Separate permission should be sought from the Ministry for the publication of the findings.

4. All the cost implications that will result from this study will be the responsibility of the applicant and **not** of the MoHSS.

Yours sincerely,

BEN NANGOMBE
EXECUTIVE DIRECTOR

"Your Health Our Concern"

ANNEXURE H: INFORMATION AND CONSENT LETTER FOR MODIFIED DELPHI

Title of the research: Strategies for utilization of Routine Health information system (RHIS) for management of child healthcare in Namibia

Dear……………..

My name is Rauna.N.Namukwambi, PhD candidate, Nursing Science at University of South Africa. I hereby invite you to participate in Delphi process of this study. The purpose is to validate proposed strategies that will enhance the use of Routine Health Information System (RHIS) in the managing of child health care.The validation process might involve two or three rounds. Hence, you might me expected to complete the questionnaire more than twice. The strategies were developed based on the findings from literature and phase one and phase two on the routine health information processes, nurses understanding of RHIS, experiences of RHIS utilization in management and planning of child health care services, managers' experiences of RHIS utilization in planning and management of child health services. Information obtained from the review may help to formulate implementable strategies that will strengthen the capacity of health professionals at all levels of the health systems, to generate quality data that can be transformed into useful information. The strategies can be used in strengthening decision making that could improve child health care.

The study will not benefit as a participant. However, your comments on the strategies will assist the researcher in modifying strategies and make them valid and implementable in utilising RHIS in managing child health care.

There are no risks involved in sharing your opinions regarding the strategies. You will be required to complete a questionnaire with demographic information and rate your level of agreement on the space provided on the proposed strategies. The approximate time to complete the questionnaire is 30 minutes. Your name will not appear on the questionnaire. All data will be stored in a secured place, and no one except the research team will have access to it. In addition, your identity will not be revealed when the study is reported or published.

Your participation is voluntarily. You can withdraw at any time without any penalty. This study and its procedures have been approved by Ethics Committee of the University of Namibia and permission was obtained from the Ministry of Health and Social Services to conduct the study.

Should you any queries regarding Ethical aspects you can contact my Research Supervisor; Prof.M.Ramukumba, Email : mokholelana@gmail.com .Or Anything to do with the study, Rauna Namukwambi, Email: 56228325@mylife.unisa.ac.za ,Cellphone Number: +264814077316

I, Rauna Namukwambi, have discussed the points above with the participant, and it is my opinion that they understand risks, benefits and obligation involved in participating in this study.

……………………………………	…………………………..
Investigator	Date

Declaration by the participants

I…………………..voluntarily consent to participate in this study. The purpose, risks and benefits of the study have been explained to me. I know that I can refuse to participate and/or withdraw my participation at any time without penalty.

………………………………………..	………………………………………
Signature of the participant	Signature of the witness

Date:……………………………….

ANNEXURE I: QUESTIONNAIRE FOR VALIDATION OF THE STRATEGIES

Dear participant

Your invited to partake in the validation of strategies to enhance the utilization of Routine Health Information System (RHIS) in managing child health care in Namibia.

The purpose of the study is to develop strategies that will enhance the use of RHIS in managing child health care.

This questionnaire is part of the study and it is seeking opinions and consensus of the proposed strategies from the experts in health information system and child health care. As a policy maker, manager, technical advisor, health information system officer or/and child health care , you are requested to validate the proposed strategies.

Your participation is voluntarily and you have the right to withdraw from the study without any penalties. Your name will not appear on the questionnaire. Answer the question at the space provided.

For more information about this study, you can ask me anytime , my cellphone is; 0814077316 and 56228325@mylife.unisa.ac.za or contact my supervisor at University of South Africa, Prof.M.Ramukumba , on her email : mokholelana@gmail.com

Thank you for your time in completing this questionnaire as well your contribution to the successful completion of the study.

Researcher: Ms.R.N.Namukwambi

Supervisor: Prof.M.M.Ramukumba

Title of the research: Strategies for utilization of Routine Health Information System (RHIS) for management of child healthcare in Namibia

Guide to answering questions.

- Read the statement or question carefully
- Kindly answer all questions
- Write comments about each strategy or action plan in the spaces provided

Section A: Socio-demographic information

No.	Question	Option	Response
1.	What is your gender	Male	1
		Female	2
2.	What is your age in years	30-39	1
		40-49	2
		50-59	3
		60 and above	4

3.	What is your highest qualification	Doctoral Degree	1
		Master Degree	2
		Bachelor Degree (Honours)	3
		Bachelor Degree	4
4.	Which Organization or department are your working	Ministry of Health and Social Services (National Level)	1
		Ministry of Health and Social Services (Regional Level)	2
		Ministry of Health and Social Services (District Level)	3
		Technical Health agencies/Non-	4

		Governmental Organization	
5.	Please indicate your position in your organization/Department		
6.	How many years have your worked at your current position		

Section B: Strategies to enhance the use of Routine Health Information System for managing child healthcare

1. Strengthening data management processes

Please use the Likert scale to indicate your agreement with each proposed strategy and actions plans in the response column
Put = 1 If you agree
2 if you are neutral;
3 if you disagree.
If you disagree or you are neutral please write down your suggestions to modify the strategies at the space provided

	Identified gaps from combined data sets	**Proposed strategies**	**Expected Outcomes**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
1.	Challenges with data collection tools	1.1. Integration of various child health elements in one register	Child health elements integrated	1.1.1 Create a platform to discuss the grouping of various child health care elements	Policy makers	1	2	3

	a. Multiple data collection tools			1.1.2 Develop a register that captures all data elements on child health care	Policy makers, managers at regional level	1	2	3
				1.1.3 Implement the comprehensive child health care register	Managers at regional and district level	1	2	3
				1.1.4 Evaluate the implementation of a comprehensive child health care register	Policy makers, managers at regional and district level	1	2	3

Comments

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	Identified gaps from combined data sets	Proposed strategies	Expected Outcomes	Action plans	Responsible authority	Agree	Neutral	Disagree
	Insufficient data collection tools	1.2 Increase budget allocation for data collection resources	Increased budget allocation for data collection resources	1.2.1 Review the usage of the data collection resources	Managers at regional and district level	1	2	3
				1.2.2 Make an inventory of existing data collection tools	Managers at regional and district level	1	2	3

				1.2.3 Determine the maximum and minimum number of data collection stock required for health facilities	Managers at regional and district level	1	2	3
				1.2.4 Procure data collection tools timely and ensure adequate resources	Managers at regional and district level	**1**	**2**	**3**
				1.2.5 Develop mechanisms for resource control	Managers at regional and district level	**1**	**2**	**3**

Comments

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	Identified gaps from combined data sets	**Proposed strategies**	**Expected Outcomes**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	C. Heavy reliance on paper-based tools at health facility level	1.3 Provide adequate infrastructure for information, communication and	Increased budget allocation for data collection resources	1.3.1 Develop a plan to introduce the DHIS2 and electronic patient records at the health facilities 1.3.2 Review the budget for ICT and increase	Policy makers Policy makers	1	2	3

		technology at health facilities		funding for ICT infrastructure		1	2	3
				1.3.3 Increase the internet bandwidth at health facilities	Managers at regional and district level	1	2	3
				1.3.4 Train all staffs at health facility on digital literacy and DHIS2	Managers at regional and district level	1	2	3
				1.3.5 Support staffs in the implementation of eHealth platforms and electronic patient records	Managers at regional and district level	1	2	3

Comments

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	Identified gaps from combined data sets	**Proposed strategies**	**Expected Outcomes**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	Absence of Health Information plans at regional and district level	1.4 Formulate plans to support data management processes at health facility and district level	HIS plans available	1.4.1 Share a national strategy implementation plan with regional and district level	Policy makers	1	2	3
				1.4.2 Cascade and customize plan to the region	Policy makers, managers from	1	2	3

				and district level to guide the implementation of HIS 1.4.2 Monitor the implementation of HIS plans for regional and district level	region and district Policy makers Policy makers,	1	2	3
				1.4.3 Evaluate the implementations of HIS plans	Policy makers	**1**	**2**	**3**

