USE OF DISTRICT HEALTH INFORMATION SYSTEM DATA TO FACILITATE DECISION MAKING IN UASIN GISHU SUB COUNTY HOSPITALS, KENYA

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DECLARATION

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This research thesis is my original work and has not been presented for a degree in any

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DEDICATION

I dedicate this work to my wife Zena and children Stacey, Abby, Roy and Ronell for their prayers, love and moral support.

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ABSTRACT

Comprehensive and dependable information is basis for making decisions. WHO building blocks: services delivery, health information, products and technologies, health workforce, financing and governance. Aim of study was to assess use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals. Specific objectives were to determine level of knowledge, organizational, technical and individual factors prompting District Health Information System2 data use in Uasin Gishu Sub Hospitals. Study was conducted in Uasin Gishu-Sub County Hospitals (Kapseret, Kesses, Ainabkoi, Moiben, Turbo and Ziwa). Study used quantitative and qualitative methods using cross-sectional design. Questionnaire was administered to gather quantitative data from 283 providers who were selected randomly while 10 key informers were purposively selected for in-depth interviews. Quantitative data was analyzed using R Software for descriptive, bivariate and multivariate logistic regression. Thematic analysis was used to analyze qualitative data using Qualitative Data Analysis (QDA) software. Bivariate association comparing independent variables and dependent was calculated using Pearson's Chi Square test and fishers exact test where chi square assumptions were violated. Multivariate analysis was done using logistic regression to measure for predictors. A P value of 0.05 was considered as significant. Findings of numerical variables were depicted in graphs, charts and tables. Results for qualitative data were summarized in form of themes. Approval was got from KeMU SERC and NACOSTI. Consent was sought from participants of the study. Study found that 68.4% respondents reported good, very good or excellent competence levels in data management using DHIS2, DHIS2 information application to inform policy and operational planning was reported as good, very good, and excellent by 37.3%, 18.9%, and 8.0% respectively. Half of the participants (50.0%) acknowledged availability of funds to support DHIS2, champions promoting use of DHIS2 information were records officers (56.2%). Moreover, 61.7% of participants agreed or strongly agreed age influences health workers adoption and use DHIS2 while 65.4% of participants were dissatisfied with IT Support from MOH. Although 80.9% of respondents had log in credentials, only 24.2% had difficulty with logging into DHIS2. Furthermore, 79.5% had low or moderate level of training in DHIS2, 15.0% had never trained and this is why only a third of participants had some confidence in handling tasks using DHIS2. Inferential results show Kapseret, Moiben, and Turbo were associated with higher odds of rating as moderate vs. low or high vs. low users of DHIS2 data compared to Ainabkoi, OR: 4.15 (95% CI), 3.07 (95% CI) and 5.51 (95% CI) respectively. In addition, there is significant associations between level of knowledge, organizational, technical, individual factors and level of DHIS2 data use (p<0.05). Study concludes that level of knowledge on DHIS2 information use is fair across six Sub County Hospitals in Uasin Gishu but utilization of DHIS2 information by CHMT is low. Additionally, main funder of DHIS2 system is County Government while support from National Government is minimal; age influences users' adoption of DHIS2 data. Level of training on DHIS2 is generally low while utilization of information on DHIS2 to facilitate decisions range from moderate to low. Consequently, study recommends that County scales up utilization of DHIS2 information and generate policy measures to facilitate decision making.

LIST OF ABBREVIATIONS

CHMT County Health Management Team

DHIS2 District Health Information System2

HIS Health Information System

HSS Health System Strengthening

ICT Information Communication Technology

IRB Institutional Review Board

KeMU Kenya Methodist University

MOH Ministry of Health

MTRH Moi Teaching and Referral Hospital

NACOSTI National Commission for Science, Technology and Innovation

SERC Scientific Ethics Research Committee

WHO World Health Organization

UHC Universal Health Coverage

SDGs Sustainable Development Goals

HRIO Health Records and Information Officer

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CHAPTER ONE

INTRODUCTION

This part describes background of thesis, problem statement, objective, specific objectives, research questions, justification, limitation and delimitation of study. Study significance and assumptions are explained in this section.

1.1 Background of Study

Globally, information systems are important for achieving Universal Health Coverage (UHC). Information is the in thing for health interventions, health sector assessments, planning and resource distribution and programme supervision. ("WPRO The World Health Organization Health Systems Framework," 2016).

All-encompassing and trusted information is substance of decision making across all health system pillars that includes: Governance; Leadership ensures policy frameworks are in place together with effective supervision, collaboration, provision of appropriate regulations and motivations, attention to design of systems, and responsibility, Health Financing; Good system promote enough resources in hospitals for people to access needed services, and are protected from losses or poverty resulting from paying for services, Service Delivery; Better health services provide safe, effective, quality personal or non-personal health interventions to those who need them, whenever needed, with minimum waste of resources, Human Resources; Functioning workforce is receptive, fair and efficient in achieving best health outcomes with available resources and conditions (World Health Organization [WHO], 2012). They should be sufficient numbers and mix of staff, fairly distributed, competent, responsive and fecund. Health Information; Well-functioning information system ensure reliable

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generation, analysis, dissemination and use of accurate and timely information on health factors, performance, health status and Product Management ensure access to important medical equipment, vaccines and technologies of assured quality, safety, efficacy and cost-effectiveness, and their technically thorough and profitable use identified by WHO as areas where gaps could be addressed in order to support health systems (WHO, 2012).

Health Information Systems (HIS) is one of the pillars earmarked for strengthening health systems. Health System Strengthening is collection of innovations and strategies that improves one or more of the roles of health system that is impetus to better health through quality, access, coverage, or efficiency (WHO, 2016).

During the start of HIS, the aim was to start and maintain an accessible and comprehensive HIS that is flexible to the needs of patients and managers (HIS Policy, 2009). In addition, the role of HIS in the health system is routine gathering of health care data and disseminating to higher levels of health care system. DHIS2 is a free software mainly used to track health pointers for a national healthcare system. Gathering and summarizing data helps to improve healthcare outcomes by ensuring that decisions are made based on evidence, rather than intuition or estimates (Otieno & Arunga, 2014). It also facilitates actions at all levels especially at the point of generation where information is most needed. There is significant burden being applied on health care systems worldwide to deliver high quality care in a more impartial manner to a greater proportion of populations and, preferably, at a lower cost. This has been stated as the impossible triad Naylor and although it describes industrialized countries, Naylor's summation holds true for most other countries. The use of DHIS2 is to strengthen the health information pillar in Kenya and it is hunched in realization of

2030 vision, where overall intention is to have a fair and affordable healthcare at highest attainable standard to her people. The vision 2030 is guided by Millennium Development Goals (MDGs), which is now Sustainable Development Goals (SDGs) a global initiative, Kenya Health Policy Framework, 1994-2010 and National Health Sector Strategic Plan II. Effective and efficient use of DHIS2 will hasten reforms in place that directed to fusing and solidification of gains seen in the healthcare sector since 2003. DHIS2 make use of available Information Communication Technology infrastructure; favourable policy, legal framework and local skills to embrace automation for improved healthcare delivery (Ministry of Medical Services Ministry of Public Health & Sanitation, 2011).

Uasin Gishu Sub County Hospitals are expected to have an efficient and reliable DHIS2 that would facilitate strategic decision making for optimal health service delivery. Data is routinely collected and uploaded on to DHIS2 by health records and information officers from every Sub County Hospital which is later utilized by the County Health Managers and Ministry of Health in decision making. In addition, health information generated from DHIS2 is also used by researchers and health care providers in decision-making to support patient care. There are over 63 standard DHIS tools used for reporting.

This study therefore assessed the use of DHIS2 data in facilitating decision making in Uasin Gishu Sub County Hospitals.

1.2 Statement of the Problem

Good care delivery system must have a proper connection between the six pillars in which the Health System is based. However, little devotion has been given to the Health

Information Pillar as the paramount constituent that brings together the other pillars making up the Health System ("Western Pacific Region|The WHO Health Systems Framework," 2016). Public hospitals experience shortcomings in collection, compilation, analyzing, evaluating and interpreting important health data and information to guide in decision making (Belay & Lippeveld, 2013). Incomplete, inaccurate and erratic data affect managers' self-confidence to use data.

Hospitals were still facing hardships on how to use information in DHIS2 for decision making at the various tiers (Swanepoel, 2014). Knowledge gap amongst users of DHIS2 on how to leverage information for evidence-based decision making in Uasin Gishu Sub County Hospitals in addition to unending shortages of human resources continued to affect quality of data generated and used. Consequently, inadequate utilization of data in DHIS2 could affect management of workload in specific areas to inform for instance, justification for extra health workforce to address big shortages or their redistribution, interventions and better management of communicable and non-communicable diseases including service access and availability, for instance where to place new facilities. In addition, it might affect the Referral System of patients from the Community Level. Through cases referred, the County health managers would miss very important data to determine if such cases qualified to be referred and/or if there was need to improve local facilities and staffing to handle such cases and thus decongest Referral Hospitals and other higher tiers. Inability to use data and information in DHIS2 might negate budget allocation. If health data and information from the County was not used to determine allocation of funds to all facilities it might lead to under/over budgeting. This is even more important since Counties have to make their own budgets.

There is emphasis on improvement of maternal, neonatal and child health indicators as primary goal in the SDG 3. Progress has been delayed by poor policy application and frail health systems, which do not involve, or answer to, community requirements. This results in poor access and utilization of preventive and curative health services (Manual et al., 2015).

Therefore, the researcher pursued to assess the use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals with an opinion to recommend better ways of using information in DHIS2 for sound decision making for better health Care Improvement.

1.3 Broad Objective

The broad objective was to assess use of (DHIS2) data to facilitate decision-making in Uasin Gishu Sub County Hospitals.

1.4 Specific Objectives

1. To determine level of knowledge on the use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals.

2. To determine organizational factors influencing use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals.

3. To assess technical factors influencing the use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals.

4. To evaluate individual factors influencing use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals.

1.5 Research Questions

1. What describe level of knowledge and factors influencing use of DHIS2 data to

facilitate decision making in Uasin Gishu Sub County Hospitals?

2. What organizational factors influence use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals?

3. What technical factors influencing use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals?

4. What individual factors influencing use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals?

1.6 Justification of the Study

Health information systems are prerequisites for accomplishment of universal health coverage (UHC). Information is used for informing sector projects, evaluations, planning and resource provision and program monitoring and evaluation (World Health Organization, 2012). However, it seemed that no assessment has been done to ascertain that the tiers use information derived from DHIS2 to make evidence-based decisions in the Uasin Gishu Sub County Hospitals. The findings of this study would help the Uasin Gishu County Health Managers and Health System in general to accept and occasionally measure relevant health information systems to improve DHIS2 and ensure return on investment in County Public Hospitals and Kenyan Health Care Delivery System as a whole. In addition, results will reinforce HIS Pillar and fast track the realization of Kenyan Vision 2030, SDGs, HSS and enhance knowledge in health information systems. Although there are studies on DHIS2, there is hardly any focusing on how DHIS2 has influenced factual decision making in Sub County Health facilities and other tiers in developing countries and thus decision to conduct study in Uasin Gishu Sub County Hospitals.

1.7 Limitations of the Study

Some interviewees basically from County Health Management were not well conversant with the use of DHIS2. The study being cross-sectional, researcher was not able to control the facts of the information because it was collected at a particular point in time. What happened before or after the study was not captured.

1.8 Delimitation of the Study

The researcher was only able to get responses from health records and information officers by use of a questionnaire and County health managers by using an interview guide. This sample constitutes health workers who directly use DHIS2 and/or use information in DHIS2 to make decisions in Uasin Gishu Sub County Hospitals.

1.9 Significance of the Study

Use of information in DHIS2 is critical to health care delivery system. Research findings will be useful to Uasin Gishu County Health Managers and Ministry of Health in achievement of Vision 2030 and Sustainable Development Goals (SDGs). The results of this research will help the Uasin Gishu County Health Leadership, policy makers and Health System in general on how to periodically assess DHIS2 and its importance of using proof to make choices and thus assure proper operations in Kenyan Health Care Delivery System at large.

Study conclusions will enhance knowledge in the specialty of health information among researchers, students among other stakeholders by helping them to understand information in DHIS2 to inform decision making which will translate to better health products, efficient use of resources and strengthen the HIS Pillar.

1.10 Assumptions of the Study

Researcher expected respondents would give truthful and honest responses and that information collected would reflect on the research topic. In addition, the study assumed that Uasin Gishu County Health Managers use DHIS2 information in decision making.

1.11 OPERATIONAL DEFINITION OF TERMS

DHIS2   The District Health Information System (DHIS2) is the information system used for the collection, compilation, analysis and dissemination of data from lower tiers to higher tiers.

ICT infrastructure   Everything that supports the flow and processing of information that include network infrastructure, technology policy, computers and ICT services in an organization.

Management support   That activeness and enthusiastic willingness to promote the system, build support and overcome resistance amongst the multiple user groups with the aim of ensuring that the system is actually installed and used for evidence-based decision making.

Training Organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill

HSS is any array of initiatives and strategies that improves one or more of the functions of the health system and that leads to better health through improvements in access,

coverage, quality, or efficiency and improvements in data quality. The definition of Health System Strengthening has been adopted as it is in this study.

Challenges Factors that influence use of DHIS2 information for decision making which include technical, organizational and behavioral factors.

Technical Factors   All the factors that are related to the specialized know-how on

information technology, software development and technology to develop, manage and useDHIS2 for evidence-based decision making.

Organizational Factors All the factors that are related to organizational structure, financial resources, supervision, training, and culture to develop, manage and use information in DHIS2 for evidence-based decision making.

Individual Factors   All those factors related to educational level, confidence, motivation and competence of staff in using information in DHIS2 for decision making.

CHAPTER TWO:

LITERATURE REVIEW

2.1 Introduction

This chapter describes assessment of DHIS2 data in facilitating decision making, level of awareness among healthcare providers on use and effectiveness of DHIS2 data to facilitate decision making, factors influencing use of data in DHIS2 and explores the challenges experienced in the use of DHIS2. The conceptual framework is illustrated in Figure 2.1 and is described in this chapter.

2.2 Knowledge on the use of DHIS2

2.2.1 Knowledge on Data Management

Overall purpose of DHIS2 application is to create, summarize, distribute information to facilitate proper policy development, planning, implementation, monitoring and evaluation of health services and program involvements in the health sector (Karuri, Waiganjo and Orwa et al., 2014).They continued to say that DHIS2 support collection, collation and analysis of daily statistics, population guesstimates, facility activities and survey data. Data is collected using registers, tally sheets, and assembling forms at every health facility. Summarized monthly figures are entered into DHIS2 or relayed to headquarters, currently County level for analysis. DHIS2 is envisioned to capture organization unit figures, do analysis, hence uplifting its consumption.

In addition, DHIS2 is structured to create standard or modified reports that meet user specifications. It does quality scrutiny and has dashboard for tracking trends for certain indicators. Requisite reports are in-built and instantly available for review by hospitals at all points.

Various health sector reviews done over the last decade highlight stagnating or downward trends in health indices in the country, especially in maternal, neonatal and well-baby clinics. Among other factors, HIS that was weak and unable to provide the public health information necessary to inform timely health interventions was identified as one of the reasons for declining health indices. Recognizing this critical role of HIS, in 2010 Kenya's HIS Department began a complete of the current system to replace it with DHIS2 ("District Health Information Software 2," n.d.). Despite these arguments, no major studies have been done to particularly establish what influence the use of quality information on DHIS has had on decision making in public hospitals particularly in a devolved County Health System.

2.2.2 Knowledge on Cost effectiveness of DHIS2

DHIS2 has ease of use advantage in various information bases and data sharing capabilities which is an important feature in its operation. One of the most important aspect is to use the information to spot which parts of the system is performing as expected, and which parts should be taken action upon and upgraded (Second, Vasbotten, & Tronerud, 2015).

Quality data empowers informed healthcare decisions. For example, quality HIS metrics managed well can be used in surveillance of diseases, to prevent outbreaks. Healthcare professionals can use data for training or research, and policy guidelines to inform national health policies and programs (Karuri et al., 2014).

Concerted efforts are required rightly from National Government to County Governments' Health Managers to build capacity among all health providers on the

importance of DHIS2 information and its subsequent use thereof to make informed health care decisions geared towards service improvement.

2.2.3 Knowledge on Cost Efficiency of DHIS2

HIS consolidate data from the repetitive departments/clinics. Previously, unreliable HIS in under-developed countries has been made more difficult by too many parallel reporting systems demanded by donors which occasionally reports on wrong indicators (Braa, Heywood, & Sahay, 2012; "District Health Information Software 2," n.d.) . It is inspiring to report that WHO member states came together with other partners to formulate Health Metric Network (HMN) framework, that is aimed at strengthening country's HIS. They continued to say that artistic automation of functions in such countries can lead to effective planning and delivery of healthcare services, resource mobilization, and making choices in different levels of health system. HIS implementation standards approval in these countries is an important step in application of suitable computer technology to create unified data repository for all stakeholders, and thus doing away with vertical systems (Braa et al., 2012; K. Braa, n.d.)

Additionally, HIS is documented as one of the six building blocks of HSS and hence, streamlining national HIS that create dependable and precise information as a key approach to support sector reform initiatives in developing countries (Braa et al., 2012; Braa, n.d.).

