

**UTILIZATION OF DISTRICT HEALTH INFORMATION SYSTEM 2 BY  
HEALTHCARE WORKERS IN LESOTHO**

by

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MAY 2022

## DECLARATION

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I declare that the dissertation “**UTILIZATION OF DISTRICT HEALTH INFORMATION SYSTEM 2 BY HEALTHCARE WORKERS IN LESOTHO**” is my own work and that, all the sources that I have used or quoted have been indicated and acknowledged by means of complete references. I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality. I further declare that I have not previously submitted this work, or part of it, for examination at UNISA for another qualification or at any other higher education institution.



SIGNATURE

JANUARY 2022

DATE

## **DEDICATION**

I dedicate this thesis to the following special people: my wife Marorisang Tsoeu, I love you and thank you for the support you gave me, my daughters Rorisang Tsoeu and Tlholo Tsoeu, you are the reason I continue to be better and my siblings, you are always proud of me, I love you all.

# UTILIZATION OF DISTRICT HEALTH INFORMATION SYSTEM 2 BY HEALTHCARE WORKERS IN LESOTHO

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## ABSTRACT

The purpose of the study was to investigate the utilization of District Health Information System 2 (DHIS2) by healthcare workers in Lesotho. The study was conducted at three specific healthcare facilities in Lesotho and used a quantitative descriptive and cross-sectional design. The population consisted of 291 healthcare workers. Probability stratified random sampling was used. The sample consisted of 93 respondents. Data was collected from the 16<sup>th</sup> June to 16<sup>th</sup> July 2021 using self-administered questionnaires. Data was analysed using Statistical Package for the Social Science version 26. Descriptive and inferential statistics were used to summarize raw data.

The study found that DHIS2 is not effectively used as (76.4%, n=68) respondents often use DHIS2 for data entry only, (71.9%, n=64) encountered challenges on its use and (82.0%, n=73) needed support to resolve challenges encountered. The recommendations include, need for equipment review, refresher trainings, supervision and motivation concerning utilization of DHIS2.

**KEY CONCEPTS:** Antiretroviral treatment; data clerk; district health information system version 2; healthcare workers; monitoring and evaluation officer; nursing assistant; policymakers; registered nurse.

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## TABLE OF CONTENTS

DEDICATION .....	iii
ABSTRACT .....	iv
ACKNOWLEDGEMENTS .....	v
LIST OF ANNEXURES .....	xv
LIST OF FIGURES.....	xvi
LIST OF TABLES.....	xvii
LIST OF ABBREVIATIONS AND ACRONYMS.....	xx
<b>CHAPTER 1.....</b>	<b>1</b>
<b>ORIENTATION TO THE STUDY .....</b>	<b>1</b>
1.1 INTRODUCTION.....	1
1.2 BACKGROUND OF THE STUDY .....	3
1.3 STATEMENT OF THE RESEARCH PROBLEM .....	5
1.4 RESEARCH PURPOSE .....	6
1.4.1 Research objectives.....	7
1.4.2 Research questions.....	7
1.5 SIGNIFICANCE OF THE STUDY.....	7
1.6 DEFINITIONS OF KEY CONCEPTS.....	7
1.6.1 Conceptual definitions.....	7
1.6.1.1 Antiretroviral treatment (ART).....	7
1.6.1.2 Challenge .....	8
1.6.1.3 Data Clerks.....	8
1.6.1.4 District Health Information System version 2 (DHIS2).....	8

1.6.1.5	Healthcare workers .....	8
1.6.1.6	Monitoring and Evaluation officer .....	8
1.6.1.7	Nursing Assistant .....	8
1.6.1.8	Policymakers .....	9
1.6.1.9	Registered nurse .....	9
1.6.1.10	Utilization.....	9
1.6.2	Operational definitions.....	9
1.6.2.1	Antiretroviral treatment (ART) data.....	9
1.6.2.2	Challenge .....	9
1.6.2.3	Data clerks .....	9
1.6.2.4	District Health Information System version 2.....	10
1.6.2.5	Healthcare workers .....	10
1.6.2.6	Monitoring and Evaluation officer .....	10
1.6.2.7	Nursing Assistant .....	10
1.6.2.8	Policymakers .....	10
1.6.2.9	Registered nurses .....	10
1.6.2.10	Utilization.....	11
1.7	RESEARCH SETTING .....	11
1.8	RESEARCH DESIGN.....	11
1.9	RESEARCH METHODS.....	11
1.9.1	Population.....	12
1.9.2	Sampling methods, sample and sample size.....	12
1.9.3	Data collection.....	12
1.9.4	Data analysis.....	14
1.10	VALIDITY AND RELIABILITY OF THE RESEARCH INSTRUMENT .....	14
1.10.1	Validity.....	14

1.10.2	Reliability.....	15
1.11	ETHICAL CONSIDERATIONS.....	15
1.12	SCOPE AND LIMITATIONS OF THE STUDY.....	15
1.13	STRUCTURE OF THE DISSERTATION.....	16
1.14	CONCLUSION .....	16
<b>CHAPTER 2</b>	<b>.....</b>	<b>17</b>
<b>LITERATURE REVIEW</b>	<b>.....</b>	<b>17</b>
2.1	INTRODUCTION.....	17
2.2	OVERVIEW OF DHIS.....	17
2.3	BENEFITS OF THE UTILIZATION OF DHIS2 .....	20
2.4	CHALLENGES ENCOUNTERED BY HEALTHCARE WORKERS IN USE OF DHIS2.....	23
2.5	UTILIZATION OF DHIS2 BY HEALTHCARE WORKERS IN WORLD (COUNTRIES OUTSIDE AFRICA, AFRICA AND SOUTHERN AFRICAN DEVELOPMENT COMMUNITIES (SADC)) .....	25
2.5.1	Countries outside Africa.....	25
2.5.1.1	India .....	26
2.5.1.2	Afghanistan .....	26
2.5.1.3	Indonesia.....	26
2.5.1.4	Bangladesh .....	27
2.5.1.5	Sri Lanka .....	27
2.5.2	Africa and Southern African Development Communities.....	27
2.5.2.1	Uganda.....	28
2.5.2.2	Malawi .....	28
2.5.2.3	Kenya.....	28



2.5.2.4	Zimbabwe.....	29
2.5.2.5	South Africa.....	29
2.5.2.6	Lesotho .....	29
2.6	REQUIREMENTS OF HEALTHCARE WORKERS FOR EFFECTIVE USE OF DHIS2.....	29
2.7	FUTURE USE OF DHIS2.....	32
2.8	CONCLUSION .....	32
	<b>CHAPTER 3.....</b>	<b>33</b>
	<b>RESEARCH DESIGN AND METHODS.....</b>	<b>33</b>
3.1	INTRODUCTION.....	33
3.2	RESEARCH SETTING .....	33
3.3	RESEARCH DESIGN.....	33
3.3.1	Quantitative design.....	33
3.3.2	Descriptive design.....	34
3.3.3	Cross-sectional design .....	34
3.4	RESEARCH METHODS.....	34
3.4.1	Population.....	35
3.4.2	Sampling technique and sample size.....	35
3.4.2.1	Sampling technique .....	35
3.4.2.2	Sample size.....	36
3.4.3	Inclusion and exclusion criteria.....	37
3.4.3.1	Inclusion criteria .....	37
3.4.3.2	Exclusion criteria .....	37
3.4.4	Development and pre-testing of the measurement instrument (questionnaire).....	37

3.4.4.1	Development of data collection instrument (questionnaire).....	37
3.4.4.2	Pre-testing of the measurement instrument (questionnaire).....	39
3.5	DATA COLLECTION.....	41
3.5.1	Data collection procedures.....	42
3.6	DATA ANALYSIS.....	45
3.7	VALIDITY AND RELIABILITY OF THE STUDY.....	45
3.7.1	Validity.....	45
3.7.1.1	Face validity.....	46
3.7.1.2	Content validity.....	46
3.7.1.3	Internal validity.....	46
3.7.1.4	External validity.....	46
3.7.2	Reliability of the study.....	47
3.8	ETHICAL CONSIDERATIONS.....	47
3.8.1	Researcher- specific ethical considerations.....	47
3.8.2	Respondents- specific ethical considerations.....	48
3.8.2.1	Avoidance of harm.....	48
3.8.2.2	Informed consent.....	48
3.8.2.3	Deception of the respondents.....	48
3.8.2.4	Right to privacy.....	48
3.8.2.5	Anonymity.....	49
3.8.2.6	Confidentiality.....	49
3.8.2.7	Compensation.....	49
3.9	CONCLUSION.....	49
<b>CHAPTER 4</b>	.....	<b>50</b>

<b>DATA ANALYSIS, PRESENTATION, AND INTERPRETATION OF THE RESULTS.....</b>	<b>50</b>
4.1 INTRODUCTION.....	50
4.2 MANAGEMENT OF DATA ANALYSIS.....	50
4.3 RESEARCH RESULTS.....	52
PART 1.....	53
4.3.1 Section A.....	53
Biographical information .....	53
4.3.1.1 Gender .....	53
4.3.1.2 Age.....	54
4.3.1.3 Category.....	55
4.3.1.4 Years of experience in DHIS2 .....	55
4.3.2 Section B.....	56
Use of DHIS2 by healthcare workers.....	56
4.3.2.1 Systems used for health information .....	56
4.3.2.2 Use of DHIS2 at workplace .....	57
4.3.2.3 Frequency of use of DHIS2 at workplace in a month .....	58
4.3.2.4 What respondents use DHIS2 for.....	60
4.3.2.5 Reasons why the respondents do not use DHIS2.....	61
4.3.2.6 How respondent view DHIS2 in term of usefulness.....	62
4.3.2.7 Why DHIS2 is not useful .....	63
4.3.2.8 Functions that the respondents can perform with confidence on DHIS2.....	65
4.3.2.9 Function used more often by the respondents .....	66
4.3.2.10 Why the respondents use none of the functions.....	66
4.3.2.11 Do the respondents enjoy using DHIS2 .....	67

4.3.2.12	Why the respondents do not enjoy using DHIS2 .....	67
4.3.2.13	Respondents` perspective on effective use of DHIS2. ....	68
4.3.3	Section C.....	70
	Challenges healthcare workers encounter when using DHIS2 .....	70
4.3.3.1	Healthcare workers who encounter challenges when using DHIS2. .	70
4.3.3.2	Challenges encountered by healthcare workers when using DHIS2.	71
4.3.3.3	Challenges mostly encountered by healthcare workers when using DHIS2.....	72
4.3.3.4	Respondents` view on the complexity in use of DHIS2 .....	72
4.3.4	Section D.....	75
	Support needed by healthcare workers for effective use of DHIS2.....	75
4.3.4.1	Frequency distribution of respondents who need support and those who do not need it in use of DHIS2 .....	75
4.3.4.2	What respondents think can be done to use DHIS2 with ease without encountering challenges.....	75
4.3.4.3	Respondents` view on whether DHIS2 is a user-friendly tool or not..	76
4.3.4.4	What can be done to improve DHIS2 to make it user friendly .....	77
4.3.4.5	Changes respondents think can be done in DHIS2 for users to use it effectively.....	78
4.4	PART 2.....	78
4.4.1	Results of the Chi-square test of association of the variables.....	78
4.5	CONCLUSION .....	80
	<b>CHAPTER 5.....</b>	<b>81</b>
	<b>DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>81</b>
5.1	INTRODUCTION .....	81
5.2	SUMMARY OF THE RESEARCH RESULTS.....	81

5.2.1	Biographical information.....	81
5.2.2	Systems used for health information.....	82
5.2.3	Frequency of use of DHIS2 at workplace in a month.....	82
5.2.4	Reasons for use of DHIS2.....	83
5.2.5	Reasons why the respondents do not use DHIS2.....	84
5.2.6	Views of the respondents in terms of usefulness of DHIS2.....	84
5.2.7	Why DHIS2 is not useful.....	84
5.2.8	Functions used more often on DHIS2 by the respondents.....	85
5.2.9	Reasons why the respondents use none of the functions of DHIS2.....	85
5.2.10	Do the respondents enjoy using DHIS2?.....	86
5.2.11	Reasons why the respondents do not enjoy using DHIS2.....	86
5.2.12	Respondents` perspective on effective use of DHIS2.....	86
5.2.13	Challenges encountered by healthcare workers when using DHIS2.....	87
5.2.14	Respondents` view on the complexity in use of DHIS2.....	87
5.2.15	What respondents think can be done to use DHIS2 with ease without encountering challenges.....	87
5.2.16	Changes respondents think can be done in DHIS2 for users to use it effectively.....	88
5.2.17	Results of the Chi-square test of association of the variables.....	88
5.3	RECOMMENDATIONS .....	89
5.3.1	Education.....	89
5.3.2	Clinical practice.....	89
5.3.3	Management.....	89
5.3.4	Future research.....	89
5.4	LIMITATIONS OF THE STUDY.....	89
5.5	CONCLUDING REMARKS.....	90

LIST OF SOURCES ..... 91

ANNEXURES ..... 98

## LIST OF ANNEXURES

Annexure 1. Ethical clearance from department of health studies UNISA.....	98
Annexure 2. Questionnaire for all the respondents .....	99
Annexure 3. Consent to participate in the study.....	106
Annexure 4. Researcher confidentiality agreement.....	107
Annexure 4.1. Statistician confidentiality agreement.....	108
Annexure 5. Request for permission letter to Ministry of health.....	109
Annexure 5.1. Permission letter from Ministry of health.....	110
Annexure 6. Request for permission letter to hospital one.....	111
Annexure 6.1. Permission letter from hospital one.....	112
Annexure 7. Request for permission letter to hospital two.....	113
Annexure 7.1. Permission letter from hospital two.....	114
Annexure 8. Request for permission letter to hospital three.....	115
Annexure 8.1. Permission letter from hospital three.....	116
Annexure 9. Letter from the statistician.....	117
Annexure 10. Professional language editor`s letter.....	118
Annexure 11. Setting map.....	119
Annexure 12. Open-ended questions data set extracted from the spreadsheet.....	121

## LIST OF FIGURES

Figure 2.1. Overview of DHIS2.....	19
Figure 2.2. Information cycle.....	20
Figure 4.1. Gender distribution of the respondents.....	53
Figure 4.2. Age distribution of the respondents.....	54
Figure 4.3. Category distribution of the respondents.....	55
Figure 4.4. Use of DHIS2 at workplace.....	57
Figure 4.5. Age group compared to frequency of use of DHIS2.....	58
Figure 4.6. Comparison of frequency of use by category.....	59
Figure 4.7. How DHIS2 is used by respondents.....	60
Figure 4.8. Reasons for use of DHIS2 by categories.....	61
Figure 4.9. DHIS2 usefulness.....	62
Figure 4.10. Functions that the respondents can perform with confidence on DHIS2.....	65



## LIST OF TABLES

Table 1.1. Structure of the dissertation.....	16
Table 2.1. List of countries using DHIS2.....	25
Table 3.1. Population frame.....	35
Table 3.2. Specific healthcare facility one sampling.....	36
Table 3.3. Specific healthcare facility two sampling.....	36
Table 3.4. Specific healthcare facility three sampling.....	36
Table 3.5. Questionnaire distributed and returned from healthcare facilities.....	44
Table 4.1. Emerged themes from open-ended questions.....	52
Table 4.2. Years of experience in DHIS2 distribution (N=89) .....	55
Table 4.3. Systems used for health information per category (N=89) .....	56
Table 4.4. Use of DHIS2 at workplace compared to age distribution (N=89) .....	57
Table 4.5. Use of DHIS2 in a month by respondents (N=89) .....	58
Table 4.6. Categories and themes of reasons why the respondents do not use DHIS2.....	62
Table 4.7. Categories and themes of reasons why DHIS2 is not useful.....	63
Table 4.8. Functions the respondents use more often (N=89) .....	66
Table 4.9. Categories and themes of reasons why the respondents use none of the functions.....	66

Table 4.10. Respondents` response on whether they enjoy using DHIS2 or not (N=89).....	67
Table 4.11. Categories and themes of reasons why the respondents do not enjoy using DHIS2.....	68
Table 4.12. Respondents` perspective on usefulness of DHIS2 (N=89) .....	68
Table 4.13. Respondents` perspective on use of DHIS2 in decision-making (N=89) .....	69
Table 4.14. Respondents` perspective on benefits of DHIS2 (N=89) .....	69
Table 4.15. Respondents` perspective on effective use of DHIS2 by facilities (N=89) .....	70
Table 4.16. Respondents who encounter challenges on use of DHIS2 (N=89) .....	70
Table 4.17. Categories and themes of challenges encountered by healthcare workers when using DHIS2.....	71
Table 4.18. Categories and themes of challenges mostly encountered by healthcare workers when using DHIS2.....	72
Table 4.19. Respondents` perspective on complexity of use of DHIS2 (N=89) .....	72
Table 4.20. Respondents` perspective on use of DHIS2 adding workload (N=89) .....	73
Table 4.21. Respondents` perspective on a need of IT specialist in use of DHIS2 (N=89).....	73

Table 4.22. Respondents` perspective on facing no challenges on use of DHIS2 (N=89) .....	74
Table 4.23. The respondents who need support and those who do not need it (N=89).....	75
Table 4.24. Categories and themes of what respondents think can be done to use DHIS2 with ease without encountering challenges.....	76
Table 4.25. Respondents who view DHIS2 as a user-friendly tool and those who do not (N=89).....	76
Table. 4.26. Categories and themes of what can be done to improve DHIS2 to make it user friendly.....	77
Table. 4.27. Categories and themes of changes respondents think can be done in DHIS2 for users to use it effectively.....	78
Table 4.28. Significance of variables on use of DHIS2 at workplace.....	79
Table 4.29. Significance of variables on frequency of use of DHIS2.....	79
Table 4.30. Significance of the variables on use of DHIS2 by healthcare workers...	80

## LIST OF ABBREVIATIONS AND ACRONYMS

ART	Antiretroviral Treatment
CHAL	Christian Health Association of Lesotho
DHIS2	District Health Information System 2
DHMT	District Health Management Team
ECOWAS	Economic Community of the West African States
EGPAF	Elizabeth Glazer Paediatric Aids Foundation
EHR	Electronic Health Records
EMR	Electronic Medical Record
GIS	Geographical Information System
GoL	Government of Lesotho
HIS	Health Information System
HIV	Human Immunodeficiency Virus
HMIS	Health Management and Information system
ICAP	International Centre for AIDs care and treatment Project
ICT	Information Communication Technology
IDR	Integrated Data Repository
IPPF	International Planned Parenthood Federation
Jhpiego	Johns Hopkins Program for International Education in Gynaecology and Obstetrics.
LPPA	Lesotho Planned Parenthood Association

MCH	Maternal and child health
M & E	Monitoring and Evaluation
MoH	Ministry of Health
MSF	Médecins Sans Frontières
NGOs	Non-governmental Organizations
NHSP	National Health Strategic Plan
OHN	Open Health News
OPD	Outpatient Department
PEPFAR	President`s Emergency Plan for AIDS Relief
PMTCT	Prevention from mother to child
PSI	Population Service International
SADC	Southern African Development Communities
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Science
TB	Tuberculosis
UKAID	United Kingdom Agency for International Development
UNICEF	United Nations International Children`s Emergency Fund
USAID	United States Agency for International Development
WHO	World Health Organisation

## CHAPTER 1

### ORIENTATION TO THE STUDY

#### 1.1 INTRODUCTION

Technology involves systems or devices designed to perform a certain function (Carroll 2017:19). In healthcare system, technology is used to improve the quality and effectiveness of services. This involves the use of devices, applications and systems to solve health problems, and improve quality of health by way of prevention, diagnosis, and treatment of illness and diseases (WHO 2020:106). According to the 2019 Sustainable Development Goals (SDGs) report, technology is one key strategy that can drive progress towards achievement of all the 17 Sustainable Development goals (Sachs, Schmidt-traub, Kroll, Lafortune & Fuller 2019:2).

In developing countries like Lesotho, there is still a challenge in the access and use of technology such as the District Health Information System (DHIS). DHIS has multiple versions (DHIS and DHIS2). The focus of this study is on DHIS2. According to Open Health News (OHN) (2020:1), DHIS2 is defined as an open-source software platform developed by the University of Oslo. Its main functions are data collection, validation, analysis and presentation of aggregate and patient-based statistical data. It enables the user to design the contents of information he/she is interested in working on without programming skills.

The DHIS2 is a type of technological application used for managing health information, data collection and decision-making by healthcare workers. This includes registered nurses, nursing assistants and data clerks at facility level and, programs' coordinators as well as Monitoring and Evaluation (M & E) officers at central level (Dehnavieh, Haghdoost, Khosravi, Hoseinabadi, Rahim, Poursheikhali, Khajehpour, Khajeh, Mirshekari, Hasani, Radmerikhi, Haghghi, Mehrolhassani, Kazemi & Aghamohamadi 2018:3). It has been reported that in Ghana, it was used to collect quality data on morbidity and mortality, and in Kenya, it was used to improve the national health system's data analysis. In Zambia, it is successfully used as a reporting tool in malaria program (OHN 2020:1).

Although the DHIS2 has had good impact on the healthcare systems in some of the developing countries where it has been implemented; in Lesotho, the use of DHIS2 in healthcare system has encountered challenges. Despite trainings offered to healthcare workers; they are still not proficient in using the system to manage their data. This is shown through inconsistency of data reporting from DHIS2 versus paper reports. DHIS2 misses some data, which is patients' information on paper reports. For instance, treatment regimen on paper report is not the same as one in the DHIS2. Furthermore, the total stock balance in store is not the same as balance in DHIS2.

For the system to be used effectively, the healthcare workers must collect data as per the indicators such as number of people on Antiretroviral Treatment (ART), number of clients seen per month, and segregation of clients by gender and regimen. They further have to validate the data, and then submit data reports in both, paper and electronic DHIS2 versions. Paper and electronic reports are needed from healthcare facility level to District Health Management Team (DHMT) for verification purposes.

Data from clients is recorded in the registers by both registered nurse and nursing assistant. Data clerks must also routinely check that all data is filled as per the indicators by the registered nurses and nursing assistants, and capture data into the DHIS2 system. Before it is uploaded on the DHIS2 where M & E officers can have access to it, the registered nurse, nursing assistants and data clerks must check its completeness and validate it. All data reports on the services offered by the hospital being Outpatient, ART, Human Immunodeficiency Virus (HIV) testing services and maternal health should be completed and presented on time as per the schedule set by the Ministry of Health (MoH). After being validated, data is then analysed by the data clerk, registered nurse and nursing assistant. This is the analysis done at healthcare facility level. The analysed data is then used in decision-making. The informed decision involves the targeted population for certain services and community mapping on services offered. The population from which area has high prevalence of certain diseases and needs to be targeted on service delivery. The analysed data also enables the hospital to make informed improvement decisions in terms of service delivery. In this study, the researcher focused on investigating the utilization of District Health Information System 2 (DHIS2) by healthcare workers in Lesotho.

The researcher, being part of the clinical staff, and also a member of the research team assessing the progress of Lesotho on the Health Management and Information Systems (HMIS), observed the challenge of data management at some of the healthcare centres. When incorrect data is entered in the DHIS2 by healthcare workers, it misleads the M & E officers in the information they communicate to policymakers at the MoH. Consequently, this negatively affects policy direction, hence the need to understand the existence of knowledge gap in the use of DHIS2 by healthcare workers in Lesotho. This knowledge will help to justify the purpose of adopting DHIS2 in Lesotho`s healthcare facilities; which is to strengthen HMIS in order to inform evidenced based decision-making, and improve service delivery to the clients (Sahay, Rashidian & Doctor 2019:1).

The inaccuracy of data captured into the DHIS2 led the researcher to conduct this study. Hence, the purpose of this study was to investigate the utilization of DHIS2 by healthcare workers in Lesotho. The researcher hopes that the results of this study will provide the Minister of Health with the information that will assist in understanding the way healthcare workers perceive and utilise DHIS2. Furthermore, to help on developing measures to be taken in order to make DHIS2 more effective. This will also assist in planning, improving and implementing data management using DHIS2 to strengthen HMIS.

## **1.2 BACKGROUND OF THE STUDY**

Lesotho is a small country with 30 000 km<sup>2</sup> area. It is a mountainous country surrounded with a population of 2.29 million people of which 25% lives in urban areas and 75% in rural areas (World population review 2020:1). The country is divided into 10 administrative districts, with Maseru, Leribe, Berea and Mafeteng as the four largest districts with a total population of 64.7% (Lesotho 2018:17).

Lesotho healthcare service delivery occurs at three different levels, namely, primary, secondary and tertiary level. According to National Health Strategic Plan (NHSP) 2017-2022 (2016:9), the country has 372 healthcare facilities. These consists of one referral hospital, two specialty hospitals, 18 district hospitals, three filter clinics, 188 health centers, 48 private surgeries, 66 nurse clinics and 46 pharmacies. The



Government of Lesotho (GoL) owns 58% of the health facilities and Christian Health Association of Lesotho (CHAL) own 42%.

There are also some Non-governmental Organizations (NGOs) which work hand in hand with the MoH to deliver healthcare services to the clients. These NGOs include: Elizabeth Glazer Paediatric Aids Foundation (EGPAF), International Centre for AIDs care and treatment Project (ICAP), Johns Hopkins Program for International Education in Gynaecology and Obstetrics (Jhpiego), Population Service International (PSI) and Lesotho Planned Parenthood Association (LPPA) (NHSP 2017-2022 2016:10).

In 2005, Lesotho developed an Information Communication Technology (ICT) policy. This policy showed that ICT is essential to strengthening the nation`s healthcare system by ensuring efficient and effective service delivery to the clients, assisting healthcare workers in the control and eradication of diseases. The system also assisted in the reduction of the cost of healthcare services. The main objective of ICT policy is to improve performance of healthcare system by using HMIS (ICT Policy for Lesotho 2005:42). DHIS is the backbone of HMIS in Lesotho, hence there is a need to use it effectively in the healthcare system.

The historical development of DHIS in Lesotho showed that it was launched in February 2015 using HIV, Tuberculosis (TB), and Prevention from mother to child (PMTCT) data. In October same year, more data from Outpatients department and Inpatients department were added. In November 2015, the country moved to version 2 of DHIS, and between March and May 2016, healthcare workers were trained on the use of DHIS2 with tablets. More healthcare workers including data clerks were trained in May 2017 and in June 2017, the facilities started using DHIS2 for reporting of facility monthly data reports (Gadisa & Saito 2018:20).

With the use of DHIS2, facilities monthly data reporting was improved in terms of completeness and timeliness. The country was then able to use the data compiled. Such data was inclusive of antenatal care, HIV, ART and PMTCT as shown by the national indicator dashboard to assist in monitoring of healthcare services for the managers. The MoH, with the help of ICAP trained more than 210 managers from central to facility levels to use data collected in decision-making. With the use of DHIS2, Lesotho is now able to monitor some healthcare services like test and treat

services for HIV, TB services and outbreaks relatively easily at a national level, district level and facility level. This is unlike before where data collection, reporting and analysis were done on paper (Gadisa & Saito 2018:28).

While some considerable achievement has been made in the Lesotho healthcare system with DHIS2, there are still gaps in its use with regard to data management by the healthcare workers. The gaps are mainly in the area of timeliness, data quality and completeness of facility reports. The gaps identified include inconsistency of DHIS2 data compared to data on paper reports and physical stock compared to data of stock in DHIS2, late reporting and incomplete reports submitted by healthcare workers. These gaps affect good decision-making in healthcare system hence service delivery.

### **1.3 STATEMENT OF THE RESEARCH PROBLEM**

Technology in healthcare system management has been used in Lesotho since 2013 (Hirsch-Moverman, Daftary, Yuongling, Saito, Ntoane, Frederix, Maama & Howard 2017:37). The introduction of DHIS2 technology in 2015 was to assist the healthcare system in the country in efficient data flow, management and for programmatic decision-making (PEPFAR 2019:66). This means effective and efficient use of DHIS2 can result in quality healthcare as it can influence good decision-making by healthcare workers and policy makers. However, where DHIS2 is not effectively used, quality healthcare cannot be found. Lack of quality healthcare result in little or no improvement in patient care, leading to poor programmes management and poor decision-making.