Comments;

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	Identified gaps from combined data sets	**Proposed strategies**	**Expected outcomes**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	E. Limited skills on data management	**1.5 Capacity building on data management processes**	Improved skills and competencies in data management processes	1.5.1 Review roles and responsibilities in terms of HIS	Policy makers, managers at regional and district level	**1**	**2**	**3**
				1.5.2 Identify skills and competencies of various health workers	Policy makers, managers at regional and district level	**1**	**2**	**3**

				1.5.3 Align the skills of various health information system to their tasks	Policy makers, managers at regional and district level	**1**	**2**	**3**
				1.5.4 Design a comprehensive training programme which include;		**1**	**2**	**3**
				1.5.5 Identify objectives of the training	Policy makers and managers at regional level, Technical agencies	**1**	**2**	**3**
				1.5.6 Budget for the training	Policy makers and managers at regional level	**1**	**2**	**3**
				1.5.7 Conduct training on use of data sources and reporting tools, data analysis, data visualization, data dissemination and information use	Policy makers and managers at regional level, Technical agencies	**1**	**2**	**3**
				1.5.8 Monitor post training skills of the participants	Policy makers and managers at regional level	**1**	**2**	**3**

				1.5.9 Evaluate the impact of training on data management process	Policy makers and managers at regional level	**1**	**2**	**3**

Comments

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	Identified gaps from combined data sets	**Proposed strategies**	**Expected outcomes**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	Poor data dissemination at all levels	1.6 Improve data dissemination at all levels	Improved data dissemination at all levels in healthcare system	1.6.1 Develop a framework for data dissemination at health facilities and all levels and provide adequate resources.	Managers at district level	1	2	3
				1.6.2 Establish mechanisms for effective data review meetings	Managers at regional and district level	1	2	3
				1.6.3 Identify key stakeholders such as nurses and other health workers at health facility	Managers at regional and district level	1	2	3

				level to be part of the review meeting				
				1.6.4 Establish a framework on reporting national health information reports annually	Policy makers	1	2	3
				1.6.5 Disseminate national health information reports annually	Policy makers	1	2	3

Comments

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2. Strategies to improve the legislative framework for the implementation of RHIS

	Please use the Likert scale to indicate your agreement with each proposed strategy and actions plans in the response column **Put = 1 If you agree** **2 if you are neutral;** **3 if you disagree.** **If you disagree or you are neutral please write down your suggestions to modify the strategies at the space provided**							
2.	**Identified gaps from combined data sets**	**Proposed strategies**	**Expected outcome**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	Absence of policies, guidelines and	2.1 Develop HIS policies,	Availability of HIS policies, guidelines and	2.1.1 Provide technical and financial support to formulate	Policy makers and	1	2	3

	legislative framework to guide the implementation of RHIS in Namibia	guidelines and legislative framework to guide the implementation of RHIS in Namibia	strong legislative framework	HIS policies, guidelines and legislative framework	Technical agencies			
				2.1.2 Develop policies to guide the implementation of RHIS	Policy makers	1	2	3
				2.1.3 Develop a legislative framework to regulate the operations and data management various health information system	Policy makers	1	2	3

Comments

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	Identified gaps from combined data sets	Proposed strategies	Expected outcome	Action plans	Responsible authority	Agree	Neutral	Disagree
	Multiple and disparate health information systems	2.2 Integrate various health information system in DHIS2	Integrated Health Information Systems	2.2.1 Involve various system developers in establishing HIS interoperability standards framework	Policy makers	1	2	3
				2.2.2 Develop a standard operating procedure for stakeholders to adopt set interoperability standards that will enable the exchange of data	Policy makers	1	2	3

				2.2.3 Create awareness among managers on interoperability standards utilized by various stakeholders	Policy makers and managers at regional level	1	2	3
				2.2.4 Evaluate the implementation of the interoperability standards of all the health information systems used in data generation	Policy makers and managers at regional level	1	2	3

Comments

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3. Strategies to enhance data quality

			Please use the Likert scale to indicate your agreement with each proposed strategy and actions plans in the response column **Put = 1 If you agree** **2 if you are neutral;** **3 if you disagree.** **If you disagree or you are neutral please write down your suggestions to modify the strategies at the space provided**					
	Identified gaps from combined data sets	**Proposed strategies**	**Expected outcome**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
3.	Insufficient knowledge to perform data quality checks	3.1.Improve data quality assurance practices	Improved data quality	3.1.1 Develop a standard operating procedure (SOP) for assessing data quality at all levels	Policy makers	1	2	3
				3.1.2 Conduct training of dimensions of data quality for all nurses and managers involved in data management at all levels	Policy makers, Managers at regional and district level and Advisors from technical agencies	1	2	3
				3.1.3 Share the quality assessment SOP with all the nurses and managers involved in data management	Managers at regional and district level	1	2	3

				3.1.4 Conduct data quality assessment monthly before submitting data to the next level	Nurses at health facility level, managers at regional and district level	1	2	3
				3.1.5 Evaluate the implementation of quality assessment through data quality audit	Policy makers, managers at regional and district level	1	2	3

Comments

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	Identified gaps from combined data sets	**Proposed strategies**	**Expected outcome**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	Infrequent feedback and support supervision to the lower structures	3.2. Establish feedback mechanisms on data quality to lower structures	Improved data quality	3.2.1 Develop a reporting format for providing feedback to lower structures	Policy makers and Advisors at technical agencies	1	2	3
				3.2.2 Provide feedback on data performance on monthly basis to lower structures	Managers at regional and district level	1	2	3

		3.3. Improve support supervision to all structures in the health system	Improved data quality	3.3.1 Review the support supervision checklist on data management process	Policy makers and Advisors at technical agencies	1	2	3
				3.3.2 Develop a bi-annual data management support supervisory visits schedule	Managers at regional and district level	1	2	3
				3.3.3 Conduct support supervisory visits focusing on the assessment of completeness, timeliness and accuracy of data, data analysis, dissemination and information use	Managers at regional and district level	1	2	3
				3.3.4 Identify action points from support supervisory report and develop corrective mechanisms	Managers at regional and district level	1	2	3

Comments

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4.Strategies to strengthen the use of Routine Health Information in managing child health care

	Please use the Likert scale to indicate your agreement with each proposed strategy and actions plans in the response column **Put = 1 If you agree** **2 if you are neutral;** **3 if you disagree.** **If you disagree or you are neutral please write down your suggestions to modify the strategies at the space provided**							
	Identified gaps from combined data sets	Proposed strategies	Expected outcome	Action plans	Responsible authority	Agree	Neutral	Disagree
4.	Unequal access to DHIS2	4.1.Improve access of DHIS2 by all managers	Improved access to Routine Health Information System	4..1.1 Make DHIS2 available at all levels	Policy makers	1	2	3
				4.1.2 Train managers on DHIS2	Managers at region and district level, advisors from technical agencies	1	2	3
				4.1.3 Create profiles for managers and assign them roles befitting to their functions in data management process	Managers at region and district level, advisors from technical agencies	1	2	3

Comments

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	Identified gaps from combined data sets	**Proposed strategies**	**Expected outcomes**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	No real time data access to DHIS2	4.2 Improve DHIS2 architecture to enable real time data access	Improved access to Routine Health Information System	18.1 Plan and budget for subscription to external host commercial cloud company	Policy makers	1	2	3
				18.2 Use that cloud based central server which will enable data entered or changes available immediately to all users	Policy makers	1	2	3
				18.3 Execute DHIS2 server upgrades	Policy makers	1	2	3