2.2.4 Quality information in DHIS2 to facilitate decision making

Solidification of complete and precise data, through DHIS2, has ensured that states across Nigeria are using real-time information to guide decision-making. (Daskalakis, 1992). The WHO (2008) defines HIS as structure that bring together gathering of data,

analysis, dissemination and use of information necessary for improving health service in hospitals through better management at all tiers of MOH.

HMISs are necessary gears in the administration of health care services. In 1983, the Government of Kenya (GoK), reorganized the MOH's to the districts. This was organogram line with WHO resolve to strengthen District Health Systems (DHS) (Odhiambo-Otieno, 2005). Otieno postulated that these information systems are meant to offer members of County Health Management Team (CHMT) and County Health Management Board (CHMB) with the information they require to make decisions. Following this decentralization, HISs at County level in Kenya has gone through ultimate changes that have brought about introduction of different types of information systems. A quick inspection of Kenya's MoH reveals that it operates multiple DHMISs at lower levels. The first DHMIS was introduced at Murang'a in 1988 and was sponsored by UNICEF. This system introduced 26 data collection forms, 11 were for collecting health service data and 15 for collecting administrative (Odhiambo-Otieno, 2005).

Valuable information, generated by manual or technological methods, can support or improve quality of care. Equally, inaccurate information can lead to poor choices in health investments (Kihuba et al., 2014).

2.2.5 Improved Staff performance through use of DHIS2

WHO's HMN framework indicated that an operational HIS is comprised of six essential units which countries need to embrace in order to come up with home grown HIS in ways that empowers those contributing to or benefitting from health information (Karuri et al., 2014). HISs components according to Karuri include: Inputs such as HIS

Properties e.g. employees, funds and infrastructure, procedures such as gauges to measure performance, data sources; such as Routine Health Information System (RHIS); Census; for instance, Surveys etc., Data Management to ensure good processing and cumulative figures from different sources i.e. Information results that are made for analysis, comparison, data transfer and use make information available.

Karuri further postulated that, achievement of any nation's HIS must be measured not only on the quality of data output, but also on its continuing use of data to improve health system performance, to react to growing threats, and to improve health. Furthermore, improving data obtainability, quality and use will require a wide range determinant of performance. She continued to say that any outline devised to evaluate strength of a health system should generally address all components of HIS. These are: resources available, its methods of work, products and results in terms of data availability, quality and use (Karuri et al., 2014). HMN agrees that such assessment is multifaceted as overall system performances depend upon several determinants such as technical, social, organizational and cultural factors. This holds true for DHIS2 in Uasin Gishu County Health Facilities.

DHIS2 facilitate use of available information to support operational decision-making and planning. Accurate information assembled at District HIS Office are data mined, compiled and made available regularly to DHMT and DHMB for planning, supervision and impact evaluation (Odhiambo-Otieno, 2005).

2.2.6 Data quality checks

Data Quality Assessment (DQA) is the endorsement of the accuracy, extensiveness, consistency and timeliness of data. (MoH, 2016) Data quality aims to improve the

accuracy and steadfastness of the data in the system. This can be done through authentication rules and various statistical checks. Data quality has different proportions including correctness, completeness, consistency and timeliness. ("DHIS2 End-user Manual," n.d.)

Correctness: Data collected is expected to be within ordinary ranges. Major differences should be seen when compared with data from related data elements.

Completeness: Data principles for all facilities should be submitted on time.

Consistency: Data should be constant with ones entered during earlier months but providing room for emerging issues.

Timeliness: Data from organization units should be submitted on time.

Data quality checks can be executed through:

- Point of entry, software can check data entered to see if it falls within min-max series of data elements (based on all earlier data).
- Defining validation rules, which can be done once user has ended data entry.
- User check entered data for particular period and Organization Units against validation rules, and display violations.
- Breakdown of data sets, checking gaps in data and also data triangulation which is comparing same data or indicator from different sources. ("DHIS user manual," n.d.)

Lessons of information systems in poor countries reveal difficulties with data quality, incomplete records and late reporting. These systems are usually the only data sources available for continuous, monitoring of health programs. Data quality is ensured

through data collection process and functions within the DHIS in it is segmented web interface which makes it easy include various sections, to enable multiple paper reporting arrangements that are inimitable to each country of employment (Jimenez et al., 2012; Luoma et al., 2010).

2.2.7 Dissemination/Reporting

Many organizations dealing in data will be appraised on how fast data and information are made available. Ability to publish, share, access, integrate, and use information will beneficial. Inability to share data raise distrust regarding the quality of data they collect. (MoH, 2016). DHIS2 Strategy use the mobile for tracking programs and reminding citizens about health visits has evolve the mobile as a feedback terminal and has created simple interfaces for reports. (Braa, 1994).

In South African DHMIS Policy, data is used at the creation, before transmitting to next level. In addition, managers will ensure data collected by respective facilities are revised during their monthly meetings, and corrective actions are implemented to improve service delivery where data records dismal performance. (National Department of Health, 2011).

2.3 Organizational factors influencing use of DHIS2 in Decision Making

Organizations face constraints ranging from ambiguity, trade-offs, and risks. Response to such situations can be hindered ones shortcomings (See & Clemen, 2005).

Quality data underpins health system advances; however, many programs fall short of efficient use of data to inform priorities. Many times reports and databases are not used when starting new programs or improvement, policy change, strategic planning, or

promotion. Rolling out of parallel HISs which would not respond to information needs is the root cause. Consequently, management teams are unable to access data they need in a timely manner to inform their future decisions (Nutley & Reynolds, 2013).

HIS, Kenya covers five key parts (Republic of Kenya, 2013): (i) Information generation – different kinds of information and how they are collected, and stored, (ii) Information validation – Revising information to improve accuracy and representativeness, (iii) Information analysis – Procedure of understanding what information is saying, (iv) Information distribution – Process of sharing emerging information with relevant users, and (v) Information utilization – Ensuring information is utilized during decision making process. These areas are entwined, and form continuum of HIS.

Several logistical issues affect decision making process in Uasin Gishu Sub County Hospitals. These are: policies and procedures, organizational hierarchy and organizational politics. Counties have cascaded policies and procedures which have been developed to mitigate common problems and guide managers when making decisions in form of approved disciplinary regulation which assist managers when resolving issues with staff.

2.3.1 Organizational hierarchy

Moreover, organizational pyramid, which is organogram of County which have diverse echelons of management which have different notches of authority. This directly impacts on the nature of decisions one makes. Similarly, Records Officer cannot make decisions about overall goals of the County. Officer can decide how the Department contributes to the achievement of County's aspirations. See and Clemen posited that seeming danger to managerial value and control, and found it as a obstacle to decision

process innovation and thus tendency for managers to perceive such innovations as threats to their own discretion, and control (See & Clemen, 2005).

2.3.2 Organizational politics

Organizational politics means actions depicted by persons or groups which is designed to stimulate others on use of health information systems. Entities and groups will mainly use policies to: voice their callings, welfares, ideas on health information technology adoption. This applies to Uasin Gishu Sub County Hospitals (See & Clemen, 2005).

Organizations such as Uasin Gishu Sub County Hospitals and its Departments are composed of entities with inherent beliefs, values and interests. These differences are usually powerful forces behind organizational politics that can influence use of DHIS2. For example, County Health Records and Information Officer may use politics to influence his County Director of Health to allocate more funds for Health Information Technology in his Department along other opposing demands in the County.

2.3.3 Managerial Support

Support from management has been believed as an important thing for success of Information System (Jitpaiboon & Kalaian, 2005). According to Loonam, McDonagh, Kumar, O'Regan (2014) posited that a number of styles are available for use by senior managers in organizations to facilitate Information System (IS) activities which include; the importance of maintaining a constructive attitude, building effective and powerful cluster, creating an large leading committee, developing a strong vision for IS, aligning the IS strategy with the institution strategy, communicating the IS initiative

at the entire organization, and providing sufficient resources for the IS initiative (Loonam et al., 2014).

2.3.4 Environmental Factors

Environment is the exterior aspects that affect the society. Types of external issues that have effect on decision include: Market in which organization activates, economy, government laws, customers' reaction to its products and services with respect to use of DHIS2 (See & Clemen, 2005).

Studies have been commenced in the country from 2003 to evaluate HIS and various energies have been spent to improve system. However, in 2008 HIS, Government still stressed to access quality and timely data to inform priorities. This was evident at local levels where lack of system for improving data access, fusion, communication, and interpretation was hindering districts to make decisions about service delivery issues (Nutley & Reynolds, 2013). They further said assessment of HIS between done in 2006 and 2007 defined HIS as stand-alone systems at national level. The manual systems made data unavailable for planning, monitoring, and appraisal of health system at all levels. National Health Information Strategy, developed in 2009, identified gaps related to non-use of data in decision making. Health information strategy removed parallel HIS. DHIS2 was identified as remedy and was implemented from 2010. Introduction of DHIS2 has improved data use (Nutley & Reynolds, 2013).

2.2.5 Organizational Culture

Clemen, (2005) said organizational Culture is key besides managers' actions toward change, since acuteness is expected to play a major role in innovation adoption. They

suggested that for innovation to occur and be fruitful, liaison among managers and other users to familiarize and implement the new processes.

PRISM framework says that if organizations endorse information culture, this will improve their aptitude in performing RHIS tasks, and improve self-assurance. When environment does not promote RHIS positive attitudes or values, health workers may not co-opt required values to generate, maintain, and improve information system (Belay & Lippeveld, 2013).

2.3.6 Policy Framework

The start point in espousing e-health involves configuring of comprehensible national e-health policies and strategies that are in tandem with development plans, national ICT policies and with buy-in from healthcare workers. Government with private sector has made important steps towards creating suitable climate for the acceptance of e-Health. Publication of Standards and Guidelines for Electronic Medical Records (EMR) in Kenya (2010), Strategic Plan for HIS, (2009-2014), Kenya ICT policy (2006), and Kenya Communications Act (2009) are important markers towards creating an environment with legal frameworks auspicious to development and adoption of e-Health in Kenya (Juma, nahaso, Apollo, Gregory & Patrick, 2012).

Reasons for introducing these systems include: health facilities collected information illogically and erratically; this was also incomplete, unreliable, inadequate analysis and use at units. (Odhiambo-Otieno, 2005). Otieno continued to say that systems within DHSs are categorized as lacking integration, disjointed and separate, with no effective center co-ordination to ensure availability of information.

Kenya Health Sector Strategic and Investment Plan (KHSSP) July 2013-June 2017 noted that there are no comprehensive systems have been established to ensure and monitor policy making, lack of data demand, and knowledge to guide planning for activities, minimal use of information on vital events to guide decision making. (Republic of Kenya, 2013).

2.3.7 Incomplete Reporting

The tiers lack working referral monitoring system that promote appraisal, feedback, and responsibility for service givers (Byl, Punia & Owino, 2013). Byl continued to say that referrals being part of health care system, must be included in the health sector performance M&E. Therefore, a system of keeping records and information should be a must. Further, MOH registers do not provide for recording of referrals. They emphasized that Data collected is poor and rarely used. System needs standardized referral forms to record and capture referral data. Byl said these include referral forms, registers, data collection and update, tracking, feedback forms, and directory of services. Accountability is not assured and referral data collection is not prioritized. (Byl et al, 2013).

Concern raised by HIS experts is lack an information culture in developing nations. There is need to focus on support command and feedback for HIS. Feedback keeps communication lines open and tenaciously solve problems leading to improvements in HIS. Health workers collating and transmitting data hardly get any feedback, and when such feedback is given it is negative, delayed and not very constructive (La Vincente et al., 2013; Chitama et al., 2011; Hotchkiss, Aqil, Lippeveld, Mukooyo, 2010; Garrib, Stoops, McKenzie, Dlamini, Govender, Rohde & Herbst, 2008;).

2.3.8 Lack of Data Ownership

HIS policy espouses that records like documents or disks are the property of the institution, but data is not. Data cannot be owned since different people have interest in them. Health related data and information belongs to GoK) (Ministry of Medical Services Public Health & Sanitation, 2010).

Common challenges with HIS in such nations is lack of ownership of data due to workers' perception that HIS submit reports to higher levels, meaning there is no enticement for health workers at lower levels to analyze, use and interpret health data (AbouZahr & Boerma, 2005; Hotchkiss et al., 2010; Riley et al., 2012).

2.3.9 Staff Experiences in Managing Data in DHIS

State of the art systems are critical for strengthening care delivery as it generates timely information for proper planning, monitoring and evaluation of service in health system. However, in sub-Saharan Africa, health reporting has been manual producing incomplete and flawed reports. Evidence shows that continued use of conventional systems contributes to poor data quality in terms of reliability, availability, timeliness and completeness of reporting, and compromises health service delivery. In Malawi, for instance, Makombe found that the use of paper-based health facility reports to generate national synopses resulted in a 12% underreporting of persons on first-line antiretroviral treatment because many sites did not submit accurate data to the national level. (Kiberu, Matovu, Makumbi, Kyozira, Mukooyo & Wanyenze, 2014)

Monitoring and regulating health care projects heavily rely on complete, accurate and timely flow of data between primary health care facilities, hospitals and central

information center. However, data collected and transferred to district headquarters is unreliable(Jimenez et al., 2012).

Study carried out in South Africa to discover and explains staff practices in managing data and/or information when utilizing (DHIS2) to support data quality improvement, strengths and weaknesses of current data management processes signified strengths, weaknesses and barriers that staff encounters. Data capturers was stated as a strength. Weaknesses included staff shortages of both clinical and corporate staff, shortage of computers and Internet access, poor feedback, training needs and data quality issues. Most of weaknesses and barriers meant proper implementation of DHMIS policy, Standard Operating Procedures (SOPs), e-Health strategy and training staff, should be given attention (Garrib et al., 2008).

Health system needs internal machineries to formulate performance marks, track progress, create and manage knowledge for improvement. PRISM assess determinants for RHIS performance and how they affect systems before implementing interventions to improve quality of data and and later evaluate change brought by actions. This creates opportunities for improvement by identifying strengths and weaknesses of HIS (Belay & Lippeveld, 2013).

2.4 Technical Factors influencing use of DHIS2

2.4.1 Technology infrastructure

These are tenets related to specialized savvy and technology development, organize, improvement and/or DHIS2 performance both directly and through interaction. (Belay & Lippeveld, 2013).

Researches have been done from 2003 to assess HIS and gains made in its implementation to improve the system. However, in 2008, Government of Kenya was still trying to have timely data to inform decision making. This was identified at lower tiers where there is no system for improving data access, fusion, communication, and interpretation was hindering districts in taking right strides in managing health care services. (Nutley, McNabb & Salentine, 2013).

There is general perception that issues related to DHIS2 in Uasin Gishu Sub County Hospitals are mainly a preserve of Records Officers and ICT Officers. They added that people are mostly hesitant to use quantitative or technological tool during decision making process.

Successful implementation of technology infrastructure and adoption of e-Health received boost with arrival of submarine fiber optic cables linking big towns have had positive impact on e-Health. With increasing penetration of mobile phones and introduction of 4G technology, it will provide a necessary infrastructural impetus for e-Health (Juma et al., 2012).

Lack of accurate, timely, relevant and complete information, is not able to facilitate DHS managers in their day-today operational management. DHMIS was found not helpful to managers' strategic, tactical and operational management functions. Consequently, DHMISs are negated by numerous designs, operational, resources and managerial problems. (Odhiambo-Otieno, 2005)

2.4.2 Lack of System Integration

While amalgamation of information systems is the target from angle of efficiency reduction of load in information collection and reporting, challenges abound. (Boone

& Cloutier, 2015). Blockades to interoperability mentioned by participants include: Split health systems due to donor-specific funding and reporting difficulties, deployed information systems, that were developed to cater for a specific need, cannot be substituted with an integrated information system that may not be functional. A top down design approach would therefore not meet adequately the needs of lower levels. Missing standardized data definitions, makes it difficult to link patient, facility, and other administrative records across databases. In addition, inadequate leadership and political will from health ministry, including lack of organizational culture toward data use, are part of the setbacks. Other issues include lack of strong reciprocal relationship between HIS unit, program managers, donors and between divisions within the health ministry. Tendency for an HIS component to be sensitive rather than proactive in responding to changing health information needs is also challenging. Limited resources for capacity building in collection, analysis, and use of data or integrated tools, insufficient resources (technical, human, financial, etc.) for maintenance of HIS are problems. Integrated data collection vide integrated tools is a burden on healthcare workers and inadequate understanding of role of RHIS or the benefits of an integrated HIS is still a challenge. (Boone & Cloutier, 2015).

Rockefeller Foundation report from e-Health conference (2008) organized by Health Level 7(HL7) and World Health Organization, pointed out challenges to use of health information as lack of interoperable health systems and data standards. This reduces value of e-Health worldwide. Interoperability is defined as the ability of two or more systems to exchange information and to use information that has been exchanged. Current Status of E-Health in Kenya and Emerging Global Research Trends (Juma et al., 2012).

Human resources for health worldwide agreed that HIS in many developing countries, are really inadequate to provide necessary information to support individual healthcare and public health activities. Moreover, poor use of information for decision making is singled out as one of main causes of the current lack of connections between individual care and public health systems. In addition, HIS have progressed in a rather disordered manner, with multiple and overlapping demands from parallel disease programs and national health administrative departments and ministries. Vertical programs maintain own parallel reporting information systems, existing alongside national HIS. Over time data is dispersed in uncoordinated and unattended data collection systems and coupled with a national HIS that is unreliable, irrelevant, ineffective and inadequate in providing needed data for decision making (Garrib et al., 2008; Riley et al., 2012).