The researcher discovered that the facilities experience challenges in healthcare data management in use of DHIS2. This was evidenced by incomplete and late reports, data inconsistency and data not used in decision-making at the facilities. Furthermore, the researcher noted that the healthcare workers are still challenged in use of DHIS2 regardless of trainings offered.

Thus, in order to achieve a level of effective healthcare data management system in Lesotho, data has to be properly collected as per the indicators, validated, analysed and it has to be complete and reported on time using DHIS2. Without good healthcare data management, health system will not reach success that is expected to reach as shown by PEPFAR. PEPFAR (2019:66), shows that, effective implementation of

DHIS2 technology ensures streamlined and efficient data flow, management and use for programmatic decision-making.

DHIS2 offers important information through its functions. It offers functions such as the number of people that are served by the health facility, prevalence of a certain disease in the area and stock balances in the facilities. These are important to assist healthcare workers to come up with strategies, and make decisions on healthcare problems. Healthcare data managed by DHIS2 involves Outpatient, ART, HIV testing services and maternal health data. However, the focus of this study will be on ART data.

With effective use, DHIS2 was seen to have huge impact in assisting healthcare systems to achieve success in provision of care. With ineffective use of DHIS2, success in provision of care will not be achieved. Ineffective use observed in some health facilities in Lesotho involves inconsistency in data reports and no analysis of data at facility level.

PEPFAR (2019:66) reported that the use of the technological application related to healthcare, specifically DHIS2 in Lesotho is not effective, as healthcare workers are challenged by using it despite several measures taken to assist them to use the tool effectively like refresher trainings and supportive supervision (Gadisa & Saito 2018:44).

Poor healthcare data management in use of DHIS2 has led the researcher to investigate the utilization of DHIS2 by healthcare workers in Lesotho. The results of this study will help the Minister of Health to understand the way healthcare workers perceive and use DHIS2, and what can be done to make it more effective. This will assist in planning, improving and implementing data management using DHIS2 to strengthen HMIS.

#### **1.4 RESEARCH PURPOSE**

The purpose of the study was to investigate the utilization of District Health Information System 2 (DHIS2) by healthcare workers in Lesotho.

### **1.4.1 Research objectives**

The objectives of this study were:

- To assess the extent of utilization of DHIS2 by healthcare workers' in the healthcare facility.
- To identify the challenges encountered by healthcare workers in using DHIS2 in the facility.
- To determine the support needed by healthcare workers for effective use of DHIS2 in the healthcare facility.

### **1.4.2 Research questions**

The research questions were as follows:

- To what extent do healthcare workers use DHIS2 in the healthcare facility?
- What are the challenges encountered by healthcare workers in using DHIS2 in the facility?
- What support do healthcare workers need for effective use of DHIS2 in the healthcare facility?

## **1.5 SIGNIFICANCE OF THE STUDY**

This study will provide information and recommendations, which will enable the Minister of Health to understand the way healthcare workers, perceive and use DHIS2. The provided information and recommendations will help in the planning, improvement and implementation of data management system, using DHIS2 to strengthen health management information system in Lesotho. Furthermore, this study will provide baseline information for future research on data management using DHIS2

## **1.6 DEFINITIONS OF KEY CONCEPTS**

### **1.6.1 Conceptual definitions**

#### **1.6.1.1 Antiretroviral treatment (ART)**

Antiretroviral treatment (ART) refers to treatment that uses a combination of three or more drugs to treat HIV infection (National Cancer Institute 2021:1).

### **1.6.1.2 Challenge**

Challenge refers to factors that hinder or object the proper functioning of a tool, process or system. It demands more effort to overcome those factors (Collins English Dictionary 2018: loc76597).

### **1.6.1.3 Data Clerks**

Data clerk refers to the person who records data and put it into the system. The data clerk also assists in its management and analysis (Husted 2020:1).

### **1.6.1.4 District Health Information System version 2 (DHIS2)**

District Health Information System version 2 refers to a technological application used to collect, validate, analyse and present aggregate and patient-based data related to integrated health information management activities (DHIS2 user manual 2016:1).

### **1.6.1.5 Healthcare workers**

Healthcare workers are people who provide care and services to those who are sick. This can be directly as nurses or doctors or indirectly as aides, data clerks or laboratory technicians (Joseph & Joseph 2016:71).

### **1.6.1.6 Monitoring and Evaluation officer**

Monitoring and Evaluation officer is a person who analyses information about a project or programme and assesses ongoing performance of the project through data (School of Geography & the Environment 2014:5).

### **1.6.1.7 Nursing Assistant**

Lesotho Nursing Council scope of practice and framework of competencies (2014:6) define nursing assistant as a “Healthcare provider who is listed by the regulatory authority to provide services under the supervision (direct or indirect) of a registered nurse or midwife within the limits of a defined scope of practice authorized by the regulatory authority”

### **1.6.1.8 Policymakers**

Policymakers refer to people who come up with plans of action that are used by the country to assist in decision-making (Collins English Dictionary 2018: loc 351290).

### **1.6.1.9 Registered nurse**

Lesotho Nursing Council scope of practice and framework of competencies (2014:4), define registered nurse as a “Licensed self-regulated health care professional who works autonomously and in collaboration with others in the generalist scope practice with capacity and authority to practice in primary, secondary, and tertiary health care in all settings and branches of nursing, and has the capability and legal responsibility to supervise and direct nursing assistants and auxiliaries”

### **1.6.1.10 Utilization**

Utilization refers to the act of using something in an effective manner (Collins English Dictionary 2018: loc500741).

## **1.6.2 Operational definitions**

### **1.6.2.1 Antiretroviral treatment (ART) data**

In this study, antiretroviral treatment (ART) data will refer to data collected using DHIS2 that is related to care and treatment of people living with HIV.

### **1.6.2.2 Challenge**

In this study, challenge will refer to factors that will be identified by the healthcare workers to be hindering them from using DHIS2 in managing their ART data effectively.

### **1.6.2.3 Data clerks**

In this study, data clerk will be referred to as healthcare professionals who work together with the registered nurse and nursing assistant to collect ART data as per the indicators, validate it, check its completeness and timeliness and further analyse it using DHIS2.

#### **1.6.2.4 District Health Information System version 2**

In this study district health information system version 2 will refer to a platform accessed by the healthcare professionals using tablets or computers. This platform assists healthcare professionals to collect ART data, validate it, and analyse it to make informed decisions on service delivery.

#### **1.6.2.5 Healthcare workers**

In this study, healthcare workers will refer to data clerks, registered nurses and nursing assistants who offer health care services directly or indirectly to clients, and use DHIS2 to manage health care data in the specific healthcare facilities.

#### **1.6.2.6 Monitoring and Evaluation officer**

In this study, monitoring and evaluation (M & E) officer will refer to the personnel based at DHMT and MoH headquarters. M & E officer supports non-governmental organization that receives collected data from the hospitals and further assesses its quality and analyses it at district and country levels to inform decision- making in the health system.

#### **1.6.2.7 Nursing Assistant**

In this study, nursing assistant will refer to healthcare professionals found in hospital departments who assist the registered nurses in provision of nursing care, and they work together with the registered nurses to record data in the registers as per the indicators still under supervision by registered nurses.

#### **1.6.2.8 Policymakers**

In this study, policymakers will refer to higher-level management staff in the health care system who receives DHIS2 analysed data from the M & E officers at headquarters with recommendations. They use that data to inform their decision in development of plans of actions in the health care system.

#### **1.6.2.9 Registered nurses**

In this study, registered nurses will refer to healthcare professionals who provide nursing care, and supervise the nursing assistants in provision of care to the clients.

They receive information from patients, and record it in the registers as per the indicators. The data will be captured using DHIS2. They provide primary, secondary and tertiary health care to the clients, and use analysed data using DHIS2 to inform their decisions in their nursing care plans.

#### **1.6.2.10 Utilization**

In this study, utilization will refer to the process of collecting, validating, analysing and reporting data using DHIS2.

### **1.7 RESEARCH SETTING**

Research setting is the location at which the study is conducted (Grove & Gray 2019:59). The study was conducted in three specific healthcare facilities in Lesotho. (refer to annexure 11). For the purpose of this study, those specific healthcare facilities were named as healthcare facility one, two and three for the purpose of ethical considerations.

### **1.8 RESEARCH DESIGN**

According to Fain (2017:155), a research design is a structured approach used by the researcher to get answers to the research questions. It is also referred to as a framework or general guide regarding the structure of the study to answer research questions (Brown 2018:381). A quantitative, descriptive and cross-sectional design was used to investigate the utilization of DHIS2 by healthcare workers in Lesotho. Details on the research design will be provided and discussed in chapter 3 (Research design and methods).

### **1.9 RESEARCH METHODS**

Research methods are defined as techniques researcher use to structure a study and to gather and analyse information relevant to the research question (Polit & Beck 2017:33). In this chapter population, sampling methods and sample, data collection, data analysis, validity and reliability and ethical considerations will be briefly discussed however, more details on the research methods will be provided and discussed in chapter 3 (Research design and methods).



### **1.9.1 Population**

Population is the entire set of elements that meet specified criteria from which the researcher wants to gather information from (Boswell and Cannon 2020:224). The population of this study consisted of nurses (registered nurses and nursing assistants) and data clerks. The total population was 291 healthcare workers from three specific healthcare facilities (213 registered nurses, 65 nursing assistant and 13 data clerks). The number of the population was obtained from the staff records in specific healthcare facilities.

### **1.9.2 Sampling methods, sample and sample size**

Grove and Gray (2019:59) define sampling as the process of selecting respondents from the population of interest while sample is the subset of the population selected to represent the population (Grove & Gray 2019:293). Probability stratified random sampling technique was used to select the sample from the population. According to Saunders, Lewis and Thornhill (2019:311), probability stratified random sampling is a type of sampling where the target population is divided into groups called strata to enhance representativeness from each group of the population, then from the groups a random sample is selected. The specific healthcare facilities were selected purposively. From each specific healthcare facility, there were 3 strata, namely registered nurses, nursing assistants and data clerks. According to De Vos, Strydom, Fouche and Delport (2011:249), the guideline for sampling show that the percentage sample that should be drawn from population of 200 is 32%. With the assistance of the statistician calculation of sampling for the whole population was  $290 \times 32\% = 93$ . The statistician further assisted in analysis of data.

### **1.9.3 Data collection**

Data collection is the process of gathering the required information from the respondents to measure specific variables that are relevant to the study (Boswell & Cannon 2020: 206). Data was collected at different times at each specific healthcare facility, starting with specific healthcare facility one, two and three. During data collection, the researcher adhered to COVID-19 guidelines by sanitizing of hands, wearing of mask and maintaining 1.5m social distancing. The researcher met with

specific healthcare facility manager to discuss how data will be collected, and to request contacts details of departments that are targeted in order to set appointments.

After receiving contact details of the departments, an appointment was set telephonically with the head of the targeted departments. A request of permission to access their departments in order to meet the respondents in preparation for data collection was also made. After receiving permission to access the departments, the researcher met the respondents with the purpose of making appointments with them.

Introduction of the study and how data will be collected was also discussed with the respondents. Introduction of the study was done at different departments by the researcher to the respondents. Social distancing was maintained, and masks were worn. Those respondents were the registered nurses, nursing assistants and data clerks. The researcher hand sanitized at the entrance of the department. The respondents also sanitised their hands upon entering the departments.

On the set date of data collection, the researcher distributed the informed consent (refer to annexure 3) and the questionnaire (refer to annexure 2). Distribution took place at the entrance of the department where the box was placed, and they were placed in it. The researcher and the respondents were wearing mask and social distancing of 1.5m was maintained.

Participation in this study was voluntary, and the researcher assured the respondents that they can withdraw from the study even if they have signed the informed consent without any penalty. Measures of privacy, anonymity, confidentiality and adherence to COVID-19 guidelines were maintained. The respondents were not required to write the name on the instrument; only a unique code which does not link to the respondent was used to ensure anonymity. At the department, a private space was requested from the manager. This is the space respondents used to answer the questions. In order to maintain confidentiality, the researcher and the statistician both signed a confidentiality agreement form (refer to annexure 4 (researcher) and annexure 4.1 (statistician)). These documents were shown to the respondents during the introduction.

It took the respondents 30-40 minutes to complete the questionnaires. The completed informed consent and questionnaires were then dropped in the box placed at the entrance of the department. The questionnaires distributed were 93, and 92

questionnaires were collected, 1 respondent declined participation. From the 92 questionnaires; 3 were incomplete, and they were not considered for the study. The total of 89 questionnaires was considered for data analysis. The researcher then entered the collected data in the data entry tool, which was protected by password. The researcher also locked the informed consent and data on hard copy in the cabinet accessed by researcher and statistician. A detailed data collection was discussed in chapter 3.

#### **1.9.4 Data analysis**

Data analysis is the process of using statistical tools to create meaning from the data collected (Grove & Gray 2019:71). With the assistance of the statistician who signed the confidentiality agreement form (Annexure 4.1), the collected data was analysed using Statistical Package for the Social Science (SPSS) version 26.0 of 2019. To create meaning from data collected in this study, tables and bar charts were used to present analysed data. Descriptive and inferential statistics were used to summarize raw data in an understandable and meaningful way. This was done in order to describe the study variables and draw conclusions. For the open-ended questions the researcher used content analysis approach to analyse the questions. The variables consist of independent and dependent variables. The independent variables include age, healthcare worker`s category, gender, and years of experience. The dependent variables include use of DHIS2 by healthcare workers, use of DHIS2 at workplace, and frequency of use of DHIS2 at workplace in a month. Chi-square test was also used to assess relationship between variables.

### **1.10 VALIDITY AND RELIABILITY OF THE RESEARCH INSTRUMENT**

#### **1.10.1 Validity**

Validity is the degree at which an instrument measures what it was intended to measure (Saunders et al 2019: 214). The three major components of validity are content, face, criterion and construct validity (Saunders et al 2019: 214). Therefore, measures of validity which was discussed in detail in chapter 3 are face, criterion, construct, content, internal and external validity.

### **1.10.2 Reliability**

Reliability refers to the consistency with which an instrument or test measures whatever it is supposed to measure (Fain 2017:245). To ensure reliability, the researcher pre-tested the questionnaire with 2 registered nurses, 2 nursing assistants and 1 data clerk. The respondents completed the questionnaire to measure the accuracy and consistency of the questionnaire. After testing, the questionnaire was checked for unclear questions, and those questions were resolved to avoid misinterpretation in the main study. The statistician and the supervisor assisted in compilation of the questionnaire for consistency, stability and equivalence. Cronbach's Alpha was considered by the statistician to check the reliability of an instrument.

### **1.11 ETHICAL CONSIDERATIONS**

Ethics is a system of moral values that are concerned with the extent to which research procedures comply with professional, legal, and social obligations to study participants (Polit & Beck 2017:1017). The ethical considerations pertaining to this study include research specific ethical considerations which addressed Ethical clearance, permissions and approvals to conduct the study from the healthcare facilities and respondent specific ethical considerations which covered, informed consent, avoidance of harm, deception of the respondents, anonymity, privacy, confidentiality and compensation. The researcher also adhered to COVID-19 guidelines of the country. Measures of ethical considerations will be discussed in Chapter 3 being methodology chapter.

### **1.12 SCOPE AND LIMITATIONS OF THE STUDY**

This study was conducted at three healthcare facilities out of 18 district hospitals. The results could, therefore, not be generalized to the whole population of nurses and data clerks in other districts hospitals. The study includes only nurses and data clerks while there are other healthcare workers who use DHIS2.

## 1.13 STRUCTURE OF THE DISSERTATION

Below is the structure of the research which consists of five chapters:

**Table 1.1: Structure of the dissertation**

Chapters	Chapter name	Description of the chapters
1	Orientation to the study	Introduction presents the background to research problem, statement of the problem, purpose of the study, objectives, key concepts, significance of the study, scope and limitation of study, structure of the dissertation and conclusion.
2	Literature Review	Relevant empirical studies, reports and commissions are discussed in relation to study objectives.
3	Research design and methods	Discusses the research design and methods. These include: research setting, research design (quantitative and descriptive design), research methods (population, sampling techniques and sample size, sampling frames, inclusion and exclusion criteria, development and pre-testing of the measurement instrument), data collection, data analysis, validity and reliability of the study, ethical considerations (researcher-specific ethical considerations, respondents-specific ethical considerations)
4	Data analysis, presentation and interpretation of the results	This chapter presents the results of the study and its interpretation.
5	Discussion, Conclusion, and recommendations	This chapter presents the discussion, conclusion and recommendations from the study.

## 1.14 CONCLUSION

This chapter presented the background information, problem statement, purpose, key terms, study design, data collection and data analysis and ethical considerations. The following chapter 2 will discuss literature review.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

The previous chapter (chapter 1) introduced the study. This chapter discussed the literature review on utilization of DHIS2 by healthcare workers internationally, regionally and nationally (Lesotho). According to Grove and Gray (2019:199), literature review refers to current knowledge and what is not known about a topic. In this study, both primary and secondary sources were used to review the literature. The sources include; books, journals, articles, internet web pages, meeting reports, thesis and conferences proceedings.

The following topics were discussed in this chapter;

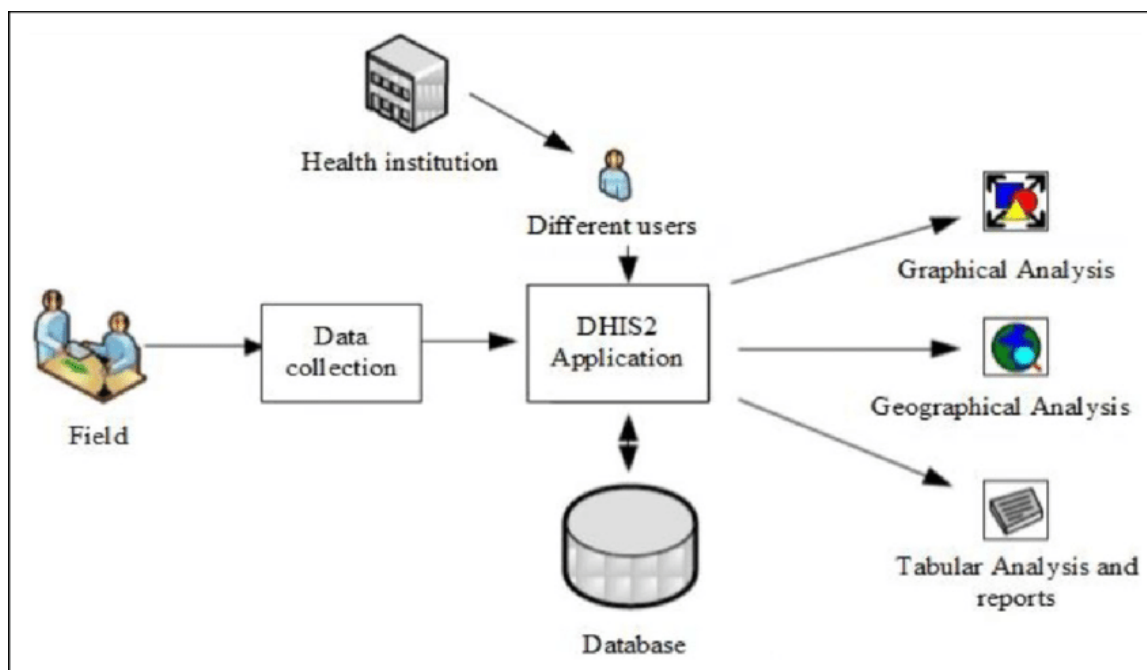
- Overview of DHIS
- Benefits of the utilization of DHIS2
- Challenges encountered by healthcare practitioners in use of DHIS2
- Utilization of DHIS2 by healthcare workers in international countries, Africa and Southern African Development Communities (SADC)
- Requirements of healthcare workers for effective use of DHIS2
- Future use of DHIS2

#### **2.2 OVERVIEW OF DHIS**

In the year 1994, a team of experts from the University of Cape Town and the University of Oslo came together to come up with a Health Information Systems Programme (HISP). This programme was designed to assist healthcare workers in poor townships in Cape Town to deliver better health services to the local population (Braa & Sahay 2017: 1). This initiative was first the strategy for the South African government to reform healthcare provision for the communities that suffered under apartheid. The key objective when designing HISP was to come up with a decentralized system of health districts, which later gave birth to the District Health Information Software (DHIS) (Braa & Sahay 2017:1).

Braa and Sahay (2017: 2) explained that DHIS was developed as a tool to integrate and decentralize information to support the districts in managing health information. The first version of DHIS had some limitations. This included extreme fragmentation due to the previous segregated health systems which were divided between racial groups and independent administrations. To address this challenge, the developers came up with design principles to give DHIS a sense of uniformity, and those principles are still in use currently. Those principles include: a flexible metadata structure, a data model, single atomic units, use of indicators and data validation.

Version 1 of DHIS was based on Microsoft office platform. In 2004 a Java based and fully open source DHIS version 2 was developed with a base in the Department of informatics at the University of Oslo (Braa & Sahay 2017:3). This new version incorporates modern technology, can work offline and has an independent web-based platform as well as database. This new version contains different analysis functions and data visualization tools which include geographical information system (GIS) mapping tools. DHIS2 also has a function called tracker. This function is used to collect, store, analyse and aggregate individual patient data. Additionally, this function is essential in surveillance purposes such as contact tracing of patients in situations such as COVID-19 pandemic (Magnuson & Dixon 2020: 476). Figure 2.1 below gives an overview of DHIS2; that is, how it operates from the field until decision- making point.



(Dehnavieh, Haghdoost, Khosravi, Hoseinabadi, Rahim, Poursheikhali, Khajehpour, Khajeh, Mirshekari, Hasani, Radmerikhi, Haghighi, Mehrolhassani, Kazemi & Aghamohamadi 2018: 3).

**Figure 2.1: Overview of DHIS2**

Furthermore, figure 2.1 indicates overview of DHIS2. It shows data collection part of data, which occurs at the field and at the health institutions, and then data is put in the DHIS2 application in the centre where it becomes part of database. From DHIS2 data can be used in different ways through graphical analysis, geographical analysis or tabular analysis and reports.

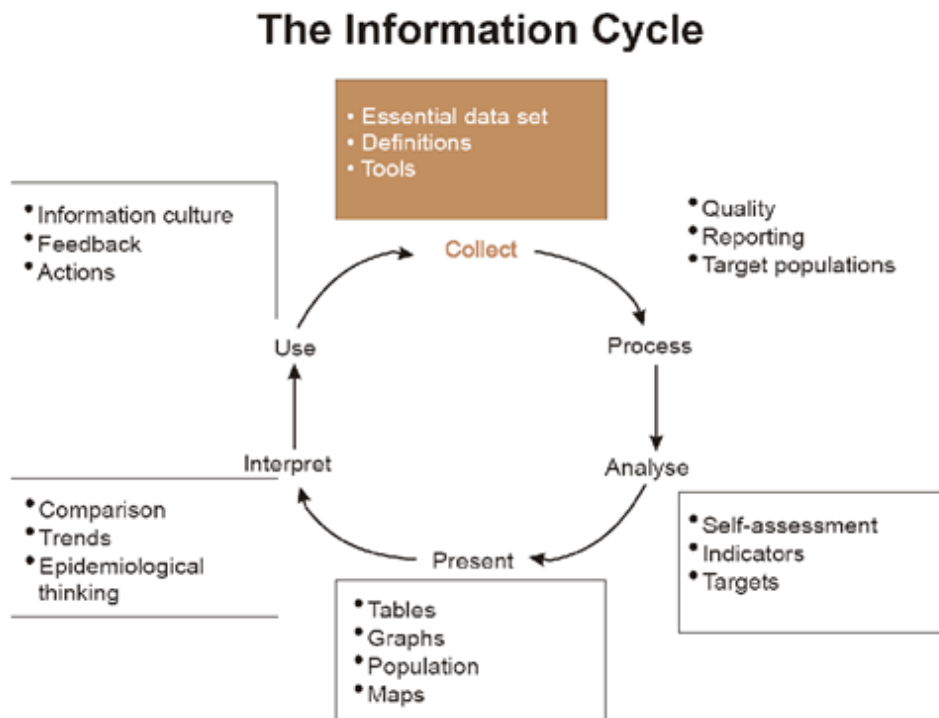
According to Durr, Fahrion, Knopf and Taylor (2017:74), DHIS2 was specifically designed for health surveillance. It has the following functions which enable proper decision-making, data aggregation and disaggregation, individual patient data management, data analysis, data visualization, integral sharing functionality with mass communication and messaging capabilities.

According to Durr et al (2017:74), DHIS2 has been implemented globally and some countries have adopted it as the national health information system. These countries include: Malawi, Kenya, Uganda, Rwanda, Ghana, Liberia and others. This is due to its vital functions which we will be discussed later in this chapter under 2.3 benefits of the utilization of DHIS2.

Figure 2.2 below shows the information cycle of health information system (HIS) that DHIS2 supports. It shows different components, stages and processes through which



data is collected, checked for quality, processed, analysed and used. DHIS2 support the following facets of HIS; collection of data, quality check of collected data, data access at multiple levels, reporting, analysis, comparison across time and display of data in time series (DHIS2 user manual 2016:1).



(DHIS2 user manual 2016:1).

**Figure: 2.2 Information cycle**

### 2.3 BENEFITS OF THE UTILIZATION OF DHIS2

With the introduction of DHIS2, many countries benefitted from the initiative and improvements were seen in different parts of the health sector. The improvements included proper decision - making and better provision of care to the clients. Given several benefits that DHIS2 offers, different countries were seen to be adopting DHIS2 as national healthcare data management system. Other countries implemented it in different departments. The implementation moved towards the whole country rollout and different NGOs were seen to be adopting DHIS2 to manage their programmes data.

Many countries and NGOs have benefited from the DHIS2 functions that allow it to capture all diverse information needs for the health system, provide framework for different systems and share data with the warehouse to generate all necessary outputs for the health system (Sahay, Rashida & Doctor 2019:3). Before DHIS2, effective

management of data was not possible as developed systems were able to capture only specific information related to the programme like electronic medical record (EMR), TB, HIV and Malaria information systems. As a result there was a need for a system that can incorporate all healthcare system components being primary, secondary and tertiary care programmes like DHIS2.

Another benefit of DHIS2 is that it enables users to enter data and to access it online. This improves information quality and utility. That is, costs are saved from transportation of data, and timeliness and completeness of data improved. Online platform also enables effective data usage as data is reflected at all levels as it is entered. It further encourages transparency in data as it enables peers to access data. The online platform encourages data recording personnel to enter accurate data (WHO 2020:5).

DHIS2 is a system which is computerized and can be used on mobile phone. According to Koc, Kilic, Oztas, Ceylan and Silay (2018:66) computerized systems make a remarkable impact in health care by accelerating health care delivery, reduce costs and ensure relevant patient data is available in short time. They further make it easy to interpret many difficult related events in health care in a secure and accurate way.

DHIS2 has assisted different countries to make progress towards attaining SDGs by 2030. According to Sahay et al (2019:2) to attain SDGs by 2030, a robust and well-functioning health information system is necessary. This will assist to achieve universal health coverage. In addition, strong HIMS is accompanied by ability of the country to identify gaps, reduce mortality, improve quality of care, determine the extent of coverage and track progress of programmes. All of these have been seen to be achieved by different countries through the use of DHIS2.

Open health news (2020:1) indicates that, DHIS2 offers various functions which include monitoring of patients, improvement of disease surveillance, mapping of disease outbreaks, accessing of health data by health facilities and governments quickly and easily for better decision-making. Different countries have benefited from these functions.

Countries which have improved their health care system through DHIS2 include Kenya, Zimbabwe, South Africa, Bangladesh, and Zambia. According to WHO (2020:3), DHIS2 managed to improve Kenya HIS data completeness and timeliness from non-functioning system to 80% completeness in 2011 after the roll out.

Karuri, Waiganjo & Orwa (2017:2) further shows that, in Kenya the DHIS2 was used to assist health care workers to analyse their performance in service delivery and understand what is lacking in their programmes. They also used it to assess their performance towards meeting the expected target. This system has been seen to have the potential to transform countries poor health information system to an ideal situation of availability and use of quality health information.