Comments

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	Identified gaps from combined data sets	**Proposed strategies**	**Expected outcomes**	**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
	Low coverage of	4.3. Review and revise existing child health indicators	Improved child healthcare indicators	1.4.1 Identify information needs of decision makers on child health care	Policy makers, managers at	1	2	3

	child health indicators				regional and district level			
				1.4.2 Review all existing data elements in relation to child health indicators	Policy makers, managers at regional and district level	1	2	3
				1.4.3 Involve nurses and managers in revising data elements and child health care indicators	Policy makers, managers at regional and district level	1	2	3
				1.4.3 Implement the revised data elements and child health indicators	Managers at regional and district level, nurses at facility level	1	2	3
				1.4.4 Support the implementation of the revised data elements and child health indicators	Policy makers, managers at regional and district level	1	2	3

Comments

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	Identified gaps from combined data sets	**Proposed strategies**		**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**

	Limited information use at health facility level	4.4 Improve the culture of information use at the health facility level		20.1 Increase awareness and capacity on information use of child health care	Managers at regional and district level	1	2	3
				20.2 Develop a performance based incentive system for HIS programme at all levels to encourage information use by;	Managers at regional and district level	1	2	3
				20.2.1 Recognizing good performance	Managers at regional and district level	1	2	3
				20.2.2 Awarding excellent performers in information use with certificates of appreciation	Managers at regional and district level	1	2	3
				20.2.3 Sharing best practices	Managers at regional and district level	1	2	3
				20.3 Planning for monthly meeting and discuss performance of child health indicators	Managers at regional and district level	1	2	3
				20.4 Establishing a reporting format all health facilities on child health indicators	Managers at regional and district level	1	2	3

				20.5 Developing an action plan from the discussions in the meeting	Managers at regional and district level	1	2	3

Comments

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	Identified gaps from combined data sets	Proposed strategies	Action plans	Responsible authority	Agree	Neutral	Disagree
21.	Limited information use at health facility level (continue)	21. Establish an information use audit at all levels	21.1 Develop an information use audit checklist	Policy makers, advisors from technical agencies, managers at regional and district level	1	2	3
			21.2 Provide technical and financial support for audit	Policy makers, advisors from technical agencies, managers at regional and district level	1	2	3
			21.3 Conduct information use audit	Policy makers, advisors from technical agencies, managers at regional level	1	2	3

			21.4 Prepare and share feedback with all the data users	Policy makers, advisors from technical agencies, managers at regional and district level	1	2	3

Comments

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	Identified gaps from combined data sets	**Proposed strategies**		**Action plans**	**Responsible authority**	**Agree**	**Neutral**	**Disagree**
22.	Limited information use at health facility level (continue)	Publish data on child health indicators on brochures and leaflets		22.1 Provide financial and technical support for publication and secure funding for the publication of child health care indicators	Managers at regional and district level	1	2	3
				22.2 Identify information which will be on brochures and leaflets	Managers at regional and district level	1	2	3
				22.3 Distribute the brochures and leaflets to the nurses at health facilities through paper based and social medias such as WhatsApp	Managers at regional and district level	1	2	3

				22.4 Evaluate the use of published information in planning and managing child health care	Managers at regional and district level	1	2	3

Comments

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ANNEXURE J : STRATEGIES VALIDATION TOOLS

Please rate the criteria for the proposed strategies using the following scale: a. = agree, b. = neutral, c. = disagree

Domain of criteria	Agree	Neutral	Disagree	Comments
A. Scope and Purpose The strategies adequately cover the focus areas which are; strengthening data management processes, improving legislative framework for implementation of routine health information and strengthen the use of data in managing child health care				
B. Clarity The strategies are coherent and clear to the policy makers, managers and nurses who are involved in data management processes				
C. Feasibility The strategies are achievable in improving data management process, legislative framework for the implementation of routine health information system, enhancing data quality and strengthening the use of routine health information in managing child health care				

D. Importance The strategies are significant in improving data quality and strengthen the utilization of routine health information in managing child healthcare				
E. Quality Quality of the content the strategies display the expected value that will lead to good data quality and the use of routine health information in managing child healthcare				
F. Appropriate The strategies are suitable and relevant in improving data quality and the use of routine health information in managing child healthcare				
G. Valuable The strategies are beneficial to the health system and worth being implemented in improving the utilization of routine health information system by policy makers, managers and healthcare workers				

I would recommend these strategies for use

Yes ☐

No ☐

Additional comments

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Rauna N.Namukwambi

56228325@mylife.unisa.ac.za

ANNEXURE K: FINAL STRATEGIES

1.Strengthening data management processes			
Strategy	Expected Outcome	Action plans	Responsible authority
1.1 Integration of various child health elements in one register	Child health data elements integrated in one register	1.1.1 Create platforms to discuss the grouping of various child health care elements	Policy makers
		1.1.2 Develop a register that captures all data elements on child health care register	Policy makers , managers at regional level
		1.1.3 Provide in service training to all nurses orient them on a new revised register	Managers at regional and district level
		1.1.4 Implement the comprehensive child health care register	Managers at regional ,district and supervisors

			at health facility level
		1.1.5 Evaluate the implementation of comprehensive child health care register	Policy makers
1.2 Increase budget allocation for data collection resources	Increased funding for data collection resources	1.2.1 Strengthen the review of the usage of the data collection resources	Managers at regional and district level
		1.2.2 Make an inventory of existing data collection tools	Manager at regional and district level, Supervisors at health facility level
		1.2.3 Determine the maximum and minimum of data collection tools stock required for health facilities	Managers at regional, district and supervisors at health facilities

		1.2.4 Procure data collection tools timely and ensure adequate resources	Managers at national level general store
		1.2.5 Develop mechanism for resource control	Policy makers, Managers at regional and district level
1.3 Provide adequate infrastructure for information, communication and technology	Adequate ICT for data management	1.3.1 Strengthen the implementation of the DHIS2 and introduce electronic health record at the health facilities	Policy makers
		1.3.2 Review the budget for ICT and increase funding for ICT	Policy makers
		1.3.3 Install fiber internet cable to increase the internet bandwidth at health facilities	Managers at regional and district level
		1.3.4 Train all staffs at health facility on digital literacy	Managers at regional and district level

		1.3.5 Incorporate DHIS2 in curriculum of all health related courses	Institution of higher learning Policy makers
		1.3.6 Support staffs in implementation of eHealth platforms and electronic patient information system	Managers at regional and district level
1.4 Formulate plans to support data management processes at health facility and district level	HIS plans available	1.4.1 Strengthen the implementation of the national strategy implementation plan at regional and district level	Policy makers
		1.4.2 Cascade and customize plan to the district level and health facility to guide the implementation of HIS	Policy makers, managers from region and district level
		1.4.3 Monitor the implementation of HIS plans for regional, district level and health facility level	Policy makers

		1.4.4 Evaluate the implementations of HIS plans at all levels	Policy makers
1.5 Capacity Building on data management process	Improved skills and competencies in data management processes	1.5.1 Review roles and responsibilities in terms of HIS	Policy makers, managers at regional and district level
		1.5.2 Identify skills and competencies of various health workers	Policy makers, managers at regional and district level
		1.5.3 Align the skills of various health information system to their tasks	Policy makers, managers at regional and district level
		1.5.4 Recruit HIS graduate as data capturers or data managers at district and assist at health facilities	Policy makers, managers at the regional and district level
		1.5.5 Increase the number of trainings at the district and health facility level	Policy makers, managers at the

			regional and district level
		1.5.5.1 Identify objectives of the training	Policy makers and managers at regional levels
		1.5.5.2 Budget for the training	Policy makers and managers at regional level and national level
		1.5.5.3 Strengthen the training on use of data sources and reporting tools, data analysis, data visualization, data dissemination and information use	Managers at regional level, Technical agencies
		1.5.5.4 Monitor post training skills of the participants	Policy managers and managers at regional level, technical agencies