Kenyan MoH decided to use DHIS2 based on a wide evaluation by University of Nairobi in year 2010. MoH requested technical support from University of Oslo, and implementation was initiated in October 2010. A main concern from start was whether to use online central server or multiple standalone connections at district offices and hospitals. Uncertainty was rife on status of Internet coverage in the country and doubts whether all districts will be able to be connected (World Health Oorganization Independent Expert Review Group, 2012).

2.4.3 Inadequate Expertise on DHIS2 use

There is long-lasting shortage of medical staff in Africa and it is not going to change soon. Finding solution to scarcity of doctors and nurses and control online medical information and decision support tools will be key to improving access to quality health care in all parts of the world (Juma et al., 2012). The author further continues to say

that inadequate ICT skills in health sector, such as ICT maintenance staff, health informatics, and lack of ICT content in health professionals' curricula were among ICT capacity challenges facing health workers. There is a need to train more workers on health informatics.

Data entry training and data management is a health system issue. This can be approached through concerted efforts amongst stakeholders in the sector with increased resource allocation. Lack of capacity for adapting and implementing software solutions perseveres ((World Health Organization Independent Expert Review Group, 2012).

2.5 Individual Factors influencing use of DHIS2

Individual factors are all those factors related to educational level, confidence, motivation and competence of staff in using information in DHIS2 for decision making.

2.5.1 Attitude towards data Use

Creating an information culture is an enduring behavioral remedy. PRISM framework scans past closeness between HMIS processes and performance, and combines behavioral and organizational factors that determine HMIS performance. Liberia HMIS policy supports and strengthens local performance monitoring. To actualize this, a changed mind set is required to change simple reporting of data and responding to situation as directed by higher authorities, so as to analyze and interpret information at hand, provide self-assessment and solutions to problems. (Aqil et al., 2009).

Regular data use will be essential in improving acceptance of tool and ultimate impact on data quality, informed decision making, and overall functioning of Kenya's HIS. (Nutley & Reynolds, 2013).

2.5.2 Evaluation of DHIS2

Many barriers stop people from engaging in evaluating DHIS2 because they have no time, technology incompetence or dislike of its impersonal nature (O'Connor, Mair

McGee-Lennon, Bouamrane & O'Donnell 2016). They continue to say that other factors that beneficial to patients and public motivation to engage with electronic platforms personally to improve health and learn new means to manage conditions. Further, O'Connor said much is needed to create successful engagement strategies with better quality digital solutions that are easy to use and to get clinical accreditation whenever required. More funds are needed to enhance computer literateness and ensure technologies are accessible and affordable (O'Connor et al., 2016).

2.6 Theoretical Framework

Researcher used Sagimo (2002) Framework acted as a guide in the study. (Sagimo, 2002), said effective management of health information ensures that information reach right user, department, time, form and cost for right action by managers. DHIS2 will allow health information to be sufficiently collected, stored, processed and transmitted to users by professionals for effective decision making if well implemented. Health Care Managers need the right information for factual insights.

With successful implementation and use of DHIS2in Sub County Hospitals, Sagimo further found out that such an information system facilitates efficient and effective registering and collation of information, improvement of data quality, complete reporting, timeliness and accuracy of information amongst a raft of crucial contribution to institutions. This theory applies to the study because Uasin Gishu Sub-County Hospitals are fully using DHIS2 and thus knowledge of the importance of such a system in effective service delivery and sound decision making is crucial in the whole process.

Data collection, analysis, presentation, dissemination and use should be organized in such a way that all users are identified. Subsequently, institutional planning should be hinged on facts, and strategies should be designed to remedy any identified discrepancies in information system implementation and utilization. In addition, no Information System can discourage successful use of its information resources by producing information outputs that are not in line with needs users at the end. Therefore, no system should be initiated without first assessing levels of information generation and use will be based on precise data. Sagimo emphasizes further the essence of team work in motivating staff to adopt new systems of communication and overall information use for decision making.

Unified Theary of Acceptance and Use of Technologies (UTAUT)
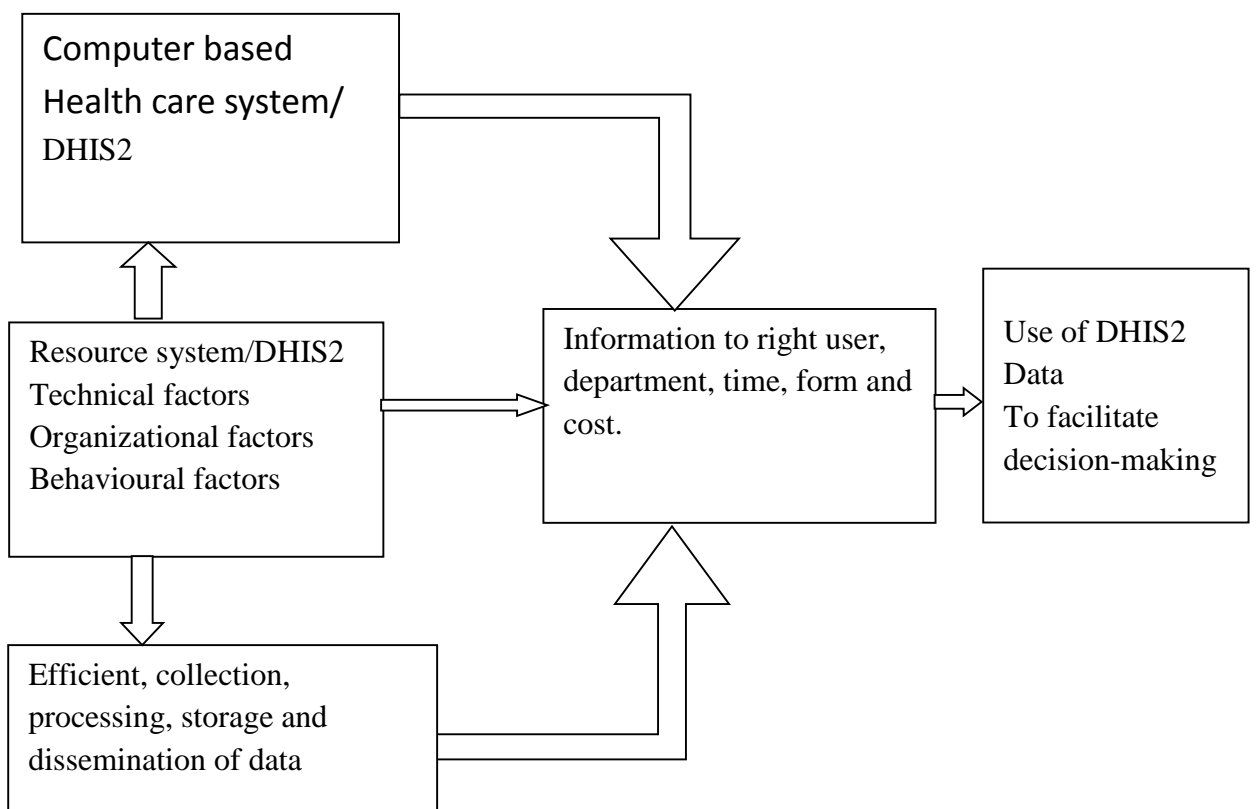
Figure 2.1: Theoretical Framework Source: **Sagimo, 2002.**

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2.6.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

Theory explains user intentions to implement and use systems like DHIS2 and user behavior. It illustrates four concepts of user acceptance and usage behavior. They are: performance anticipation, effort expectation, social stimulus, and facilitating situations. The four restraining variables include: age, experience, gender and voluntariness. Authors stated it provides an instrument for managers to assess probability of success of technology introductions and implementations and to understand the drivers of acceptance in order to design interventions, which include training, governance, information technology (IT), supervision and staff motivation. It focuses on users who are less likely to embrace and use new systems. For many years, a lot of studies on Management Information Systems roll out have been done to identify and assess organizational features that lead to success or failure of systems. User acceptance together with different determinants are created to measure user agreement of information systems which is indicator of system success or failure, each theory has been tested to predict user acceptance.

2.6.2 Model of the IT Implementation Process

This prototype is built on organizational change, innovation, and technological diffusion literature. Purpose is to offer a framework for ICT implementation in research. Kwon and Zmud's (1987) stage model contain six stages, namely, organizational adoption, adaptation, acceptance, adoption, customization and infusion. It thus cover implementation process from skimming of organizational needs to full and effective use of technology in daily practice. It identifies five contextual factors which impact on processes and products in every stage: characteristics of users, organization, technology

being adopted, task, and organizational environment and subsequent use of information to inform choices.

2.7 Conceptual Framework

Conceptual framework is a grid of intertwined ideas that provide comprehensive thoughtful spectacle or phenomena. Frameworks have ontological, epistemological, and methodological hypotheses, and each concept within a conceptual framework plays an ontological or epistemological role (Jabareen, 2009).

Conceptual framework of this study was developed by Researcher. The framework brings out the independent variables; the influence of DHIS, factors affecting DHIS use and challenges experienced in use of DHIS information to facilitate decision making in Uasin Gishu Sub County Hospitals and dependent variable; use of DHIS2 data and how they interact to provide quality information for use in decision making by health care managers. Use of DHIS will be influenced by use of DHIS information, data management, cost effectiveness, cost efficiency, Staff performance, data quality and dissemination. In addition, factors including organizational, technical and behavioral affecting use of DHIS information for decision making at all levels of health care. Consequently, a number of challenges are experienced by health workers in use of DHIS and they may include system integration, policy framework, inadequate expertise, incomplete reporting, lack of data ownership and staff experiences in their quest to use DHIS information to make evidenced-based decision. Intervening variables such as ICT infrastructure and economic standing play a pivotal role in promoting DHIS information use.

Conceptual Framework used in this study is shown in the schematic diagram in Figure

2.2.

Independent Variables
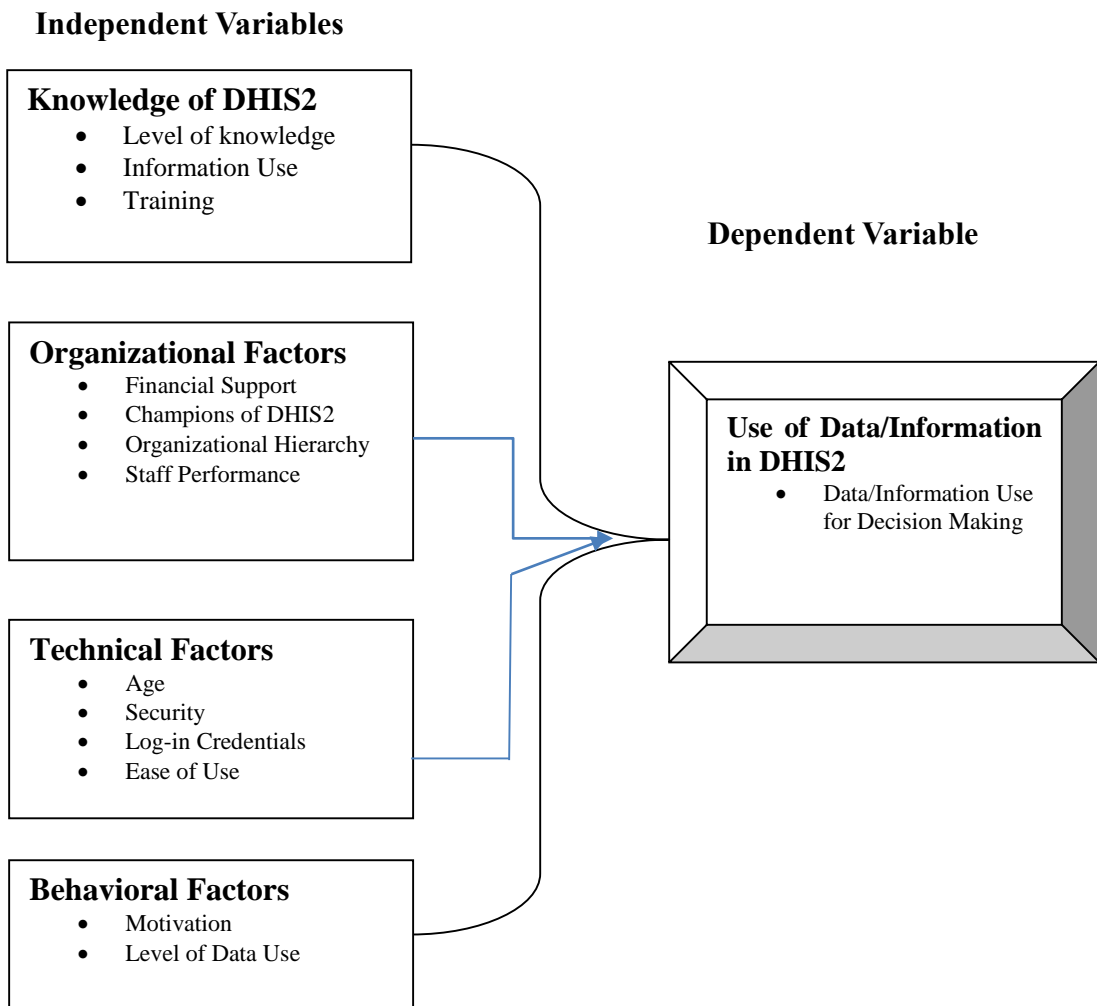
Figure 2.2: Conceptual Framework

2.8 Knowledge Gap

Most studies on HIS have focused solely on development and implementation, without

considering information usage in HISs. Thus, researcher's need to assess use of DHIS2

data to facilitate decisions to bridge the gap.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The chapter describes research design, variables, location and population, data collection instruments, the procedure that was used to carry out the study, ethical considerations, data administration and analysis.

3.2 Research design

A cross-sectional descriptive research design employing both qualitative and quantitative approaches was used to study the factors influencing use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals. Methodological triangulation where both questionnaires and in-depth interview guide enhances reliability. Descriptive cross-sectional research design examines exposure and outcome at the same time. Cross-sectional research is where researcher uses different clusters of people who differ in the variable of interest but share other characteristics, such as socio-economic status, educational background, and ethnicity. These studies are based on observations that take place in diverse groups at one time (Howick, 2002). This study design assisted the researcher get data on all variables at once and made it easy to conduct since there was much time available for follow up.

3.3 Location of Study

The study was carried out in Uasin Gishu Sub County Hospitals located in mid-west of Kenya's Rift Valley, 330km North West of Nairobi, Uasin Gishu County is bordering Kericho County to the south, Nandi to the south west, Bungoma to the west, and Trans Nzoia to the north. Other Counties sharing borders with Uasin Gishu County are Elgeyo

Marakwet to the east and Baringo to the South East. County is named after Ilwuasinkishu Maasai clan who initially used area for grazing. Uasin Gishu County has three main regions namely Eldoret North, Eldoret South and Eldoret East, which are further subdivided into six constituencies - Soy, Turbo, Kapseret, Kesses Ainabkoi and Moiben. Uasin Gishu County is home to 894,179 people as per the 2009 National Statistics (Kenya National Bureau of Statistics, 2009), representing 50% male and 50% female. It is largely a cosmopolitan region. The total health workforce in Uasin Gishu Sub County Hospitals is 1061. The six Sub County Hospitals (Kesses, Ainabkoi, Kapseret, Moiben, Turbo and Ziwa) were selected because they are of the same level (Level 4). Researcher covered all the six Sub County Hospitals in order to gather comprehensive data as the County did not have a fully functional County Referral Hospital. They serve a population with similar environmental and social economic characteristics.

3.4 Target Population

Target population comprised of all healthcare workers in study area who total up to 1061. This included: Health Records and Information Officers, Nurses, Clinicians, Laboratory Technologists, Medical Doctors, Pharmacists, Nutritionists, Physiotherapists, Occupational Therapists, Public Health Officers and County Health Management Team (CHMT) who included; the County Director of Health, Director Clinical Services, Director Preventive Services, Health Administrator, County Health Records and information Officer (CHRIO), County Chief Nurse, County Public Health Officer, County Pharmacist, ICT Coordinator, Assistant Director Clinical Services.

3.5 Study Population

Table 3.1: Uasin Gishu Sub County Hospitals Profile

Cadre	Uasin Gishu Sub-Counties						
	Ainabkoi	**Moiben**	**Turbo**	**Soy**	**Kapseret**	**Kesses**	**Total**
Medical Officers	9	8	6	6	0	0	29
Nurses	103	94	100	110	80	76	563
Pharmacists	4	6	6	4	0	0	20
Pharm Tech	9	7	10	7	7	5	45
Public Health officers	27	23	32	29	24	25	160
Health records and information officers	5	6	5	7	4	4	31
Clinical Officers	14	15	20	20	4	9	82
Laboratory Technologist	8	7	19	29	6	12	81
Others	9	8	9	11	7	6	50
Total	**182**	**170**	**209**	**225**	**136**	**139**	**1061**

3.6 Inclusion criteria and Exclusion Criteria

i. Inclusion criteria

Participants included in the study were those who consented, worked within study site for six or more than six months, within ministry of health and/or working in decision making position or involved in management of DHIS2.

ii. Exclusion Criteria

Participants who had worked for less than six months in the six sub county hospitals, those not in decision making position and those who did not consent were not included in the study.