In Zimbabwe through DHIS2 timely reporting, enhanced data quality and completeness were achieved for child health related data. Furthermore, in Zambia DHIS2 assisted malaria control program to improve case detection, diagnostic confirmation and reduction of unconfirmed malaria cases (Durr et al 2017:74).

According to Nielsen and Kimaro (2019:74), in South Africa, DHIS2 was used to establish regional implementation organization like HISP. DHIS2 platform has been used to empower local level management by providing them access to their data and its use. Furthermore, the system has been used to support provinces and nations with data management. The ability of DHIS2 to support different levels of service delivery and users has been reported to be the reason for the successful use in South Africa (Braa & Sahay 2017:2).

DHIS2 has different functions within it. These include: dashboards, messaging, data entry, event capture, tracker capture, analysis, data visualizer, GIS, maps, events reports and data quality functions (DHIS2 user manual 2016:1). DHIS2 dashboard has made DHIS2 more user friendly to the local level planning in Bangladesh. Dashboard is a graphical presentation found in DHIS2 under different functions. It has assisted the managers in Bangladesh to identify the essentials to overcome health service challenges (Begum, Khan, Adamou, Ferdous, Pravez, Islam, Kumkum, Rahman & Anwar 2020:10).

According to WHO (2020:1), DHIS2 has been used in more than 301 developing countries where it assisted them in sustaining health information systems. Some of

the countries are discussed in item 5.1. It ensures proper information flow from communities, health facilities, districts, and provinces. This technological application can be accessed through laptops, tablets and mobile phones hence its user friendly.

## **2.4 CHALLENGES ENCOUNTERED BY HEALTHCARE WORKERS IN USE OF DHIS2**

Despite the benefits of DHIS2, there are still some challenges that hinder its full potential to achieve goal 3 of Sustainable Development Goals (good health and well-being). The common challenges for most countries are internet connectivity, infrastructure, acceptability by healthcare workers, lack of policies that govern ICTs, lack of skilled human resource, inadequate use of the system and poor feedback mechanism (Dehnavieh et al 2018:9).

DHIS2 cannot operate on its own. It needs health care workers to run it. Hence it is a challenge to implement it without enough capacitated human resource. This is the case in many developing countries. It has been shown that the implementation of DHIS2 in West African countries will be challenged by lack of human capacity as defined by Economic community of the west African states (ECOWAS) policy document (WHO 2020:6).

According to WHO (2020:7), for the implementation of DHIS2 to be successful; there is a need for policy frameworks. The following areas where policies are needed seem to be lacking in most African countries. These policies include HIS harmonization policy, data access issues policy, IT acquisition and open source policy, data ownership and security in networked society policy.

Karuri et al (2017:2) explained that in most developing countries, the main challenge in the implementation of DHIS2 as part of ICT in health is infrastructure. Successful implementation of DHIS2 depends on ICT hence inappropriate infrastructure to accommodate ICT pose a challenge to successful implementation of DHIS2. This challenge is prevalent in most developing countries.

Karuri et al (2017:16) further shows that factors that affect the acceptance and use of DHIS2 differ across different healthcare workers' categories. That is, the challenges faced by data clerks are different from the ones experienced by the nurses. Social

influence among healthcare workers also contributes to poor acceptance and use of DHIS2. Computer or smart technology anxiety in developing countries is another challenge. This is due to the fact that most of the health system is not computerized (Karuri et al 2017:17).

From the review of DHIS2 use done by three millennium development goal fund, it was found that healthcare workers do not use dashboards function in DHIS2 and also analysis with pivot tables function have not been used adequately by healthcare workers (Three millennium development goal fund 2016:7). Therefore, this inadequate use of the system poses a challenge when the user has to analyse and make a decision for better health provision.

According to Sujatmiko (2015:1), for a successful use of DHIS2, facilities need to receive information on their performance compared to targets set. This information should be known by all healthcare workers so that they have direction on where they are towards target. Unfortunately, this does not occur. This is due to long turnaround time to send paper-based feedback to facilities due to transportation. Due to electricity power cuts, it is not easy to send feedback to facilities through emails. Work overload, limited resources and time do not allow face - to -face feedback mechanism (Sujatmiko 2015:1).

According to Begum et al (2020:2), effective use of DHIS2 in Bangladesh could not be achieved due to health care personnel lacking accountability, shortage of human resource for data collection and analysis, low internet connectivity, frequent power cuts and poor culture of not using data for decision- making. DHIS2 data was also partially used by the health ministry and other ministries.

In a study that was conducted in Kenya on the assessment of data use of the district health information system, lack of training in DHIS2, inadequate computers, poor internet connectivity, change of tools without consultation of health workers, lack of skills in data analysis, system not always operational and lack of electricity were identified to be challenges hindering successful use of DHIS2 (Gathua 2016:35).

WHO report shows that 52% of the barriers to proper use of mHealth technologies which involve DHIS2 were competing priorities. Lack of knowledge, unsupportive policy and unclear cost effectiveness form part of the second barriers. Infrastructure

was reported to be the least of the barriers taking up just 26%. Finally, the barriers with smallest percentage are lack of technical expertise and lack of mHealth solution demand (Sujatmiko 2015:10).

## **2.5 UTILIZATION OF DHIS2 BY HEALTHCARE WORKERS IN WORLD (COUNTRIES OUTSIDE AFRICA, AFRICA AND SOUTHERN AFRICAN DEVELOPMENT COMMUNITIES (SADC))**

### **2.5.1 Countries outside Africa**

Due to vital functions of DHIS2, it did not only stop in Africa, even some international countries outside Africa have adopted it as their national HIS platform. Implementation of DHIS2 has been done at different stages in countries internationally. There are countries that have completed national implementation, and those on pilot stages (Garg & Garg 2015:41). Table 2.1 below list examples of those countries at different stages. The discussion on this part will look at utilization of DHIS2 in some countries outside Africa.

**Table 2.1: List of countries using DHIS2 (Dhis2 community 2018).**

<b>DHIS2 Implementation Globally</b>	<b>List of Countries</b>
Completed Nation Implementation	Afghanistan, Bukina Faso, Democratic Republic of Congo, Ivory Coast, Algeria, Gambia, Guinea, Guinea Bissau, Haiti, Lebanon, Liberia, Lesotho, Madagascar, Mozambique, Niger, Nepal, Solomon Islands, Senegal, Somalia, Somalialand, Tajikistan, Zanzibar, Zambia, Zimbabwe, South Africa, Bangladesh, Benin, Botswana, Cameroon, Cameroon, Eritrea, Ghana, Kenya, Laos, Sri Lanka, Mali, Myanmar, Malawi, Namibia, Ningeria, Palestine, Rwanda, Sudan, Sierra Leon, Tanzania, Some states of India
Pilot stage	Angola, Burundi, Colombia, Djibouti, Ethiopia, Grenada, Honduras, Indonesia, Irag, Cambodia, Comoros, Libya, Mogolia, Mauritania, Madives, Pakistan, South Sudan, Togo, Eastimor, Vietnam, Some states of India

DHIS2 has been implemented in many countries, and it has managed to move countries from poor HIS to better HIS both internationally and in African countries. There are many international countries where DHIS2 has been implemented, but the discussion will focus on the five countries where most impact was seen. Those countries are India, Afghanistan, Indonesia, Bangladesh, and Sri-Lanka.

### **2.5.1.1 India**

In India more than 20 states have adopted DHIS2. In India DHIS2 starts at village level where data is collected by Auxiliary nurse midwife through door-to-door visits. DHIS2 goes further to link health information data for all facilities at different level of health service provision in India. That is from villages, clinics, hospitals, speciality hospitals and private hospitals. DHIS2 in India has been implemented in two phases; phase 1 was about data collection, validation and reporting. Phase 2 is about decision- making and development of strategies and higher level of policy makers (Garg & Garg 2015:40).

### **2.5.1.2 Afghanistan**

According to Dhis2.org ([s.a.]), since 2016 Afghanistan has been using DHIS2 as a platform that create a unified data warehouse. From pilot stage DHIS2 was used to bring together data from different sources. DHIS-2 was used to compare data from one source to the other to make improved decisions. Data from human resource was compared to immunization data, and low-level health facility out-performed large health facilities in vaccination rates. Further analysis using DHIS2 showed that centres with female vaccinator performed best in vaccination rate. In Afghanistan, DHIS2 was used to make health information data available to all stakeholders using data visualization function on DHIS2 (WHO 2020:13).

Furthermore, DHIS2 was used to create dashboard for the ministry of public health in Afghanistan. Additionally, DHIS2 has been built into the management of national health system of Afghanistan. This was done to regulate payment of healthcare providers using their performance based on 11 performance indicators. All NGOs in Afghanistan are required to use DHIS2 to collect their data to empower HIS for better decision-making. Due to the vital functions of DHIS2 there is an interest to even expand DHIS2 beyond ministry of health to other ministries in Afghanistan (Dhis2.org [s.a.]).

### **2.5.1.3 Indonesia**

Indonesia too was not left behind to improve their HIS using DHIS2. In Indonesia DHIS2 android capture application was used to collect health data from community level to fight childhood stunting. With the assistance of DHIS2, National Nutrition

Communication Campaign was able to build a monitoring and evaluation component for their programme (Dhis2.org [s.a.]).

#### **2.5.1.4 Bangladesh**

One of the countries in Asia that have contributed a significant impact on global DHIS2 implementation strategy is Bangladesh. About 75% of public health facilities in Bangladesh are using DHIS2. Bangladesh started using DHIS2 in 2009. In Bangladesh, DHIS2 is used to collect data on logistics, procurement, human resource and health indicators focusing on maternal and child health (Begum et al 2020:2). DHIS2 is also used to manage TB case reporting for the TB case management program in Bangladesh (Management Sciences for Health 2021:1).

#### **2.5.1.5 Sri Lanka**

According to Dhis2.org ([s.a.]), Sri Lanka was the first country to utilize DHIS2 for COVID-19 surveillance using assistance from HISP. The country used DHIS2 tracker function to create DHIS2 tracker specifically designed for COVID-19 surveillance. This was two days after the first case of COVID-19 was recorded. This assisted the country to fight the battle against COVID-19.

### **2.5.2 Africa and Southern African Development Communities**

As mentioned, DHIS2 first started in Africa. From success seen in South Africa; many African countries including SADC started using the initiative. Gyamfi, Nielsen and Saebo (2019:73) explained that ministries of health and NGOs in more than 100 developing countries use DHIS2 to manage their data. Most of the developing countries including African countries and some of the NGOs found in African countries use DHIS2. The NGOs are President's Emergency Plan for AIDS Relief (PEPFAR), Medicines Sans Frontières (MSF), Population service International (PSI) and International Planned Parenthood Federation (IPPF) which address HIV pandemic.

Utilization of DHIS2 in Africa and SADC will be discussed below. The following countries in Africa and SADC were seen to have more improvements in healthcare system through DHIS2 utilization: Uganda, Kenya, Zimbabwe, Malawi, South Africa and Lesotho.



### **2.5.2.1 Uganda**

DHIS2 was used to improve maternal and child healthcare in Uganda. DHIS2 system was used in maternal healthcare to track women under antenatal care, delivery and postnatal care to strengthen retention in to care. DHIS2 was used to capture data through mobile phones and a function of SMS in DHIS2 was used to remind women about their appointments hence this helped to retain them in care (WHO 2020:4).

### **2.5.2.2 Malawi**

DHIS2 was introduced in Malawi in 2012. Two functions in DHIS2 which are DHIS2 mobile and DHIS2 GIS have been seen to be very useful in Malawi in enhancing health management information system. DHIS2 mobile was used to improve data collection and reporting timelines. DHIS2 GIS was used to enhance data analysis, integration and presentation in Malawi (Chikumba 2017:162). In Malawi, DHIS2 was also seen to be vital in analysis and planning for programmes. This was seen through use of DHIS2 by malaria coordinators who used DHIS2 data for planning in their programmes (WHO 2020:3).

### **2.5.2.3 Kenya**

In Nairobi Kenya it was reported that the health planning Department used DHIS2 to improve their programmes on policies, medium term expenditure framework and monitoring and evaluation strategies. DHIS2 was also used in this particular country to manage human resource, capacity building and management of medical supplies. Additionally it was used in advocacy activities to increase stakeholder`s participation and to improve health indicators and in discussing health issues to arrive at informed decision (Gathua 2016:37).

Furthermore, in Kenya, DHIS2 data has been used to account for the resources. Development partners and Departments in health applied DHIS2 to account for money used for maternity services, and funds received for acquisition of drugs. With the assistance of DHIS2, data has been shared between the Government and the development partners in health services such as USAID, UKAID, AMREF, UNICEF and WHO to improve the performance of the country in delivering health services (Gathua 2016: 38).

#### **2.5.2.4 Zimbabwe**

In Zimbabwe, DHIS2 together with mHealth solutions were used in prevention from Mother to Child Transmission (PMTCT) program to report on HIV results for pregnant women. This is where DHIS2 was observed to be supporting integration of different information system as mentioned earlier. In Zimbabwe, it was used to integrate TB and village health workers information systems (Ortuno & Rojas 2015:59).

#### **2.5.2.5 South Africa**

DHIS2 started in South Africa in 1994. It was first piloted in few Districts, it moved to two provinces. Its success led to country rollout in 2000. Since 2000, DHIS2 has been national health information management tool in South Africa. DHIS2 successfully supported different levels and types of users by providing them with easy access to health data and analytical tools. It further supported provinces with data requirements (Braa & Sahay 2017:3). Through DHIS2, South African facility-based information system is seen as the global best practice. Different countries started using DHIS2 after its success in South Africa.

#### **2.5.2.6 Lesotho**

Lesotho started using DHIS in 2005 using HIV, TB, PMTCT and IDR data. The country later changed to DHIS2 toward end of 2015 as a District level reporting tool. In 2017, the country started using DHIS2 at facility level. Since the use of DHIS2 in Lesotho; there has been a noted improvement in reporting rate and completeness of reports from facilities (Gadisa & Saito 2018:20). However, Lesotho specifically, some health centres there are challenges of late reporting, inconsistency in data reports and DHIS2 reports, and data analysis function not effectively used.

### **2.6 REQUIREMENTS OF HEALTHCARE WORKERS FOR EFFECTIVE USE OF DHIS2**

DHIS2 cannot operate on its own. It needs healthcare workers for it to be a success. Without the input of healthcare workers on what they want for it to be effective, it would not work. Therefore, there is a need to explore their requirements for effective use.

According to WHO (2020:7), for a successful implementation of DHIS2 in most African countries; the need for policy frameworks is critical. Policy frameworks such as HMIS harmonization, data access issues, IT acquisition and open source, data ownership and security in networked society are needed. From the review on DHIS2 use done by three millennium development goal fund, it was found that dashboards are not used and analysis with pivot tables not adequately used by healthcare workers (Three millennium development goal fund 2016:7). Therefore, there is a need to use dashboards and pivot tables to analyse data to improve effectiveness of DHIS2

WHO (2020:6) explained that, it is important to build local expertise on HIS by introducing HIS programmes in universities. Universities will help healthcare workers with skills to analyse data, use data and harmonize data. Another important requirement for effective use of DHIS2 is collaboration of countries to exchange skills and knowledge through circulation of practitioners between implementing countries. This was seen to be very helpful in Uganda. A project manager from Kenya who had expertise in using DHIS2 exchanged skill by training trainers in Uganda to transfer skills to other healthcare workers (WHO 2020:6).

Regional approach is important to overcome challenges in use of DHIS2. This is a situation where countries which are similar geographically and institutionally share and learn each other`s approaches, methods, experiences, products and resources. This strategy helps to empower countries, and to avoid making same mistakes. This was seen to be effective in strengthening HIS; as it worked for 22 countries of the WHO Eastern Mediterranean region (Sahay et al 2019:2).

In a study that was conducted among Canadian health workers on experience time pressure and stress electronic health records (EHR) usability and information technology, it was seen that the acceptability of nurses was low while the one for physicians was higher. EHR proved not to be compatible with nurse`s preferred working style, existing practices and values. Therefore, this shows that the system should be developed in line with the user to avoid compatibility issues. (Vehko, Hypponen, Puttonen, Kujala, Ketola, Tuukkanen, Aalto & Heponiemi 2019:2). Karuri et al (2017:4) explained that, WHO and other stakeholders recommend that countries should undertake studies to assess use of HIS systems and its acceptance.

Three millennium development goal fund (2016:3) shows that basic skills in computer and willingness to learn about technology are necessary for successful implementation of DHIS-2. Therefore, healthcare workers with basic skills in computer and willing to develop them should be nominated as focal person for DHIS2. In the early stages of implementation of DHIS2, implementing partners play important roles. It is essential to have them. It should be understood that the implementing partner's role is to support while the role of the health care workers is to be hands on.

Gathua (2016:10) recommends that training for health workers on DHIS2 should be intensified so as to assist them to use DHIS2 for decision-making. He further recommends that more health workers should be given the right to access data. Infrastructure is also important to provide a friendly environment for the success of DHIS2. Moreover, internet and electricity availability are very important to ensure accurate and complete data capturing. As shown that workload is a challenge it is also important to increase human resource (Gathua 2016:36).

From the case study that was done at Gombe State Nigeria on quality of routine facility data for monitoring priority maternal and new-born indicators in DHIS2, it was discovered that, for effective use of DHIS2; there is a need for coordinated action from different levels so as to maximize reporting of data, rationalizing data flow, reviewing data quality, supervisions and feedback. This should occur at all levels from facility level to District level and national level (Bhattacharya, Umar, Audu, Felix, Allen, Schellenberg & Marchant 2019:2).

Mandatory data quality checks and monthly coordination at different levels in health system with participation from all stakeholders have been proven to be essential towards effective use of DHIS2 in Bangladesh. Therefore, it is important for the managers and supervisor to check quality of data and assist health care workers in its implementation. Giving incentives to DHIS2 users have been proven to have impact in its utilization. It brings positive mind set to the user. Another important driver towards effective use of DHIS2 is data ownership. This enables the field level users to understand the purpose of data collection (Begum et al 2020:10). It is important to assist healthcare workers in understanding the importance of data that they are collecting and on how to use it effectively.

## **2.7 FUTURE USE OF DHIS2**

As much as there have been great achievements through DHIS2, there is still a need for improvement of the system to reach full capacity effectiveness. It also needs to be update for it to be aligned with modern technologies. At the 4<sup>th</sup> annual DHIS2 symposium held in 2018, it was mentioned that there is a need for international NGOs to support governments to strengthen HMIS through DHIS2. More effort needs to be applied to integrate and develop DHIS2 in android applications (DHIS 2 symposium 2021:1).

DHIS2 developers have developed DHIS2 COVID-19 toolkits which will help nations with COVID-19 surveillance and national vaccine delivery. This will assist countries to respond effectively and efficiently to COVID-19 pandemic (Dhis2.org [s.a.]).

At the 6<sup>th</sup> DHIS2 symposium held in 2020 on building community innovation to improve impact, it was shown that, it is essential to centre DHIS2 on tools the consumer is already using. Tools such as face book and WhatsApp. This was learned from the current situation of the pandemic; where clients use social media more to access information. As a result, they have learned the importance of digital consumer powered healthcare (DHIS2 Symposium 2021:1).

According to DHIS2 Symposium (2021:1), there will be a new development in DHIS2 which is designed to manage new-born mortality. This function will help the health care providers from low-income countries where there is high infant mortality rate by equipping them with skills to recognize and manage new-born complications.

## **2.8 CONCLUSION**

This chapter reviewed the existing literature on DHIS2. In addition, this chapter discussed how different countries have benefitted from effective utilization of DHIS2. Furthermore, challenges that hinder successful implementation of DHIS2 and utilization of DHIS2 internationally, continentally and within SADC were discussed. Finally this chapter further discussed essentials needed for the healthcare workers to effectively use of DHIS2, and what can be changed or added to DHIS2 and how it can be used in future. The following chapter will discuss research design and methodology.

## **CHAPTER 3**

### **RESEARCH DESIGN AND METHODS**

#### **3.1 INTRODUCTION**

The previous chapter discussed literature review based on the utilization of DHIS2 by healthcare workers, benefits of DHIS2 in healthcare system, challenges encountered by healthcare workers on effective use of DHIS2 and future use of DHIS2. This chapter discussed the design and methodology used to gather data based on the purpose and objectives of the study. The following aspects were addressed: population, sampling and sample, development and pre-testing of an instrument, data collection and analysis, validity, reliability, and ethical considerations.

#### **3.2 RESEARCH SETTING**

Research setting is the location at which the study is conducted (Grove & Gray 2019:59). It is also defined as a place where participants are recruited, and the data are collected (Lobiondo-wood & Haber 2018:108). The study was conducted in three specific healthcare facilities (refer to Annexure 11). In the study they are named healthcare facilities one, two and three respectively for the purpose of the study and for ethical considerations. These facilities were selected because they serve more population, and this is where DHIS2 was first implemented in the country.

#### **3.3 RESEARCH DESIGN**

Research design is a structured design used by the researchers to get answers to the research questions, and it is referred to as the architecture of the study as it shows how to select the sample from the population, collect data and analyse it (Ehrlich & Joubert 2014:78). Sileyew (2019:2) further defines the research design as the framework of the study. A quantitative, descriptive and cross-sectional design was used to conduct this study.

##### **3.3.1 Quantitative design**

Quantitative design is a formal objective systematic process which uses numerical information to describe situations, events, concepts. This kind of design can also be used to examine relationships among variables (Grove & Gray 2019:54). Brown

(2018:21) also shows that, in quantitative design, the researchers assume a basic understanding of phenomena that allows numerical measurement of variables. The researcher used numerical measurements to confirm the level at which phenomena is present, and explore the nature of relationships among situations under various conditions.

The researcher used this design to assess how healthcare workers utilise DHIS2 in data related to Anti-Retroviral Treatment ART in their facilities. The researcher used self-administered questionnaire to collect data and the data was analysed quantitatively to understand utilization of DHIS2 by healthcare workers in Lesotho. Furthermore, the results of this study were presented in a numerical form and objectivity of the data collection.

### **3.3.2 Descriptive design**

Descriptive design is one class of non-experimental design that gather information about a condition, attitudes, or characteristics of individuals or groups to describe the meaning of existing phenomena (Fain 2017:168). Boswell and Cannon (2020:174) further show that; descriptive design examines the characteristics of sample population to develop theory and hypothesis. This design was preferred because it assisted to assess the use of DHIS2 by healthcare workers using ART data in the facilities.

### **3.3.3 Cross-sectional design**

Cross-sectional design is the design that occurs when the researcher collects data at one point in time with no follow-up. That is the researcher measures what exist at that moment (Fain 2017:26). In this study the researcher measured utilization of DHIS2 at one point in time, there was no follow-up made either in the past or in future.

## **3.4 RESEARCH METHODS**

Research methods are practices and techniques a researcher uses to collect, process, and analyse data (Bowling 2014:166). Polit and Beck (2017:33) define it as techniques researchers use to structure a study and to gather and analyse information relevant to the research question. The research methods focused on the population,

sampling, and development of data collection instrument and pre-testing of an instrument, validity, reliability and ethical considerations.

### 3.4.1 Population

Population is the entire set of subjects being a group of people or cases, who are of interest to the researcher. (Houser 2018:229). Brown (2018:64) also defines it as a group of people having the same condition or problem. This group of people or cases should have common characteristics defining them. Population is further categorised into accessible and target population. Accessible population is a group of people or cases that have designated criteria, and are accessible for the study. They form part of the target population. Target population is the entire set of elements that meet specified criteria (Boswell & Cannon 2020:224).

The population of this study were registered nurses, nursing assistants and data clerks of the specific healthcare facilities. Total population from the specific healthcare facilities was 291 comprising of 213 registered nurses, 65 nursing assistants and 13 data clerks. This number of population was obtained from the staff records in specific healthcare facilities. Table 3.1 shows population frame.

**Table 3.1: Population frame**

Specific healthcare facilities	Registered nurses	Nursing Assistant	Data clerks	Total
One	85	25	4	144
Two	50	25	3	78
Three	78	15	6	99
<b>Total</b>	<b>213</b>	<b>65</b>	<b>13</b>	<b>291</b>

### 3.4.2 Sampling technique and sample size

#### 3.4.2.1 Sampling technique

Grove and Gray (2019:59) define sampling as the process of selecting respondents from the population of interest which represent the population. This study used probability stratified random sampling to select the sample from the population. This is a type of sampling where a population is divided into homogeneous groups called strata to enhance representativeness from each group of the population. From the groups, elements are selected at random (Houser 2018: 240). The specific healthcare facilities were selected purposefully. They are the healthcare facilities where DHIS2



was first implemented. From each specific healthcare facility, there were 3 strata; namely registered nurses, nursing assistants and data clerks. Then from each strata all those with access to DHIS2 were selected to participate in the study.

### 3.4.2.2 Sample size

Sample size is the subset of the population selected to represent the population (Nieswiadomy & Bailey 2018:170). According to De Vos, Strydom, Fouche and Delport (2011:249), the guideline for sampling show that, the percentage sample that should be drawn from population of 200 is 32%. The target sample size for this study was 32% of the population of 291 healthcare workers. Therefore, using the guideline, 32% of 291 healthcare workers is 93 respondents. From the population of different cadres of healthcare workers this made (32% of 213) 68 registered nurses, (32% of 66) 21 nursing assistants and (32% of 11) 4 data clerks using DHIS2. The sample consisted of 93 healthcare workers (36 from specific healthcare facility one, 25 from specific healthcare facility two and 32 from specific healthcare facility three). The tables below show sampling for each specific healthcare facility selected using probability stratified random sampling.

**Table: 3.2 Specific healthcare facility one sampling**

<b>Specific healthcare facility one</b>		
<b>Strata</b>	<b>Population</b>	<b>Sample (population x 32%)</b>
Registered nurses	85	(85x32%) 27
Nursing assistants	25	(25x32%) 8
Data clerks	4	(4x32%) 1
<b>Total</b>	<b>114</b>	<b>36</b>

**Table 3.3: Specific healthcare facility two sampling**

<b>Specific healthcare facility two</b>		
<b>Strata</b>	<b>Population</b>	<b>Sample (population x 32%)</b>
Registered nurses	50	(50x32%) 16
Nursing assistants	25	(25x32%) 8
Data clerks	3	(3x32%) 1
<b>Total</b>	<b>78</b>	<b>25</b>

**Table 3.4: Specific healthcare facility three sampling**

<b>Specific healthcare facility three</b>		
<b>Strata</b>	<b>Population</b>	<b>Sample (population x 32%)</b>
Registered nurses	78	(78x32%) 25
Nursing assistants	15	(15x32%) 5
Data clerks	5	(5x32%) 2
<b>Total</b>	<b>98</b>	<b>32</b>

With reference to the indicated tables (3.2, 3.3 and 3.4) the sample of this study was  $36 + 25 + 32 = 93$ .

### **3.4.3 Inclusion and exclusion criteria**

#### **3.4.3.1 Inclusion criteria**

Inclusion criteria are the criterion that clearly defines characteristics of the desired population (Houser 2018: 256). These are characteristics one should have in order to participate to the study.

The inclusion criteria were:

- Respondents between 18 and 55 years old;
- Registered nurses, nurse assistants and data clerks who were trained on the use of DHIS2 and
- Respondents who have credentials to access DHIS2.

#### **3.4.3.2 Exclusion criteria**

Exclusion criteria indicate subjects who are not suitable for the study questions. These are individuals who do not have characteristics of the desired population (Houser 2018: 256).

Exclusion criteria for this study were:

- Other healthcare workers, who are not, registered nurses, nursing assistants and data clerks.
- Registered nurses, nursing assistants and data clerks who have not been trained on the use of DHIS2 and do not have credentials to access DHIS2.

### **3.4.4 Development and pre-testing of the measurement instrument (questionnaire)**

#### **3.4.4.1 Development of data collection instrument (questionnaire)**

An instrument is a tool used to gather information for the study (Nieswiadomy & Bailey 2018:191). In this study, a questionnaire was used as a data collection instrument. A questionnaire is a self-report instrument. It seeks a respondent's response to

questions regarding a particular subject (Nieswiadomy & Bailey 2018:204). According to Lobiondo-wood and Haber (2018: 579), questionnaires are a method of choice because they are less expensive, they offer opportunity for anonymity, and they pose no interviewer bias.