		1.5.5.5 Evaluate the impact of training on data management process	Policy makers and managers at regional level
1.6 Improve data dissemination at all levels	Improved data dissemination at all levels in health care systems	1.6.1 Review the mechanism for data dissemination at health facilities and all levels and provide adequate resources	Managers at district and supervisors at health facilities
		1.6.2 Establish mechanisms for effective integrated data review meeting	Managers at regional and district
		1.6.3 Identify stakeholders such as nurses and other health workers at health facility level to be part of the review	Managers at regional and district level
		1.6.4 Establish a framework on national health information reports	Policy makers

		1.6.5 Disseminate national health information reports annually	Policy makers

2.Strategies to improve the legislative framework for the implementation of routine health information system			
Strategies	Expected outcomes	Action plans	Responsible Authority
2.1 Develop HIS policies, guidelines and legislative framework to guide the implementation of RHIS in Namibia	Availability of HIS policies, guidelines and strong legislative framework	2.1.1 Provide technical and financial support to formulate HIS policies, guidelines and legislative framework	Policy makers
		2.1.2 Develop policies to guide the implementation of RHIS	Policy makers
		2.1.3 Develop a legislative framework to regulate the operations and data management for various health information systems	Policy makers
2.2 Integrate various health information system	Integrated Health Information Systems	2.2.1 Involve various system developers in establishing HIS	Policy makers

		interoperability standard framework	
		2.2.2 Develop a standard operating procedure for stakeholders to adopt set interoperability standards that will enable the exchange of data	Policy makers
		2.2.3 Create awareness among managers on interoperability	Policy makers and managers at regional level
		2.2.4 Evaluate the implementation of the interoperability standards of all health information systems used in Namibia	Policy makers and managers at regional level

3.Strategies to enhance data quality			
Strategies	Expected outcome	Action plans	Responsible authority
3.1 Improve data quality assurance practices	Improved data quality	3.1.1 Strengthen the implementation of standard operating procedure (SOP) for assessing data quality at all levels	Policy makers

		3.1.2 Conduct training on dimensions of data quality for all nurses and managers involved in data management process	Policy makers, managers at regional and district level and technical agencies
		3.1.3 Share the quality assessment SOP with all the nurses and managers involved in data management	Managers at regional and district level
		3.1.4 Conduct data quality assessment monthly before submitting data to the next level	Nurses at health facility level, managers at regional and district level

		3.1.5 Incorporate data management in curriculum of health professionals courses with practical components for students to acquire relevant competencies	Institution of higher learning and policy makers
		3.1.6 Evaluate the implementation of quality assessment through data quality audit	Policy makers, managers at regional and district level
3.2 Establish feedback mechanisms on data quality to lower structures	Improved data quality	3.2.1 Develop a reporting format for providing feedback to lower structures	Policy makers and technical agencies
		3.2.2 Implement the revised support supervision checklist on data management process	Policy makers and technical advisors of HIS

		3.2.3 Strengthen a bi-annual data management support supervisory visits schedule	Managers at regional and district level
		3.2.4 Strengthen the support supervisory visits focusing on the assessment of completeness, timeliness and accuracy of data, data analysis, dissemination and information use	Managers at regional and district level
		3.2.5 Identify action points from support supervisory report and develop corrective mechanisms	Managers at regional and district level

4.Strengthen the use of Routine Health Information in managing child healthcare			
Strategies	Expected outcomes	Action plans	Responsible authority
4.1 Improve access of DHIS2 by all managers		4.1.1 Make DHIS2 available at all levels	Policy makers

	Improved access to Routine Health Information System	4.1.2 Develop an inventory of new and existing managers	Managers at regional and district level,
		4.1.3 Train all new managers on DHIS2	Managers at the regional level and district level, advisors from technical agencies
		4.1.4 Create profiles for managers and assign them roles befitting to their functions in data management process	Managers at the regional level and district level
4.2 Improve DHIS2 architecture to enable real time data access	Improved access to Routine Health Information System	4.2.1 Plan and budget for subscription to external host commercial cloud company	Policy makers
		4.2.2 Use that cloud based central server which will enable data entered or changes available immediately to all users	Policy makers
		4.2.3 Execute DHIS2 server upgrades	Policy makers

4.3 Review and revise existing child health indicators	Improved child health indicators	4.3.1 Identify information needs of decision makers on child health care	Policy makers, managers at regional and district level
		4.3.2 Review and revise existing data elements in relation to child health indicators	Policy makers, managers at regional and district level
		4.3.3 Involve health workers and managers in revising data elements and child health care indicators	Policy makers, managers at regional and district level
		4.3.4 Implement the revised data elements and child health indicators	Managers at regional and district level, nurses at facility level
		4.3.5 Support the implementation of the revised data elements and child indicators	Policy makers, managers at regional and district level
		4.3.6 Evaluate the implementation of data elements of child health	Policy makers, managers at regional and district level

		care involve all health workers	
4.4 Improve the culture of information use at the health facility level	Enhanced culture of information use	4.4.1 Increase awareness and capacity on information use of child health care	Managers at regional and district level
		4.4.2 Develop a performance-based incentive system for HIS programme at all levels to encourage information use by;	Mangers at regional at district level
		4.4.2.1 Recognizing good performance	Managers at regional and district level
		4.4.2.2 Awarding excellent performers in information use with certificates of appreciation	Managers at regional level
		4.4.2.4 Sharing best practices	Managers regional and district level
		4.4.2.3 Planning for monthly meeting and	Managers regional and district level

		discus performance of child health indicators	
		4.4.2.4 Establishing a reporting format for all health facilities on child health indicators	Managers at regional and district level
		4.4.2.5 Developing an action plan from discussions in the meeting	Managers at regional and district level
4.5 Establish an information use audit at all levels	Enhanced culture of information use	4.5.1 Develop an information use audit checklist	Policy makers, Advisors from technical agencies, managers at regional and district level
		4.5.2 Provide technical and financial support for audit	Policy makers, Advisors from technical agencies, managers at regional and district level
		4.5.3 Conduct information use audit	Policy makers, Advisors from technical agencies, managers at regional and district level
		4.5.4 Prepare and share feedback with all the data users	Policy makers, Advisors from technical agencies, managers at regional and district level

4.6 Publish data on child health indicators in brochures	Enhanced culture of information use	4.6.1 Provide financial and technical support for publication and secure funding for publication of child health indicators	Managers at regional and district level
		4.6.2 Identify information which will be on brochures and leaflets	Managers at regional and district level
		4.6.3 Distribute the brochures and leaflets to nurses at health facilities through paper based and social medias such WhatsApp	Managers at regional and district level
		4.6.4 Evaluate the use of published information in planning and managing child health care	Managers at regional and district level

ANNEXURE L: SAMPLE OF A TRANSCRIPT

Participant 3

Researcher: Good evening and a warm welcome to our interview, our interview is on the strategies for routine utilization of routine Health Information System for management of child health care, I would want to inform you that this study, the information that I'm going to get from you is not going to be linked to your name. In day, I shall keep the record of your study in your name is confidential, your name will not appear on the recording transcription of the report. Hence, the information will not link to you. All data will be stored in a secure place and no one except the research team will have access to it. Your participation is voluntary and you can withdraw at any time of the research without any penalty. So okay, I would want to start with our interview. So, can you please share with me about the data sources? Where do they a US manager at the health? At the Regional Health on for the regional level? Where do you get your sources of data?

Participant "The first source of data?"