3.7 Sampling methods

A purposive sampling technique was used to select the six sub county hospitals in Uasin Gishu Sub County Hospitals namely; Kapseret, Kesses, Ainabkoi, Turbo, Moiben and Ziwa. All facilities were selected in order to for researcher to collect sufficient data since Uasin Gishu County Referral Hospital is not fully functional. A simple random sampling method was used to select participants to be included. To actualize simple random sampling, a numbered list of all healthcare workers in the study area was prepared and computer randomization program was used to select random numbers between 1 and 1061. 10 out of 15 members of the CHMT were purposively selected for in-depth interviews.

i.   Sample Size Determination

Cochran advanced equation that yield representative sample for proportions (Israel, 1992) was used to determine the sample size for large populations.

ii.   Sample Size Calculation

Sample size $n_0 = Z^2 pq/e^2$

where n_0 is sample size, Z^2 is the abscissa of normal curve is 95% confidence level $=1.96$, e is the desired level of accuracy set at 0.05, p is estimated proportion of a trait that is present in population set at 0.5, while q is 1-p:

$$n_0 = 1.96^2 \textbf{ X } 0.5 \textbf{ X } 0.5/0.05^2$$

$$n_0 = 384.16 = \underline{\textbf{385}}$$

Sample size was adjusted using following equation for target population<10,000 requires a smaller sample size (Israel, 1992) :

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Thus, sample for this study was:

n=385÷ (1+ (385-1) ÷1061) =282.69≈283 respondents.

The sample for each cadre of staff was done in proportion to the total population for each group by the following formula: $n_x = x/N_0 * n$; where n_x is the sample for specific cadre of health workers; x is the total number of the employees in a specific cadre; N_0 is total number of health providers in study area, while n is sample size. Through the formula, each cadre of health workers included in study is shown in table 3.2 below:

Table 3.2: Population Sample Size Distribution

S/No	Staff Per Cadre	Sample Size(n_x)	Total Population(x)
1	Health Records and Information Officers	8	31
2	Nurses	150	563
3	Clinical Officers	22	82
4	Pharmacists	17	65
5	Laboratory Technologists	22	81
6	Radiographers	2	8
7	Nutritionists	6	22
8	Medical doctors	8	29
9	Public health officers	43	160
10	Physiotherapists	2	8
11	Occupational Therapists	1	5
12	Hospital administrators	2	7
	Total	**n=283**	**N₀=1061**

3.8 Construction of Research Instruments

The study managed to collect quantitative and qualitative data using a self-administered questionnaire and an in-depth interview guide. Questionnaire for health workers was constructed in accordance to the study objectives to ensure internal validity. To establish internal consistency of the questionnaire, Cronbach's alpha method was used. Questionnaire had six main sections; section A to F which consisted of demographic information, questions on level of knowledge in use of DHIS2 data, organizational, technical, individual and departmental level of data use in DHIS2 for respondents to fill. The statements were rated on a five-point and four-point Likert Scale and responses arranged from 5: Excellent, 4: Very Good, 3: Good, 2: Poor, 1: Very Poor or 5: Very Easy, 4: Easy, 3: Fairly Easy, 2: Difficult, 1: Very Difficult or 4: Strongly Agree, 3: Agree. 2: Strongly Disagree, 1: Disagree. In-depth interviews were also conducted with the County Health Managers to collect qualitative data. Researcher was able to get responses on factors influencing use of DHIS2 data to facilitate decision making.

3.9 Pretest Study

The researcher pilot-tested or pre-tested the questionnaire with 10 MTRH staff who possessed same characteristics as study participants, this was done to ensure accuracy or precision of the measuring instrument in terms of clarity, suitability and flow of questions before questionnaire was finally administered to participants. Pilot testing is done to confirm degree to which measuring tool produces unchanging and constant results (Nahid, 2003). The researcher was then able to fine tune the tool to improve its reliability and internal consistency.

3.10 Reliability and Validity

Quality control was ensured throughout the study to maximize validity and reliability of the study findings.

i. Reliability

Reliability is degree to which measuring tool produces unchanging and constant results (Nahid, 2003). To guarantee reliability of the instruments the researcher pilot-tested or pre-tested the questionnaire with 10 MTRH staff who possessed same characteristics as study participants, this would indicate accuracy or precision of the measuring instrument. The alpha coefficient done for the forty-two (42) items in the questionnaire for MTRH staff is .803, suggesting that the items have relatively high internal consistency, that is, Cronbach's α = .803, number of items N = 42. Cronbach's alpha shows if test you have designed is accurately measuring the variable of interest.

In addition, methodological triangulation where both questionnaire and in-depth-interview guide were used to collect data from participants enhanced reliability.

ii. Validity

Validity in this study was ensured by means of restricting the statements in the questionnaire to the concepts of the key variables and all the identifiable indicators of a specified variable was within the same conceptual elements. Researcher accomplished this through pilot testing the tool with MTRH staff and discussed it with supervisors. Validity shows whether research truly measure that which it is envisioned to measure or how truthful research results are (Nahid, 2003). In addition, comprehensive literature done and voluntary participation by health care workers and county health managers also ensured internal validity. External validity was ensured through random sampling to reduce selection bias.

3.11 Methods of Data Collection

In this particular study, the researcher collected both primary and secondary data in order to make conclusions and recommendations.

i. Quantitative Data Collection

Self-administered questionnaire having closed and open-ended questions was used to collect quantitative data because it provides direct response and feedback in an easy way and time saving. Structured questionnaire eased process of data analysis due to its speed and accurate recording of information. Researcher with four research assistants who were trained on data collection instruments, ethical requirements before embarking on quantitative data collection, went to the six Uasin Gishu Sub County Hospitals with introductory letters seeking permission to access the facilities with the NACOSTI and KeMU SERC approvals and held meetings at Sub-County HRIO's offices, consented the participants and filled most questionnaire forms with them.

ii. In-depth interviews

In-depth interviews were administered to County Health Management Team (CHMT) where an in-depth interview guide was used to guide in-depth interviews with participants in order to collect qualitative data. The in-depth interviews were done at their respective offices. Note books were used to record proceedings during the in-depth interviews. Tape recorders were used to complement in-depth interviews in case the researcher missed out to capture some information. The objectives of the one-on-one in-depth interviews were to collect information on broad themes around the subject of use DHIS2 data to facilitate decision-making in Uasin Gishu Sub County Hospitals. These included; a) workers experience of DHIS2; b) attitude of health workers; c) perceived quality of DHIS2; d) preference for alternative systems; f) expectations of

workers; and g) their satisfaction or dissatisfaction to DHIS2. Field notes were recorded, audio-tapes were made after informed consent. Each session lasted 30-45 minutes.

3.12 Data Entry, Analysis and Presentation

This was a rigorous exercise that consisted of checks for any missing data, errors or omissions from questionnaires, where corrections were made. Detailed analysis of all filled questionnaires to ensure accuracy and consistency with all the gathered data. Tools containing data were stored in safe cabinets to avoid damage or loss of questionnaires. Data coding was done for ease of analysis after which direct data entry for quantitative data using R Software Version 3.5 was done and analyzed for descriptive statistics in form percentages, and inferential statistics such as bivariate and multivariate logistic regression statistical analysis, confidence intervals and Pearson Chi-Square test that yielded p-values and odds ratios were used by researcher to provide detailed information concerning the data and draw out relationships. Level of significance was set at P-value ≤0.05 with corresponding 95% confidence interval. Data was presented using frequency distribution tables, charts and graphs. All qualitative data was thoroughly checked for completeness and cleaned for content analysis. Tape-recorded information was copied into transcripts in Ms Word. The Transcripts were then imported into the Quality Data Analysis (QDA) Software. Data in QDA Software were coded into themes for analysis. The data was then analyzed into descriptive thematic narratives.

3.13 Ethical Considerations

Ethical approval to conduct study was granted from Scientific Ethics Research Committee (SERC) of KeMU and National Commission for Science and Technological Institutions (NACOSTI). The health care workers and CHMT were given information pertaining to the study before the study began. The information included objectives of the study, voluntary participation, right to decline to participate, anonymity and confidentiality. Researcher got consent from all participants of the study and permission from respective institutions within the research location. The decision by some participants who decline to be included in the study was respected. To safeguard on confidentiality of participants, only demographic information such as age, experiences was collected. Their names, positions and/or other identifiers was not collected or taken. Quantitative data collected through questionnaires was locked in cupboards or cabinets while during publishing the names of participants were not included to preserve confidentiality of documents.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter covers presentation and interpretation of findings based on the data collected and analyzed. Results are arranged beginning with socio-demographic features of respondents and findings based on specific objectives. The chapter thus entails opinions regarding results of the study and explanations on implications of results. This chapter begins by restating and answering the research questions asked in the introduction, followed by explanations of results in relation to expectations and consistency with previously published work, discuss limitations and weaknesses of the study, and finally provide inferences of the results.

4.2 Response Rate and Demographics

The study targeted health care workers who had worked in the six sub county hospitals for six or more than six months and who were working with Ministry of Health.

Table 4.3: Response Rate and Demographics

Variable	N	(%)
Site		
Ainabkoi	49	(22.3%)
Kapseret	41	(18.6%)
Kesses	24	(10.9%)
Moiben	32	(14.5%)
Turbo	45	(20.5%)
Ziwa	29	(13.2%)
Total	**220**	**(100%)**
Age (Years)		
18-24	11	(5.1%)
25-30	72	(33.2%)
31-40	81	(37.3%)
41-50	41	(18.9%)
51-60	12	(5.5%)
Total	**217**	**(100%)**
Male	76	(35.8%)
Total	**212**	**(35.8%)**
Education level		
Certificate	21	(9.7%)
Diploma	150	(69.1%)
Degree	43	(19.8%)
Masters	3	(1.4%)
Total	**217**	**(100%)**
Years employed		
1-5	85	(41.3%)
6-10	49	(23.8%)
11-15	31	(15.0%)
>15	41	(19.9%)
Total	**206**	**(100%)**

A significant majority 134(61.8%) respondents were aged above 30 years, 76(35.8%) were male, 171(78.8%) had a certificate or diploma level of education, and 72(35.0%) had worked for more than 10 years as detailed in table 4.3. The response rate was (215/283) *100 = 76% which is very good. A total of 10 key informants out of 15, 8

males and 2 females, drawn from the County Health Management Team (CHMT) were approached for interviews but one of them, a female, declined.

Table 4.4: Association between response rate and demographics across the facilities

Variable	N	Ainabkoi	Kapseret	Kesses	Moiben	Turbo	Ziwa	P-value
Age (Years), n (%)								
18-24		2 (4.1%)	1 (2.5%)	1 (4.4%)	4 (12.5%)	1 (2.3%)	2 (6.9%)	
25-30		21 (42.9%)	8 (20.0%)	8 (34.8%)	7 (21.9%)	13 (29.6%)	15 (51.7%)	
31-40	217	15 (30.6%)	14 (35.0%)	7 (30.4%)	11 (34.4%)	24 (54.6%)	10 (34.5%)	0.024
41-50		9 (18.4%)	11 (27.5%)	6 (26.1%)	9 (28.1%)	4 (9.1%)	2 (6.9%)	
51-60		2 (4.1%)	6 (15.0%)	1 (4.4%)	1 (3.1%)	2 (4.6%)	0 (0.0%)	
Sex, n (%)								
Female		28 (57.1%)	26 (68.4%)	14 (60.9%)	20 (64.5%)	29 (67.4%)	19 (67.9%)	
Male	212	21 (42.9%)	12 (31.6%)	9 (39.1%)	11 (35.5%)	14 (32.6%)	9 (32.1%)	0.873
Education level, n (%)								
Certificate		6 (12.5%)	2 (5.1%)	4 (16.7%)	4 (12.5%)	5 (11.1%)	0 (0.0%)	
Diploma	217	33 (68.8%)	28 (71.8%)	16 (66.7%)	21 (65.6%)	30 (66.7%)	22 (75.9%)	0.469
Degree		8 (16.7%)	9 (23.1%)	4 (16.7%)	5 (15.6%)	10 (22.2%)	7 (24.1%)	
Masters		1 (2.1%)	0 (0.0%)	0 (0.0%)	2 (6.3%)	0 (0.0%)	0 (0.0%)	
Years employed, n (%)								
1 – 5		23 (51.1%)	10 (25.6%)	9 (39.1%)	14 (50.0%)	12 (28.6%)	17 (58.6%)	
6 – 10	206	6 (13.3%)	8 (20.5%)	5 (17.9%)	5 (17.9%)	15 (35.7%)	10 (34.5%)	
11 – 15		6 (13.3%)	7 (18.0%)	3 (13.0%)	3 (10.7%)	10 (23.8%)	2 (6.9%)	0.008
>15		10 (22.2%)	14 (35.9%)	6 (26.1%)	6 (21.4%)	5 (11.9%)	0 (0.0%)	

Comparison of age and years of employment of the participants across the facilities did show significant association of P<0.05 while sex and level of education did not show serious evidence of variability across the facilities.

4.3 Descriptive statistics: Description of level of knowledge and factors influencing use of DHIS2

Descriptive statistics are able to provide basic summaries concerning the study sample by describing quantitatively the main features. In this study, researcher used frequency

distribution tables to present responses from participants measured in percentages and frequencies. This was useful in determining the magnitude of a phenomena.

4.3.1 Level of knowledge in use of DHIS2

The level of knowledge among health workers in data management, verification and validation, data back-up, use of data in disease surveillance and clinical decision making in Uasin Gishu Sub County Hospitals is key in ensuring utilization of DHIS2 data to facilitate decision making.

Table 4.5: Level of knowledge in use of DHIS2

| Variable | N | n (%) | | | | | |
		Very poor	Poor	Good	Very Good	Excellent	Mean(SD)
Competence in data management	215	22 (10.2%)	46 (21.4%)	86 (40.0%)	43 (20.0%)	18 (8.4%)	2.9(1.0)
Verification and validation of data	216	25 (11.6%)	50 (23.1%)	81 (37.5%)	40 (18.5%)	20 (9.3%)	2.9(1.1)
Backup and securing of information	212	30 (14.2%)	60 (28.3%)	72 (34.0%)	34 (16.0%)	16 (7.5%)	2.7(1.1)
Information use in clinical decision making	212	25 (11.8%)	43 (20.3%)	86 (40.6%)	43 (20.3%)	15 (7.1%)	2.9(1.0)
Disease surveillance reporting	210	21 (10.0%)	40 (19.0%)	88 (41.9%)	39 (18.6%)	22 (10.5%)	3.0(1.0)
Timely reporting and dissemination of reports	214	26 (12.1%)	42 (19.6%)	73 (34.1%)	52 (24.3%)	21 (9.8%)	3.0(1.1)

Up to 147(68.4%) of the participants reported good, very good or excellent competence levels in data management using DHIS2, and 141(65.3%) reported good, very good or excellent verification and validation of using DHIS2. Slightly above half 122(57.5%) reported good, very good or excellent knowledge levels in backup and securing of the data. Up to 144(68.2%) of the participants reported that information use in clinical decision making and disease surveillance reporting was as good, very good or excellent. Timely reporting and dissemination of reports, and policy and operational decision making using DHIS2 was reported as good, very good or excellent by 146(68.2%), and 64.2% respectively. These details are shown in table 4.3. The mean for the level of

knowledge on use of DHIS2 data was 3 thus slightly above half and the six indicators

ranged from 2.7 to 3.0. Variation was also minimal across the six indicators.
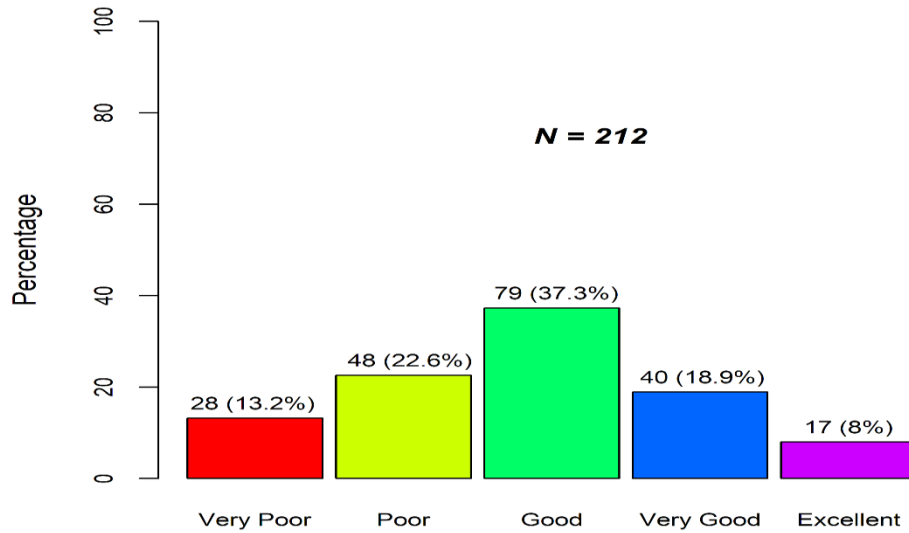
Figure 4.1: Use of Information in DHIS2 to Inform Policy and Operational Decision Making

Use of information in DHIS2 to inform policy and operational decision making was

reported as good, very good, and excellent by 37.3%, 18.9%, and 8.0% respectively as

detailed in figure 4.1.
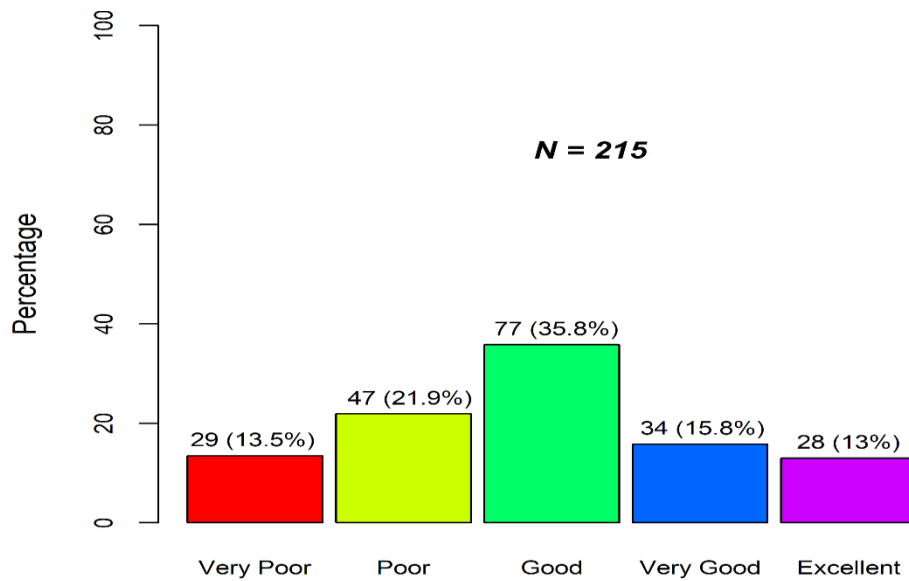
Figure 4.2: Training on DHIS2 tools e.g. MOH 705A, MOH 705B

Additionally, figure 4.2 shows that knowledge on the training on DHIS2 tools e.g. MOH 705A, MOH 705B, MOH 713 among others was reported as good, very good and excellent by 77(35.8%), 34(15.8%), and 28(13.0%) respectively.