The questionnaire (refer to Annexure 2) was designed to address all the objectives of the study. The instrument was developed with reference to the literature reviewed on utilization of DHIS2 by healthcare workers, challenges healthcare workers encountered when using DHIS2 and recommendations of healthcare workers on the effective use of DHIS2 in the facilities. Furthermore, objectives of the study were considered in the development of the questionnaire (measurement instrument).

The questionnaire was sent to the supervisor, statistician, DHMT M & E officer and DHMT public health nurse to ensure validity and reliability. Cronbach Alpha was established by the statistician to ensure the reliability of an instrument.

In this study a self-administered questionnaire which was pre-tested and approved by the supervisors and statistician was used to collect data from the respondents. The questionnaire used was in a paper form. The questionnaire was written in English. The respondents would read the question and answer on the instrument either by writing or ticking the preferred answer.

It contained different structures of questions. The question structures were inclusive of open-ended, closed-ended and Likert scale. Open-ended questions allow the respondent to respond in their own words (Houser 2018:279). Closed-ended questions offer fixed number of response options to the respondent to choose the most appropriate answer (Houser 2018:280). Likert scale questions consists of different declarative items that express the viewpoint on the topic, they ask the respondent to show the degree to which they agree or disagree with the opinion expressed by the statement (Polit & Beck 2017:398).

The questionnaire was further divided into four sections (refer to annexure 2). Section A consisted of the biographical data of the respondents. These are; age, gender, occupation, and years of experience. It comprised of 4 questions. Section B assessed the extent of use of DHIS2 by healthcare workers in the facility and it comprised of 15 questions. Section C identified challenges encountered by healthcare workers in the

use of DHIS2 in the facility and it comprised of 7 questions. Section D determined the support needed by healthcare workers for effective use of DHIS2 in the facility having 5 questions. Cumulatively, the questionnaire comprised of 31 questions. The questionnaire was designed to take 40 minutes for the respondent to complete it.

#### **3.4.4.2 Pre-testing of the measurement instrument (questionnaire)**

Pre- testing of an instrument is the stage in research where an instrument is tested on part of targeted population to evaluate the reliability and validity of an instrument before its final distribution (Sauders, Lewis & Thornhill 2019:540). Pre-testing was conducted after being granted approvals from the relevant authorities (refer to Ethical considerations in item 3.8). Pre-testing of the questionnaire helped to determine if the respondents understand the questions as well as if they could perform the task or have the information that questions require. Pre-test also provided the most direct evidence for the validity of the questionnaire data for most items.

The researcher contacted the manager of healthcare facility two on the 5<sup>th</sup> May 2021 using a cell phone, and indicated the targeted dates for pre-testing. The targeted dates were 18<sup>th</sup>, 19<sup>th</sup> and 26<sup>th</sup> May 2021. Both the researcher and the manager discussed the availability of the respondents. The researcher explained to the healthcare facility manager that measures of COVID-19 under level 1 will be observed. The manager then set appointment for the researcher to meet with the heads of departments to introduce the study, and explain how pre-testing would be done. On the 10<sup>th</sup> of May 2021, the researcher met with the heads of two departments (ART and maternal and child health (MCH) in a room maintaining social distancing, and all wore masks. Afterwards, the researcher set appointments with heads of departments at healthcare facility two in order to introduce the study to the respondents and for pre-testing.

Pre-testing was conducted on the 18 May 2021 for 1<sup>st</sup> respondent, 19 May 2021 for 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> respondents and 26 May 2021 for the 5<sup>th</sup> respondent at specific healthcare facility two. The five (5) respondents being, 2 registered nurses, 2 nursing assistants and 1 data clerk volunteered to participate in pre-testing, however, the researcher requested them not to take part in the main study to avoid Hawthorne effect.

COVID-19 level 1 guidelines were adhered to. During pre-testing, the researcher wearing a mask, and with sanitized hands, placed the informed consent (refer annexure 3) and the questionnaire (refer annexure 2) at the entrance of the waiting room in the box. The respondents sanitised their hands using a hand sanitizer that was placed next to the box. Upon picking the forms from the box, the researcher requested the respondents to keep 1.5cm social distancing between themselves.

Upon entering the waiting room, the study was introduced to the respondents maintaining social distancing. The respondents were then briefed on how pre-testing will be conducted. The researcher explained to the respondents that their participation in the study is voluntary, and they are free to withdraw from pre-testing even if they have signed the informed consent form. They were further assured that they would not be penalised for withdrawing their participation in the pre-testing. The researcher further explained to the respondents that the information will be shared only with the supervisor, statistician and MoH.

Each respondent was allowed to complete the questionnaire in different consultation rooms of the department. The respondents were not required to write their names on the questionnaire in order to maintain anonymity. Instead, a code was provided which was not linked to their names. The researcher and the statistician signed the confidentiality agreement forms to ensure confidentiality (refer annexure 4 and 4.1) and this was shown and explained to the respondents to reassure them before pre-testing.

Each respondent took 20 to 30 minutes to complete the questionnaire. When the respondents had completed the questionnaires, they dropped the completed questionnaires and signed informed consent in the box placed at the entrance of the waiting room. The researcher thanked all the respondents as they were dropping the forms. After all forms (informed consent and questionnaire) were dropped in the box, the researcher sealed the box with the tape for protection. The sealed box was then kept in a locked cabinet, where only the researcher and statistician had access.

From the pre-testing, the researcher noted that the respondents understood the questions. Question 31 (If the minister of health was here, what can you say to him about improvements that can be done on DHIS2 use?) was not clear to them.

Amendments were made by the researcher. The question was modified to “What changes or improvements do you think can be done in DHIS2 in order for you to use it effectively”. The supervisor was informed about the amendments and approved the pre-tested questionnaire. The approved questionnaire was used for data collection. From the results of pre-testing, the researcher noted that the respondents have the required information for the questions, and this also helped to validate the tool.

### **3.5 DATA COLLECTION**

Data collection is the process of gathering the required information from the respondents to measure specific variables that are relevant to the study (Boswell & Cannon 2020:206). It is further, described as the foundation piece of all aspects of the research process. It drives the tool selection, aid in the determination of the research methodology, speak to the questions about sampling, and drive the selection of the statistical or evaluation process for the study (Boswell & Cannon 2020:244). Data was collected after receiving approvals from the relevant authorities to conduct the study (refer to item 3.8 ethical considerations).

The researcher contacted the specific healthcare facilities’ managers using a cell phone on the 11 June 2021 for specific healthcare facility one. Managers of specific healthcare facility two and three were contacted on the 24<sup>th</sup> June 2021. The researcher explained to the healthcare facility managers the purpose of the study and its significance. Furthermore, the researcher indicated the targeted population to the healthcare facility managers. The targeted population comprised of all registered nurses (213), nursing assistants (65) and data clerks (13) at the healthcare facility who use DHIS2. The healthcare facility managers then set appointments on behalf of the researcher with the heads of departments for introduction of the study and discussion of how data collection will be conducted.

The researcher held face-to-face meeting with the heads of the departments in maternal and child health (MCH) department’s waiting rooms. The meeting for healthcare facility one was on the 14<sup>th</sup> June 2021, for healthcare facility two and three was on the 28<sup>th</sup> and 29<sup>th</sup> June 2021 respectively. COVID-19 guidelines as guided by ministry of health under level 1 were adhered to. The researcher and the heads of departments hand sanitised, wore mask and kept social distancing. At the meeting,

appointments for data collection date were set by the heads of departments with the researcher for the respondents of the targeted three (3) healthcare facilities. Each head of department selected an appropriate day that their department would be less busy for data collection. Furthermore, the heads of departments were then requested to cascade information about the study, how data collection would take place and the appointments dates for data collection to the respondents. This was done to avoid frequent visits to the hospitals as COVID-19 prevention measure under level 1 and to gain cooperation from the respondents.

It should be noted that, similar data collection and procedures were applied to all targeted specific healthcare facilities however, at different dates. Appointment dates for data collection of the three targeted health facilities will be indicated in item 3.5.1 being data collection procedure.

### **3.5.1 Data collection procedures**

At the set appointment for each specific healthcare facility (14<sup>th</sup> June 2021 for healthcare facility one, 28<sup>th</sup> June 2021 for healthcare facility two and 29<sup>th</sup> June 2021 for healthcare facility three), the researcher met with the heads of departments in the waiting room of one department at each facility. The researcher continued to adhere to COVID-19 level 1 guidelines at all three specific healthcare facilities. This included wearing of mask, hand sanitising and social distancing and avoidance of physical contact. The approved pre-tested questionnaire (refer to Annexure 2) was used for data collection.

The study was introduced, and data collection procedure was explained. Afterwards, appointments were set with heads of departments at each specific healthcare facility to introduce the study to the respondents and for data collection purposes. The appointments were as follows; for specific healthcare facility one was the 16<sup>th</sup> to 18<sup>th</sup> June 2021, followed by specific healthcare facility two on the 6<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> July 2021 and specific healthcare facility three on the 14<sup>th</sup> to 16<sup>th</sup> July 2021, respectively.

On the specified appointment dates which were given by the heads of the departments of the targeted healthcare facilities for data collection, the researcher met with the respondents in the waiting room of each department (MCH, ART, out-patient department (OPD), adolescent, men`s clinic). At the stipulated appointment, both the

researcher and respondents adhered to COVID-19 level 1 regulations. The researcher then introduced the study and explained data collection process. The researcher also explained to the respondents that their participation in the study is voluntary, and they are free to withdraw from the study even if they have signed the informed consent form without being penalized. The researcher further explained that the information will be shared only with the supervisor, statistician and MoH.

After introducing the study, the researcher continued with data collection. The researcher hand sanitized and put the box containing the informed consent and questionnaire at the entrance of the waiting room. The respondents were then allowed to hand sanitize using a sanitizer next to the box before picking the informed consent form and the questionnaire from the box still maintaining 1.5cm social distancing between themselves.

The respondents picked the informed consent form (refer to annexure 3) and questionnaire (refer to annexure 2). Each respondent took 20-30 minutes to complete the questionnaire. To maintain privacy, each respondent was allowed to complete the questionnaire in a provided department consultation room. The respondents were not required to write the name on the instrument only a unique code on each questionnaire which does not link to the respondents was used to ensure anonymity. In order to maintain confidentiality, both the researcher and the statistician signed the confidentiality agreement forms (refer to annexure 4 (researcher) and annexure 4.1 (statistician)) and the signed forms were explained and shown to the respondents in order to reassure them on confidentiality issues.

Upon completion of the questionnaire, each respondent dropped the signed informed consent and the completed questionnaire in the box placed at the entrance of the department. The respondents were still maintaining 1.5cm social distancing. The researcher then thanked each respondent for their time as they were dropping the forms and lastly thanked the heads of the department and the specific healthcare facility manager for their time and cooperation in the study. Table 3.5 indicates the number of questionnaires distributed and returned, and following table 3.5 is the discussion.



**Table 3.5: Questionnaires distributed and returned from healthcare facilities**

Health care facility	Questionnaires distributed	Completed questionnaires returned	Incomplete questionnaires	Declined questionnaires	Date of distribution
One	20	19	0	1	16/06/2021
	6	6	0	0	17/06/2021
	10	9	1	0	18/06/2021
<b>Sub total</b>	<b>36</b>	<b>34</b>	<b>1</b>	<b>1</b>	
Two	5	5	0	0	6/07/2021
	11	11	0	0	7/07/2021
	9	9	0	0	8/07/2021
<b>Sub total</b>	<b>25</b>	<b>25</b>	<b>0</b>	<b>0</b>	
Three	22	21	1	0	14/07/2021
	6	5	1	0	15/07/2021
	4	4	0	0	16/07/2021
<b>Sub total</b>	<b>32</b>	<b>30</b>	<b>2</b>	<b>0</b>	
<b>TOTAL</b>	<b>93</b>	<b>89</b>	<b>3</b>	<b>1</b>	

On the 16<sup>th</sup> to 18<sup>th</sup> June 2021 at healthcare facility one 36 questionnaires were distributed to the respondents. From the targeted 36, 1 respondent declined participation, 35 questionnaires were returned, and 1 questionnaire was incomplete. The incomplete questionnaire did not form part of data collected. The 34 questionnaires were considered as data collected from healthcare facility one and for data analysis.

At healthcare facility two 25 questionnaires were distributed on the 6<sup>th</sup> to 8<sup>th</sup> July 2021 to the targeted 25 respondents. All 25 questionnaires were returned, and none were incomplete. The 25 questionnaires were considered as data collected from healthcare facility two and for data analysis.

At healthcare facility three 32 questionnaires were distributed on the 14<sup>th</sup> to 16<sup>th</sup> July 2021 to the 32 targeted respondents. From the 32 questionnaires which were distributed 2 were incomplete and were not considered as part of data collected for specific healthcare facility three. The 30 questionnaires were considered as data collected from healthcare facility three and for data analysis.

In total 34 questionnaires from healthcare facility one, 25 from healthcare facility two and 30 from healthcare facility three led to a total of 89 questionnaires which were used for data analysis.

The collected data was then entered into the data entry tool protected by password and the informed consent, and the hard copies of questionnaires were locked in the cabinet where only the statistician and the researcher had access.

### **3.6 DATA ANALYSIS**

Data analysis is the process of using statistical tools to create meaning from the data collected (Grove & Gray 2019:71). Eighty-nine questionnaires from three healthcare facilities were analysed with the assistance of the statistician who signed the confidentiality agreement form (Annexure 4.1). The collected data was analysed using Statistical Package for the Social Science (SPSS) version 26.0 of 2019. To create meaning from data collected in this study, tables and bar charts were used to present analysed data. Descriptive and inferential statistics were used to summarize raw data in an understandable and meaningful way in order to describe the study variables and draw conclusions.

The variables include independent and dependent variables. Independent variables include age, healthcare worker's category, gender and years of experience. Dependent variables include use of DHIS2 by healthcare workers, use of DHIS2 at workplace, and frequency of use of DHIS2 at workplace in a month. For open - ended questions, the researcher used content analysis approach to analyse them. Chi-square test was also used to check relationship between variables. The analysis and checking of reliability of an instrument being Cronbach's Alpha was done with the assistance of the statistician.

### **3.7 VALIDITY AND RELIABILITY OF THE STUDY**

#### **3.7.1 Validity**

Validity is the degree at which an instrument measures what it was intended to measure (Fain 2017:240). LoBiondo-wood and Haber (2018:278) view validity as the extent to which an instrument measures the attribute of a concept accurately. The three major components of validity are content and face, criterion, and construct validity (Fain 2017: 250). Therefore, measures of validity, which are applicable and discussed in this study are face, content, internal and external validity.

### **3.7.1.1 Face validity**

Face validity refers to whether the tool in use for the study looks like it is measuring the target abstract idea that the researcher wants to measure (Polit & Beck 2017:450). The questionnaire was given to the statistician, District health management team (DHMT) M & E officer, DHMT public health nurse and the supervisor as the experts to ensure that it measures what the researcher intends, and they have approved it and made some corrections.

### **3.7.1.2 Content validity**

Content validity is the measure of the extent to which instrument measures an intended content area (Fain 2017:250). Literature that facilitated the development of a self-designed questionnaire was reviewed with assistance of the statistician and the supervisor to ensure content validity. Pre-testing of an instrument was conducted in order to ensure validity of an instrument. The questionnaire was approved by the statistician, DHMT M & E officer, DHMT public health nurse and the supervisor as the experts in the field to ensure content validity. The corrections were made after pre-testing and experts' inputs were considered before data collection.

### **3.7.1.3 Internal validity**

Leedy and Ormrod (2015:103) explained internal validity as the extent to which the study design and data yielded from the study allow the researcher to draw accurate conclusions about cause and effect and other relationships within the data. A self-designed questionnaire which was used to collect data about utilization of DHIS2 by healthcare workers was used to ensure that the study reflects the true reality. Randomization and stratification were used to ensure internal validity and the questionnaire was pre-tested to ensure validity.

### **3.7.1.4 External validity**

External validity is the degree to which the results observed in the study can hold true over variations in people, conditions, and settings (LoBiondo-wood & Haber 2018: 171). The results cannot be generalized to other hospitals in Lesotho since only the three hospitals were used.

### **3.7.2 Reliability of the study**

Reliability is concerned with the consistency of the results obtained. That is the extent to which a score for a person who has not changed is the same if measurements are repeated (Boswell & Cannon 2020:272). To ensure reliability, the researcher pre-tested the questionnaire with 2 registered nurses, 2 nursing assistants and 1 data clerk. The respondents completed the questionnaire to measure the accuracy and consistency of the questionnaire. After pre-testing, the questionnaire was checked for unclear questions and were resolved to avoid misinterpretation in the main study. The statistician and the supervisor assisted in compilation of the questionnaire for consistency, stability, and equivalence. Cronbach's Alpha was considered by the statistician to check the reliability of an instrument.

## **3.8 ETHICAL CONSIDERATIONS**

Ethics is a system of moral values that are concerned with the extent to which research procedures comply with professional, legal, and social obligations to study respondents (Polit & Beck 2017: 208). The ethical considerations pertaining to this study include the following: researcher specific ethical considerations and respondent specific ethical considerations. The researcher also adhered to COVID-19 level 1 guidelines of the country.

### **3.8.1 Researcher- specific ethical considerations**

The research proposal was submitted to the Research and Ethics committee of the University of South Africa in the College of Human Sciences for ethical clearance (refer to Annexure 1). After receiving approval from the Research and Ethics committee of the University of South Africa, the researcher requested a permission to conduct the study from the Ministry of Health Lesotho (refer to Annexure 5). Afterwards, permission was also requested from the Hospital managers to undertake the study at the facilities (refer to Annexure 6, 7, 8). The scientific honesty of the research was maintained by referencing and listing of all sources of information used in the study. Skills earned from research module the researcher has completed under post-graduate diploma in Public health gave the researcher guidance in ensuring scientific honesty. The researcher also signed the confidentiality agreement form (refer to annexure 4) and it was shown to the respondents.

### **3.8.2 Respondents- specific ethical considerations**

There are three fundamental ethical principles for protecting study respondents which include respect for human dignity, beneficence, and justice. These principles were observed through the following:

#### **3.8.2.1 Avoidance of harm**

In this study the researcher ensured that the respondents are not exposed to any harm. The respondents were informed of any harm related to the study and they participated voluntarily. They were allowed to withdraw from the study at any time they wish to. Measures to avoid contracting COVID-19 were observed as guided by the MoH under level 1.

#### **3.8.2.2 Informed consent**

In this study, a written informed consent (refer to Annexure 3) was obtained from all the respondents who are psychologically and legally fit to participate in the study. Furthermore, the respondents were informed that they can withdraw from the study at any point in time should they wish with no penalty. The informed consent also covered precautionary measures to avoid contracting COVID-19 under level 1. COVID-19 adherence measures such as wearing of mask, sanitizing hands, avoiding physical contact, checking of temperature and social distancing were clearly explained to the respondents.

#### **3.8.2.3 Deception of the respondents**

The researcher ensured that any deceptions are prevented by providing the respondents with all the information regarding the study. The researcher did not withhold any information that could have led the respondent not to take part in the study. If deception occurred without the researcher's awareness it was discussed with the respondents before or after the introduction of the study.

#### **3.8.2.4 Right to privacy**

The respondents completed the questionnaire in a private space provided by department. The respondents were also informed that no names should be written on the questionnaire. Only a unique code which was not linked to the respondent's

identity was used. The information was also entered in the data entry tool protected by password, and locked in the cabinet where only the researcher and the statistician had access. The information was shared only with the supervisor, University of South Africa, MoH Lesotho and Facility manager. Data was collected from all departments which report using DHIS2.

#### **3.8.2.5 Anonymity**

Anonymity is about protection of respondents` rights such that even the researcher cannot link the respondents to the data provided (Polit & Beck 2017:1004). In this study the respondents used unique codes in state of names on the questionnaire. Therefore, the questionnaires cannot be linked to the respondents. Names were not used in the study to refer to the respondents.

#### **3.8.2.6 Confidentiality**

The collected information was entered into the data entry tool protected by password, and information on paper was locked in the cabinet where the statistician and the researcher had access. The researcher signed the confidentiality agreement form (refer to Annexure 4).The statistician also was requested to sign the confidentiality agreement form (refer to Annexure 4.1) to ensure confidentiality.

#### **3.8.2.7 Compensation**

No compensation was offered to the respondents. The respondents benefitted indirectly from the study. It was explained to them that the study results will help the minister of health to understand how DHIS2 is used by the healthcare workers and what changes need to be done in order to utilise the system effectively and hence this will influence change that they want.

### **3.9 CONCLUSION**

This chapter covered the design and methods utilised to conduct the study. These included research design, pre-testing of an instrument, data collection, data analysis, validity and reliability of the study and ethical considerations. The following chapter 4 will discuss data analysis and presentation of the results.

## **CHAPTER 4**

### **DATA ANALYSIS, PRESENTATION, AND INTERPRETATION OF THE RESULTS**

#### **4.1 INTRODUCTION**

Chapter 3 discussed research design and methods. This chapter focused on analysis, presentation, and interpretation of the results. The aim of this analysis was to address the study objectives.

The objectives of this study were to:

- assess the extent of utilization of DHIS2 by healthcare workers in the healthcare facility;
- identify the challenges healthcare workers are encountering in using of DHIS2 in the facility and
- determine the support needed by healthcare workers for effective use of DHIS2 in the healthcare facility.

#### **4.2 MANAGEMENT OF DATA ANALYSIS**

Grove and Gray (2019:71) define data analysis as the use of statistical tools to create meaning from the gathered data. Quantitative data analysis is the numerical representation and manipulation of observation. It uses statistical techniques in order to express the purpose of describing and explaining the outcome of research as they pertain to the hypothesis (Boswell & Cannon 2020:302). With the assistance of the statistician (refer to Annexure 4.1) data gathered by means of closed-ended questions was analysed using SPSS 26.0 of 2019. Descriptive and inferential statistics were calculated and summarised in an understandable and meaningful way. The analysis assisted the researcher to describe the study variables and draw conclusions. For confidentiality purposes the statistician signed a confidentiality agreement form (refer to Annexure 4.1).

According to Houser (2018:401) descriptive statistics use numbers normatively, in tables, or in graphic displays to organize and describe the characteristics of a sample. Inferential statistics are referred to as the statistical procedures that are used to reach conclusions about associations between variables (Bhattacharjee2019:263). One of

the inferential statistics tests used in the study was Chi-square. It was used to assess the relationship between independent and dependent variables.

The independent variables include age, healthcare worker`s category, gender, and years of experience. The dependent variables include use of DHIS2 by healthcare workers, use of DHIS2 at workplace, and frequency of use of DHIS2 at workplace in a month. Descriptive and inferential statistics were used to give meaning and make conclusions on data in the study.

The researcher used content analysis approach to analyse data generated from the open-ended questions. Content analysis involves creating categories of data and developing rules for coding data into those categories (Nieswiadomy & Bailey 2018: 72).

According to Nieswiadomy and Bailey (2018:72), the steps for content analysis are listed as follows:

- reading through collected data;
- responses grouped and given codes (refer to annexure 12);
- creating categories and
- identifying themes.

In this study, the researcher read through collected data in order to familiarise with it. Having read through the response, using the open-ended questions data set extracted from spreadsheet (refer to annexure 12) the researcher coded data by attaching labels to the texts or phrases. After coding, the categories were created by grouping coded segments into groups in order to reduce number of different pieces of data. The similar codes were identified and merged to create categories and themes to get broader sense of the data. Categories and themes that were identified are indicated in table 4.1. They will be discussed in the discussion of the results.



**Table 4.1: Emerged themes from open-ended questions**

Item	Categories	Emerged themes
4.3.2.5	• Equipment	• Inadequate equipment
	• Staffing	• Workload
	• Supervision	• Poor monitoring and evaluation
	• Skill	• Incompetency of the healthcare workers • Not part of job description
4.3.2.7	• Skill	• Do not understand how it relates to their job • Useful tool for the NGOs
	• Supervision	• Lack of follow ups from supervisors on the use of DHIS2
4.3.2.10	• Equipment	• Inadequate equipment
	• Staffing	• Workload
	• Skill	• Incompetency of the healthcare workers
4.3.2.12	• Staffing	• Workload
	• Compatibility	• Not user-friendly
	• Skill	• Not part of our job
4.3.3.2	• Technical issues	• Network • System issues
	• Skill	• Lack of skills
	• Supervision	• No feedback • Lack of supervision by direct supervisors
4.3.3.3	• Technical	• Network • System issues
	• Skill	• Lack of skills
4.3.4.2	• Supervision	• Monitoring and evaluation
	• Trainings	• Refresher trainings
	• Staffing	• More staff
	• Equipment	• Availability of adequate equipment
4.3.4.4	• Compatibility	• Involvement of healthcare workers in application building • Have local developers of the system
	• Technical issues	• Have technical team onsite • The government own it, it shouldn't be an NGO property
4.3.4.5	• Trainings	• Refresher trainings
	• Staffing	• Add staff
	• Supervision	• Have feedback from supervisors through DHIS2 • Intensive supervision and mentorship by direct supervisors
	• Compatibility	• Be customized to local needs

## RESEARCH RESULTS

Below is the presentation and interpretation of the results in sections as they appear on the questionnaire. The interpretation was supported by literature. The analysis was conducted according to the following sections:

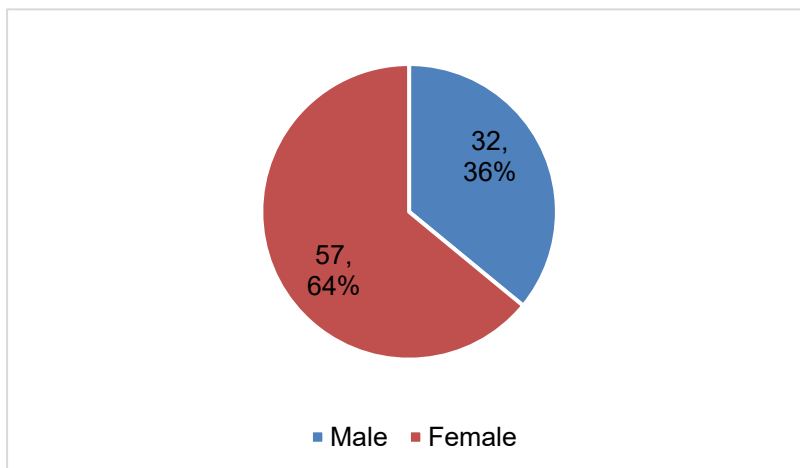
- Section A presents the biographical data of the respondents which included gender, age, category, and years of experience in DHIS2.
- Section B presents the results for the extent of use of DHIS2 by healthcare workers in the facility.
- Section C presents the results of the challenges healthcare workers are encountering in use of DHIS2 in the facility.
- Section D presents results on the support needed by healthcare workers for effective use of DHIS2 in the facility.

## PART 1

### 4.3.1 Section A

#### Biographical information

##### 4.3.1.1 Gender

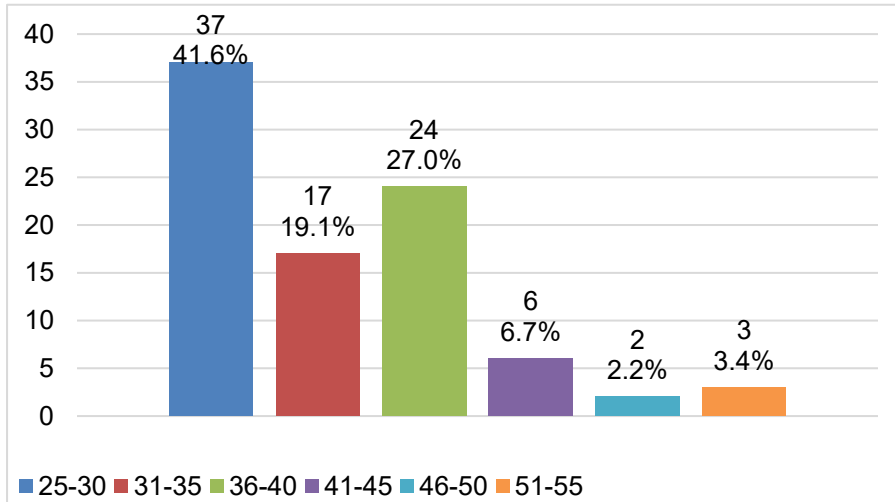


**Figure 4.1: Gender distribution of the respondents (N=89)**

Figure 4.1 shows that, from the total number of 89 respondents, the majority (64%, n=57) were females and (36%, n=32) were males. That is an indication that, in each department there were more females than male healthcare workers who took part in the study. This is because the health sector consists of more registered nurses and nursing assistants than other healthcare workers. Registered nurses and nursing assistants' categories are female dominated. Jhpiego (2018:1) revealed that, nursing is a female dominated profession in Lesotho. The results of this study show that the majority of healthcare workers are females in the departments, and they are involved

in use of DHIS2 to manage health information than males. These results concur with Jhpiego (2018:1) annual report on men`s health.