Researcher "Yes. Okay. It depends When it's coming to sometimes you get it from the nurses from the clinic and health center or either get it from the ward where the admitted. But since we have also another program, health extension program, we are also taking sources from the community from health extension workers we call them Now community health workers those are the main source, data sources of data

Researcher : So now, could you tell me how does the routine health Information System , the routine that is now captured always every month? How does it provide you with the data that you are using?

Participant "How do they provide me with the data?

Researcher " yeah. How do you Oh, how do your if I can rephrase is that you have your routine health information data and this routine health data is expected to to give you information. And then how do you this routine health information in decision making?

Participant "Okay, I think it helped us, especially when you look at immunization for instance, when you receive data from the clinics, first it comes to the district, they put them together because this each clinic is sending information to the district . And the district will compile now the whole data for the district and then they forward it to the region, me as the regional manager, Me as a regional manager I need now to analyze my data. So for instance , I need to look EPI programme So I need to check which are they completing their immunizations schedule or not? If they are not completing their immunizations schedule what is the problem maybe , where there some like stock out of the medication. Or Maybe some of the outreach service was suspended? Or why ? the EPI may be is dropping down. yaeahThat is now one point.

Or either , for instance for maternal death , it can also tell me that women, I meant nurses , they are doing well when it comes to quality nursing care, when it comes to mothers who are pregnant, right?

Yeah, if the mother if I realise that for instances every month I am receiving a maternal death cases then, I need to look at my nurses, . Do they know how to take care of the pregnant woman? Maybe they lack some skills or either they lack some knowledge or maybe they need a refresher course or refresher training or in service trainings , why are we losing mothers? something like that?

So it's really help me when we need to plan and again for you to know the pharmaceutical items you need to budget for your regions, you need to know how many patients are you serving and for plan well also to budget well. You can also go back when you receive the data, not necessarily only for budgeting or maybe for sending to national level, or maybe for analysis once you analyse you need to back and feedback the community, so that they know where they are standing , for instance, each region, they'll have a regional health committee meeting or the either clinic they have a health facility committee , they have a committee, so they need to also need to give feedback to the community that in my community, the last three month we are experiencing diarrhoea but if you don't analyze, you only ticking diarrhoea, diarhoea but you don't analyze, that out of 30 children who visited my clinic 20 of them they have diarrhoea, then that is an outbreak . So you need to analyze your data. So that at least you know, whether you are doing well or you are not but if you are just collecting without analyzing them, it will, it will be a meaningless.

Researcher : Okay, thank you, please tell me of a decision that you have made in terms of Child Health Care Program, under you, when you were using the routine Health Information System data. So tell me about one decision about child health that you can remember that you use your routine health information, and then you made a decision and kindly also tell me which information did you use?

Participant “So, I have, I can see, I can choose I have many example. I need weigh now. I like PMTCT. So when we started with a pmtct program our region was fortunate that it , it was a pilot region for mother baby follow-up care of babies who are born with HIV, by HIV positive mothers who were exposed. So we piloted that in that region, my aim was to know, this tail, this medication prophylaxis for mothers, so that at least we can help babies to be infected, Is it really working? So I started analyzing every month, out of the children who , may be tested because you are testing them, the first test is six weeks nee by that time, I am not talking about the current guideline because the current guidelines depends now,you can be tested at birth , later at six, especially which is very high, then you need to test at birth I am talking now previously when you have to test all the babies who are exposed to HIV, they are , you test them at six week test , at six weeks, you test all the babies, after we test all the babies when we receive the results , I am always analysing, out of, although, there is a database already, before , there was no even database, you have to analyse yourself..

I even started binding the the way develop a a spreadsheet spreadsheet where I plotted all the babies and when the test was done, and what was the outcome of the test at six weeks. Once the child is tested HIV positive, I'm always go back to the facility. And when I go back to the facility, I need to go to do the home visit to visit this mother and to find out why the child was infected if the mother maybe was on the ARV and the baby was on the prophylaxis, so that at least you can analyze and see what was the problem. And most of the time you, when we when you do a home visit, either the mother will tell you that, I started working but now since I started working , I don't have enough milk. So I have to mix when I go to work I give them formula milk when I come back, I will give breast milk such kinds of things or sometimes the mother stopped her ARV treatment or either she, the adherence is not well today's she is taking tomorrow is not taking. So those are the things now, or sometimes the mother may be she developed another infection. Like STI , some of these things now maybe I when I was pregnant, you now my husband is refusing again to to have a condom or something like that. So we end up having a sexual intercourse, with my husband , on without a condom. So at the end of the day now the re infection is coming because the husband is not an ARV, and most of the time these ladies, they don't want to disclose their status to their partner so these are some of the things I use to develop something so I end up now developing like a counselling session nee, counselling book, continuous session for the mothers who were mothers now who were tested , this is positive. Who the KPs now , who knows their HIV positive , some they are KPs They know their HIV status, but they do not disclouse their husband, we started having aa like counselling the sessions, continuous counselling sessions for the mothers at least so that we can support them. So that at the end of the day, they should adhere to the treatment, they should make sure that they also adhere to the feeding recommendations , which option with they chose if its exclusive breastfeeding, they should really exclusive breastfeed with their baby for the first six months, not mixing.

Researcher : Okay, you gave me a nice example of how you use your data in in managing that child health care program of regarding the elimination of mother to child transmission that time was PMTCT. So now How was the outcome now of your decision from the data? After you've come up with that counselling sessions? How was the outcome of the decision that you have made? Or the collective decision that you made?

Participant ;Yeah, I think they're collective went to well, because it was not only because , this information, it was cross cutting, I used to do even a review meetings on quarterly basis with my nurses. I use also to do the supervisory supervisors meeting or and I conducted on the job training and so that it least It will be like a routine for all the facilities, all the clinics now, they know that once they did it get a person with a baby with HIV positive they need to conduct a what, a field visit , at the end of the day now the cases started reducing as well
Researcher : of positive or
Participant “the positive, we no longer any positive cases,ee

Researcher : Okay tell me this information that is coming now, from the routine health information like there is the PMTCT , there is the immunization statistics that is there nutritional indicator ,indicators such as such as stunting and weight wasted in all those things. How do they meet your needs to make a decision?

Participant : You know, sometimes the information they're collecting,one can also think that that is not proper. Especially know when it's when you're analyzing the data. There are some data elements that need to tally together. But you can realize that that is there is a gap . So, sometimes, this information it can really hamper your planning because you cannot really say yes, I immunize this number of children. Because you can have. for instance I can give an example of EPI,at six weeks, you are giving penta, PCV , rota and polio, but for instance , all the antigens you have at the facility at this child when it's come with they come in six weeks. They need to to receive all , three ,all the four antigens, but when they tally in the statistics , when you are going for the analysing you realise that one child is the child, one child, but not receive all the four antigens but there was no any stock out of any antigens so these are the things now which you release that maybe number one, the negligence among the nurses , they are not serious when they are tallying the things and maybe they don't have a good understanding , when it's come to data collection and why are they collecting data , something like that , I think its not going well and its sometimes difficult to correct some of these errors, because you don't have a client anymore. The client has gone home already .

Researcher : Thank you.So I still want us to I, the question, the question that you've answered is the one that I was supposed to ask thank you very much for answering it in advance regarding data quality. However, I would like you to tell me more about to like what I want to I was referring to information needs is that we have the indicators that are collected routinely. Do you think this data that are collecting routinely, like the immunization are sufficiently ,well constituted for you to say, I'm able to make the decision with these indicators or data that are collected in our normal HIS ?

Participant. Yeah, some, some they are , some they are not I can give you an example of family planning. Yeah, not family planning, but papsmear done , if the data you have only data element is said, number of papsmear done and what is the outcome now, its not there its not captured anywhere and we are not interested in the number of papsmear done, we are interested on the outcome, how many may be detected with CHN one or two or three or something like that?