Unlike the quantitative findings the key informant interviews showed that all the key informants believed that DHIS2 is a strong tool that can influence the decisions of CHMT.

The study sought to determined levels of knowledge on the use of DHIS2 for objective 1 namely; data management, verification and validation, information use in clinical decision making and disease surveillance, timely reporting and dissemination of reports, policy and operational decision making, training on DHIS2 tools as well use of information in DHIS2 to inform policy and operational decision making, all these aspects of knowledge recorded a good score with over 60% of participants reporting good, very good or excellent competence levels. In addition, above half (57.5%)

reported good, very good or excellent knowledge levels in backup and securing of the data.

In addition, the key informants described different levels of ability to utilize the DHIS2 system:

i. Ability to log-in to the system: one of the participants said, "*I use to log in that time when I was working in HIV care, I could access, but when I moved to administration I left it to someone else…*" Participant 01. However, their ability to manipulate the system resources is limited to just accessing information as explained by one of the participants thus "*Yah I can maneuver, log in but I cannot change anything*" Participant 02.

ii. Ability to access information: Key informants reported that they could access the DHIS2 information anytime when they need it and one of them said, "*…So, but I can access the information on DHIS2 in and of course if need be I can access it*" Participant 01. However, this right of access to the DHIS2 information is limited to the officers at sub-county level up wards as explained by participant 03, "*……The access rights, it is only given up to sub-county level…. all county and sub-county managers have access rights. On hierarchy, this is because you find out that starting from the data review meetings, you have the County Director and CEC Health attending the meeting, then rights of logging is given to CHRIO who in turn give the same rights to sub-county HRIOs who also can now issue access right to other users*" Participant 03.

iii. Perform data analysis: Some of the key informants had ability to perform analysis on data within the DHIS2 system, particularly as a way to monitor progress of key issues within their departments, "*I am good in data use, I can*

access e.g. PMTCT coverage for comparison see weak areas in Dhis2 and I do good analysis in DHIS" Participant 05.

4.3.2 Organizational factors influencing use of DHIS2 data
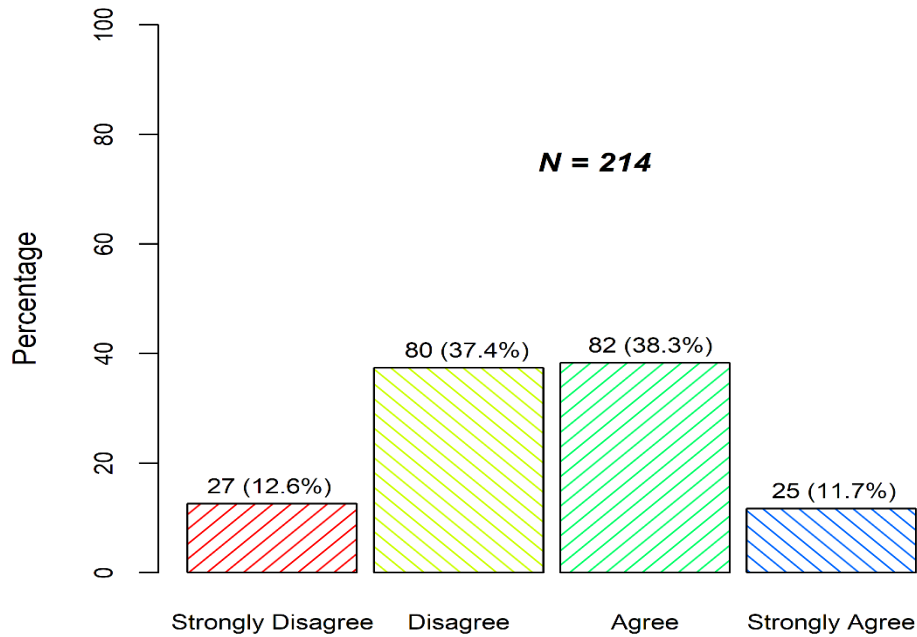
Figure 4.3: Adequacy of financial support for the running of DHIS2 functions in the County

One hundred and seven 107 (50.0%) of the participants acknowledge there are adequate finances to run DHIS2. Of this number 92 (86.0%) responded when they were asked about the financiers of DHIS2. Out of the 92, 72 (79.1%), and 11 (12.0%) said that County Government, and donors' finances DHIS2 respectively (figure 4.3).
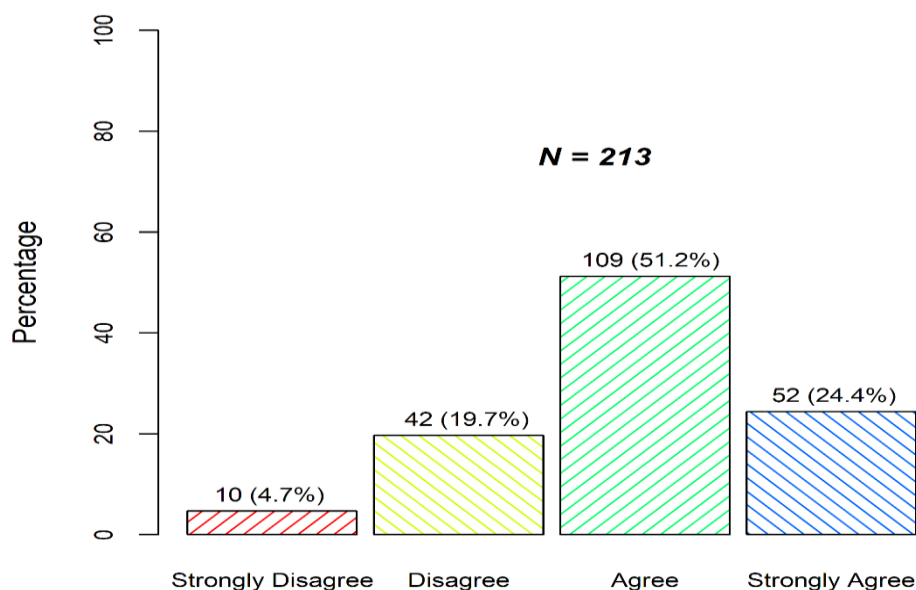
Figure 4.4: Adequacy of support on matters of DHIS2 from Sub-County or County Health Records and Information Officer

Three quarters 161 (75.6%) agreed or strongly agreed that there is adequate support on matters of DHIS2 from Sub-County or County Health Records and Information Officer (figure 4.4).

Table 4.6: Champions promoting DHIS2 information
                              N (210)

Champion(s)	N	(%)
County Governor	28	(13.3%)
Deputy Governor	3	(1.4%)
County Director of Health	61	(29.0%)
Medical Superintendent	27	(12.9%)
County Health Records and Information Officer	118	(56.2%)
Sub County Health Records and Information Officer	82	(39.0%)

Table 4.6 details the main champions promoting use of DHIS2 information for decision making at the Sub County Hospitals. The main champions promoting the use of DHIS2 information for decision making in the County were the county health records and information officers 118 (56.2%), and the sub-county health records and information officers 82 (39.0%).

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Table 4.7: Factors favouring use of information in DHIS2 in Uasin Gishu Sub County Hospitals   N (215)

Variable	N	(%)
Availability of computers	144	(67.0%)
Network and internet services	114	(53.0%)
Power backup	65	(30.2%)
ICT support supervision	94	(43.7%)
Conducive policy and legal framework	53	(24.7%)
Trained staff	114	(53.0%)
Management support	89	(41.4%)
Organizational politics	24	(11.2%)

The determinants of use of information in DHIS2 to facilitate decision making in Uasin Gishu Sub County Hospitals (Table 4.7) were mainly availability of computers 144 (67.0%), availability of network and internet services114 (53.0%), and presence of trained staff 114 (53.0%).
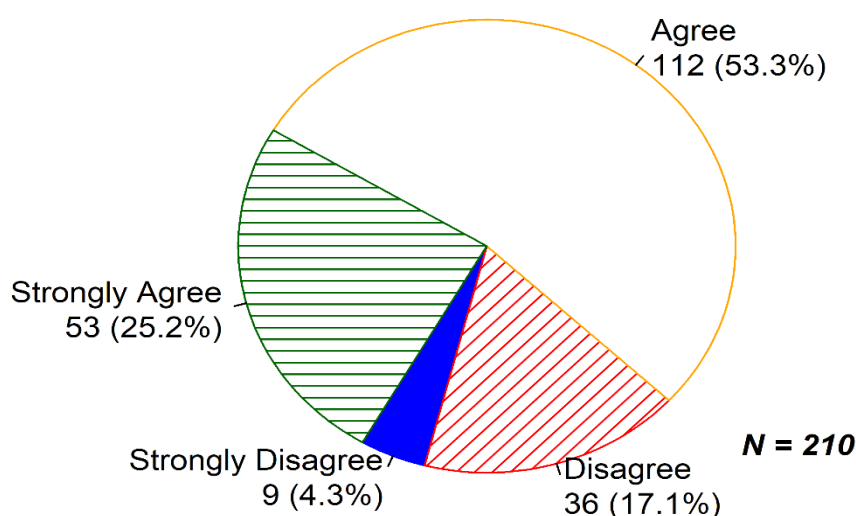
Figure 4.5: Believe on influence of organizational hierarchy on use of DHIS2

Up to 165 (78.5%) agree or strongly agree that organizational hierarchy influences the use of DHIS2 data (Figure 4.5).
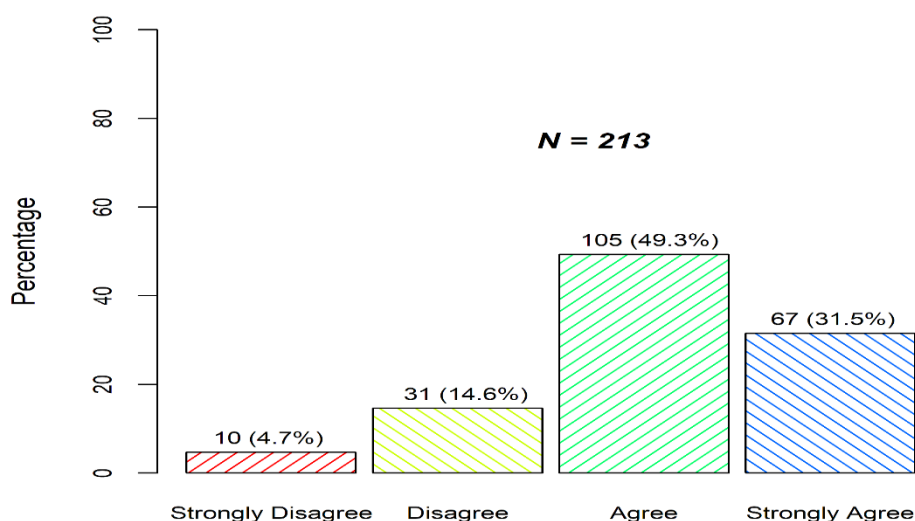
Figure 4.6: Believe on improved staff performance due to use of DHIS2

Majority of respondents 172 (80.8%) agree or strongly agree that there is improved staff

performance due to utilization if DHIS2 (Figure 4.6).

Table 4.8: Owners of the data and external factors influencing the use of DHIS2

Variable	N	N(%)
Owners of the data		
National Government	82	(38.0%)
Uasin Gishu County Government	87	(40.3%)
Department	55	(25.5%)
Patient	2	(0.9%)
Total	216	
External factors influencing use of DHIS2		
Market	24	(11.1%)
Government legislation	129	(59.7%)
Customer reaction to DHIS2 services	61	(28.2%)
Total	216	

Eighty-two (38.0%) participants thought that the ownership of the data rests with the

national government, and 87 (40.3%) thought that it rests with Uasin Gishu County

government. There were 2 (0.9%) who thought that the patient owns the data (Table

4.6). The external factors influencing the use of DHIS2 data include the government legislation 129 (59.7%), and customer reaction to DHIS2 services 61 (28.2%).

Table 4.9: Challenges in use of information in DHIS2 for decision making in Uasin Gishu Sub County Hospitals   N (210)

Variable	N	N	(%)
Lack of management support		72	(34.3%)
Poor skills set among users		102	(48.6%)
Indequate computers		77	(36.7%)
Unreliable internet services		99	(47.1%)
Lack of power backup		58	(27.6%)
Lack of antivirus software		34	(16.2%)
Resistance to change		44	(21.0%)
Lack of accurate and quality data		57	(27.1%)
Total	**210**		

The major obstacles encountered in use of information in DHIS2 for decision making in Uasin Gishu Sub County Hospitals by respondents include lack of management support 72 (34.3%), poor skills among users 102 (48.6%), lack of enough computers 77 (36.7%), and weak internet connectivity 99 (47.1%) (Table 4.7). Others include lack of power backup 58 (27.6%), and resistance to change 44 (21.0%).

The study sought to also determine the findings on organizational factors for objective 2, which showed that there were adequate finances for DHIS2 and most of the funding (79.1%) came from the County Government. The study further underscored that support on matters of DHIS2 came mainly from Sub-County or County Health Records and Information Officers. Besides, the same cadre of professionals was found to be the main champions promoting the use of DHIS2 information for decision making in the County. Some of the main determinants of use of information in DHIS2 for decision making included: availability of computers, networking and internet services, and presence of trained staff. In addition, majority of the participants affirmed that the utilization of

DHIS2 improves staff performance and can be influenced by organizational hierarchy. Furthermore, the use of DHIS2 can be influenced by government legislation, and customer reaction to DHIS2 services. However, major challenges experienced while using information in DHIS2 to facilitate decision making in Uasin Gishu Sub County Hospitals, comprise lack of management support, poor skills among the users, lack of adequate computers, and unreliable internet connectivity. Others include lack of power backup and resistance to change. It has been established that the use of computer systems, training and harmonization of indicators facilitated the increased use of HMIS data but lack of capacity to analyze, interpret and use data for both data producers and users was seen the main challenge in data utilization for decision making (Humba, 2015). Additionally, Malindi study noted that organizational factors especially support for data review and sharing forums were seen to affect information use (Chorongo, 2016). Karuri, et al 2014 established similar challenges found in this study namely inadequate infrastructure, low computer proficiency, inadequate staffing capacities, lack of proactive leadership and information ownership at all levels, as well as the still unmet demand for better quality and complete health data (Karuri et al., 2014). A similar study in Botswana cited several challenges in the national health information management system including inadequate IT infrastructure including computers and unreliable internet access; limited skills in using the system and inadequate human resource capacity Seitio-kgokgwe & Mashalla, (2016) and a similar trend was established in Cameroon (Asah & Ivar, 2017). A study in Iran postulated that there was relationship of resources of the organizations, organizational knowledge, processes, managerial structure, values and goals with use of computer and showed a meaningful relationship between managerial structure and attitude, resources of the organizations

and attitude Barzekar and Karami, (2014) and this had been earlier affirmed that organizational attributes are important predictors for diffusion of information technology innovations (Ash, 1997).