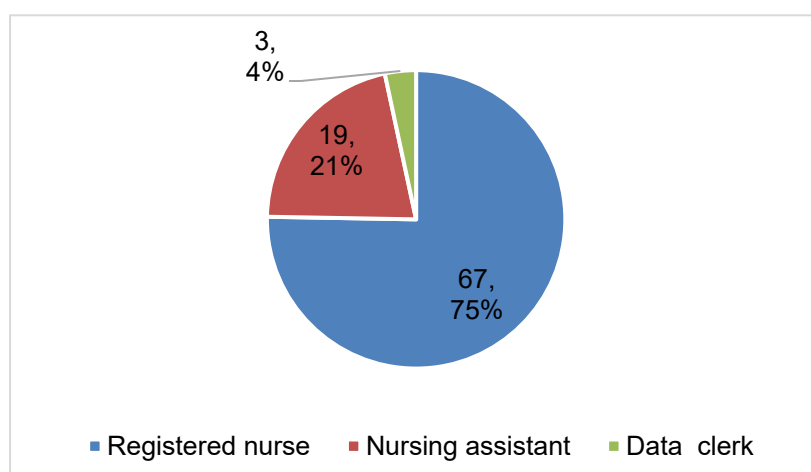
#### 4.3.1.2 Age



**Figure 4.2: Age distribution of the respondents (N=89)**

Figure 4.2 reveals that, the majority of the respondents (41.6%, n=37) were aged between 25 and 30, followed by age group 36 and 40 with (27.0%, n=24). Only (2.2%, n = 2) of the respondents were aged between 46 and 50 years. According to Johnson (2021:1) the majority of online users, which is (32%) were aged between 25 and 34. The results of this study show that the majority of the healthcare workers are at the age (25-30). These are ages where they can actively use and understand technology or applications like DHIS2 to manage the healthcare information. These results concur with Johnson (2021:1) on the report of age distribution of internet users worldwide.

### 4.3.1.3 Category



**Figure 4.3: Category distribution of respondents (N=89)**

Figure 4.3 shows that the majority of the respondents (75%, n=67) were registered nurses, followed by nursing assistants with (21%, n=19) and (4%, n=3) of the respondents were data clerks. These results reveal that, registered nurses constitute a large percentage in human resource in targeted health facilities. These results concur with Public health sector review (2017:22) which shows that Lesotho's health service is nurse driven with, 11.58 nurses per doctor across the government-run health system. Since registered nurses constitute the majority to the human resource at healthcare facilities, they also make a great impact in effective use of DHIS2.

### 4.3.1.4 Years of experience in DHIS2

**Table 4.2: Years of experience in DHIS2 distribution (N=89)**

Years of experience	Frequency (n)	Percentage (%)	Cumulative percentages (%)
<1 Year	35	39.3	39.3
1-3 Years	18	20.2	59.5
>3 Years	36	40.4	99.9
<b>Total</b>	<b>89</b>	<b>100</b>	

Table 4.2 shows that the majority of the respondents (40.4%, n=36) had more than 3 years' experience in DHIS2. This was followed by (39.3%, n=35) respondents with less than 1 year of experience. While (20.2%, n=18) of the respondents had experience between 1 to 3 years. The results further show that more than half of the respondents (59.5%, n=53) either had experience of less than 1 or 1-3 years. The respondents with less than 1 year of experience constitute the most to this percentage. Therefore, the

majority of the healthcare workers have less experience in use of DHIS2. These healthcare workers are unable to use it to its full capacity or effectively.

### 4.3.2 Section B

#### Use of DHIS2 by healthcare workers

##### 4.3.2.1 Systems used for health information

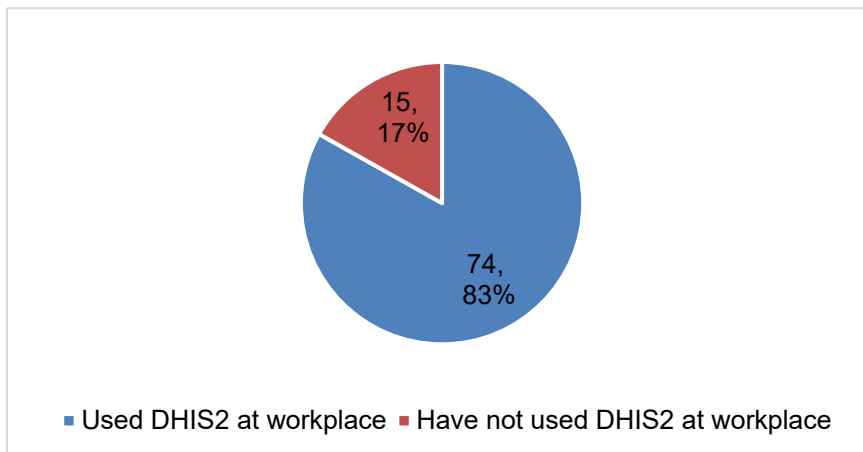
**Table 4.3: Systems used for health information per category (N=89)**

Category	System used for health information			
	Frequency (n) Use of DHIS2	Percentages (%)	Frequency (n) use of other system	Percentages (%)
Registered nurse	57	77.0	10	66.7
Nursing assistants	14	18.9	5	33.3
Data Clerk	3	4.1	0	0.0
<b>Total</b>	<b>74</b>	<b>83.1%</b>	<b>15</b>	<b>16.9%</b>

Table 4.3 shows that the majority of the respondents (83.1%, n=74) use DHIS2, (16.9%, n=15) use other system which is not DHIS2 for health information. When checked against category, the results reveal that the majority of the respondents (77.0%, n=57) who use DHIS2 were registered nurses followed by nursing assistants (18.9%, n=14), while (4.1%, n=3) were data clerks. For the other systems which is not DHIS2, the majority of the respondents (66.7%, n=10) who use it were registered nurses and (33.3%, n=5) of the respondents who use it were nursing assistants. None of the data clerks were found to be using the other system. These results revealed that the majority of the healthcare workers use DHIS2 to manage their healthcare information in their departments. Data clerk's category is outstanding with all its respondents using DHIS2.

According to WHO (2020:106), in order to solve health problems and improve quality of health by way of prevention, diagnosis and treatment of illness and disease, countries should use technological devices, applications and systems. Therefore, Lesotho is not an exception as reflected by the results showing the majority of healthcare workers using DHIS2.

### 4.3.2.2 Use of DHIS2 at workplace



**Figure 4.4: Use of DHIS2 at workplace (N=89)**

Figure 4.4 shows that the majority of the respondents (83.0%, n=74) have used DHIS2 at workplace while (17.0%, n=15) of the respondents have not used DHIS2 at the workplace. This indicates that more healthcare workers use DHIS2 at workplace to manage health information.

**Table 4.4: Use of DHIS2 at workplace compared to age distribution (N=89)**

Age group	Frequency (n) Have used DHIS2 at workplace	Percentage (%)	Frequency (n) Have not used DHIS2 at workplace	Percentage (%)
25-30	30	81.0	7	19
31-35	15	88.2	2	11
36-40	23	95.8	1	4.2
41-45	3	50.0	3	50
46-50	1	50.0	1	50
51-55	2	66.7	1	33.3
<b>Totals</b>	<b>74</b>	<b>83.1</b>	<b>15</b>	<b>16.9</b>

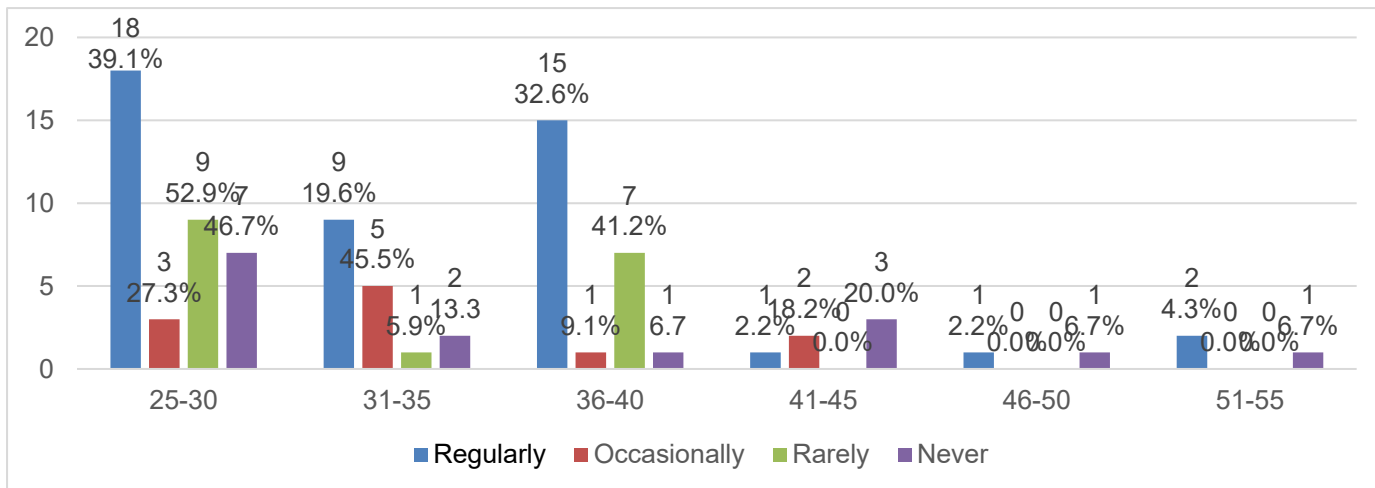
Table 4.4 shows that out of 89 respondents, 74 respondents used DHIS2 at workplace while 15 respondents have not used DHIS2 at workplace. The table shows comparison of percentages between those who used DHIS2 and those who did not in individual groups. The results are based on individual groups. The majority of the respondents (95.8%, n=23) aged 36-40 years use DHIS2 at workplace, followed by respondents aged 31-35 with (88.2%, n=15), 25-30 with (81.0%, n=30), 51-55 with (66.7%, n=2) and both 41-45 and 46-50 with 50.0% (n=3) and (n=1) respectively. The results revealed that from all age categories; either 50.0% or more of the healthcare workers use DHIS2 at workplace to manage health information.

### 4.3.2.3 Frequency of use of DHIS2 at workplace in a month

**Table 4.5: Use of DHIS2 in a month by respondents (N=89)**

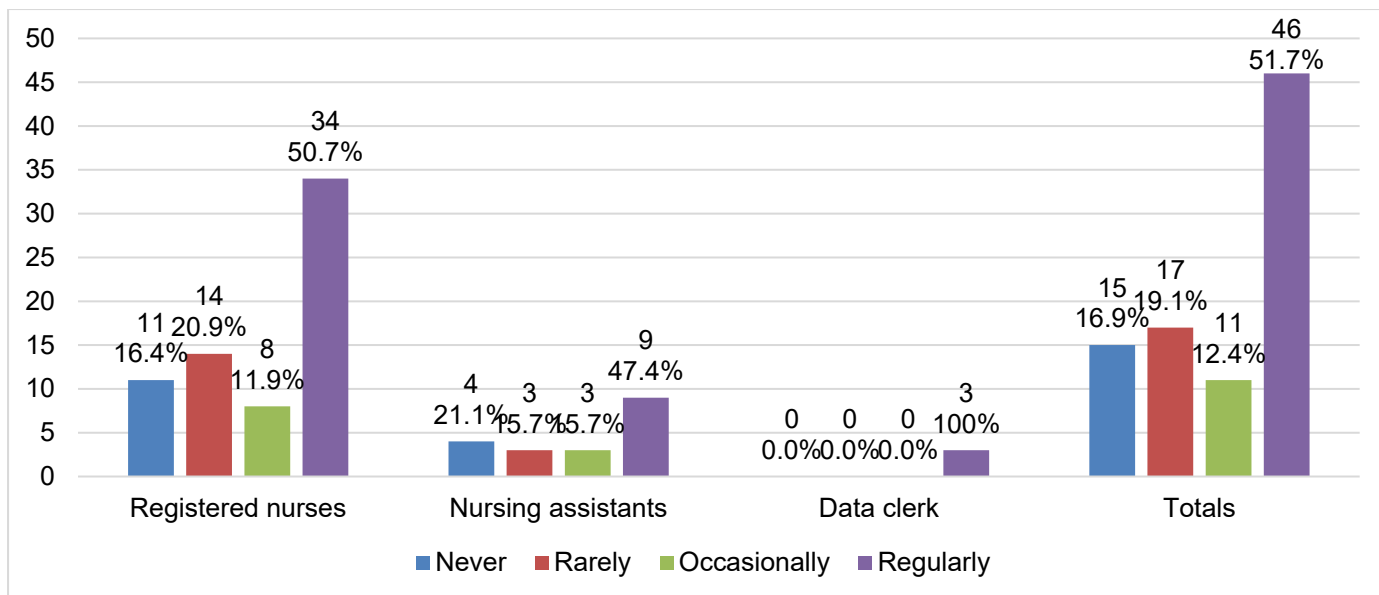
Frequency of use	Number of respondents	Percent (%)	Cumulative percent (%)
Regularly	46	51.7	51.7
Occasionally	11	12.4	64.1
Rarely	17	19.1	83.2
Never	15	16.9	100
<b>Totals</b>	<b>89</b>	<b>100</b>	

Table 4.5 shows that the majority of the respondents (51.7%, n=46) use DHIS2 regularly in a month while (19.1%, n=17) use it rarely. Whereas (16.9%, n=15) never use DHIS2 in a month while (12.4%, n=11) use DHIS2 occasionally. These results show that more healthcare workers use DHIS2 at workplace in a month.



**Figure 4.5: Age group compared to frequency of use of DHIS2 (N=89)**

Figure 4.5 shows that the majority of the respondents (39.1%, n=18) aged 25-30 use DHIS2 regularly, followed by age group 36-40, (32.6%, n=15) and group 31-35, (19.6%, n=9). While group 41-45, (2.2%, n=1), 46-50, (6.7%, n=1) and 51-55, (4.3%, n=2) use DHIS2 regularly. The results show that the younger the healthcare worker, the more they are likely to use DHIS2 contrary to the older healthcare workers who use DHIS2 less.

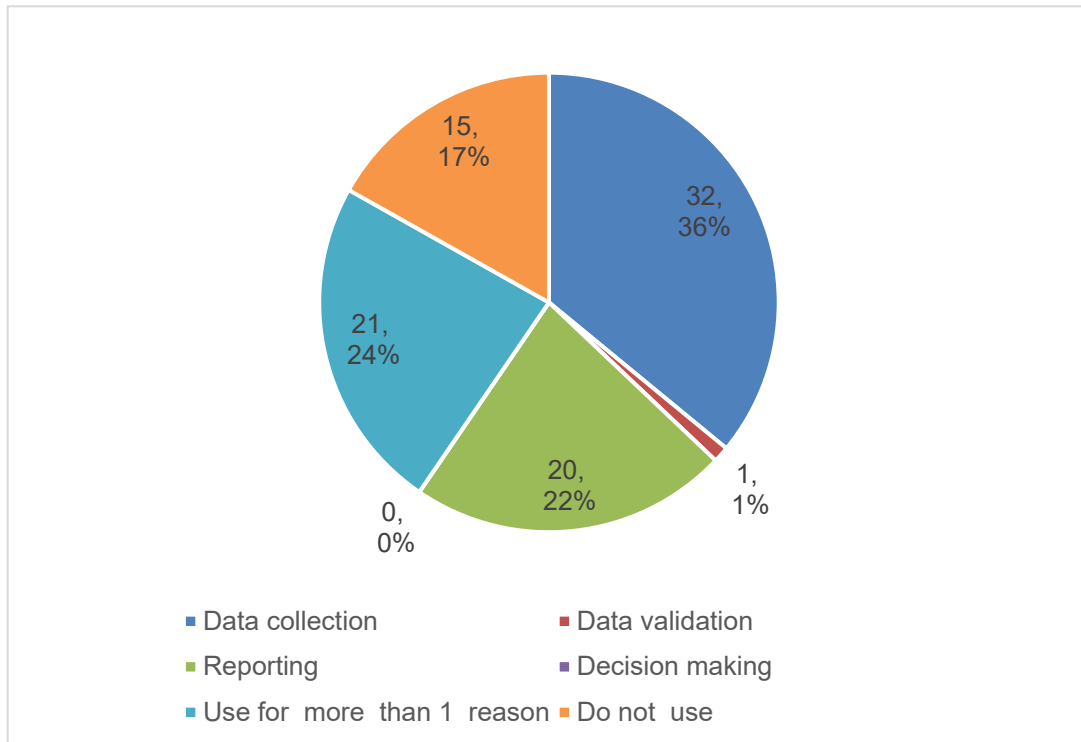


**Figure 4. 6: Comparison of frequency of use by category (N=89)**

Figure 4.6 shows that registered nurses contribute the majority to users of DHIS2 regularly with (50.7%, n=34) of the respondents. Followed by nursing assistants with (47.4%, n=9) of the respondents who use DHIS2 regularly in a month. For data clerk's category, all the respondents (100%, n=3) use DHIS2 regularly. The results revealed that all data clerks use DHIS2 regularly while other categories only a certain percentage use DHIS2 regularly in a month at the facility. This is because data clerks were mainly hired to manage health information while other cadres feel their focus is mainly on medical activities not data.



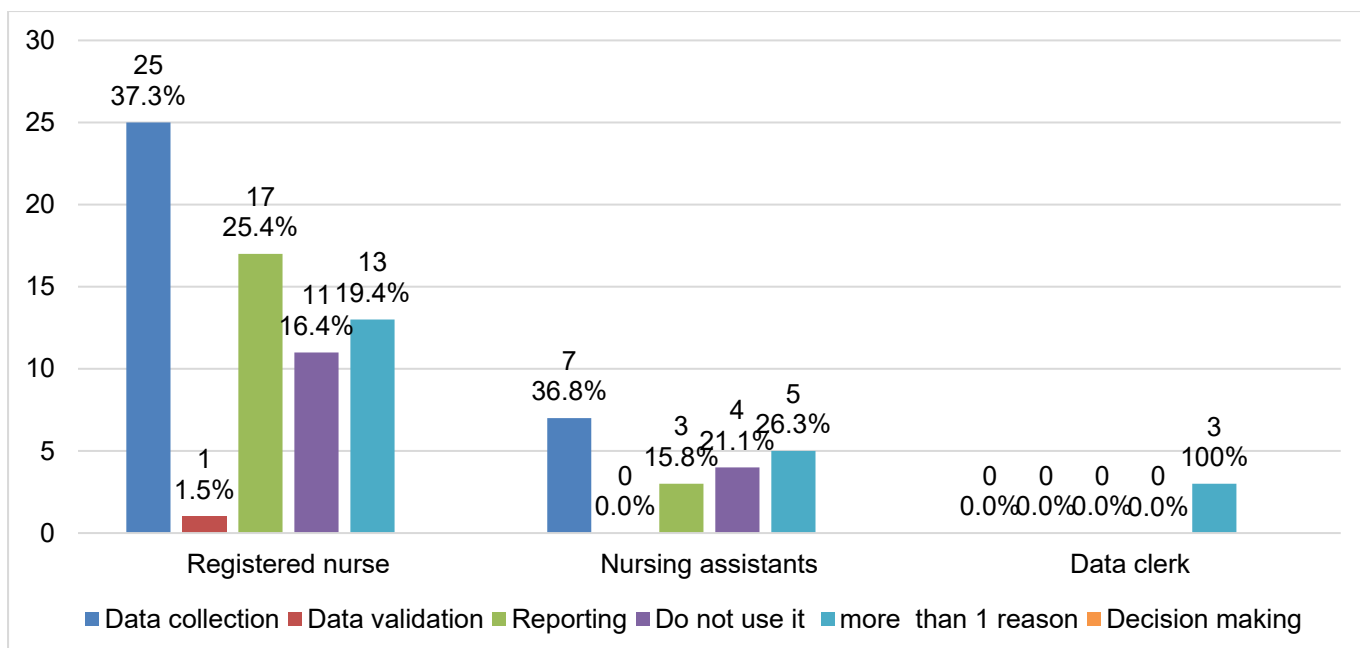
#### 4.3.2.4 What respondents use DHIS2 for



**Figure 4.7: How DHIS2 is used by respondents (N=89)**

Figure 4.7 shows that the majority of the respondents (36%, n=32) use DHIS2 for data collection only, followed by (24%, n=21) of the respondents who use it for more than 1 reason and (22%, n=20) of the respondents who use DHIS2 for reporting only. It is further shown that (17%, n=15) of the respondents do not use DHIS2 for any reason. Only (1%, n=1) of the respondents use DHIS2 for data validation only, and none of the respondents use DHIS2 for decision-making only.

According to Durr, Fahrion, Knopf and Taylor (2017: 74), from the study on elimination of dog mediated human rabies; the main development of DHIS2 was for health surveillance. For this purpose to be achieved, all functions of DHIS2 should be put in action by the user. Therefore, this study results revealed that DHIS2 system is not effectively used by the healthcare workers.



**Figure 4.8: Reasons for use of DHIS2 by categories (N=89)**

Figure 4.8 shows that for the respondents' category registered nurse and nursing assistants, DHIS2 is mostly used for data collection (registered nurses (37.3%, n=25), nursing assistants (36.8%, n=7). They also show that all data clerks (100%, n=3) use DHIS2 for more than 1 reason. Only (1.5%, n=1) of the respondents is seen to use DHIS2 for data validation in registered nurses' category. Out of all the 89 respondents, (16.4%, n=11) of registered nurses and (21.1%, n=4) of nursing assistants do not use DHIS2.

These results showed that different healthcare workers categories use DHIS2 for different reasons at the targeted healthcare facilities. According to Karuri, Waiganio and Orwa (2017:17), the difference in use of DHIS2 by categories can be due to different challenges across different healthcare workers' categories. In this study registered nurses and nursing assistants do most of the clinical work at the department. Due to workload, they find themselves using only one function (data collection) as they require it to do their daily work unlike data clerks who mainly deals with data, hence all of them were using more than one function.

#### **4.3.2.5 Reasons why the respondents do not use DHIS2**

In response to the question, why the respondents do not use DHIS2, the categories and themes that emerged from the respondents' responses are listed in table 4.6.

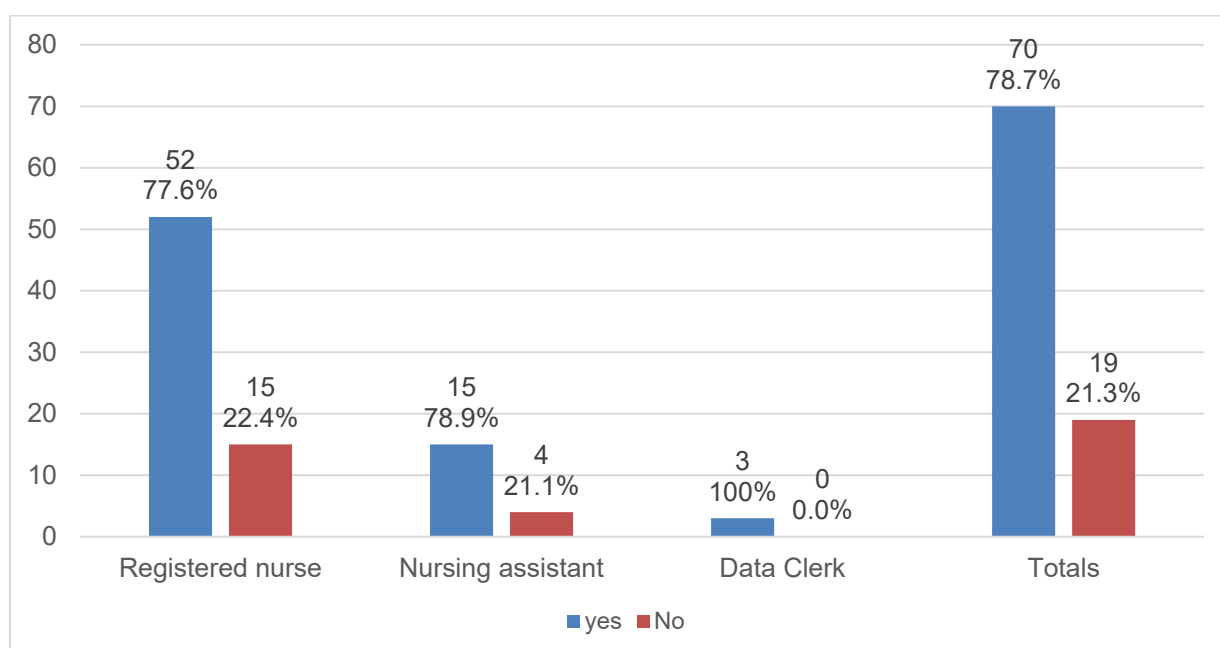
**Table: 4.6: Categories and themes of reasons why the respondents do not use DHIS2.**

Item	Categories	Emerged themes
4.3.2.5	• Equipment	• Inadequate equipment
	• Staffing	• Workload
	• Supervision	• Poor monitoring and evaluation
	• Skill	• Incompetency of the healthcare workers • Not part of job description

Table 4.6 showed the following categories and their themes (as indicated in table 4.1): equipment (inadequate equipment), staffing (workload), supervision (poor monitoring and evaluation) and skill (incompetency of healthcare workers and not part of job description). It should be noted that the question addressed the responses of (16.9%, n=15) respondents who do not use DHIS2 as indicated on figure 4.8 above.

These results show that the main reasons DHIS2 is not used by healthcare workers were inadequate equipment, workload, poor monitoring and evaluation, incompetency of the healthcare workers, and not part of job description. These results are in line with Gathua (2016:35) who found that, inadequate computer (inadequate equipment), incompetency, and lack of skills in data analysis were hindering success in effective use of DHIS2 (Gathua 2016:35).

#### 4.3.2.6 How respondent view DHIS2 in term of usefulness



**Figure 4. 9: DHIS2 Usefulness (N=89)**

Figure 4.9 shows that the majority of the respondents (78.7%, n=70) view DHIS2 as useful, while (21.3%, n=19) view it as not useful. The majority of all categories, (data clerks (100%, n=3), nursing assistants (78.9%, n=15), and registered nurses (77.6%, n=52) see DHIS2 as useful.

Sahay, Rashidian and Doctor (2019:3) show that, countries and NGOs have seen DHIS2 as a very useful tool. Capturing of diverse information for health system, provision of framework for different system and sharing of data with the warehouse to generate all necessary output were some of the benefits gained from using DHIS2. The results showed that the majority of the healthcare workers view DHIS2 as a useful tool in healthcare system at the targeted healthcare facilities. These results concur with Sahay, Rashida and Doctor (2019:3).

#### 4.3.2.7 Why DHIS2 is not useful

In response to the question, why DHIS2 is not useful, the categories and themes that emerged from the respondents` response are listed in table 4.7.

**Table: 4.7: Categories and themes of reasons why DHIS2 is not useful.**

Item	Categories	Emerged themes
4.3.2.7	<ul style="list-style-type: none"> <li>• Skill</li> </ul>	<ul style="list-style-type: none"> <li>• Do not understand how it relates to their job</li> <li>• Useful tool for the NGOs</li> </ul>
	<ul style="list-style-type: none"> <li>• Supervision</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of follow-ups from supervisors on the use of DHIS2</li> </ul>

Table 4.7 showed the following categories and their themes (as it was indicated in table 4.1): skill (do not understand how it relates to their job and useful tool for the NGOs) and supervision (lack of follow-ups from supervisors on the use of DHIS2). This open-ended question addressed the responses of the (21.3%, n=19) respondents who do not see DHIS2 as useful as indicated on figure 4.9.