Some of the information that I think , there was a time when the ministry was in the process of revising these data elements setting I don't know how far they are now, because I am really with HIS I am just a program manager, yeah, something like that, but there, there are some gaps which needs to be filled.

Researcher : like in terms of child health, can you think of an indicator that does, or data elements that does not give you sufficient data that you can use with the for planning purposes?

Participant Yes, we have. Like de worming , we have de worming and de worming is not captured anyway. Because even the new revised health passports is not capturing the the zinc, the de worming and zinc , and we need zinc and we need de worming especially, the under five because they places like northern regions we have problems with , worm infestations.

Researcher : So what you are telling me is that zinc supplement is well as the albendazole de worming which is routinely given is not collected in the health info , routine Health Information System?

Participant “ aaye, shaking the head”,

Researcher : ok

Participant “zinc and de worming , they only having vitamin A, but zinc and de worming is not there

Researcher “Okay. So now tell me how do you think, now sometimes , we have these data if we are not using routine data, how does it affect the performance of child health care programme if we are not using these data?

Participant “ Because you never know where you are, if you don’t use the data, you never know, because each clinic or each region is suppose to have a graph, and and you go to the facility where the graph they not there. Because for every month, you need to analyze and by analysing you cannot put them in your head. You need to put them on your either on a file or either on your wall and then you plot and if you are not plotting if you are not analysing how will you know , you are doing good , you Never know and again if you, for instances every time , you have a stock out of maybe cotrimoxazole ,why , we send you sixth bottles of cotrimoxazole , yeah but before the end of the month, the stock is finished , why ? because you are not analysing , how many children , am I treating , those who need cotrimoxazole, you don’t know them and it will really hamper your, your service because you never plan properly and even giving, get good budget , you will never get a good budge and also also you can even improve the quality you cannot view, see that the quality that you rendering or rendered by the nurses is of good quality , if I don’t analyse your data .

Researcher : so, now can you tell me what are the barriers that you have experienced while you are using this routine health information data from the routine health from the Health Information System in child health care what was your barriers in terms of using this data?

Participant “ mmh, the barrier one is the incomplete data some of the data their incomplete and also sometimes the timely its not there, and also what I have also noticed is the understanding you know we have some staff movement, some of the new that are coming in maybe the induction was not properly done and also may be because , you can have a clinic where we have only the newly registered nurse and newly enrolled nurses, no one is really going to mentor them, you know I think the trainings institution they should also I don't know whether they are they're having something on M & E some of this information needs really to be taught from school not only when you reach the clinic especially those are doing bachelor may be, the final year, may be they should also touch how do you collect data from or how do you compile data, so that at least, when, and because child health is the main, is the back bone of the whole information especially those who are working at the primary health care.

Researcher : so , you've highlighted on the , on the staffs skills and capacity the data quality Now tell me ,when I was interviewing others ,other health professionals they were also complaining about lack of paper tools where they are capturing the data sometimes they don't even have a tally sheet they have to pay out from their pockets to complete these tally sheets because it seems these tally sheets are not may be produced in it the headquarter How was your experience regarding the the the infrastructures or the data collection tools in your region?

Participants "Yeah, especially , the the community health workers, it's a problem and also for immunizations , especially the, how do we call this for immunization , there was time when it was really stock out for along time, so, all the so you have to make copies now and sometimes they don't have copy which is working also . Yeah. Yeah.
Researcher : okay, so now

Participant " It's a problem really the tools sometimes especially if when the book finished and there's nothing in store because the books you have to order them from store and store need to order from Windhoek , of there is nothing it will really push you to go make copies , even sometimes the health passport for the babies you don't have to where record the immunization, when you give immunization to the baby, sometimes you have , but only have pink and for the girls and you don't have for the boys.

Researcher : With this barriers that you have highlighted, what do you think can be improved, can be done to improve the use so that you can use more our routine health information, data, especially in child healthcare .

Participant "I think number one, they need to speed up the revision of, of the data tools because there were a lot which we propose when it comes to child health which need to be added . Number two I think the induction need to be done when a person may be is arriving the clinic or maybe a newly recruit from each facility. I think they need to be inducted not only how to complete this tools or how to complete the register but need they also know why , am I collecting data, and I after I complete, because most of the time what I notice especially in the clinic , me at the regional level I know better the clinic than the nurse because everytime , it come, we I am collecting the data I need to analyse which clinic is doing well. Even when it comes to teenage pregnancy m aybe for this ANC , I need to or growth monitoring , I need to know from this clinic I have 2% of stunting or 2% of underweight and 10% of wasted, but a nurse herself at the clinic , she doesn't have that information, because she doesn't analyse its only put the numbers together and send. I think that thing should really , not only looking how to complete the forms and complete what ever on time, she should know also how to use their own data, so that it helps the quality of the services they provide , and can also, even health education , you cannot give health education, like for instance malaria and you do not have malaria in your region, you need to give health education based on what, condition that are available , that hampering your , your services in the community , yeah those are the things"

Researcher : like you added tools on child health ,You have highlighted already in the previous question that especially the de worming part is and the zinc supplement is not included in the data collection tools and that information it needs to be used used. Can you think about any other tool ,data tools that needs to be added in child health care that needs to be part that can enhance the use routine health information

Participant " you know its only that now I don't register with me , remember when you collect information, there are some data that are not captured, like sore throat ,ear infection, based, you know we have IMNCI but IMCI, most of the conditions they are not capture in the health information system.

When we develop something , nee, all you need to develop a guideline, but the guideline should be followed by a , a data , tool or database too, otherwise you are just collecting information, what otherwise you are just doing something but its not documented anywhere. And when we have started with PMTCT now, Now , now, is elimination there was no tool that is capturing the , the mother baby follow-up , there were not captured , you just keep PMTCT, I mean Nevirapine and others but from there what now ?you need to know after I give nevirapine how many were tested positive , how many were tested negative, how many percentage and now you also need to analyse furth compile maybe 2020. How many 2021,2022 and then at least the trends should go down not go up, something like that, I think the nurses they need to know as I said early, the training institution, they need include the M & E in their cirrulum and again the nurses , they need understand that data collection ,not collecting data for someone else, they are collecting for themselves, they should start using their own data. Not sending to other person to use it but collecting them, compiling them to us them, and now need to look now at their budget, how can they improve on printing of data tools , so that at least they should be readily available and I was thinking this time we should get rid of paper workers , why can’t we can’t we provide the facility with computer, and each clinic will , like ART, ART all the clinics, they have ART database ,they have a computer, they have clerk , so that at least everything can be captured from the clinic. You don't need to send to all these papers to the region , its really a waste of time ,mmh.

Researcher : So now how do we enhance, you have talked about that the nurses ,are, we need to encourage them now to use the data at their point of care not only to collect, but how are we going to motivate them instil that culture of information use particularly the graduating ones that you've just started or the ones that have stayed but they were not in that culture of using information how can we enhance this?

Participant “ I think it's just supervision support visit, support on job training, because, us also managers from the region we don’t visit them, we don’t give them support , we don’t see, you are only waiting for the end of the month and then you start looking aah, you did not do ABC, you need to go and sit for a day, and do the things and show the person the right things , because I know like EPI, when you are trained on MLM (Mid Level Management) training for EPI , they have a component of ME ,M & E , they really, even RED approach , remember RED Approach, the routine, how do you collect data, how do you budget for the vaccines, based on your population, how do you calculate all this, and I think the nurses who, those who are coming from the schools , I don’t think they have this knowledge and their expected to do all things, all though in the induction I don’t think that its tackled, mmh

Researcher : Thank you. So with the other previous interview that I did is that it seems there is no policy or guidelines that is guiding the routine Health Information System in Namibia ,so and if there will be a guideline or a policy that will be developed and shared, what would you want to what do you want it to include? What would you, What do you want to see that guideline that is talking about routine health information system or that is talking about data use that is talking about health information. Why would you want to see there?