They key informants highlighted the following as main factors that determines utilization of data in organization:

i. Demand for information: This was highlighted among the organizational factors influencing use of DHIS2 system, it is explained that information should be availed to all those in need, especially the health professionals. Participant 01 explained this point as follows, "*Eh….one is the need for information --- for all to be able to access… so that demand or information….*".

ii. Teamwork: Additionally, participant one highlighted the importance of teamwork, "*…… it is also the issue of teamwork…. unlike previously where it was a preserve of HRIOs (laughter) where only one person was the main player. Whereas all of us are in need of information and create the same. You cannot be told that you can take this food but you cannot enter the hotel*" Participant 01, on his call for concerned parties to utilize information on DHIS2 system.

iii. Hierarchical utilization of data: We also found that utilization of data within DHIS2 system has been affected by the hierarchical arrangement which limit access to the system in favor of senior officers in the organization. This is vividly explained as follows, "*Utilization of data and…… and Dhis2 varies with levels top sub-county and County level managers use the data more than lower level staff*" Participant 05.

iv. Policy: Policy was also highlighted by participant 05 who explained that policy influence the use of DHIS2 system; "*Policies also influence use of data in DHIS2*" Participant 05.

v. Interest in utilization of data: DHIS2 data could be influenced by individual interest of top level management so that if they are really interested in it the rest of the system will certainly embrace DHIS2, thus *"…. if top management is interested in/our data obviously this will improve data use*" Participant 05.

vi. Internal and external factors: Staff knowledge and external factors like management support and provision of adequate servers to the staff influence utilization of DHIS2 data. Participant 05 explained this point as follows, "*External and internal factors such as staff knowledge and management support, server affects us also*" Participant 05.

vii. Political interference: There was also the issue of political interference that seem to influence how reports are made from the DHIS2 system data, this point was expressed in the following words, "*Political really affects legal e.g. report requests*" Participant 05.

4.3.3 Technical factors influencing the use of DHIS2 data

Technical factors such as age, level of training, adequacy of training, technical capacity, IT support and ICT infrastructure influence the way health workers adopt and use information in DHIS2.

Table 4.10: Technical factors influencing DHIS2 use

Variable	N	(%)
Age influences way health workers adopt & use DHIS2:		
Strongly disagrees	28	(13.3%)
Disagrees	53	(25.1%)
Agrees	86	(40.8%)
Strongly agrees	44	(20.9%)
Total	**211**	**(100%)**
Level of training in DHIS2:		
Very poor	25	(12.4%)
Poor	52	(25.7%)
Good	99	(49.0%)
Very good	26	(12.9%)
Total	**202**	**(100%)**
The training received in DHIS2 was adequate:		
Strongly disagrees	35	(17.9%)
Disagrees	64	(32.7%)
Agrees	76	(38.8%)
Strongly agrees	21	(10.7%)
Total	**196**	**(100%)**
County government possesses technical capacity to support DHIS2 without relying on Ministry of Health:		
Strongly disagrees	19	(9.1%)
Disagrees	71	(34.1%)
Agrees	82	(39.4%)
Strongly agrees	36	(17.3%)
Total	**208**	**(100%)**
Level of satisfaction with the IT Support you receive from MOH:		
Not satisfied	31	(14.9%)
Less satisfied	105	(50.5%)
Satisfied	59	(28.4%)
Very satisfied	13	(6.2%)
Total	**208**	**(100%)**
ICT infrastructure in place:		
Computer hardware and software	156	(77.2%)
Network and internet connectivity	73	(36.1%)
Power supply	80	(39.6%)
ICT experts	26	(12.9%)
Policy and legal framework	11	(5.4%)
Total	**202**	**(100%)**

Up to 130 (61.7%) of participants agreed or strongly agreed that age influences way

workers adopt and use DHIS2 in the hospitals, and 77 (38.1%) reported that the level

of training on DHIS2 was either very poor or poor. The training received on DHIS2 was reported to have been inadequate for 99 (50.6%) participants, and 56.7% of the participants agree or strongly agree that the County Government have required technical capacity to support the DHIS2 without necessarily relying on the Ministry of Health. Two thirds of the participants are dissatisfied with the IT Support they receive from the Ministry of Health, 136 (65.4%). The ICT infrastructure in place is mainly the computer hardware and software (77.2%), the network and internet connectivity (36.1%), and power supply (39.6%). The ICT experts, and the policy and legal framework were reported to be available by 26 (12.9%), and 11 (5.4%) of the participants respectively (Table 4.10).
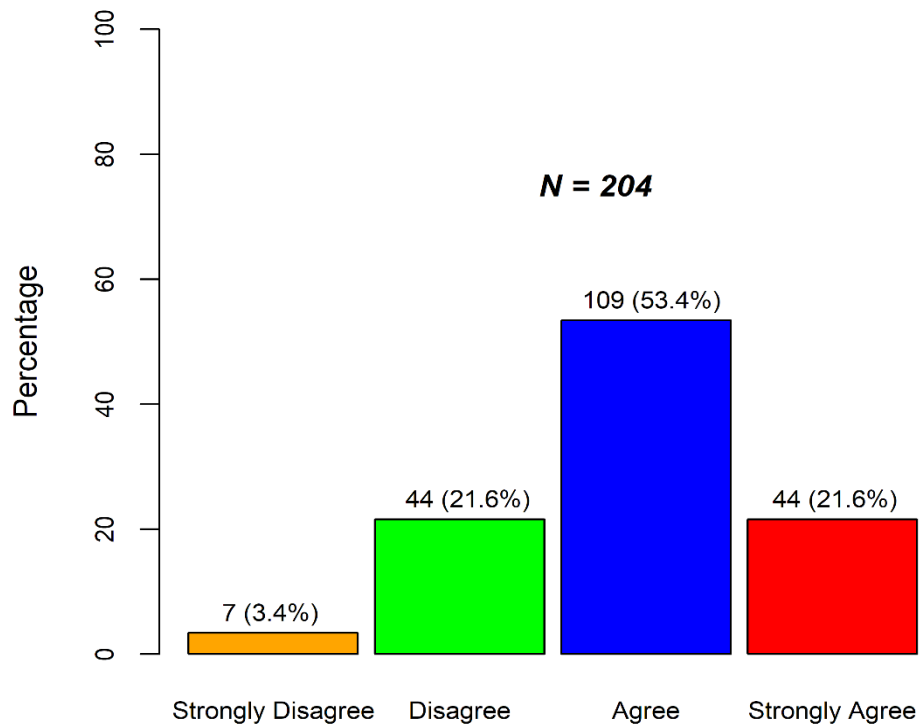
Figure 4.7: Opinion on Kenya's position in putting in place adequate measures to ensure security of data collected and processed through DHIS2

Three quarters of the participants agree or strongly agree that Kenya has in place measures to ensure security of data collected and processed through DHIS2 (Figure 4.7 above).
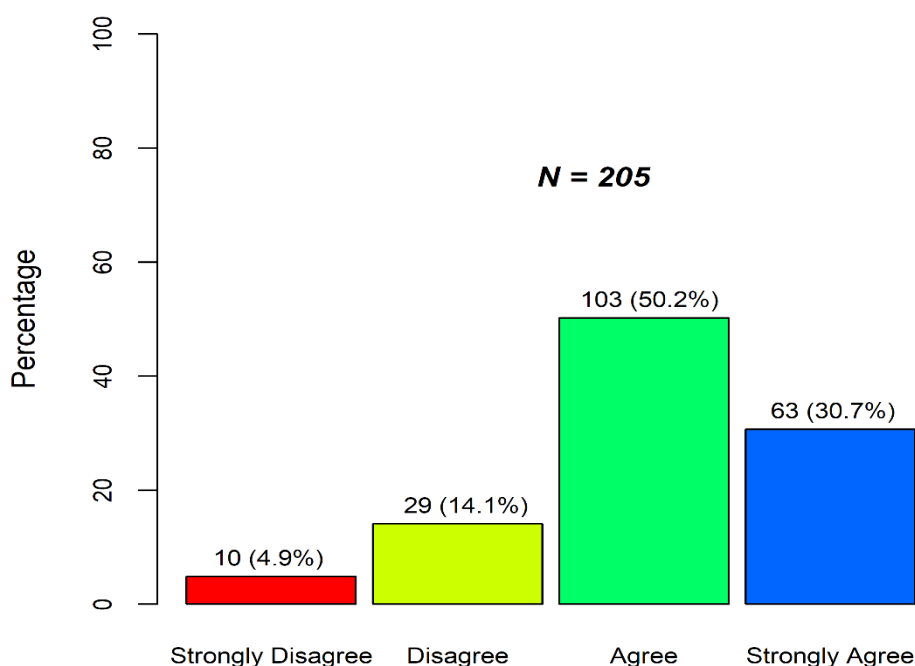
Figure 4.8: Opinion on availability of the log-in credentials for all DHIS2 Users

Up to 166 (80.9%) of the participants agree or strongly agree that all the DHIS2 users

have log in credentials (Figure 4.8).

Table 4.11: Ease of Use of DHIS2

Variable	N	Very difficult	Difficult	Fairly easy	Easy	Very Easy
				n (%)		
Log-in	202	16 (7.9%)	33 (16.3%)	46 (22.8%)	67 (33.2%)	40 (19.8%)
Data entry	199	22 (11.1%)	32 (16.1%)	59 (29.6%)	58 (29.1%)	28 (14.1%)
Data accuracy checks	200	32 (16.0%)	41 (20.5%)	53 (26.5%)	57 (28.5%)	17 (8.5%)
Data validation checks	198	36 (18.2%)	45 (22.7%)	56 (28.3%)	43 (21.7%)	18 (9.1%)
Data analysis	198	34 (17.2%)	55 (27.8%)	52 (26.3%)	41 (20.7%)	16 (8.1%)
DHIS2 analysis tools	197	35 (17.8%)	58 (29.4%)	47 (23.9%)	41 (20.8%)	16 (8.1%)
Dashboard	199	29 (14.6%)	44 (22.1%)	55 (27.6%)	46 (23.1%)	25 (12.6%)
Reporting and dissemination	199	33 (16.6%)	45 (22.6%)	43 (21.6%)	47 (23.6%)	31 (15.6%)

Up to 49 (24.2%) of the participants reported difficulty with logging into the DHIS2,

54 (27.2%) reported difficulty with data entry into the DHIS2. Data accuracy checks

and data validation checks were reported to be difficult to very difficult by 73 (36.5%),

61

and 81 (40.9%) respectively (Table 4.9). Data analysis using DHIS2 was reported to be difficult to very difficult by 89 (45.0%) of the participants. The use of DHIS2 analysis tools and the use of dashboard were reported to be difficult or very difficult to work with by 93 (47.2%), and 73 (36.7%) of the participants respectively. Reporting and dissemination using DHIS2 was reported to be difficult or very difficult by 78 (39.2%) of the participants.

The second objective of the study was to assess technical factors influencing the use of DHIS2 in order to measures objective 3. Generally, the study found that age influences the way health workers adopt and use DHIS2 in the hospitals. Besides, a significant portion of the participants (50.6%) reported that the training received on DHIS2 was inadequate, although, 56.7% were confident that the county government possessed the requisite technical capacity to support the DHIS2 without necessarily relying on the Ministry of Health. This could be explained by the higher numbers of the participants (65.4%) who were dissatisfied with the IT Support received from the Ministry of Health. Moreover, the ICT infrastructure in place mainly included computer hardware and software, the network and internet connectivity as well as power supply. Although very few participants, 12.9% and 5.4% respectively, affirmed that ICT experts and policy and legal framework were available, three quarters of the participants believed that Kenya has put in place adequate measures to ensure security of the data collected and processed through DHIS2. In addition, significant majority (80.9%) of the participants stated that all the DHIS2 users have log in credentials but a few either had difficulty with logging into the DHIS2 (24.2%) or with data entry into the DHIS2 (27.2%). There were also reports of difficulties reported in the study with data accuracy checks and data validation checks, data analysis using DHIS2 and use of DHIS2

analysis tools and the use of dashboard. However, a few stated that reporting and dissemination using DHIS2 was difficult. On technical factors, Malindi study, established that availability of information for use was seen to be affected negatively by knowledge on IT and lack of documentation tools (Chorongo, 2016).

Key informants reported the following as the main technical factors influencing use of DHIS2:

i. **Training:** Among the technical factors influencing use of DHIS2 system, training was identified as key feature; "*One is training which need to be accelerated to all …. Training also we have to scale up the training then of course support with equipment then internet,*" Participant 01. This training should target staff currently enrolled into the system in order to build on their capacity to deal with DHIS2 system, as explained by participant 03: "*What we might need is training i.e. capacity building of the existing staff,*" **Adequate equipment:** The need to have adequate equipment and ample space to keep them was highlighted by a number of participants, for instance, one of them said, "*there is need to avail the equipment computers are not adequate and then internet connectivity in Sub-County Hospitals.*" Participant 01. Similarly, another participant stressed on the same point, adding that development partners such as AMREF has been helpful, "*…. Yah, computers are not adequate…. County Managers are positive in purchasing computers but we get much support from partners like AMREF, what has been happening, when you request computers, they consider mostly the CHMT not ones below them and maybe for specific programmes.*" Participant 02. However, there are some like participant 05, who reported significant steps that have been made to avail adequate

equipment with the help of development partners, "w*e have been increasing computers like 10-14 now in number; we get support from development partners. Two is availability of computers and is not in use. There need to be hardware and software compliance, because only facilities with computers and internet are able to use dhis2 and are in a position to consume and evaluate their own data as opposed to those facilities without who work manually, such facilities find it difficult to evaluate their data."* Participant 05.

ii. ***Internet connectivity and power Back up:*** The importance of internet connectivity was identified as one of technical factors influencing use of DHIS2 particularly at Sub-County Hospitals and on this issue one participant explained that, "*there is need to avail the equipment, computers are not adequate.....then internet connectivity in Sub-County Hospitals*" Participant 01, although there are efforts being done to mitigate the issue of internet connectivity by supplementing it with modems as stated by one participant, "*Yah okay at the moment in the County we don't have a lot of technical challenges in terms of internet problem, the county provide modems in some few areas.*" Participant 02. Findings also show that some facilities have internet connectivity as reported by participant 05 who said, "…. *We have backups, internet and computers and laptops in our facilities….*"

iii. ***Expatriates who maintain the systems:*** Although internet connectivity is important, experts who maintain the system are equally important and their presence influences the effectiveness of the DHIS2 system. Study findings show that experts who maintain internet systems are located at the County level and are not available to solve issues experienced by staff at the lower levels. This

point is explained as follows, "*......We have IT experts at the County level only but they are not available at the Sub-County and lower levels*" Participant 02.

iv. ***Communication:*** Communication is important element of effective running of an organization and it was found that facilitation for communication is biased where some activities get the facilitation while others do not. This is explained in the following words, "*There is the issue of airtime for the facilities where partners like AMPATH, the County should actually organize to provide airtime for these activities, and airtime provided is used for HMIS activities alone.*" Participant 03.

4.3.4 Individual factors influencing use of DHIS2 data

Individual factors such as age, years in employment, level of training, motivation and level of confidence in handling DHIS2 tasks has a lot of implications on how health workers utilize DHIS2 data to facilitate decision making.