The results show that the respondents view DHIS2 as not useful for various reasons. They expressed that they do not understand how it relates to their job, there is lack of follow-ups from supervisors on the use of DHIS2 and it's a useful tool for the NGOs.

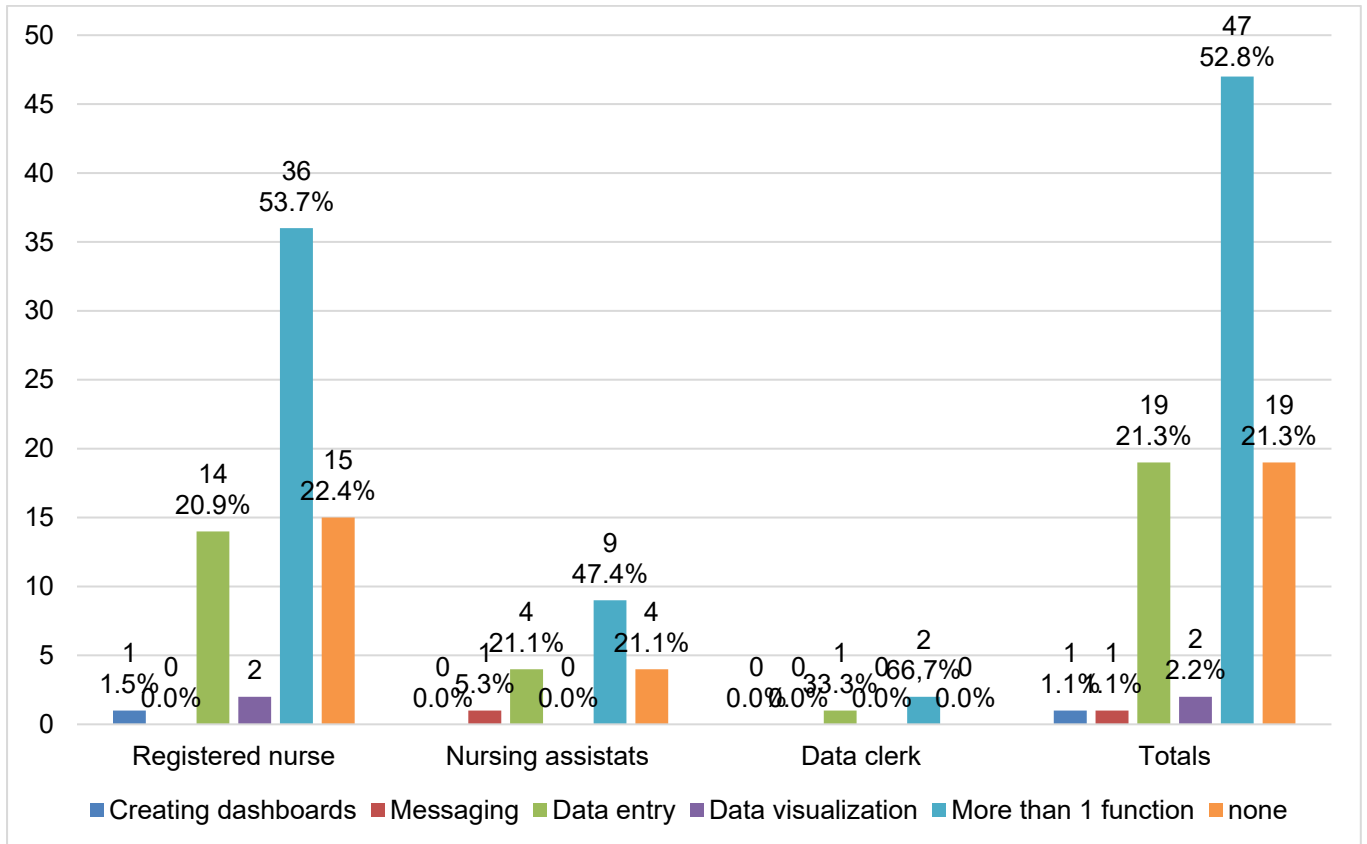
These results were due to the fact that, DHIS2 system is coordinated by an NGO assisting the ministry of health with implementation hence they see it as only useful to the NGO. The results also reflected resistance to change or lack of skills from healthcare workers as they do not understand how DHIS2 relates to their work.

Healthcare workers were mainly doing clinical work before DHIS2 was introduced, so adapting information technology into care might face resistance especially when they lack skills as it does not deal directly with patients. Moreover, the fact that there is lack of follow-ups from supervisors on the use of DHIS2, this does not instil DHIS2 usefulness to registered nurses and nursing assistants.

These results concur with Dehnavieh, Haghdoost, Khosravi, Hoseinabadi, Rahim, Poursheikhali, Khajehpour, Khajeh, Mirshekari, Hasani, Radmerikhi, Haghighi, Mehrolhassani, Kazemi and Aghamohamadi (2018:9) who found that the common challenges most countries encountered in implementation of DHIS2 were internet connectivity, infrastructure, acceptability by healthcare workers, lack of policies that govern ICTs, lack of skilled human resource, inadequate use of the system and poor feedback mechanism.

According to Bhattacharya, Umar, Audu, Felix, Allen, Schellenberg and Marchant (2019:2) for effective use of DHIS2, there should be coordinated action from different levels of health system. In this study “no follow-up from supervisors on its use” calls for need for supervision as it was shown as one of the reasons mentioned by the respondents who do not see DHIS2 as useful.

### 4.3.2.8 Functions that the respondents can perform with confidence on DHIS2.



**Figure 4.10: Functions that the respondents can perform with confidence on DHIS2 (N=89)**

Figure 4.10 shows that the majority of the respondents (52.8%, n=47) can perform more than one function with confidence on DHIS2, followed by (21.3%, n=19) who cannot perform any of the functions with confidence. It further, showed that (21.3% (n=19) of the respondents can perform only data entry. Only (2.2%, n=2) can perform data visualization only, (1.1%, n=1) of the respondents can perform creating dashboard function only, and (1.1%, n=1) can perform messaging only.

These results showed that DHIS2 is not effectively used as there are healthcare workers who cannot perform more than one function with confidence on DHIS2. Sahay et al (2019:2), state that, in order to attain Sustainable Development Goals, a robust and well-functioning health information system is necessary. A well-functioning health information system means all functions of the system are actively used not only one or two functions.

### 4.3.2.9 Function used more often by the respondents

**Table 4.8: Functions the respondents use more often (N=89)**

Category	Functions							
	Creating dashboards	Percentage (%)	Messaging	Percentage (%)	Data entry	Percentage (%)	None	Percentage (%)
Registered nurse	1	1.5	3	4.5	52	77.6	11	12.4
Nursing assistant	1	5,3	0	0	14	73.7	4	21.1
Data clerk	1	33.3	0	0	2	66.7	0	0
<b>Total</b>	<b>3</b>	<b>3.4</b>	<b>3</b>	<b>3.4</b>	<b>68</b>	<b>76.4</b>	<b>15</b>	<b>16.9</b>

Table 4.8 shows that the functions that are used often are creating dashboards, messaging, and data entry. The majority of the respondents (76.4%, n=68) use DHIS2 for data entry, (16.9%, n=15) use none of the functions of the functions, (3.4%, n=3) of the respondents use messaging function and (3.4%, n=3) of the respondents use creating dashboards function. They further show that from all categories, the majority of the respondents registered nurse (77.6%, n=52), nursing assistants (73.7%, n=14) and data clerk (66.7%, n=2) use data entry function more often.

These results showed that the healthcare workers at the targeted healthcare facilities use data entry function more often in all different categories. This showed that as much as the healthcare workers can perform more than one function with confidence, the majority preferred to use only data entry more often. This still goes back to workload as the challenge. As shown above on figure 4.10, table 4.5 further reflected that the healthcare workers do not use all functions of DHIS2.

### 4.3.2.10 Why the respondents use none of the functions

In response to the question, why the respondents use none of the functions, the categories and themes that emerged from the respondents' response are listed in the table 4.9.

**Table: 4.9: Categories and themes of reasons why the respondents use none of the functions.**

Item	Categories	Emerged themes
4.3.2.10	• Equipment	• Inadequate equipment
	• Staffing	• Workload
	• Skill	• Incompetency of the healthcare workers

Table 4.9 showed the following categories and their themes (as it was indicated in table 4.1): equipment (inadequate equipment), staffing (workload) and skill (incompetency of the healthcare workers). This open-ended question addressed the responses of the (16.9%, n=15) respondents who use none of the functions of DHIS2 as indicated on table 4.8.

The results show that the reasons why healthcare workers cannot perform any of the functions of DHIS2 with confidence are: inadequate equipment, workload, and Incompetency of the healthcare workers. The workload could be due to inadequate healthcare worker patient ratio. Incompetency of the healthcare workers could be due to lack of skills as a result of poor monitoring and supervision.

These results concur with Begum, Khan, Adamou, Ferdous, Pravez, Islam, Kumkum, Rahman and Anwar (2020:2) who found that, effective use of DHIS2 in Bangladesh could not be achieved due to healthcare personnel lacking accountability, shortage of human resource for data collection and analysis, low internet connectivity, frequent power cuts and poor culture of not using data for decision-making.

#### 4.3.2.11 Do the respondents enjoy using DHIS2

**Table 4.10: Respondents` response on whether they enjoy using DHIS2 or not (N=89)**

	Do you enjoy using DHIS2	
	Yes	No
Frequency	58	31
Percentages (%)	65.2	34.8

Table 4.10 shows that the majority of the respondents (65.2%, n=58) enjoy using DHIS2 while (34.8%, n=31) of the respondents do not enjoy using DHIS2.

The results showed that the majority of the healthcare workers enjoy use of DHIS2, and this is because they see its usefulness in changing the healthcare system for the better.

#### 4.3.2.12 Why the respondents do not enjoy using DHIS2

In response to the question, why the respondents do not enjoy using DHIS2, the categories and themes that emerged from the respondents` responses are listed in the table 4.11.



**Table: 4.11: Categories and themes of reasons why the respondents do not enjoy using DHIS2.**

Item	Categories	Emerged themes
4.3.2.12	• Staffing	• Workload
	• Compatibility	• Not user-friendly
	• Skill	• Not part of our job

Table 4.11 showed the following categories and their themes (as it was indicated in table 4.1): staffing (workload), compatibility (Not user-friendly) and skill (not part of our job). This open-ended question addressed the responses of the (34.8%, n=31) respondents who do not enjoy using DHIS2 as indicated on table 4.10.

The results showed that the reasons why the healthcare workers do not enjoy using DHIS2 were workload, not user-friendly, and not part of the job. This could be due to inadequate staffing, poor monitoring and supervision and lack of skills from the healthcare workers.

#### **4.3.2.13 Respondents` perspective on effective use of DHIS2.**

**Table 4.12: Respondents` perspective on usefulness of DHIS2 (N=89)**

Category	DHIS2 is very useful tool							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	44	49.4	8	9.0	11	12.4	4	4.5
Nursing assistant	10	11.2	5	5.6	4	4.5	0	0.0
Data clerk	3	3.4	0	0.0	0	0.0	0	0.0
<b>Totals</b>	<b>57</b>	<b>64.0</b>	<b>13</b>	<b>14.6</b>	<b>15</b>	<b>16.9</b>	<b>4</b>	<b>4.5</b>

Table 4.12 shows that on a statement that “DHIS2 is very useful tool” the majority of the respondents (64.0%, n=57) strongly agreed with the statement, followed by 16.9% (n=15) of the respondents who disagree, while 14.6% (n=13) of the respondents agree with the statement. Only (4.5%, n=4) of the respondents strongly disagree with the statement. In all categories the majority of the respondents strongly agree followed by those who agree, and the least percentage of the respondents strongly disagree with the statement.

This showed that the majority of the healthcare workers see DHIS2 as a very useful tool.

**Table 4.13: Respondents` perspective on use of DHIS2 in decision- making (N=89)**

Category	DHIS2 is very important in decision- making							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	35	39.3	26	29.2	4	4.5	2	2.2
Nursing assistant	5	5.6	13	14.6	1	1.1	0	0.0
Data clerk	3	3.4	0	0.0	0	0.0	0	0.0
<b>Totals</b>	<b>43</b>	<b>48.3</b>	<b>39</b>	<b>43.8</b>	<b>5</b>	<b>5.6</b>	<b>2</b>	<b>2.2</b>

Table 4.13 shows that on a statement that DHIS2 is very important in decision-making, the majority of the respondents (48.3%, n=43) strongly agree with the statement followed by (43.8%, n=39) of the respondents who agree with the statement, (5.6%, n=5) of the respondents who disagree and only (2.2%, n=2) of the respondents strongly disagree with the statement. In all categories the majority of the respondents strongly agree, followed by those who agree, and the least percentage of the respondents strongly disagree with the statement.

The results showed that the majority of healthcare workers understand the importance of DHIS2 in decision- making.

**Table 4.14: Respondents` perspective on benefits of DHIS2 (N=89)**

Category	The facility benefits from use of DHIS2							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	32	36.0	22	24.7	8	9.0	7	7.9
Nursing assistant	12	13.5	5	5.6	0	0.0	0	0.0
Data clerk	3	3.4	0	0.0	0	0.0	0	0.0
<b>Totals</b>	<b>47</b>	<b>52.8</b>	<b>27</b>	<b>30.3</b>	<b>8</b>	<b>9.0</b>	<b>7</b>	<b>7.9</b>

Table 4.14 shows that on a statement that “The facility benefits from use of DHIS2” the majority of the respondents (52.8%, n=47) strongly agree with the statement followed by (30.3%, n=27) who agree with the statement, (9.0%, n=8) of the respondents who disagree while (7.9%, n=7) of the respondents who strongly disagree with the statement. In all categories, the majority of the respondents strongly agree with the statement. The results reflect that healthcare workers are aware of the benefits of DHIS2.

**Table 4.15: Respondents` perspective on effective use of DHIS2 by facilities (N=89)**

Category	DHIS2 is effectively used in the facility							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	19	21.3	26	29.2	13	14.6	9	10.1
Nursing assistant	5	5.6	11	12.4	3	3.4	1	1.1
Data clerk	3	3.4	0	0.0	0	0.0	0	0.0
<b>Totals</b>	<b>27</b>	<b>30.3</b>	<b>37</b>	<b>41.6</b>	<b>16</b>	<b>18.0</b>	<b>10</b>	<b>11.2</b>

Table 4.15 shows that on a statement that “DHIS2 is effectively used in the facility” the majority of the respondents (41.6%, n=37) agree with the statement followed by (30.3%, n=27) who strongly agree with the statement, (18.0%, n=16) of the respondents who disagree, while (11.2%, n=10) of the respondents strongly disagree with the statement. In all categories, the majority of the respondents either strongly agree or agree with the statement.

The results showed that, the majority of the healthcare workers view DHIS2 as an effectively used tool in their facilities. According to WHO (2020:7), DHIS2 is not effectively used as some of the functions like dashboards and pivot tables for analysis are not adequately used by health professional. These results contradicted with the results found from WHO (2020:7) analysis on effective use of DHIS2 conducted on the report of advancing health information system. This is because in the study it was revealed that the respondents do not use some of the functions of DHIS2.

### 4.3.3 Section C

#### Challenges healthcare workers encounter when using DHIS2

##### 4.3.3.1 Healthcare workers who encounter challenges when using DHIS2.

**Table 4.16: Respondents who encounter challenges on use of DHIS2 (N=89)**

Category	Encountered challenges on use of DHIS2			
	Yes	Percentage (%)	No	Percentage (%)
Registered nurse	48	71.6	19	28.4
Nursing assistant	13	68.4	6	31.6
Data clerk	3	100	0	0
<b>Total</b>	<b>64</b>	<b>71.9</b>	<b>25</b>	<b>28.1</b>

Table 4.16 shows that the majority of the respondents (71.9%, n=64) encounter challenges on use of DHIS2, while (28.1%, n=25) of the respondents do not encounter challenges. From all categories, the majority of the respondents encounter challenges

on use of DHIS2. These results showed that the majority of the healthcare workers encounter challenges when using DHIS2. Consequently, they cannot use it effectively. There is a need for intervention for successful implementation, and to get the intended benefits of DHIS2 at the healthcare facilities.

#### 4.3.3.2 Challenges encountered by healthcare workers when using DHIS2.

In response to the question on challenges encountered by healthcare workers when using DHIS2, the categories and themes that emerged from the respondents' responses are listed in the table 4.17.

**Table: 4.17: Categories and themes of challenges encountered by healthcare workers when using DHIS2.**

Item	Categories	Emerged themes
4.3.3.2	<ul style="list-style-type: none"> <li>• Technical issues</li> </ul>	<ul style="list-style-type: none"> <li>• Network</li> <li>• System issues</li> </ul>
	<ul style="list-style-type: none"> <li>• Skill</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of skills</li> </ul>
	<ul style="list-style-type: none"> <li>• Supervision</li> </ul>	<ul style="list-style-type: none"> <li>• No feedback</li> <li>• Lack of supervision by direct supervisors</li> </ul>

Table 4.17 showed the following categories and their themes (as it was indicated in table 4.1): technical issues (network and system issues), skill (lack of skills) and supervision (no feedback and lack of supervision by direct supervisors). This open-ended question addressed the responses of the (71.9%, n=64) respondents who experience challenges when using DHIS2 as indicated on table 4.16.

These results show that the challenges encountered by the respondents when using DHIS2 were poor network connection, lack of skills, no feedback, system error, and lack of supervision by direct supervisors.

It should be noted that, each respondent mentioned more than one challenge. These results concur with Begum et al (2020:2) who found that, low internet connectivity is one of the challenges hindering effective use of DHIS2.

These results concur with Gathua (2016:35) who found that, lack of training in DHIS2, inadequate computers, poor internet connectivity, change of tools without consultation of health workers, lack of skills in data analysis, system not always operational, and lack of electricity as the challenges hindering successful use of DHIS2.

### 4.3.3.3 Challenges mostly encountered by healthcare workers when using DHIS2.

In response to the question on challenges mostly encountered by healthcare workers when using DHIS2, the categories and themes that emerged from the respondents' response are listed in the table 4.18.

**Table: 4.18: Categories and themes of challenges mostly encountered by healthcare workers when using DHIS2.**

Item	Categories	Emerged themes
4.3.3.3	<ul style="list-style-type: none"> <li>Technical</li> </ul>	<ul style="list-style-type: none"> <li>Network</li> <li>System issues</li> </ul>
	<ul style="list-style-type: none"> <li>Skill</li> </ul>	<ul style="list-style-type: none"> <li>Lack of skills</li> </ul>

Table 4.18 showed the following categories and their themes (as it was indicated in table 4.1): technical (network and system issues) and skill (lack of skills). This open-ended question addressed the responses of the (71.9%, n=64) respondents on challenges experience the most by the respondents when using DHIS2. It should be noted that the respondents indicated on table 4.16 who experienced challenges were asked a follow-up question on challenge experience the most.

The results showed that, healthcare workers mostly experienced network, system issues and lack of skills challenges in use of DHIS2. This showed that there is a need for trainings to equip the healthcare workers with skills and also proper monitoring to sharpen the learned skills.

These results concur with Gathua (2016:36) who found that, the training for healthcare workers on DHIS2 should be intensified and proper infrastructure be put in place to ease usage of DHIS2. Furthermore, there is a need for well-functioning internet and electricity to ensure accurate and complete data capturing (Gathua 2016:36).

### 4.3.3.4 Respondents' view on the complexity in use of DHIS2

**Table 4. 19: Respondents' perspective on complexity of use of DHIS2 (N=89)**

Category	DHIS2 is very complicated							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	1	1.1	14	15.7	40	44.9	12	13.5
Nursing assistant	0	0.0	9	10.1	10	11.2	0	0.0
Data clerk	0	0.0	0	0.0	0	0.0	3	3.4
<b>Totals</b>	<b>1</b>	<b>1.1</b>	<b>23</b>	<b>25.8</b>	<b>50</b>	<b>56.2</b>	<b>15</b>	<b>16.9</b>

Table 4.19 shows that the majority of the respondents (56.2%, n=50) disagree with the statement that DHIS2 is very complicated, followed by (25.8%, n=23) of the respondents who agree and (16.9%, n=15) of the respondents strongly disagree with the statement. Only (1.1%, n=1) strongly agree with the statement.

The results showed that, as much as there are challenges healthcare workers faces when using DHIS2, the majority still do not view it as a complicated tool to use. This means with proper interventions, effective use of DHIS2 can be achieved.

**Table 4.20: Respondents` perspective on use of DHIS2 adding workload (N=89)**

Category	DHIS2 add to workload							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	4	4.5	40	44.9	16	18.0	7	7.9
Nursing assistant	4	4.5	11	12.4	0	0.0	4	4.5
Data clerk	0	0.0	1	1.1	0	0.0	2	2.2
<b>Totals</b>	<b>8</b>	<b>9.0</b>	<b>52</b>	<b>58.4</b>	<b>16</b>	<b>18.0</b>	<b>13</b>	<b>14.6</b>

Table 4.20 shows that the majority of the respondents (58.4%, n=52) agree with the statement that DHIS2 add to workload, followed by (18.0%, n=16) of the respondents who disagree and (14.6%, n=13) of the respondents who strongly disagree. (9.0%, n=8) of the respondents strongly agree with the statement while 2.2% (n=2) strongly disagree with the statement.

This showed that, the majority of the healthcare workers see DHIS2 as the tool that adds to workload at the targeted healthcare facilities. These results concur with the results of the study that was conducted on perception and experience with district health information system software to collect and utilize health data in Bangladesh. The study shows that, effective use of DHIS2 could not be achieved in Bangladesh due to shortage of human resource as this brings workload (Begum et al 2020:2).

**Table 4.21: Respondents` perspective on a need of IT specialist in use of DHIS2 (N=89)**

Category	It is not easy to use DHIS2 without an IT specialist							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	0	0.0	19	21.3	42	47.2	6	6.7
Nursing assistant	2	2.2	7	7.9	10	11.2	0	0.0
Data clerk	0	0.0	0	0.0	0	0.0	3	3.4
<b>Totals</b>	<b>2</b>	<b>2.2</b>	<b>26</b>	<b>29.2</b>	<b>52</b>	<b>58.4</b>	<b>9</b>	<b>10.1</b>

Table 4.21 shows that the majority of the respondents (58.4%, n=52) disagree with the statement that it is not easy to use DHIS2 without an IT specialist. This category is followed by (29.2%, n=26) who agree and (10.1%, n=9) of the respondents who strongly disagree with the statement. Only (2.2%, n=2) of the respondents strongly agree with the statement.

This showed that the majority of the healthcare workers do not see a need for IT specialist when using DHIS2 at the targeted healthcare facilities. This could be because the majority still do not view it as a complicated system to use.

**Table 4.22: Respondents` perspective on facing no challenges on use of DHIS2 (N=89)**

Category	I face no challenge when using DHIS2							
	Strongly agree		Agree		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%
Registered nurse	5	5.6	18	20.2	39	43.8	5	5.6
Nursing assistant	2	2.2	6	6.7	6	6.7	5	5.6
Data clerk	0	0.0	0	0.0	3	3.4	0	0.0
<b>Totals</b>	<b>7</b>	<b>7.9</b>	<b>24</b>	<b>27.0</b>	<b>48</b>	<b>53.9</b>	<b>10</b>	<b>11.2</b>

Table 4.22 shows that the majority of the respondents (53.9%, n=48) disagree with the statement that “I face no challenge when using DHIS2” followed by (27%, n=24) who agree and 11.2% (n=10) of the respondents who strongly disagree. Only (7.9%, n=7) of the respondents strongly agree with the statement.

This showed that the majority of the healthcare workers face challenges in use of DHIS2 at the targeted healthcare facilities hence this hindered effective use of DHIS2 and therefore, there is a need for proper interventions.

#### 4.3.4 Section D

#### Support needed by healthcare workers for effective use of DHIS2.

##### 4.3.4.1 Frequency distribution of respondents who need support and those who do not need it in use of DHIS2

**Table 4.23: The respondents who need support and those who do not need it (N=89)**

Category	Do you think you need support to resolve the challenges that you encountered when using DHIS2			
	Yes		No	
	N	%	N	%
Registered nurse	56	62.9	11	12.4
Nursing assistant	14	15.7	5	5.6
Data clerk	3	3.4	0	0.0
<b>Total</b>	<b>73</b>	<b>82.0</b>	<b>16</b>	<b>18.0</b>

Table 4.23 shows that the majority of the respondents (82.0%, n=73) need support to resolve challenges that they encounter when using DHIS2 and (18.0%, n=16) do not need support. From all categories the majority of the respondents need support to resolve the challenges encountered when using DHIS2 for effective use.

This showed that the majority of the healthcare workers need support to resolve the challenges encountered when using DHIS2 for effective use of DHIS2. This also meant that the healthcare workers accepted the need for effective use of DHIS2; hence they need support to resolve the challenges encountered to reap the benefits of effective use of DHIS2.

##### 4.3.4.2 What respondents think can be done to use DHIS2 with ease without encountering challenges.

In response to the question, what respondents think can be done to use DHIS2 with ease without encountering challenges, the categories and themes that emerged from the respondents' response are listed in the table 4.24.



**Table: 4.24: Categories and themes of what respondents think can be done to use DHIS2 with ease without encountering challenges.**

Item	Categories	Emerged themes
4.3.4.2	• Supervision	• Monitoring and evaluation
	• Trainings	• Refresher trainings
	• Staffing	• More staff
	• Equipment	• Availability of adequate equipment

Table 4.24 showed the following categories and their themes (as it was indicated in table 4.1): supervision (monitoring and evaluation), training (refresher trainings), staffing (more staff) and equipment (availability of adequate equipment). This open-ended question addressed the responses of the (N=89) respondents on what they think can be done for them to use DHIS2 with ease without encountering challenges. Those respondents are all participants who took part in the study.

The results show that support healthcare workers at the targeted healthcare facilities need included, monitoring and evaluation, refresher trainings, more staff, and adequate equipment. These results concur with WHO (2020:6) who found that, there is a need to build local expertise on HIS through introduction of HIS programmes in universities, that will help healthcare workers with skills to analyse data, use data and harmonize it. This means a need for training in order to sharpen the skills of healthcare workers.

#### 4.3.4.3 Respondents` view on whether DHIS2 is a user-friendly tool or not.

**Table 4. 25: Respondents who view DHIS2 as a user-friendly tool and those who do not (N=89)**

Category	Do you find DHIS2 user friendly			
	Yes		No	
	N	%	N	%
Registered nurse	54	60.6	13	14.6
Nursing assistant	11	12.4	8	9.0
Data clerk	3	3.4	0	0.0
<b>Total</b>	<b>68</b>	<b>76.4</b>	<b>21</b>	<b>23.6</b>

Table 4.25 shows that the majority of the respondents (76.4%, n=68) view DHIS2 as a user-friendly tool while (23.6%, n=21) respondents do not view it as user friendly. From all categories the majority of the respondents view DHIS2 as user friendly.

This showed that majority of the healthcare workers view DHIS2 as a user-friendly tool at the targeted healthcare facilities. These results concur with the results of the study that was conducted in Bangladesh on perceptions and experiences with district health

information system software to collect and utilize health data. The results of the study in Bangladesh shows that the users at local level planning in Bangladesh have seen DHIS2 as a user-friendly tool through its dashboard function which assisted the managers to identify the essentials to overcome health service challenges (Begum et al 2020:1).

#### 4.3.4.4 What can be done to improve DHIS2 to make it user friendly

In response to the question, what can be done to improve DHIS2 to make it user friendly, the categories and themes that emerged from the respondents` responses are listed in the table 4.26.