Participant “ I think , It should start with the aim , and the aim and the objectives of data collection , how do you collect the data, how do you analyse them and how do you send them , to the other people, and how you give also feedback , like I said earlier , that we you collect data you collect , you analyse and need you also need to give feedback to the community, which is not happening, you know, we only taking about, when there is an outbreak, with this COVID or whatever , now you start talking aaye, we collected this and this but after that, we are silent and not only COVID what is a problem, we have many problems, even TB, we don’t go to the community, last month, 7 , 70 people come my facility , 3 of them or 5 of them they have TB and then you put them in percentage, because , raw data it does not also make sense , you have to them in percentage, so that at least say something to you, or to the community because you can, community you cannot of percentage you say out of may be if have 100 people, twenty , you remember we are how many here, we are 100, 20 of , among us nee, 20 of them they have already TB, so that the community will start becoming scared that, ooh, I need to be careful even my neighbour, or either my one my child or either my husband or either my, anyone who is living with me might have TB”

Researcher :Okay, Thank you very much, we came to the end of our interview, is there something that you want to add on our interview that you perhaps wanted to add from the beginning and then you just remember it now, before we conclude our interview?

Participant “ mmhm, not really its only that , I think we need to do a lot when it comes data collection because is important sometimes it can really see that, the person is not completing, when she is collecting, she is not completing data and also sometimes you really realise that this data, I can see some of them are forging .I don’t want to say it, ee, but once you can really see that, because there are some of the data elements that if you say A, you should always say B or either you don't say B you will say E. But here you can see that a person is just tick 111 or so maybe the person supposed not to tick that element, data element I think it's the understanding , the nurses they need skills, they need to understand and they also need to commit because the commitment is there . Because every time, end of the month , o statistics, statistics , no we tired , we have a lot of work , I have many clients doesn't make any sense. You just writing passport, passport, but you don’t report because if if something is not recorded its not done but we need to work together so that at least , the training institution can include the M and E part, in their curriculum, I am thinking that from school is when you are starting, you are expected to start at the clinic where is not registered nurse where is no, may be there is only enrolled nurse , you have been there only for one day , I meant for one month , mmhm and you are expected, imagine how many data you have to collect now , especially for the children , a lot and you don’t know how to interpret sometimes the card or although in school may be in school they taught how to interpret the card, the weight for age and length for height but practical is very important than theory.

Researcher : Alight thank you very much.

Participant “ Eewa”

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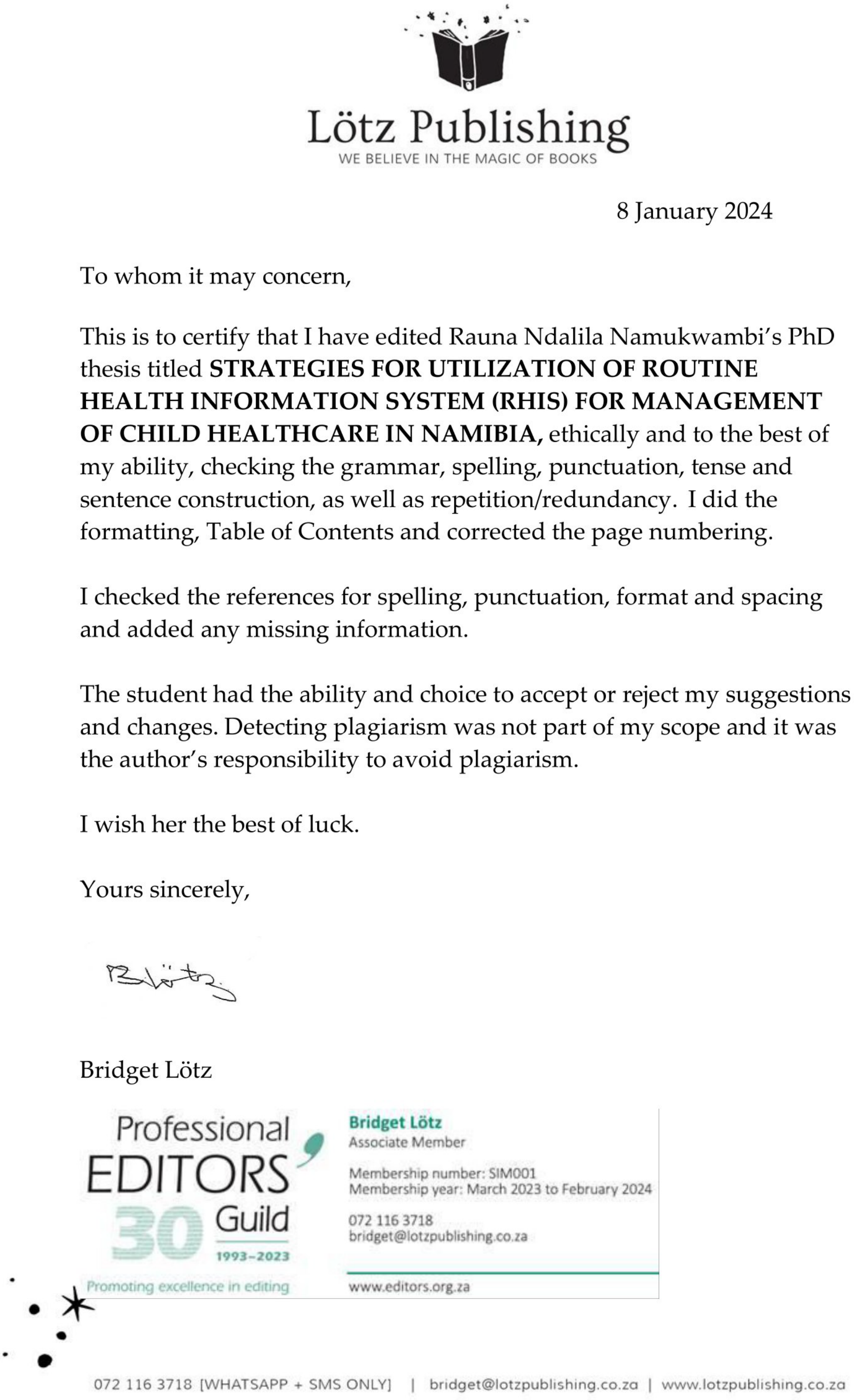
ANNEXURE M: CERTIFICATE OF EDITING



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To whom it may concern,

This is to certify that I have edited Rauna Ndalila Namukwambi’s PhD thesis titled **STRATEGIES FOR UTILIZATION OF ROUTINE HEALTH INFORMATION SYSTEM (RHIS) FOR MANAGEMENT OF CHILD HEALTHCARE IN NAMIBIA,** ethically and to the best of my ability, checking the grammar, spelling, punctuation, tense and sentence construction, as well as repetition/redundancy. I did the formatting, Table of Contents and corrected the page numbering.

I checked the references for spelling, punctuation, format and spacing and added any missing information.

The student had the ability and choice to accept or reject my suggestions and changes. Detecting plagiarism was not part of my scope and it was the author’s responsibility to avoid plagiarism.

I wish her the best of luck.