Table 4.12: Individual factors influencing the use of DHIS2

Variable	N	(%)
Education level:		
Certificate	32	(15.3%)
Diploma	13	(66.0%)
Degree	36	(17.2%)
Masters	3	(1.4%)
Total	**209**	**(100%)**
Rating own training level in DHIS2:		
Very low	31	(15.5%)
Low	38	(19.0%)
Moderate	90	(45.0%)
High	35	(17.5%)
Very high	6	(3.0%)
Total	**200**	**(100%)**
Duration of training:		
Never trained	20	(15.0%)
On job training	5	(3.8%)
Less than one week	15	(11.3%)
One week	49	(36.8%)
two weeks	16	(12.0%)
One month	28	(21.1%)
Total	**133**	**(100%)**
Rating use of information on DHSI2 in facilitating evidence based decision making in the County health facilities:		
Low	39	(19.4%)
Moderate	101	(50.2%)
High	53	(26.4%)
Very high	8	(4.0%)
Total	**201**	**(100%)**
Confidence while handling task:		
Not confident	77	(37.4%)
Confidence while under supervision	61	(29.6%)
Confidence without supervision	68	(33.0%)
Total	**206**	**(100%)**
Adequately motivated for the use of DHIS2:		
Strongly disagrees	37	(18.0%)
Disagrees	50	(24.4%)
Agrees	91	(44.4%)
Strongly agrees	27	(13.2%)
Total	**205**	**(100%)**

Up to 159 (79.5%) of the participants reported that their level of training on DHIS2 was very low, low or moderate. 20 (15.0%) have never trained, 5 (3.8%) got the "On job training", 80 (60.1%) had the training for two weeks or less, and 28 (21.1%) underwent a one-month training. Utilization of information on DHIS2 in facilitating decision making in Uasin Gishu County Hospitals was reported to be moderate to low by 140 (69.6%) of the participants. One third of the participants reported some confidence while handling a task using the DHIS2, and 118 (57.6%) agreed or strongly agreed that they are adequately motivated to use DHIS2 (See Table 4.12).
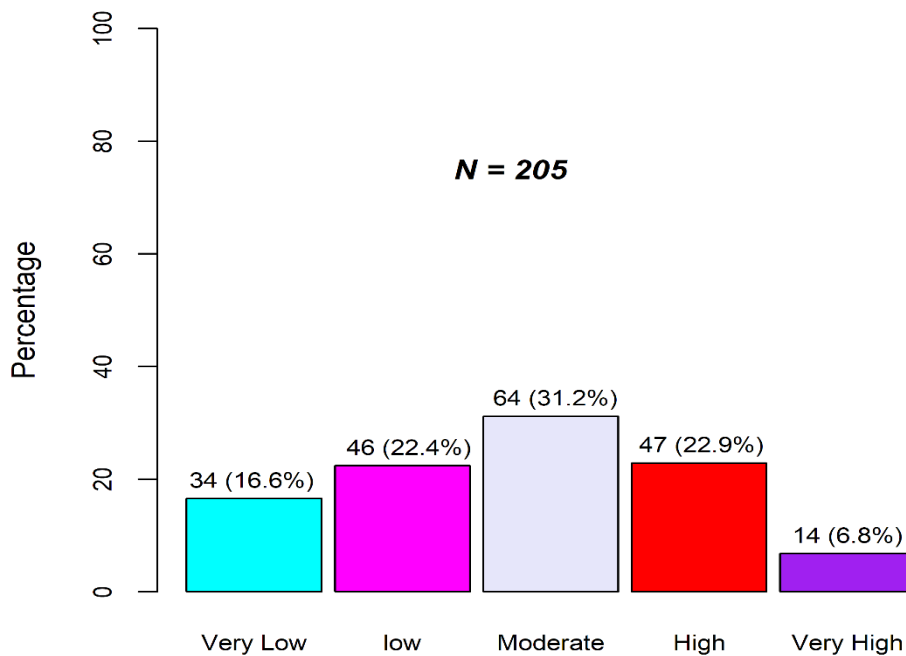
Figure 4.9: Level of motivation to create and keep health information for use

The level of motivation to create and keep health information for use was either low, very low or moderate for 144 (70.2%).
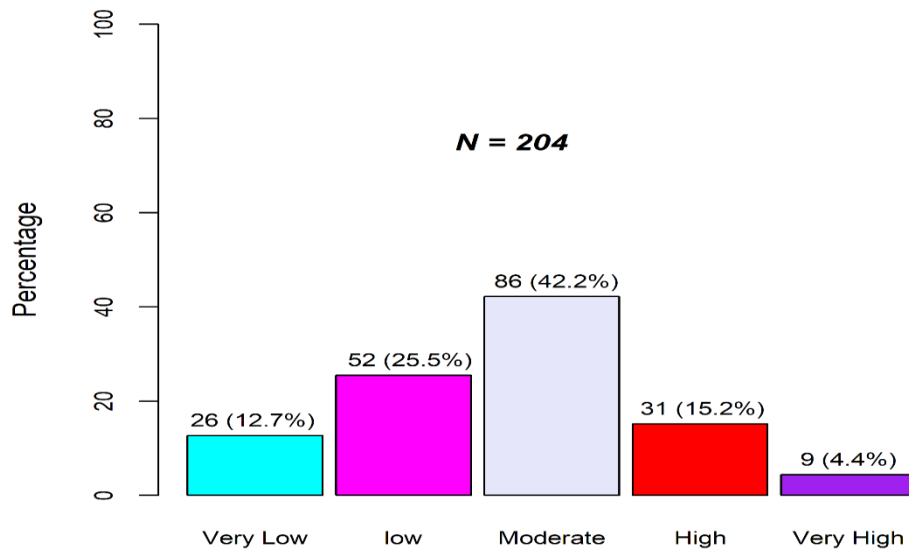
Figure 4.10: Departments level of data use in DHIS2

The level of the department in the use of data in the DHIS2 was reported as low or very low by 78 (38.2%) of the participants.

The study sought to determine Individual factors influencing the use of DHIS2. Majority of the participants 159 (79.5%) stated that their level of training on DHIS2 was ranged from low to moderate. Although, there were some participants who had never been trained 20 (15.0%), a majority (60.1%) had received training lasting two weeks or less. Utilization of information on DHIS2 in facilitating evidence-based decision making in the Uasin Gishu Sub County Hospitals was reported to be moderate to low 140 (69.6%). Whereas a third of the participants reported some confidence in handling tasks using the DHIS2, the study noted that a significant portion 118 (57.6%) of participants stated that they are adequately motivated to use DHIS2. The level of motivation to create and keep health information for use from study findings ranged from low to moderate 144 (70.2%) while departmental use of data in the DHIS2 ranged from moderate to very high. A study in Malindi established that under individual factors roles and responsibilities affected data collection and use, also staff competence/skills

and positive attitude had a relationship to the use of information and lack of incentives to use information and nature of work related to information use. The study established that utilization of health management information for decision making among health program managers in Malindi Sub County is ongoing (97.4%) however it is determined by behavioral, technical and organizational factors and that organizational factors played a key role in enhancing the behavioral and technical factors (Chorongo, 2016). A study in Khyber Pakhtunkhwa identified weaknesses in DHIS2 system to included invalid data, non-integration of the system with DHIS program, non-motivated and untrained staff, improper implementation with any supervision mechanisms and non-usage of information for any decision making process (Nawaz, Khan, & Khan, 2015). Similar findings were found in a study in Tanzania Asah & Ivar, (2017) and the study cited significant challenges exist regarding data dissemination and use in the health sector including: human, technical, organizational, and behavioural factors affect data quality, which in turn limits data dissemination and use. A study carried out in Nairobi ascertained factors influencing utilization of HIS to include age, lack of user involvement, adequate knowledge on use of health information system, understaffing, change implementation, lack of refresher training, duration taken to restore system in case it breaks down and motivation (Asah & Ivar, 2017).

According to key informants the following were the main individual factors influencing the use of DHIS2:

1. Accessibility: There is limited accessibility to DHIS2 system as described by one of the participant that, "*I think,… I think priority thing is accessibility, if you make everything available; you avail computers, you avail the internet, power backups*

and then you avoid the boundary this of sourcing it limited to a few" Participant 01.

2. Support services: There is also no support services to encourage the elderly to embrace the new system in place such as the DHIS2 and one participant explained as follows, *"If some people are very old and they are able to use it they should be supported to get this Dhis2 knowledge, provide spectacles, through NHIF cover, they can easily get them so you cannot say one is very old, you avail the gadget to necessary sustain it."* Participant 01.

3. Utilization of information: There is poor absorption and utilization of data and information generated by the DHIS2 system which has made junior officers to become less concerned, as vividly explained by one of the participants, *"What I can say is that we normally have performance review meetings based on dhis2. But what is funny is that the recommendations thereof are not taken seriously by the county managers it has developed an attitude among health workers in that if managers cannot use the information for decision making? So people just go to review meetings for joy ride ... (laughter)."* Participant 02. One of the participants explained that the senior management has ability to improve on the utilization of DHIS2 information since they have the power to make it happen, *"Top management lead in utilization data and information in Dhis2.To improve on data use, we demand staff to analyze data and send them to us so they don't have an option. Culturally and religiously here is nothing."* Participant 05.

4. Age: It is believed that the younger members of staff are more receptive and could use DHIS2 more than their older counterparts, although personal interest could also be a key factor determining how an individual staff accept and use DHIS2.This was

explained as follows, *"Of course in terms of age obviously the young are receptive and use Dhis2 than the old but to some degree there are few who have interest on DHIS2 as result of individual interest self-interest"* Participant 02. Furthermore, another participant explained that, *"...behavioral factors in age experience elderly may not be using DHIS2 a lot compared to the young on data demand and use, it is more making it a requirement for all staff to report and use Dhis2 of course considering ages knowledge as far as ICT is concerned and interest"* Participant 05, this confirms the theme of age as a factor that influence use of DHIS2.

5. Support from senior management: One of the participants stated that, *"There is the issue of political interference; the on the political wing, they are not supportive on DHIS2 and on what needs to be done is lacking e.g. in terms of staff and equipment. Now the problem is that for --- for CS and PS, is in purely in terms of political and professionalism. But now when you come to Counties there is political interference, so if you give, give out data from DHIS2 the Governors can direct the CEC or Chief Officer that I need this or that influence the data they will have to follow that"* Participant 03, this explains the rampant existence of political interference and how it influences the utilization of DHIS2.

6. Infrastructure: The operational infrastructure is under development and participants underscored the fact that organogram for health department at the county is not yet in place. On this issue one of the participants said, *"We don't currently have an existing organogram for Health Department in the County. There used to be a good CHMT, structure --- but with time it has faded away with advent of devolution. The CHMT should consist of the CEC, Chief Officer, Director of Health and that Head of Departments should operate from their Hospital's when they need to implement,*

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it failed after which they recalled back the CHMT, although there is no documented structure yet, we went to Kitale to develop Job Descriptions for county and Sub-county health workers and Teams. The problem with health is that we did not had a Human Resource Officer for Health….. Source of many HR issues…. Since there is no HR Department, the JDs are not in place" Participant 03.

4.4 Factors associated with use of DHIS2 Data

Statistical data analysis done for dependent variable versus independent variable was done using a Likert scale**.** Due to sparsity of data this variable was recorded into three levels ordinal variable; low, moderate, and high. The independent variables that had more than two levels were also recorded into two levels such as poor or good for opinions on variables measuring knowledge in use of DHIS2 in data collection, data entry and analysis i.e. competence in data management, to perform quality checks i.e. Verification and validation of data, Back up and secure information in DHIS2, DHIS2 information in clinical decision making, Use of DHIS2 in disease surveillance reporting, Use of DHIS2 in timely reporting and Dissemination of reports, Use of information in DHIS2 to inform policy and operational decision making, and Training on DHIS2 Tools e.g. MOH 705A, MOH 705B, MOH 713 etc.,), low or high for opinion on behavioral factors (How would you rate your level of training on DHIS2?, What is your rating on the use of information on DHSI2 in facilitating decision making in County health facilities?, and Rate your level of motivation to create and keep health information for use), not satisfied or satisfied for opinion on technical factors influencing use of information in DHIS2 (How satisfied are you with the IT Support you receive from MOH?), difficult or easy for opinion on technical factors influencing use of information in DHIS2 (log in, data entry, data accuracy checks, data validation

checks, data analysis, DHIS2 analysis tools, Dashboard, Reporting and dissemination), and disagree or agree for opinion on organizational factors (adequate financial support for the running of DHIS2 functions in the County, support on matters of DHIS2 from your Sub County or County Health Records and Information Officer, Organizational hierarchy influence use of DHIS2, Use of DHIS2 has improved staff performance), for opinion on technical factors influencing use of information in DHIS2 (Age influence the way health workers adopt and use DHIS2 in your Hospital, training received in question (2) above was adequate, County have required capacity to support DHIS2 without necessarily relying on Ministry of Health, Kenya has put in adequate measures to assure security of the data collected and processed through DHIS2, all DHIS2 users have login user name and password) , and individual factors influencing use of DHIS2 (Motivation to use of DHIS2 data).

Bivariate association between independent variables and dependent variable was assessed using Pearson's Chi Square test and fishers' exact test where chi square assumptions were violated. Multivariate analysis was done using logistic regression to assess for predictors. The variables that were established to be associated with the dependent in the bivariate analysis were included in the logistic regression model in order to adjust for confounders. Model selection was done using stepwise regression method. This is where the variables that had the largest p-value > 0.05 were dropped from the saturated model (model with all the significant variables) one at a time until the final parsimonious model (model that best explains the dependent variable) was achieved. The odds ratios (OR) and corresponding 95% confidence intervals were reported (95% CI).

Table 4.13: Association between response rate, demographics and departments'

level of DHIS2 data use

Variable	N	Department level of Data use in DHIS2			P-value	OR (95% CI)
		Low	Moderate	High		
Site						
Ainabkoi		30 (38.5%)	17 (19.8%)	2 (5.0%)		Reference
Kapseret		10 (12.8%)	16 (18.6%)	10 (25.0%)		4.65 (1.99, 10.84)
Kesses		10 (12.8%)	9 (1-.5%)	4 (10.0%)	0.012	2.31 (0.88, 6.04)
Moiben	204	10 (12.8%)	14 (16.3%)	6 (15.0%)		3.30 (1.37, 7.94)
Turbo		9 (11.5%)	18 (20.9%)	13 (32.5%)		6.03 (2.63, 13.84)
Ziwa		9 (11.5%)	12 (14.0%)	5 (12.5%)		3.12 (1.25, 7.81)
Age (Years)						
18 – 30		27 (35.1%)	25 (29.8%)	24 (60.0%)		Reference
31 – 40	201	26 (33.8%)	40 (47.6%)	11 (27.5%)	0.006	0.70 (0.39, 1.28)
41 – 50		24 (31.2%)	19 (22.6%)	5 (12.5%)		0.41 (0.20, 0.82)
Gender						
Female		49 (63.6%)	54 (67.5%)	22 (56.4%)		Reference
Male	196	28 (36.4%)	26 (32.5%)	17 (43.6%)	0.497	1.14 (0.66, 1.97)
Education level						
Certificate		7 (9.0%)	8 (9.5%)	5 (12.8%)		Reference
Diploma	201	56 (71.8%)	54 (64.3%)	25 (64.1%)	0.795	0.72 (0.30, 1.75)
Degree +		15 (19.2%)	22 (26.2%)	9 (23.1%)		0.94 (0.35, 2.51)
Years employed						
1 – 5		26 (35.1%)	34 (42.0%)	18 (51.4%)		Reference
6 – 10		19 (25.7%)	19 (23.5%)	6 (17.1%)	0.334	0.62 (0.31, 1.23)
11 – 15	190	12 (16.2%)	10 (12.4%)	8 (22.9%)		0.90 (0.41, 2.03)
15 +		17 (23.0%)	18 (22.2%)	3 (8.6%)		0.53 (0.26, 1.09)

The bivariate analysis shows that there was sufficient evidence from the data to demonstrate an association between the site of the facility and the department level of DHIS2 data use (p=0.12). The results show that respondents from the facilities located in Kapseret, Moiben, Turbo and Ziwa compared to those located in Ainabkoi have high odds of rating the departments as moderate versus low or high vs low users of DHIS2

data, OR: 4.65 (95% CI: 1.99, 10.84), 3.30 (95% CI: 1.37, 7.94), 6.03 (95% CI: 2.63, 13.84) and 3.12 (95% CI: 1.25, 7.81) respectively.

The age of the respondents was also significantly associated with response of department level of DHIS2 data use (p = 0.006). The bivariate results indicate that the respondents aged 31-40 years and those aged 41-50 years compared to respondents aged 18-30 had lower odds of reporting that the departments were moderate than low or high than low users of DHIS2 data; OR: 0.70 (95% CI: 0.39, 1.28) and 0.41 (95% CI: 0.20, 0.82) respectively. There was statistical association between age and years of employment with department level of DHIS2 data use (p<0.05) while gender and level of education had no significant association with department level of DHIS2 data use (p>0.05).

Table 4.14: Bivariate association between level of knowledge of DHIS2 data use and departments' level of DHIS2 data use

Variable	N	Department level of Data use in DHIS2			P-value	OR (95% CI)
		Low	Moderate	High		
Use of DHIS2 in data collection, data entry and analysis i.e. competence in data management						
Poor		36 (46.8%)	21 (25.0%)	2 (5.1%)		Reference
Good	200	41 (53.3%)	63 (75.0%)	37 (94.9%)	<0.0001	4.32 (2.34, 7.98)
Use of DHIS2 to perform quality checks i.e. Verification and validation of data						
Poor		39 (59.7%)	22 (25.9%)	5 (12.8%)		Reference
Good	201	38 (49.4%)	63 (74.1%)	34 (87.2%)	<0.0001	3.76 (2.09, 6.79)
Back up and secure information in DHIS2						
Poor		42 (56.0%)	29 (34.5%)	9 (23.7%)		Reference
Good	197	33 (44.0%)	55 (65.5%)	29 (76.3%)	0.001	2.75 (1.58, 4.79)
Use of DHIS2 information in clinical decision making						
Poor		32 (43.2%)	22 (26.2%)	5 (12.8%)		Reference
Good	197	42 (56.8%)	62 (73.8%)	34 (87.2%)	0.002	2.86 (1.58, 5.18)
Use of DHIS2 in disease surveillance reporting						
Poor		29 (39.7%)	20 (24.4%)	3 (7.5%)		Reference
Good	195	44 (60.3%)	62 (75.6%)	37 (92.5%)	0.001	3.19 (1.72, 5.93)
Use of DHIS2 in timely reporting and Dissemination of reports						
Poor		36 (47.4%)	22 (26.2%)	2 (5.1%)		Reference
Good	199	40 (52.6%)	62 (73.8%)	37 (94.9%)	<0.0001	4.26 (2.32, 7.82)
Use of information in DHIS2 to inform policy and operational decision making						
Poor		39 (52.7%)	22 (26.2%)	7 (18.0%)		Reference
Good	197	35 (47.3%)	62 (73.8%)	32 (82.0%)	<0.0001	3.43 (1.91, 6.15)
Training on DHIS2 Tools e.g. MOH 705A, MOH 705B, MOH 713 e.t.c.						
Poor		35 (45.5%)	28 (32.9%)	5 (12.8%)		Reference
Good	201	42 (54.6%)	57 (67.1%)	34 (87.2%)	0.001	2.63 (1.50, 4.62)

All the indicators for the level of knowledge of DHIS2 data use were significantly associated with the department level of DHIS2 data use (p < 0.05). The bivariate results

indicate that compared to low, a good level of knowledge of DHIS2 data use was associated with higher odds of reporting that the departments were moderate than low or high than low level use of DHIS2 data (OR>1 for all the indicators).