**Table: 4.26: Categories and themes of what can be done to improve DHIS2 to make it user friendly.**

Item	Categories	Emerged themes
4.3.4.4	<ul style="list-style-type: none"> <li>Compatibility</li> </ul>	<ul style="list-style-type: none"> <li>Involvement of healthcare workers in application building</li> <li>Have local developers of the system</li> </ul>
	<ul style="list-style-type: none"> <li>Technical issues</li> </ul>	<ul style="list-style-type: none"> <li>Have technical team onsite</li> <li>The government own it, it shouldn't be an NGO property</li> </ul>

Table 4.26 showed the following categories and their themes (as it was indicated in table 4.1): compatibility (involvement of healthcare workers in application building and have local developers of the system) and technical issues (have technical team onsite and the government own it, it shouldn't be an NGO property). This open-ended question addressed the responses of the (23.6%, n=21) respondents who do not view DHIS2 as user friendly as indicated on table 4.25.

The results showed what the respondents think can be done to make DHIS2 user friendly. Their recommendations included involvement of the healthcare workers in application development, having technical team onsite, be owned by the government not NGOs, and have local developers of the system.

These results concur with Vehko, Hypponen, Puttonen, Kujala, Ketola, Tuukkanen, Aalto and Heponiemi (2019:2) who found that, the system should be developed in line with the user to avoid compatibility issues hence a need for local developers and involvement of healthcare workers. The report on advancing health information systems, emphasise the need for data ownership (WHO 2020: 6). Therefore, the respondents` recommendations are necessary for DHIS2 to be user friendly.

#### 4.3.4.5 Changes respondents think can be done in DHIS2 for users to use it effectively.

In response to the question, changes respondents think can be done in DHIS2 for users to use it effectively, the categories and themes that emerged from the respondents` responses are listed in the table 4.27.

**Table: 4.27: Categories and themes of changes respondents think can be done in DHIS2 for users to use it effectively.**

Items	Categories	Emerged themes
4.3.4.5	<ul style="list-style-type: none"> <li>• Trainings</li> </ul>	<ul style="list-style-type: none"> <li>• Refresher trainings</li> </ul>
	<ul style="list-style-type: none"> <li>• Staffing</li> </ul>	<ul style="list-style-type: none"> <li>• Add staff</li> </ul>
	<ul style="list-style-type: none"> <li>• Supervision</li> </ul>	<ul style="list-style-type: none"> <li>• Have feedback from supervisors through DHIS2</li> <li>• Intensive supervision and mentorship by direct supervisors</li> </ul>
	<ul style="list-style-type: none"> <li>• Compatibility</li> </ul>	<ul style="list-style-type: none"> <li>• Be customized to local needs</li> </ul>

Table 4.27 showed the following categories and their themes (as it was indicated in table 4.1) trainings (refresher trainings), staffing (add staff), supervision (have feedbacks from supervisors through DHIS2 and intensive supervision and mentorship by direct supervisors) and compatibility (be customized to local needs). This open-ended question addressed the responses of the (N=89) respondents on changes they think can be done in DHIS2 for users to use it effectively. Those respondents are all the respondents who took part in the study.

The results show what the respondents think can be done for DHIS2 to be used effectively. The respondents` recommendation include refresher trainings, have feedback from the supervisors through DHIS2, be customized to local needs, add staff and intensive supervision and mentorship by direct supervisors.

## 4.4 PART 2

### 4.4.1 Results of the Chi-square test of association of the variables

This part discussed the results found when testing the relationship between variables, that is independent and dependent variables. The independent variables used in testing the association are age, healthcare worker`s category, gender and years of experience. Dependent variables used in testing the association are use of DHIS2 by

healthcare workers, use of DHIS2 at workplace, and frequency of use of DHIS2 at workplace in a month. The significance level used is 0.05.

**Table 4.28: Significance of the variables on use of DHIS2 at workplace**

Variable	Value	P-value	Degree of freedom
Age group	28.412	0.13	21

Table 4.28 shows a Chi-square test that was run to test the relationship between age group and use of DHIS2 at workplace. The value of Chi-square was 28.412 and p-value was 0.13. Since the p-value is larger than 0.05 significance level, there is no relationship between the two variables. These results showed that the age group of the healthcare worker does not have any influence on use or no use of DHIS2 at workplace at the targeted health care facilities. That is whether a healthcare worker is old or young has no influence on use of DHIS2.

**Table 4.29: Significance of the variables on frequency of use of DHIS2**

Variable	Value	P-value	Degree of freedom
Age group	89.63	0.02	63
Healthcare worker's category	3.50	0.74	6

Table 4.29 shows a Chi-square test that was run on age group, healthcare worker's category, and frequency of use of DHIS2. For the independent variable age group, the Chi-square value was 89.63 and the p-value was 0.02. From the test, it is evident that there was a relationship between frequency of use of DHIS2 and age group. That is, the change in age group has impact in frequency of use of DHIS2. The majority of healthcare workers on age group 25-30 use DHIS2 regularly while the respondents in older age groups rarely or never use DHIS2. These results show that healthcare workers decrease frequency of use of DHIS2 as they age at the targeted healthcare facilities. The fact that DHIS2 is mainly based on technology and technology keeps changing it is not easy for an individual to keep up with technology as he or she age.

The results also show a Chi-square test that was run between healthcare worker's category and frequency of use of DHIS2. The value of the Chi-square was 3.50. The p-value was 0.74. Therefore, the p-value is larger than the significance value (0.05). From these results, it shows that there is no relationship between the two variables. That is, the category of a healthcare worker has no influence on frequency of use of DHIS2. Whether an individual is a registered nurse, nursing assistant or data clerk has no impact on frequency of use of DHIS2.

**Table 4. 30: Significance of the variables on use of DHIS2 by healthcare workers**

Variable	Value	P-value	Degree of freedom
Gender	1.56	0.46	2
Years of experience	5.33	0.26	4

Table 4.30 showed a Chi-square test that was run between gender, years of experience and use of DHIS2 by healthcare workers. For gender and use of DHIS2 by healthcare workers, the value of the Chi-square was 1.56. The p-value was 0.46. Therefore, the p-value is larger than the significance value (0.05). From these results, it shows that there is no relationship between the two variables. That is, whether an individual is male or female has no influence on use of DHIS2.

For years of experience and use of DHIS2 by healthcare workers, the value of the Chi-square was 5.33. The p-value was 0.26. Therefore, the p-value is larger than the significance value (0.05). From these results, it shows that there is no relationship between the two variables, that is whether an individual has long time on use of DHIS2 or less has no influence on their use of DHIS2.

#### **4.5 CONCLUSION**

This chapter focused on analysis, presentation, and interpretation of the results. The next chapter 5 will discuss the summary of results, discussion of the results and recommendations of the study.

## **CHAPTER 5**

### **DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

Chapter 4 discussed the analysis, presentation and interpretation of the results. This chapter is about the discussion, conclusions and recommendations based on the problem statement and objectives of the study. The study's objectives were to assess the extent of utilization of DHIS2 by healthcare workers in the healthcare facility, identify the challenges encountered by healthcare workers in using DHIS2 in the healthcare facility, and to determine the support needed by healthcare workers for effective use of DHIS2 in the healthcare facility. A summary of the results addressed the indicated objectives in Lesotho.

#### **5.2 SUMMARY OF THE RESEARCH RESULTS**

##### **5.2.1 Biographical information**

The results of this study in figure 4.1 revealed that the majority of the respondents (64%, n=57) were females and (36%, n=32) were males. This is because according to Every nurse (2018:1) nursing is a profession largely dominated by females. As shown in figure 4.3 the majority of the healthcare workers are registered nurses (75%, n=67), followed by (21%, n=19) of nursing assistants.

The results in figure 4.2 further showed that the majority of the respondents (41.6%, n=37) were aged between 25 and 30. Table 4.2 revealed that the majority (59.5%, n=53) of the respondents have 3 or less years of experience in use of DHIS2.

According to Columbia University (2019:1), older people are more skilled at work as they have more experience. Therefore, as much as the majority of the healthcare workers are at the age between 25-30, where they are actively using online platforms they are not skilled in using DHIS2. This is due to these healthcare workers having few years of experience (3 or less years) in use of DHIS2 hence this leads to ineffective use of the DHIS2 system.

### **5.2.2 Systems used for health information**

The results in table 4.3 showed that the majority (83.1%, n=74) of the respondents from all categories of healthcare workers use DHIS2 to manage healthcare information. Therefore, these results showed that the targeted healthcare facilities are working towards making an impact in health system. They are also working towards improving it for the better because the majority of their healthcare workers are using DHIS2 to manage healthcare information. According to Durr, Fahrion, Knopf and Taylor (2017:74), DHIS2 has been implemented globally, and many countries like Malawi, Kenya and Uganda have adopted it as the national health information system. This is because DHIS2 improves healthcare system for the better.

### **5.2.3 Frequency of use of DHIS2 at workplace in a month**

The results in figure 4.5 showed that the majority (83.0%, n=74) of the healthcare workers have used DHIS2 at workplace. The majority (40.5%, n=30) of the respondents who have used DHIS2 at workplace are aged between 25-30. Furthermore, it has been indicated in table 4.5 that, the majority (51.7%, n=46) of the respondents use DHIS2 regularly in a month. It is also noted in figure 4.5 that the majority of the respondents (39.1%, n=18) who use DHIS2 regularly are aged 25-30.

When category of healthcare worker was compared to use of DHIS2 at workplace in figure 4.6, it was found that all data clerks (100%, n=3) use DHIS2 regularly, followed by registered nurses (50.7%, n=34) and (47.4%, n=9) nursing assistants.

The results in figure 4.4 revealed that, the majority (83.0%, n=74) of healthcare workers use DHIS2 at workplace. There is a difference of use of DHIS2 at workplace when the respondents are compared by age and category. It is important for the health system to note that the majority of the healthcare workers use DHIS2, but the difference in frequency of use of DHIS2 at workplace means there is a difference in acceptance of DHIS2 in terms of age and category.

These results concur with the results from the study on experience time pressure and stress by Vehko, Hypponen, Puttonen, Kujala, Ketola, Tuukkanen, Aalto and Heponiemi (2019:2), which showed that acceptability of electronic health records (EHR) system by nurses was low and one for physicians was higher. This was due to

compatibility of the EHR with nurses' preferred working style, existing practices and values. Therefore, the differences in working style of different healthcare workers' categories influence difference in regular use of DHIS2. It is also noted that difference in age category influence regular use of DHIS2. This is due to compatibility issues and activeness in use of technology. Therefore, age category and healthcare workers category do affect effective use of DHIS2 system in the targeted healthcare facilities.

#### **5.2.4 Reasons for use of DHIS2**

The results in figure 4.7 showed that the respondents use DHIS2 for different reasons and this include data collection, reporting, data validation and decision- making. It was also showed that other respondents use DHIS2 for more than 1 reason while others do not use it at all. These other users are indicated in the next paragraph. For effective use of DHIS2 all the functions of the system should be in use as shown by information cycle of DHIS2 (DHIS2 user manual 2016:1). The results also showed that only 22% (n=20) of the respondents use DHIS2 for more than 1 reason, hence they are the only ones who could be using DHIS2 effectively. The effective use of DHIS2 can only be achieved if all healthcare workers use all the functions of the system.

In figure 4.8, it was found that registered nurses and nursing assistants use DHIS2 mostly for data collection. Registered nurses (37.3%, n=25), nursing assistants (36.8%, n=7) and all data clerks (100%, n=3) use DHIS2 for more than 1 reason. These results concur with the results found on difference in regular use of DHIS2 at workplace on figure 4.6 which differ with category. Figure 4.8 show that all data clerks use DHIS for more than 1 reason. This means that, DHIS2 is used effectively by data clerks while other categories use it to a certain extent, thus making it ineffective.

According to Msendema, Chigona, Kumwenda, Kaasboll and Kanjo (2021:925), having multiple stakeholders in health management information system (HMIS) is a challenge. Other stakeholders do manage to get the expected quality data while others still struggle to attain high level of data quality. The results of this study concur with the results of the study that was conducted in Malawi on legitimization of data quality practices in health management information systems using DHIS2. These results prove that, different healthcare workers' categories used DHIS2 to different extents (Msendema et al 2021:925). Msendema et al (2021:925) further shows that, in the long run this deprives Malawi of the opportunity to meet the sustainable development



goal 3 whose target is `good health and well-being for all`. This is due to ineffective use of the system. Therefore, the targeted health facilities are likely to affect the country from meeting goal number 3 of good health and well-being for all.

### **5.2.5 Reasons why the respondents do not use DHIS2**

The following reasons have been indicated by the respondents (16.9%, n=15) from specific healthcare facilities in section 4.3.2.5 with regard to why they do not use DHIS2 effectively (as indicated in figure 4.8). These are inadequate equipment, incompetency, not part of job description, workload and poor mentoring and evaluation (as indicated in table 4.6). According to WHO (2020:6), lack of capacitated human resource has been the challenge of hindering successful implementation of DHIS2 for many developing countries. Healthcare workers tend to be overloaded with work because they are under-staffed. Lesotho also is not an exception hence ineffective use of DHIS2 by the healthcare workers in the targeted healthcare facilities.

### **5.2.6 Views of the respondents in terms of usefulness of DHIS2**

The response on usefulness of DHIS2 in figure 4.9, showed that (78.7%, n=70) of the respondents view DHIS2 as useful. DHIS2 has been seen to be useful in different countries. This was seen in both international and African countries. In India DHIS2 was used to link health information data for all facilities at different level of health services provision (Garg & Garg 2015:40). Adu-Gyamfi, Nielsen and Saebo (2019:73) also showed that ministries of health and NGOs in more than 100 developing countries use DHIS2 to manage their data. This showed how useful DHIS2 is.

### **5.2.7 Why DHIS2 is not useful**

As much as the majority of the respondents have seen DHIS2 as useful tool, there were still those who do not see it as useful (21.3%, n=19), (as indicated in figure 4.9). They expressed that they do not understand how it relates to the job taking the majority, there were no follow-up from supervisors on its use and according to them, the tool seemed more useful for the NGOs (as indicated in table 4.7). These reflect lack of skills, no mentorship and resistance to change from the healthcare workers.

### **5.2.8 Functions used more often on DHIS2 by the respondents**

According to Open health news (2020:1), DHIS2 offers various functions which include monitoring of patients, improvement of disease surveillance, mapping of disease outbreaks, accessing of health data by health facilities and governments, quickly and easily assist in better decision- making. All those functions can be achieved only if all the functions of the system are effectively used. Ineffective use in the facilities hinders the facilities to improve or benefit from the system. Consequently, the entire country gets affected.

The results in table 4.8 showed that the majority of the respondents (76.4%, n=68) use DHIS2 more often for data entry. This is further shown that, in all categories of healthcare workers, the majority use data entry function more often (registered nurse (77.6%, n=52), nursing assistants (73.7%, n=14) and data clerk (66.7%, n=2)). These results further showed that DHIS2 is not effectively used as the majority of the respondents use only one function often. The function that is frequently used is data entry. Therefore, the results intended for the system will not be achieved. WHO (2020:3), also showed that countries have managed to improve their health care system through effective use of DHIS2.

### **5.2.9 Reasons why the respondents use none of the functions of DHIS2**

Apart from the respondents who used only one function more often, there were (16.9%, n=15) respondents who use none of the functions as indicated in table 4.8. The respondents showed that workload, incompetency and inadequate equipment as the reasons why they do not use functions of DHIS2 (as indicated in table 4.9). This reasons further support the results outlined in item 5.2.5. Therefore, there is a need for addition of staff to reduce workload on healthcare workers. Trainings and also provision of adequate equipment for the success of the system also needs to be addressed. These results concur with the results found from the study on challenges in use of the mental health information system in a resource-limited setting conducted in Ghana. The study showed that, challenges that affect implementation of MHIS, which is a similar technological application to DHIS2, are lack of policies to govern information management, insufficient or poorly trained personnel and problems in

workflow (Kpobi, Swarts & Ofori-atta 2018:2). It is further shown that staff workload also hinders implementation of the system (Kpobi et al 2018:4)

#### **5.2.10 Do the respondents enjoy using DHIS2?**

The results in table 4.10 showed that the majority of the respondents (65.2%, n=58) enjoy using DHIS2, while 34.8% (n=31) do not enjoy using DHIS2. For the healthcare workers to use DHIS2 effectively, they have to enjoy its use. That occurs only when they have skills to operate it, and understand clearly how it supports the healthcare system. The results of healthcare workers who do not enjoy use of DHIS2 reflect ineffective use of the system.

#### **5.2.11 Reasons why the respondents do not enjoy using DHIS2**

The respondents (34.8%, n=31) as reflected in section 4.3.2.12 (as indicated in table 4.10), indicated that workload, difficult to use and not part of our job are reasons making it impossible for them to enjoy use of DHIS2 (as indicated in table 4.11). This simply shows that healthcare workers do not have skills in use of DHIS2. They find DHIS2 difficult to use, and do not understand how it forms part of their job description. When the healthcare workers are not skilled and there is shortage of staff, ineffective use of the system is inevitable.

WHO (2020:6), showed that collaboration of countries to exchange skills and knowledge through circulation of practitioners between implementing countries has been helpful for countries like Uganda and Kenya. Therefore, this emphasises the need for skilled healthcare workers for effective use of DHIS2 system in Lesotho.

#### **5.2.12 Respondents` perspective on effective use of DHIS2**

The results in table 4.12 showed that, the majority of the respondents (64.0%, n=57), strongly agree that DHIS2 is effectively used. This is followed by (16.9%, n=15) who disagree on the system being effectively used. Therefore, the majority of the respondents view DHIS2 as effectively used. These results contradict with most of the results found on this study. It was found that the majority of the respondents use only data collection function more often while other functions are rarely or never used. It was also identified that, there are healthcare workers who do not use any of DHIS2`s functions. For the system to be effectively used, all its functions should be used. All

trained healthcare workers should be able to use it. This is not the case in this study. DHIS2 system is not effectively used in the targeted healthcare facilities.

### **5.2.13 Challenges encountered by healthcare workers when using DHIS2**

It was shown in table 4.16 that (71.9%, n=64) of the respondents experience challenges when using DHIS2. They are the following: network, lack of skills, no feedback, system issues and no supervision from direct supervisors (as indicated in table 4.17). Lack of skills is also reflected in item 5.2.11 that showed that there are the respondents who do not use DHIS2 because it is difficult to use, and section 5.2.7 that showed that some of the respondents do not understand how it relates to their work.

According to WHO (2020:6) the implementation of DHIS2 in West African countries will be challenged by lack of human capacity. Kanfe, Debele, Berhanu, Ngusie and Ahmed (2021:2) also showed that many health facilities in sub-Sahara countries are challenged by inadequacy of human and financial resources, low management support, lack of supervision and leadership in utilization of DHIS.

### **5.2.14 Respondents` view on the complexity in use of DHIS2**

The results in table 4.19 have shown that the majority of the respondents (56.2%, n=50) disagree with the belief that DHIS2 is complicated to use. Table 4.21 clearly shows the majority of respondents (58.4%, n=52) who disagree with the need for an IT specialist to operate DHIS2 with ease. On the other hand, the majority of the respondents (58.4%, n=52) in table 4.20 agree that it adds workload, and the majority in table 4.22 (53.9%, n=48) experience challenges when using DHIS2. These results still reflect lack of human resource and skills to operate the system. As much as the healthcare workers do not view DHIS2 as complex, they still see it adding workload, and they are challenged on its use.

### **5.2.15 What respondents think can be done to use DHIS2 with ease without encountering challenges.**

As the results have shown, the respondents are challenged by lack of skills, no supervision, and lack of human resource when using DHIS2. The following have been identified by the respondents as the solutions to their challenges: monitoring and evaluation, refresher trainings, more staff and equipment (as indicated in table 4.24).

There is a need for more staff to reduce workload and there is also a need for monitoring and evaluation by supervisors to equip healthcare workers with skills. This will further be aided by refresher trainings. All these will not be achieved without proper equipment.

Sahay, Rashidian and Doctor (2019:2) suggest use of regional approach. This is whereby countries which are similar geographically and institutionally share and learn each other's approaches, methods, experiences, products and resources to overcome challenges.

#### **5.2.16 Changes respondents think can be done in DHIS2 for users to use it effectively.**

The respondents have shown that, for them to use DHIS2 effectively, there should be refresher trainings to sharpen their skills. Rapid feedback from supervisors through DHIS2 will assist them to overcome challenges. DHIS2 be customized to local needs, addition of staff to release workload and intense supervision and mentorship from direct supervisors are additional factors that can enhance effective use of the system (as indicated in table 4.27). These results concur with the study conducted in Ethiopia on utilization of DHIS. The study revealed that five variables that are significantly associated with utilization of DHIS for decision- making are skills, motivation, training, feedback and supervision support (Kanfe et al 2021:4)

#### **5.2.17 Results of the Chi-square test of association of the variables**

The results have shown that there is a relationship between age of a healthcare worker and frequency of use of DHIS2. However, there is no relationship between other independent variables like healthcare worker's category and frequency of use. Additionally, there is no relationship between age and usage of DHIS2 at workplace. That is, as much as the majority of healthcare workers can use DHIS2 at workplace, there is a difference in frequency of use due to difference in age. The results concur with Kanfe et al (2021:3), who suggests that the respondents aged 30 and below had good utilization of DHIS for decision-making purpose.

## **5.3 RECOMMENDATIONS**

### **5.3.1 Education**

In review of the results the following recommendations were reached for effective utilization of DHIS2 by healthcare workers.

- There should be availability of the refresher trainings of all healthcare workers on use of DHIS2.
- Building of the local capacity in healthcare workers in use of DHIS2.

### **5.3.2 Clinical practice**

- The ministry of health (MOH) should review the equipment at the facilities to effectively implement DHIS2.
- MOH should reinforce information communication technology (ICT) policy in healthcare facilities.
- Healthcare workers should be encouraged by their supervisors to use all functions of DHIS2.

### **5.3.3 Management**

- More supervision and motivation of healthcare workers on effective use of DHIS2 be encouraged.
- MOH should recruit more healthcare workers to use DHIS2.

### **5.3.4 Future research**

- Determine the challenges that hinder effective utilization of DHIS2.
- Evaluate the knowledge and attitude of healthcare workers on utilization of DHIS2.

## **5.4 LIMITATIONS OF THE STUDY**

This study was conducted at three district hospitals out of 18 district hospitals in Lesotho. Therefore, the results could not be generalized to the whole population of nurses and data clerks in other districts hospitals. The study includes only nurses and data clerks while there are other healthcare workers who use DHIS2 such as pharmacists.

## **5.5 CONCLUDING REMARKS**

The purpose of the study was to investigate the utilization of DHIS2 by healthcare workers in Lesotho. Through the results, the study has established that DHIS2 is not effectively used. This is shown by the majority of respondents (36%, n=32) who use DHIS2 for data collection only and lower number of respondents use it for other reasons. It was also established that there are respondents (16.9%, n=15) who do not use DHIS2. For DHIS2 to be effectively used all stakeholders should be fully involved and all functions of the system be in use not only one function. The results further showed that majority of the respondents (76.4%, n=68) use DHIS2 for data entry more often. Again, (71.9%, n=64) respondents encountered challenges on use of DHIS2 and (82.0%, n=73) respondents needed support to resolve challenges they have encountered when using DHIS2.

The respondents have shown that this is due to work overload, lack of skills to operate the system, poor supervision from the supervisors and inadequate equipment. The ineffective use of the system will hinder the success in achieving sustainable development goal number 3. Therefore, there is a need for interventions. Based on the results the researcher proposed the following recommendations as interventions: refresher trainings on DHIS2, intensive supervision by direct supervisors, adequate staffing and adequate equipment.

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# ANNEXURES

## Annexure 1. Ethical clearance from department of health studies (UNISA)



**COLLEGE OF HUMAN SCIENCES RESEARCH ETHICS REVIEW COMMITTEE**

01 December 2020

Dear Mr Silane Tsoeu

NHREC Registration # :  
Rec-240816-052  
CREC Reference # :  
61968471\_CREC\_CHS\_2020

**Decision:**  
**Ethics Approval from 01 December 2020 to 31 November 2023**

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**Principal Researcher(s) Mr Silane Tsoeu: (email: 61968471@mylife.unisa.ac.za)**  
**Supervisor: Prof KA Maboe (email: @unisa.ac.za)**

**Title: Utilization of District Health Information System 2 by Healthcare Workers in Lesotho.**

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**Degree Purpose: Research Masters of Public Health**

Thank you for the application for research ethics clearance by the Unisa College of Human Science Ethics Committee. Ethics approval is granted for three years.

The *medium-Risk application* was reviewed by College of Human Sciences Research Ethics Committee, on **24 November 2020** in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the College Ethics Review Committee.




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3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
  4. 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.
  5. 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.
  6. 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.
  7. No fieldwork activities may continue after the expiry date (**31 November 2023**). Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

*Note:*  
*The reference number 61968471\_CREC\_CHS\_2020 should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee*

Yours Sincerely,

Signature :   
Dr. K.J. Malesa  
CHS Ethics Chairperson  
Email: [maleski@unisa.ac.za](mailto:maleski@unisa.ac.za)  
Tel: (012) 429 4780

Signature : PP   
Prof K. Masemola  
Executive Dean : CHS  
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**Annexure 2. Questionnaire for all the respondents**

**SECTION A: BIOGRAPHIC INFORMATION**

Respondent's code (to be completed by researcher only)

Please put a cross (X) in the relevant box and fill in where you see dotted lines.

1. Gender/Sex

Male	Female
1	2

2. Age: ..... (in completed years)

3. Category

Registered Nurse	Nursing Assistant	Data clerk
1	2	3

4. Years of experience in DHIS2

<1 Year	1-3 Years	>3 Years
1	2	3

**SECTION B: THE EXTENT OF UTILIZATION OF DHIS2 BY HEALTH WORKERS USE DHIS2**

Please put a cross (X) in relevant box

5. Which system do you use for your health information?

DHIS2	Other
1	2



6. Have you ever used DHIS2 at your workplace?

Yes	No
1	2

7. How often do you use DHIS2 in a month?

Never	1
Rarely	2
Occasionally	3
Regularly	4
Do not know	5

8. What do you use DHIS2 for?

Data collection	1
Data Validation	2
Reporting	3
Decision making	4
Do not use it	5

9. If the answer to number 8 is do not use it explain why?

.....  
.....  
.....

10. Do you find DHIS2 useful?

Yes	No
-----	----

1	2
---	---

11. If answer to 10 is no, can you explain why?

.....

.....

.....

.....

12. Which functions can you perform with confidence on DHIS2? (tick all you can do; you can tick more than 1)

1.Creating dashboards	1
2.Messaging	2
3.Data entry	3
4.Event capturing	4
5.Analyzing data in pivot tables	5
6.Data visualizing	6
7.Creating Maps	7
8.Control data quality	8
9.None	9

13. Which of the above functions do you use more often, if answer to 12 is none explain why? (tick 1 and if none explain on doted lines)

1.Creating dashboards	1
2.Messaging	2
3.Data entry	3
4.Event capturing	4
5.Analyzing data in pivot tables	5
6.Data visualizing	6
7.Creating Maps	7
8.Control data quality	8
9.None	9

.....

.....

.....  
 .....  
 14. Do you enjoy using DHIS2?

Yes	No
1	2

15. If answer to 14 is no, can you explain why?

.....  
 .....  
 .....

**For the following questions please read the statement and indicate if you strongly agree, agree, disagree, and strongly disagree with the statement, tick in the box of your choice.**

Please read the statement and indicate if you strongly agree, agree, disagree, and strongly disagree with the statement, tick in the box of your choice. Where 1 indicates strongly agree, 2 agree, 3 disagree and 5 strongly disagree.	Strongly agree	Agree	Disagree	Strongly disagree
16. DHIS2 is a very useful tool	1	2	3	4
17. DHIS2 is very important in decision making	1	2	3	4
18. The facility benefits from use of DHIS2	1	2	3	4
19. DHIS2 is effectively used in the facility	1	2	3	4

**SECTION C: CHALLENGES HEALTH WORKERS ENCOUNTER WHEN USING DHIS2**

20. Have you encountered any challenge when using DHIS2?

Yes	No
1	2

21. If answer to 20 is yes, please list all the challenges below:

- 1.....
- 2.....
- 3.....
- 4.....
- 5.....
- 6.....