Yours sincerely,

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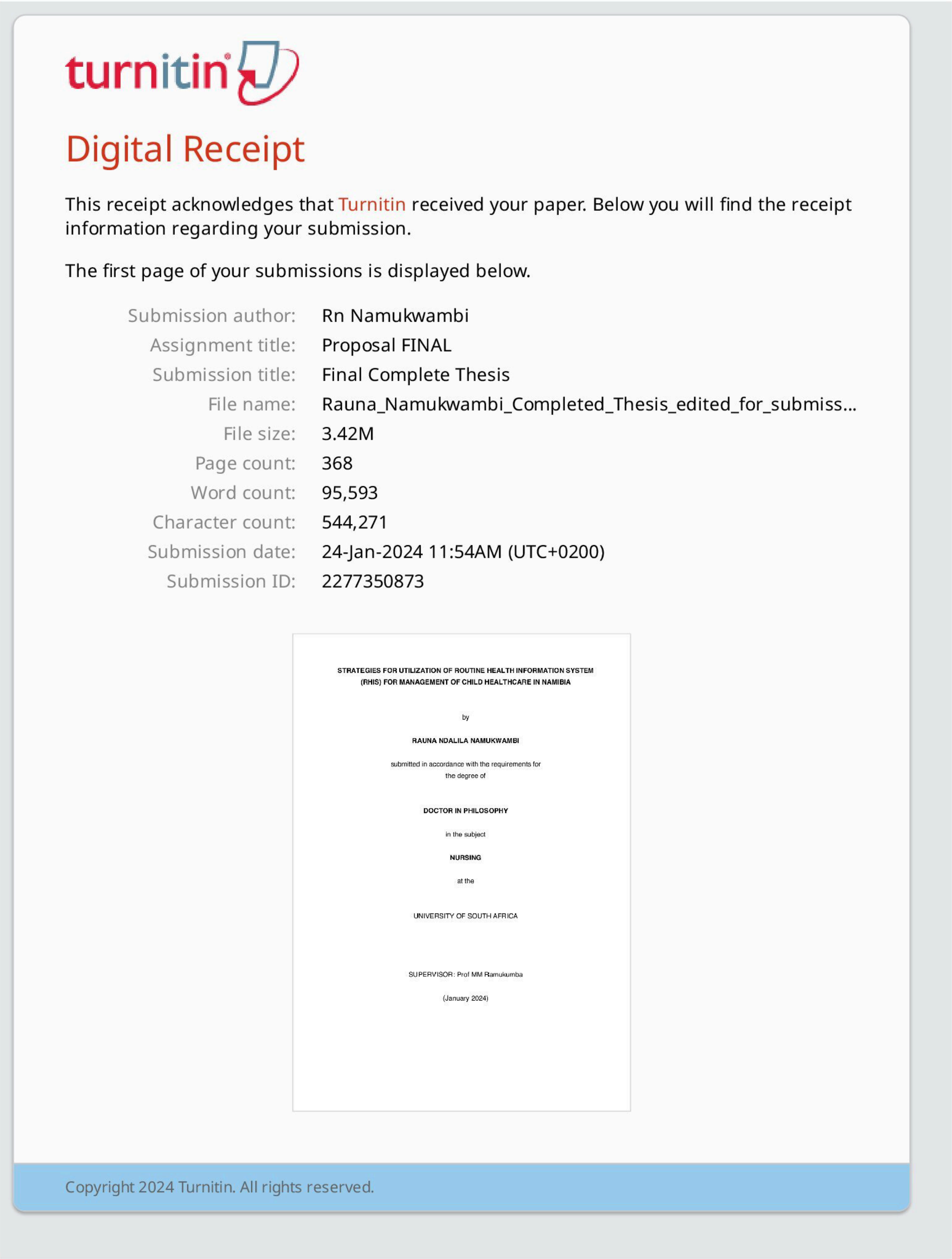

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STRATEGIES FOR UTILIZATION OF ROUTINE HEALTH INFORMATION SYSTEM
(RHIS) FOR MANAGEMENT OF CHILD HEALTHCARE IN NAMIBIA

by

RAUNA NDALILA NAMUKWAMBI

submitted in accordance with the requirements for
the degree of

DOCTOR IN PHILOSOPHY

in the subject

NURSING

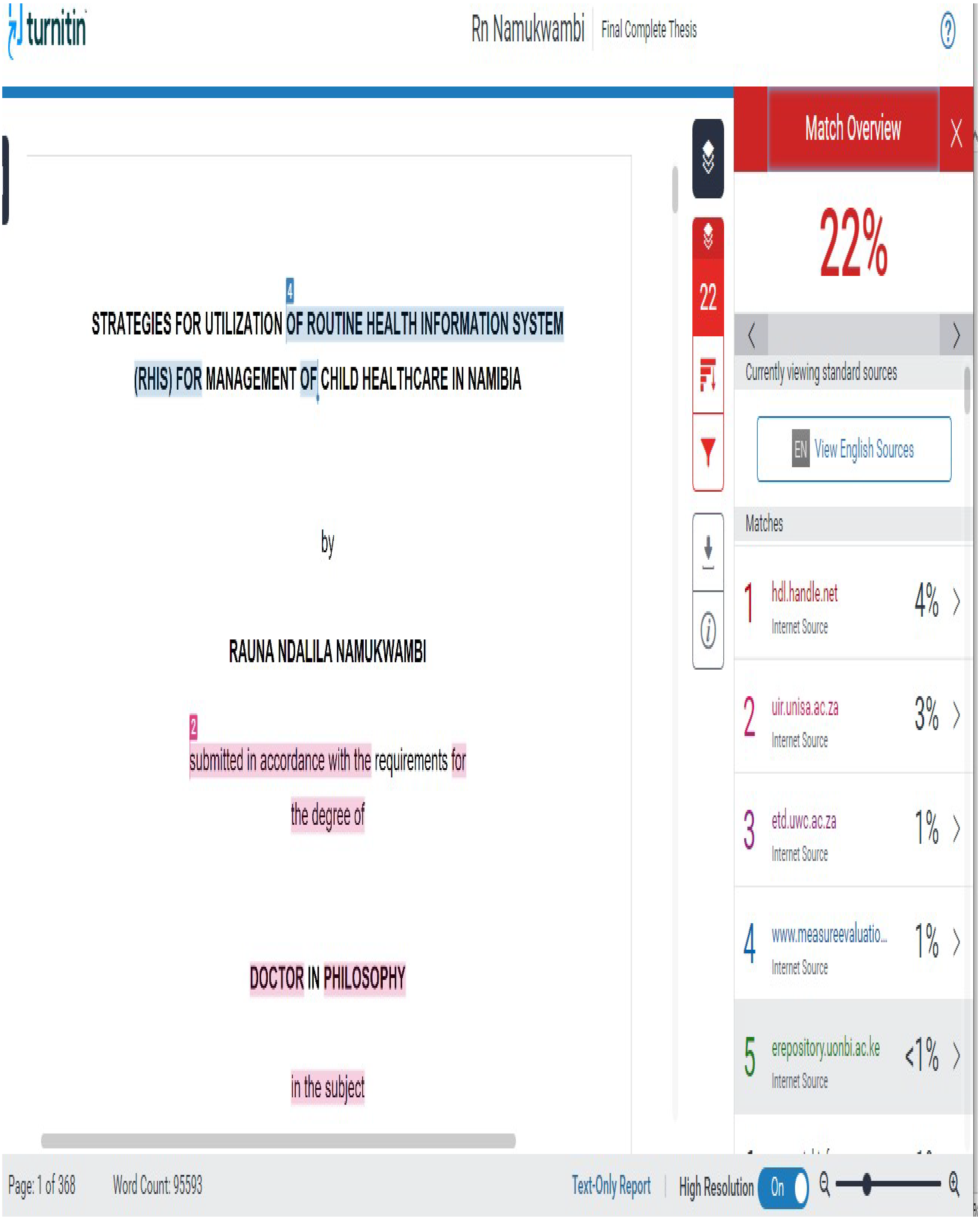
at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: Prof MM Ramukumba

(January 2024)

ANNEXURE O:TURNITIN ORIGINALITY REPORT



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4 STRATEGIES FOR UTILIZATION OF ROUTINE HEALTH INFORMATION SYSTEM (RHIS) FOR MANAGEMENT OF CHILD HEALTHCARE IN NAMIBIA

by

RAUNA NDALILA NAMUKWAMBI

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