22. Which one of the listed challenges do you experience the most?

1	2	3	4	5	6

**For the following questions please read the statement and indicate if you strongly agree, agree, disagree, and strongly disagree with the statement, tick in the box of your choice.**

Please read the statement and indicate if you strongly agree, agree, disagree, and strongly disagree with the statement, tick in the box of your choice. Where 1 indicates strongly agree, 2 agree, 3 disagree and 5 strongly disagree.	Strongly agree	Agree	Disagree	Strongly disagree
23. DHIS2 is very complicated to use	1	2	3	4
24. DHIS2 add to our workload	1	2	3	4
25. It is not easy to use DHIS2 without an IT specialist	1	2	3	4

26. I Face no challenges when using DHIS2	1	2	3	4
---	---	---	---	---

**SECTION D: SUPPORT NEEDED BY HEALTH WORKERS FOR EFFECTIVE USE OF DHIS2**

27. Do you think you need support to resolve the challenges that you encounter when using DHIS2?

Yes	No
1	2

28. If yes, what do you think can be done to help you to use DHIS2 with ease without encountering challenges?

.....

.....

.....

.....

.....

29. Do you find DHIS2 user friendly?

Yes	No
1	2

30. If no, can you say, how can it be improved?

.....

.....

.....

.....

.....

31. What changes or improvements do you think can be done in DHIS2 for you to use it effectively?

.....

.....

.....

.....

.....

**THANK YOU VERY MUCH FOR AGREEING TO PARTICIPATE IN THIS STUDY  
YOUR CONTRIBUTION IS VALUABLE.**

### Annexure 3. Consent to participate in the study



#### ANNEXURE 3: CONSENT TO PARTICIPATE IN THIS STUDY

I, \_\_\_\_\_ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I understand that COVID 19 guidelines will be adhered to if it is still a pandemic during data collection by the researcher.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname..... (please print)

Participant Signature.....Date.....

Researcher's Name & Surname: Silane Tsoeu

Researcher's signature.....Date.....



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## Annexure 4. Researcher confidentiality agreement



### ANNEXURE 4: Confidentiality Agreement


**Title of Research: Utilization of District Health Information System (DHIS) by health workers in Lesotho.**

**Researcher: Silane Tsoeu**

**Student Number: 61968471**

As a student researcher, I understand that I may have access to confidential information about study sites and participants. By signing this statement, I am indicating my understanding of my responsibilities to maintain confidentiality and agree to the following:

- I understand that names and any other identifying information about study sites and participants are completely confidential.
- I agree not to divulge, publish, or otherwise make known to unauthorized persons or to the public any information obtained in the course of this research project that could identify the persons who participated in the study.
- I understand that all information about study sites or participants obtained or accessed by me in the course of my work is confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information, unless specifically authorized to do so by approved protocol or by the local authority acting in response to applicable law or court order, or public health or clinical need.
- I understand that I am not to read information about study sites or participants, or any other confidential documents, nor ask questions of study participants for my own personal information but only to the extent and for performing my assigned duties on this research project.
- I agree to notify the local authority immediately should I become aware of an actual breach of confidentiality or a situation, which could potentially result in a breach, whether this be on my part or on the part of another person.
- I agree to adhere to COVID 19 guidelines during data collection and analyses.

-----  
Tsoeu  ----- 3/6/2020 ----- Silane  
Signature Date Printed name



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-----  
Signature of investigator Date Printed name



## Annexure 4.1. Statistician confidentiality agreement



### ANNEXURE 4.1: Confidentiality Agreement

**Title of Research: Utilization of District Health Information System (DHIS) by health workers in Lesotho.**

**Statistician: Nkhethoa Matsелеli**

As a statistician, I understand that I may have access to confidential information about study sites and participants. By signing this statement, I am indicating my understanding of my responsibilities to maintain confidentiality and agree to the following:

- I understand that names and any other identifying information about study sites and participants are completely confidential.
- I agree not to divulge, publish, or otherwise make known to unauthorized persons or to the public any information obtained in the course of this research project that could identify the persons who participated in the study.
- I understand that all information about study sites or participants obtained or accessed by me in the course of my work is confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information, unless specifically authorized to do so by approved protocol or by the local authority acting in response to applicable law or court order, or public health or clinical need.
- I understand that I am not to read information about study sites or participants, or any other confidential documents, nor ask questions of study participants for my own personal information but only to the extent and for performing my assigned duties on this research project.
- I agree to notify the local authority immediately should I become aware of an actual breach of confidentiality or a situation, which could potentially result in a breach, whether this be on my part or on the part of another person.
- I agree to adhere to COVID 19 guidelines during data collection and analyses.

01/07/2020

Nkhethoa Matsелеli

-----  
Signature

-----  
Date

-----  
Printed name

-----  
Signature of investigator

-----  
Date

-----  
Printed name



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](http://www.unisa.ac.za)

## Annexure 5. Request for permission letter to Ministry of health

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Ha Maqele  
P.O.Box 65  
Maputsoe 350  
Mobile:59615150  
14/11/2020

The Manager  
Ministry of Health  
Lesotho

**Re: Request for permission to conduct study in Lesotho**

**STUDY TITLE: Utilization of district health information system (DHIS) by healthcare workers in Lesotho**

Dear Sir/Madam

This serves as a request for permission to conduct a study with the title mentioned above at Leribe, Berea and Mafeteng government Hospitals. I am currently working as a Senior SRH and HTS officer at PSI.


I am a masters of Public Health student at UNISA and am seeking approval to conduct the said study in which I would like to solicit for information from healthcare workers using DHIS at the facility. I intent to use self –administered questionnaire as attached.

The objectives of the study are as follows:

- To assess healthcare workers' use of DHIS2 in the facility.
- To describe the challenges healthcare workers are encountering in using of DHIS2 in the facility.
- To investigate the support needed by healthcare workers for effective use of DHIS2 in the facility.

This study will determine the knowledge of healthcare workers regarding the use of District Health Information System version 2 (DHIS2). I have attached to this letter a brief summary of the research proposal.

Yours Sincerely



Silane Tsoeu

(Researcher)

## Annexure 5.1. Permission letter from Ministry of health



Ministry of Health  
P.O. Box 514  
Maseru 100

**REF: ID83-2020**  
Date: January 12, 2021  
To  
**Silane Tsoeu**  
University of South Africa

**Category of Review:**

- Initial Review
- Continuing Annual Review
- Amendment/Modification
- Reactivation
- Serious Adverse Event
- Other \_\_\_\_\_

Dear Mr Tsoeu,

**RE: Utilization of District Health Information System (DHIS) by Healthcare Workers in Lesotho.**

This is to inform you that the Ministry of Health Research and Ethics Committee reviewed and **APPROVED** the above named protocol and hereby authorizes you to conduct the study according to the activities and population specified in the protocol. Departure from the approved protocol will constitute a breach of this permission.

This approval includes review of the following attachments:

- Protocol
- English & Sesotho informed consent form
- Data collection tools in English
- Participant materials *[insert types, versions]*
- Other materials: CV of the PI, request letter for approval

This approval is **VALID** until January 14, 2022.

Please note that an annual report and request for renewal, if applicable, must be submitted at least 6 weeks before the expiry date.

All serious adverse events associated with this study must be reported promptly to the MOH Research and Ethics Committee. Any modifications to the approved protocol or consent forms must be submitted to the committee prior to implementation of any changes.

We look forward to receiving your progress reports and a final report at the end of the study. If you have any questions, please contact the Research and Ethics Committee at [rcumoh@gmail.com](mailto:rcumoh@gmail.com) (or) 59037919/58800246.

Sincerely,

**Dr. Lucy Mapota-Masoabi**  
Director General Health Services (a.i)

**DR. Llang Bridget Maama-Maime**  
Member, National Health Research  
Ethics Committee (NH-REC)

## Annexure 6. Request for permission letter to hospital one

Ha Maqele  
P.O.Box 65  
Maputsoe 350  
Mobile:59615150  
14/11/2020

The Manager  
Leribe Government Hospital  
Hlotse  
Leribe

**Re: Request for permission to conduct study at Leribe Government Hospital**

**STUDY TITLE: Utilization of district health information system (DHIS) by healthcare workers in Lesotho**

Dear Sir/Madam

This serves as a request for permission to conduct a study with the title mentioned above at your health institution, Leribe government Hospital. I am currently working as a Senior SRH and HTS officer at PSI.

I am a masters of Public Health student at UNISA and am seeking approval to conduct the said study in which I would like to solicit for information from healthcare workers using DHIS at the facility. I intent to use self –administered questionnaire as attached.

The objectives of the study are as follows:

- To assess healthcare workers' use of DHIS2 in the facility.
- To describe the challenges healthcare workers are encountering in using of DHIS2 in the facility.
- To investigate the support needed by healthcare workers for effective use of DHIS2 in the facility.

This study will determine the knowledge of healthcare workers regarding the use of District Health Information System version 2 (DHIS2). I have attached to this letter a brief summary of the research proposal.

Yours Sincerely



Silane Tsoeu

(Researcher)



**Annexure 6.1. Permission letter from hospital one**

Leribe (Motebang) Government Hospital

P.O. Box 10. Leribe 300

Tel.:+266 22400305

Date: 01/04/2021

To: Mr Silane Tsoeu

University of South Africa

**RE: REQUEST TO CONDUCT RESEARCH ON THE PREMISES OF LERIBE  
(MOTEBANG) GOVERNMENT HOSPITAL**

This serves to inform you that Leribe (Motebang) government hospital grants permission to Mr. Tsoeu to conduct research titled: **Utilization of District Health Information System 2 (DHIS 2) by healthcare workers in Lesotho.**

You are kindly requested to adhere to the conditions as stipulated in approval letter from Ministry of health ref (ID83-2020)

Wishing you the best in your studies

Kind Regards

.....  
DISTRICT MEDICAL  
OFFICER  
12 APR 2021  
BOX 10, MOTEBANG LERIBE  
TEL: 22 400 027

## Annexure 7. Request for permission letter to hospital two

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Ha Maqele  
P.O.Box 65  
Maputsoe 350  
Mobile:59615150  
14/11/2020

The Manager  
Berea Government Hospital  
Teyateyaneng  
Berea

**Re: Request for permission to conduct study at Berea Government Hospital**

**STUDY TITLE: Utilization of district health information system (DHIS) by healthcare workers in Lesotho**

Dear Sir/Madam

This serves as a request for permission to conduct a study with the title mentioned above at your health institution, Berea government Hospital. I am currently working as a Senior SRH and HTS officer at PSI.

I am a masters of Public Health student at UNISA and am seeking approval to conduct the said study in which I would like to solicit for information from healthcare workers using DHIS at the facility. I intent to use self –administered questionnaire as attached.

The objectives of the study are as follows:

- To assess healthcare workers' use of DHIS2 in the facility.
- To describe the challenges healthcare workers are encountering in using of DHIS2 in the facility.
- To investigate the support needed by healthcare workers for effective use of DHIS2 in the facility.

This study will determine the knowledge of healthcare workers regarding the use of District Health Information System version 2 (DHIS2). I have attached to this letter a brief summary of the research proposal.

Yours Sincerely



Silane Tsoeu

(Researcher)

**Annexure 7.1. Permission letter from hospital two**

**BEREA GOVERNMENT HOSPITAL  
P.O.BOX 4  
BEREA 200  
12 April 2021**

**SILANE TSOEU  
UNIVERSITY OF SOUTH AFRICA**

Dear Mr. Tsoeu


**RE: Utilization of District Health Information System 2 (DHIS 2) by  
healthcare workers**

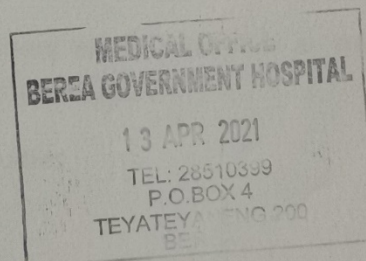
This serves to inform you that, the management of **Berea Government Hospital** has approved the above named protocol and hereby gives you permission to conduct the study.

Deviation from the above protocol will constitute the breach of this permission.

This approval is valid until January 14, 2022.

Sincerely

  
*Dr. Lubana Nkolombway*



## Annexure 8. Request for permission letter to hospital three

Ha Maqele  
P.O.Box 65  
Maputsoe 350  
Mobile:59615150  
14/11/2020

The Manager  
Mafeteng Government Hospital  
Mafeteng

**Re: Request for permission to conduct study at Mafeteng Government Hospital**

**STUDY TITTLE: Utilization of district health information system (DHIS) by healthcare workers in Lesotho**

Dear Sir/Madam

This serves as a request for permission to conduct a study with the title mentioned above at your health institution, Mafeteng government Hospital. I am currently working as a Senior SRH and HTS officer at PSI.

I am a masters of Public Health student at UNISA and am seeking approval to conduct the said study in which I would like to solicit for information from healthcare workers using DHIS at the facility. I intent to use self –administered questionnaire as attached.

The objectives of the study are as follows:

- To assess healthcare workers' use of DHIS2 in the facility.
- To describe the challenges healthcare workers are encountering in using of DHIS2 in the facility.
- To investigate the support needed by healthcare workers for effective use of DHIS2 in the facility.

This study will determine the knowledge of healthcare workers regarding the use of District Health Information System version 2 (DHIS2). I have attached to this letter a brief summary of the research proposal.

Yours Sincerely



Silane Tsoeu

(Researcher)



**Annexure 8.1. Permission letter from hospital three**

Mafeteng Government Hospital

P.O.Box 16

Mafeteng 900

13 April 2021

Mr Silane Tsoeu

Student # 61968471

University of South Africa

Dear sir,

**Re: Permission to conduct a health related academic research**

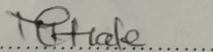
Reference is made to your letter dated 12/02/2021 in which you requested permission to conduct academic research study on “**utilization of District Health information system (DHIS) by healthcare workers in Lesotho**”

I am pleased to inform you that permission has been granted to conduct above mentioned study in this facility. The hospital is willing to accord necessary support that you may require and would appreciate it if you can share final report of the study for betterment of services.

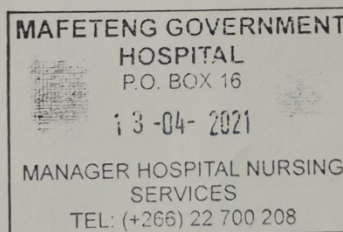
I wish you peaceful stay in our facility and wish you best of luck in this time strenuous process.

Yours Sincerely

Matsola Ntlale (M/S)



**Manager Hospital Nursing Services**



## Annexure 9. Letter from the statistician

13 December 2021

To whom it may concern

### RE: DATA ANALYSIS AND RESEARCH RESULTS

This letter serves as a proof that I have worked with Mr Tsoeu to assist him in his study on all statistical issues. This includes development of the data collection tool, data collection, data analysis, presentation, and description of results. Data was analysed using SPSS version 26.0 (2019).

For further information please contact me on +266 59598361 or [nkhethoamatseleli@gmail.com](mailto:nkhethoamatseleli@gmail.com).

Regards



N. Matseleli

## Annexure. 10. Professional language editor`s letter

Abia

Maseru 100

Phone: +26650297234

Email: [litseoanemokaloba@gmail.com](mailto:litseoanemokaloba@gmail.com)

24<sup>th</sup> January 2022

The Department of Health Sciences  
University of South Africa  
Pretoria 0002  
South Africa

To whom it may concern

### EDIT AND PROOFREADING WORK DONE ON MR. TSOEU'S THESIS

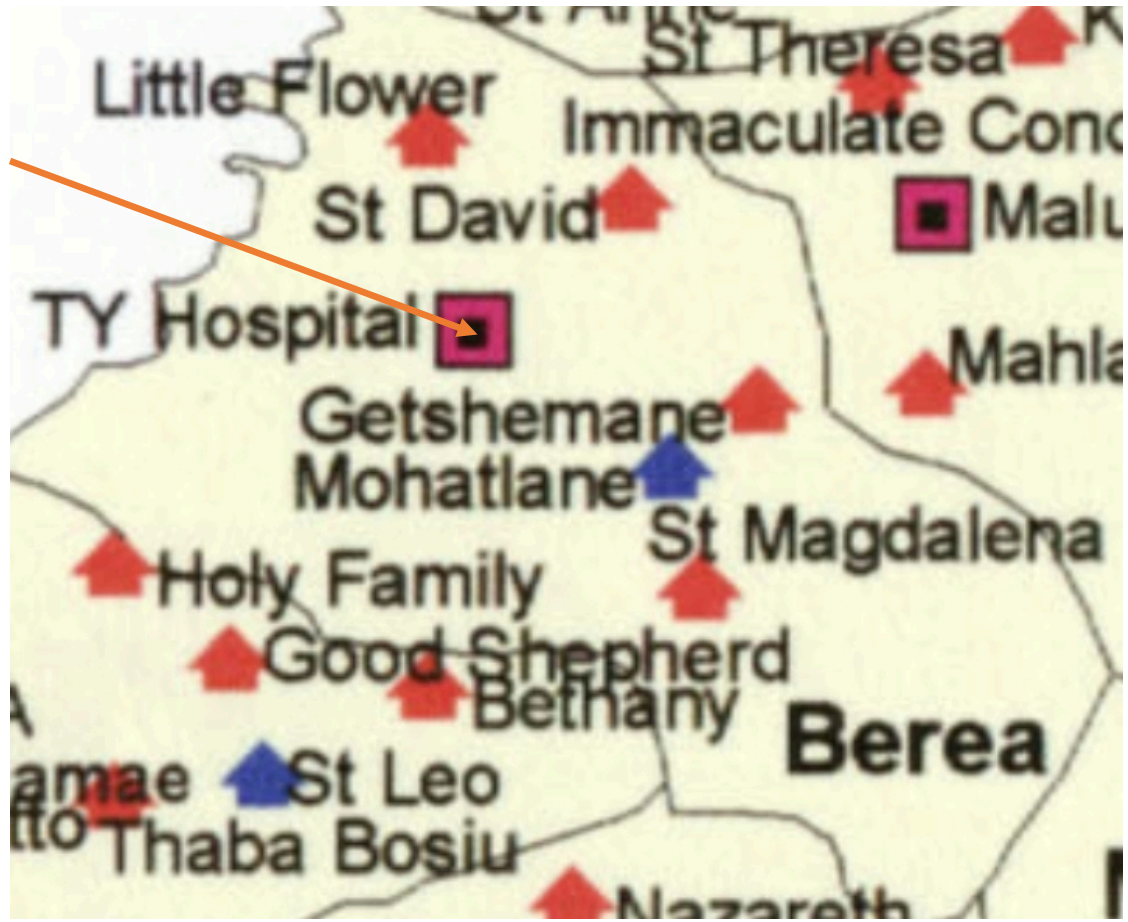
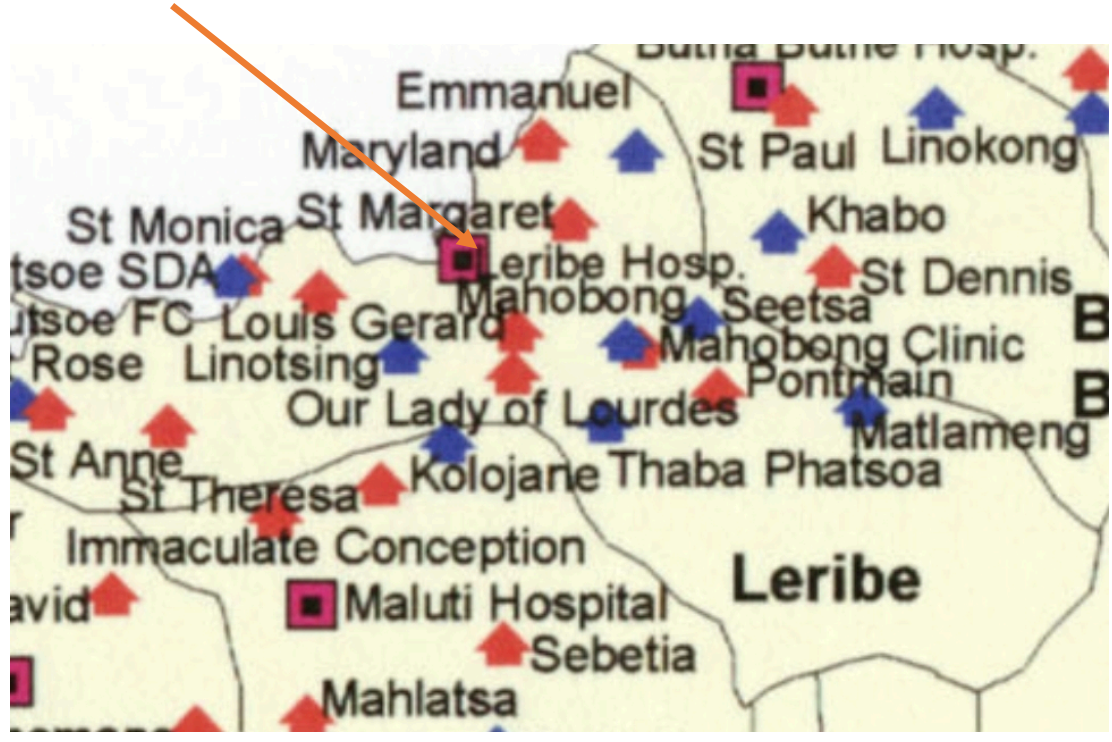
This letter serves to certify that I, Litseoane Mokaloba, proofread and edited Mr. Silane Tsoeu's thesis. I hold a bachelor's Degree in Education with English Language and Linguistics as my majors. I have four years of experience offering editing and proofreading services to students and academics.

Sincerely,

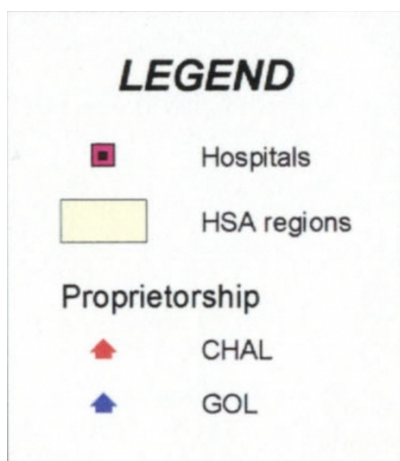


Litseoane Mokaloba

Annexure. 11. Setting map







## Annexure 12. Open-ended questions data set extracted from the spreadsheet

Question	Common Answers	codes	Categories	Themes
9. If the answer to number 8 is do not use it, explain why?	we have only 1 tablet used by data clerk, tablet lost the charger, 1 tablet in the department,	A	Equipment	Inadequate equipment
	computer not functional, we have only one slow desktop	B		
	we are short staffed so we prioritise, we are only 4 in this department and there is lot of work	C	Staffing	Workload
	we do not have time due to many patients that come to the department	D		
	the last time I used it was when I was from the training and nobody asked me about it as our reports are always done by data clerk	E	Supervision	Poor monitoring and evaluation
	The people in charge of DHIS2 normally talk to data clerk about it not all of us	F		
	It is difficult to use, ,Last used it at the training I need assistance on its use those features are not easy to remember	G	Skill	Incompetency of the healthcare workers
	I rely on the data clerk , the main work for us is to see patients and keep record in registers and DHIS part we leave it for other staff	H		
11. If answer to 10 is no, can you explain why?	It does not help me in see my patient instead it creates lot of work for me, it is useful to the data personnel when doing their reporting, useful for reporting not for my daily work, information from it usually benefits the NGOs when reporting to the funders, its mostly used by NGO staff, I do not use it to see patients i use registers all the time	H	Skill	Do not understand how it relates to their job
	not easy to use	G		Useful tool for the NGOs
	we deal directly with patients so numbers don't actually helps us in daily work	E	Supervision	Lack of follow ups from supervisors on the use of DHIS2
	There is no follow-up on its use at all, No one checks us on its use so I don't see it useful, the last time I was asked about DHIS2 by the hospital manager was when I was from the training	F		
13. If answer to 12 is none explain why? (tick 1 and if none explain on dotted lines)	We do not have enough tablets for each one of us to be able to have time to use it the tablet is mostly with the data people, we have been promised the proper equipment since the one tablet we use to use was damaged so we rely on data clerk from MCH	A	Equipment	Inadequate equipment
	available computers not updated only 1 is updated	B		
	We are short staffed, we do not have staff for it we are already overloaded we clinical work	C	Staffing	Workload
	it creates lot of work as we have to see patients, , record in register and then DHIS2 that is too much	D		
	It is not easy to use, demands more technological skills, it is difficult to understand the features how they relate	G	Skill	Incompetency of the healthcare workers
I am not good with technology and numbers,	H			
15. If answer to 14 is no, can you explain why?	too much work, we are already short staffed not able to do some of our duties so bringing DHIS2 means increase to our work, it need staff dedicated to it specifically we can't cope as we are not enough there are lots of patients	C	Staffing	Workload
	DHIS2 is mainly IT and numbers it hardly gives us information on patients, The interface not easy to navigate it	I	Compatibility	Not user friendly

	It is too general not directly to our daily work we want something that assist in diagnosis care plans and others more related to patients not numbers and reports.	J		
	I only know to insert and send data from the register other features are not easy to use, it is not easy to use it, not good at it	G	Skill	Not part of our job
	do not have IT or computer skills it really needs someone good in that area,	H		
21. If answer to 20 is yes, please list all the challenges below	error codes, system loading for a very long time, error codes taking long time to be solved,	K	Technical issues	Network
	internet problems, system shutdown	L		System issues
	difficult to use, not easy to navigate around the features, features difficult to understand	G	Skill	Lack of skills
	We never get feedback on how we have done on its use, we only get results on performance at the quarterly meetings, no one gives us assistance even when we seek for it the last time we were monitored it was after the training	F	Supervision	No feedback
		Lack of supervision by direct supervisors		
22. Which one of the listed challenges do you experience the most?	Error codes	K	Technical issues	Network
	System shut down, internet problems	L		System issues
	Difficult to use, features difficult to understand	G	Skill	Lack of skills
28. If yes, what do you think can be done to help you to use DHIS2 with ease without encountering challenges?	I think regular supervision will help, our managers should also be able to supervise us so that when we have problems we have someone next to us, the team that trained us should visit us more to check on skills delivered,	E	Supervision	Monitoring and evaluation
	we should all be monitored not only the data clerk as it is done currently, the monitoring team should talk to all of us not the data people only on matters relating to DHIS2 in that way we will feel responsible.	F		
	We need to be trained again we have forgotten all this things, at least have a training on updates and it performance quarterly or every time when there is new staff, more training needed	M	Training	Refresher trainings
	there should be staff dedicated to it to be perfected, we are short staffed to give DHIS2 time the manager should increase number of staff, staffing pattern should be revisited there is too much work, we need more equipped staff	C	Staffing	More staff
	Increase number of tablets per department,	A	Equipment	Availability of adequate equipment
	fix the computers on time, replace damaged equipment	B		
30. If no, can you say, how can it be improved?	It should talk our scientific language, it should be easy for all of us to use it	I	Compatibility	Involvement of healthcare workers in application building
	it should cater for all of us even those who are not good with technology or numbers,, it should be created by Basotho who understand clearly our situation at home and who are health professionals	J		Have local developers of the system
	It should not be controlled by the NGOs, The government superior officers should have all the rights so that they could be able to help us when we get challenged as mostly they complain of not having the required rights,	K		Technical issues
31. What changes or improvements do you	more trainings, be part of the health professionals curriculum, training of new staff, proper information	M	Trainings	Refresher trainings

think can be done in DHIS2 for you to use it effectively?	dissemination by those who are from the trainings, training on updates and their impact			
	more equipped staff, staffing pattern should be changed, have more equipped staff, increase number of staff	C	Staffing	Add staff
	The supervisors should know it, people monitoring should not do a quick visit there should be with us at least a day as work with us as we use it, regular visits from M&E people, regular checks from the supervisors, be motivated by getting feedback on our performance and be awarded	F	Supervision	Have feedback from supervisors through DHIS2 Intensive supervision and mentorship by direct supervisors
	It should be developed by Basotho, relate to the situation that we have in the country, be relevant, it should relate to our customs or how we do things at facilities not introduce something new, it should help us not bring more work.	I	Compatibility	Be customized to local needs