Table 4.15: Association between organizational factors influencing use of DHIS2 and departments level of DHIS2 data use

Variable	N	Low	Moderate	High	P-value	OR (95% CI)
		Department level of Data use in DHIS2				
There is adequate financial support for the running of DHIS2 functions in the County						
Disagree		49	36	14		Reference
		(62.8%)	(42.4%)	(36.8%)		
Agree	20	29	49	24	0.008	2.26 (1.33, 3.84)
	1	(37.2%)	(57.7%)	(63.2%)		
There is adequate support on matters of DHIS2 from your Sub County or County Health Records and Information Officer						
Disagree		29	15	4		Reference
		(38.7%)	(17.4%)	(10.0%)		
Agree	20	46	71	36	<0.00	3.52 (1.84, 6.75)
	1	(61.3%)	(82.6%)	(90.0%)	01	
Organizational hierarchy influence use of DHIS2						
Disagree		24	12	5		Reference
		(32.4%)	(14.0%)	(12.8%)		
Agree	19	50	74	34	0.006	2.80 (1.41, 5.56)
	9	(67.6%)	(86.0%)	(39.0%)		
Use of DHIS2 has improved staff performance						
Disagree		24	12	1 (2.5%)		
		(32.0%)	(14.0%)			
Agree	20	51	74	39	<0.00	4.46 (2.15, 9.26)
	1	(68.0%)	(86.0%)	(97.5%)	01	

Similarly, all the indicators for the level of organizational factors influencing use of DHIS2 data were significantly associated with department level of DHIS2 data use (p ≤ 0.05). The results indicate that compared to respondents who disagreed, those who

agreed that organizational factors influence use of DHIS2 data were associated with higher odds of reporting that the departments were moderate than low or high than low level use of DHIS2 data (OR>1 for all the indicators).

Table 4.16: Association between technical factors influencing use of DHIS2 and departments level of DHIS2 data use

Variable	N	Department level of Data use in DHIS2			P-value	OR (95% CI)
		Low	Moderate	High		
Age influence the way health workers adopt and use DHIS2 in your Hospital						
Disagree		29 (38.2%)	29 (33.7%)	17 (43.6%)		Reference
Agree	201	47 (61.8%)	57 (66.3%)	22 (56.4%)	0.561	0.93 (0.54, 1.59)
Level of training on DHIS2						
Poor		38 (55.9%)	32 (37.7%)	4 (10.3%)		Reference
Good	192	30 (44.1%)	53 (62.4%)	35 (89.7%)	<0.0001	3.75 (2.11, 6.67)
Adequacy of the training received in DHIS2						
Poor		41 (64.1%)	43 (51.8%)	13 (33.3%)		Reference
Good	186	23 (35.9%)	40 (48.2%)	26 (66.7%)	0.010	2.30 (1.32, 3.99)
The County has required technical capacity to support the DHIS2 without necessarily relying on the Ministry of Health						
Disagree		33 (44.6%)	42 (48.8%)	13 (33.3%)		Reference
Agree	199	41 (55.4%)	44 (51.2%)	26 (66.7%)	0.270	1.23 (0.73, 2.07)
Level of satisfaction with the IT Support you receive from MOH						
Not satisfied		56 (74.7%)	56 (65.1%)	21 (53.9%)		Reference
Satisfied	200	19 (25.3%)	30 (34.9%)	18 (46.2%)	0.077	1.89 (1.08, 3.28)
ICT infrastructure in place						
Computer hardware & software						
No		14 (19.2%)	21 (25.3%)	8 (21.0%)		Reference
Yes	151	59 (80.8%)	62 (74.7%)	30 (79.0%	0.645	0.86 (0.46, 1.60)
Network & internet connectivity						
No		48 (65.8%)	57 (68.7%)	17 (44.7%)		Reference
Yes	194	25 (34.3%)	26 (31.3%)	21 (55.3%)	0.033	1.61 (0.92, 2.80)
Power supply						
No		44 (60.3%)	50 (60.2%)	22 (57.9%)		Reference
Yes	194	29 (39.7%)	33 (39.8%)	16 (42.1%)	0.965	1.06 (0.62, 1.81)
ICT experts						
No		63 (86.3%)	73 (88.0%)	32 (84.2%)		Reference
Yes	194	10 (13.7%)	10 (12.0%)	6 (15.8%)	0.851	1.06 (0.49, 2.33)
Policy and legal framework						
No		70 (95.9%)	76 (91.6%)	37 (97.4%)		Reference
Yes	194	3 (4.1%)	7 (8.4%)	1 (2.6%)	0.337	1.06 (0.36, 3.08)
Kenya has put in adequate measures to ensure security of the data collected and processed through DHIS2						
Disagree		21 (28.8%)	23 (27.4%)	6 (15.4%)		Reference
Agree	196	52 (71.2%)	61 (72.6%)	33 (84.6%)	0.264	1.50 (0.82, 2.72)

The level of training on DHIS2, and the adequacy of training on DHIS2 were associated with department use of DHIS2 data (p<0.05). The results show that the respondents who rated their level of training in DHIS2 as good were more likely to rate the departments' use of DHIS2 data as moderate than low or high than low, OR: 3.75 (95% CI: 2.11, 6.67). Similarly, the respondents who rated the adequacy of the training received in DHIS2 as good were more likely to rate the departments' use of DHIS2 data as moderate vs. low or high vs. low, OR: 2.30 (95% CI: 1.32, 3.99).

There was no sufficient evidence from the data to justify whether influence of age on the way health workers adopt and use DHIS2 in the hospital affected the rating on the level of use of DHIS2 data by the department, p = 0.561.

Table 4.17: Association between ease of use of DHIS2 and departments level of DHIS2 data use

Variable	N	Low	Moderate	High	P-value	OR (95% CI)
			Department level of Data use in DHIS2			
All DHIS2 users have login user name and password						
Disagree		20 (27.0%)	14 (16.9%)	5 (7.5%)		Reference
Agree	197	54 (73.0%)	69 (83.1%)	37 (92.5%)	0.033	2.47 (1.24, 4.93)
Rating ease of logging in to DHIS2						
Difficult		35 (48.0%)	33 (39.3%)	19 (50.0%)		Reference
Easy	195	38 (52.0%)	51 (60.7%)	19 (50.0%)	0.419	1.05 (0.62, 1.78)
Rating ease of data entry using DHIS2						
Difficult		38 (52.8%)	25 (30.1%)	15 (40.5%)		Reference
Easy	192	34 (47.2%)	58 (69.9%)	22 (59.5%)	0.170	1.74 (1.00, 3.01)
Rating ease of data accuracy checks using DHIS2						
Difficult		44 (61.1%)	27 (32.5%)	14 (36.8%)		Reference
Easy	193	28 (38.9%)	56 (67.5%)	24 (63.2%)	0.001	2.42 (1.39, 4.19)
Rating ease of data validation checks using DHIS2						
Difficult		47 (65.2%)	30 (36.6%)	18 (47.4%)		Reference
Easy	192	25 (34.7%)	52 (63.4%)	20 (52.6%)	0.002	2.04 (1.19, 3.50)
Rating ease of data analysis using DHIS2						
Difficult		49 (68.1%)	37 (45.1%)	16 (43.2%)		Reference
Easy	191	23 (31.9%)	45 (54.9%)	21 (56.8%)	0.007	2.25 (1.31, 3.87)
Rating ease of using DHIS2 analysis tools						
Difficult		49 (68.1%)	38 (46.9%)	18 (48.7%)		Reference
Easy	190	23 (31.9%)	43 (53.1%)	19 (51.4%)	0.021	1.95 (1.36, 3.35)
Rating ease of using DHIS2 dashboard						
Difficult		43 (59.7%)	32 (38.6%)	18 (47.4%)		Reference
Easy	193	29 (40.3%)	51 (61.5%)	20 (52.6%)	0.031	1.65 (0.97, 2.82)
Rating ease of reporting and dissemination using DHIS2						
Difficult		48 (66.7%)	39 (47.6%)	19 (50.0%)		Reference
Easy	192	24 (33.3%)	43 (52.4%)	19 (50.0%)	0.046	1.78 (1.04, 3.05)

Acknowledging that all users had a login user name and password was associated with departments' use of DHIS2 data (p = 0.033). The respondents who acknowledged that

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they had the log in details had higher odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 2.47 (1.24, 4.93). On the contrary, there was no evidence of association between ease of logging into the DHIS2 and departments' use of DHIS2 data (p = 0.419), and between ease of data entry using DHIS2 and departments' use of DHIS2 (p = 0.170).

The ease of data accuracy check using DHIS2, ease of data validation checks using DHIS2, ease of data analysis using DHIS2, ease of use of DHIS2 analysis tools, ease of using DHIS2 dashboard, and ease of reporting and dissemination using DHIS2 were all associated with departments' use of DHIS2 data (p<0.05). The bivariate results show that the ease of data accuracy check using DHIS2, ease of data validation checks using DHIS2, ease of data analysis using DHIS2, ease of use of DHIS2 analysis tools, ease of using DHIS2 dashboard, and ease of reporting and dissemination using DHIS2 had higher odds or rating departments' use of DHIS2 data as moderate vs. low or high vs. low, OR: 2.42 (95% CI: 1.39, 4.19), 2.04 (95% CI: 1.19, 3.50), 2.25 (95% CI: 1.31, 3.87), 1.95 (95% CI: 1.36, 3.35), 1.65 (95% CI: 0.97, 2.82) and 1.78 (95% CI: 1.04, 3.05) respectively.

Table 4.18: Association between individual factors influencing use of DHIS2 and departments level of DHIS2 data use

Variable	N	Department level of Data use in DIHS2			P-value	OR (95% CI)
		Low	Moderate	High		
Rating on use of DHIS2 information in facilitating evidenced based decision making in the County health facilities						
Low		32 (42.7%)	5 (5.9%)	1 (2.6%)		Reference
High	198	43 (57.3%)	80 (94.1%)	37 (97.4%)	<0.001	14.34 (5.63, 36.55)
Level of confidence when handling DHIS2 tasks						
Not confident		47 (61.0%)	25 (29.1%)	3 (7.7%)		Reference
Confident while under supervision	202	7 (9.1%)	33 (38.4%)	26 (66.7%)	<0.0001	12.70 (6.13, 26.32)
Confident without supervision		23 (29.9%)	28 (32.6%)	10 (25.6%)		3.05 (1.55, 6.01)
Adequately motivated for the use of DHIS2						
Disagree		50 (65.8%)	32 (37.7%)	4 (10.0%)		Reference
Agree	201	26 (34.2%)	53 (62.4%)	36 (90.0%)	<0.0001	5.48 (3.07, 9.77)
Rating of the level of motivation to create and keep health information for use						
Low		51 (66.2%)	26 (30.2%)	3 (7.5%)		Reference
High	203	26 (33.8%)	60 (69.8%)	37 (92.5%)	<0.0001	7.15 (3.91, 13.05)

The data demonstrate sufficient evidence to ascertain existence of relationship between behavioral factors and departments' level of DHIS2 data use (p<0.05). The bivariate results show that respondents who rated high on the use of information on DHSI2 to facilitate evidenced based decision making in the county health facilities had more than 14 times increased odds of responding that the departments were moderately vs. less or high vs. less likely to use DHIS2 data, OR: 14.34 (95% CI: 5.63, 36.55). The respondents who respondent that they were confident when handling DHIS2 tasks while under supervision had more than 12 times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 12.70 (95% CI: 6.13, 26.32).

Similarly, the respondents who responded that they were confident when handling DHIS2 tasks without supervision had more than 3 times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 3.05 (95% CI: 1.55, 6.01). The respondents who agreed that they were adequately motivated to use DHIS2 data had more than 5 times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 5.48 (95% CI: 3.07, 9.77).

And the respondents who rated their level of motivation to create and keep health information for use as high had more than seven times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 7.15 (95% CI: 3.91, 13.05).

Table 4.19: Multivariate logistic regression model assessing the factors associated with department's level of DHIS2 data use

Variable	N	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Site			
Ainabkoi		Reference	Reference
Kapseret		4.65 (1.99, 10.84)	4.15 (1.30, 13.20)
Kesses	204	2.31 (0.88, 6.04)	2.20 (0.63, 7.60)
Moiben		3.30 (1.37, 7.94)	3.07 (1.00, 9.44)
Turbo		6.03 (2.63, 13.84)	5.51 (1.88, 16.18)
Ziwa		3.12 (1.25, 7.81)	1.66 (0.51, 5.43)
Use of DHIS2 in disease surveillance reporting			
Poor		Reference	Reference
Good	195	3.19 (1.72, 5.93)	4.50 (1.80, 11.27)
Rating ease of using DHIS2 analysis tools			
Difficult		Reference	Reference
Easy	190	1.95 (1.36, 3.35)	0.29 (0.13, 0.65)
Rating on the use of information on DHSI2 in facilitating evidenced based decision making in the County health facilities			
Low		Reference	Reference
High	198	14.34 (5.63, 36.55)	5.28 (1.66, 16.85)
Level of confidence when handling DHIS2 tasks			
Not confident		Reference	Reference
Confident while under supervision	202	12.70 (6.13, 26.32)	9.35 (3.49, 25.05)
Confident without supervision		3.05 (1.55, 6.01)	1.19 (0.46, 3.06)
Rating of the level of motivation to create and keep health information for use			
Low		Reference	Reference
High	203	7.15 (3.91, 13.05)	7.07 (3.14, 15.94)

From the multivariable logistic regression model describing the factors associated with department use of DHIS2 data for decision making, the researcher confirmed that the site of facility, use of DHIS2 data for disease surveillance reporting, use of DHIS2 analysis tools, use of information on DHIS2 in facilitating decisions in the county health facilities, level of confidence when handling DHIS2 tasks, and level of motivation to create and keep health information for use were associated with the departments level of use of DHIS2 data. The adjusted model (model all the aforementioned variables

included) finally showed that Kapseret, Moiben, and Turbo were associated with higher odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data compared to Ainabkoi, OR: 4.15 (95% CI: 1.30, 13.20), 3.07 (95% CI: 1.00, 9.44), and 5.51 (95% CI: 1.88, 16.18) respectively.

The respondents who had a good level of use of DHIS2 for disease surveillance reporting had more than four times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 4.50 (95% CI: 1.80, 11.27). The respondents who reported that the use of DHIS2 analysis tools was easy had 71% reduced odds or rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 0.29 (95% CI: 0.13, 0.65). The respondents who rated high on the use of information on DHIS2 to facilitate decisions in the county health facilities had more than five times increased odds of responding that the departments were moderately vs. less or highly vs. less likely to use DHIS2 data, OR: 5.28 (95% CI: 1.66, 16.85).

The respondents who respondent that they were confident when handling DHIS2 tasks while under supervision had more than nine times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 9.35 (95% CI: 3.49, 25.05). Similarly, the respondents who respondent that they were confident when handling DHIS2 tasks without supervision had 19% increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 1.19 (95% CI: 0.46, 3.06), but not statistically significant. Compared to the respondents who rated low their level of motivation to create and keep health information for use in the study, those who rated high had more than seven times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 7.07 (95% CI: 3.14, 15.94).

4.5 Discussion of Results Measuring Dependent Variable.

The bivariate analysis on level of knowledge on use of DHIS2 for objective 1, revealed that all the indicators for the level of knowledge of DHIS2 data use were significantly associated with the department level of DHIS2 data use ($p < 0.05$). The bivariate ordinal logistic regression model results from the study indicate that compared to low, a good level of knowledge of DHIS2 data use was associated with higher odds of reporting that the departments were moderate than low or high than low level use of DHIS2 data (OR>1 for all the indicators).(Juma et al., 2012) study confirms that lack of ICT skills in health sector in maintenance, health informatics, and content curricula were among ICT capacity challenges facing health workers. From study findings, there is a need to raise awareness of ICTs in the health sector in order to improve even better the association between knowledge of DHIS2 use and departmental level of data use for decision making. Further, (Nutley & Reynolds, 2013) agrees with the study findings when they postulated that improving attitudes towards data use will be necessary in improving acceptance of DHIS2 and its ultimate impact on data quality, informed decision making, and overall functioning of Kenya's HIS. Another study done by Morris and Venkatesh concurs when they said there are four moderating variables to user acceptance of HIS: gender, age, experience, and voluntariness of use that explain a user's intentions to implement and use Information systems like DHIS2 and subsequent user behavior. From the findings there was evidence of association between age and years of employment with department level of DHIS2 data use ($P \leq 0.05$) while there was no significant association between gender and level of education with department level of DHIS2 data use ($p > 0.05$).

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Similarly, researcher confirmed from findings on organizational factors indicated that all the indicators for the level of organizational factors influencing use of DHIS2 data were significantly associated with department level of DHIS2 data use ($p \leq 0.05$). The bivariate ordinal logistic regression model results indicate that compared to respondents who disagreed, those who agreed that organizational factors influence use of DHIS2 data were associated with higher odds of reporting that the departments were moderate than low or high than low level use of DHIS2 data (OR>1 for all the indicators). The study findings agrees with PRISM framework which assumes that if organizations promote a culture of information, this will improve their competence in conducting RHIS/tasks, and thus improve their self-confidence too as revealed by (Belay & Lippeveld, 2013). This holds true to improving competence in conducting DHIS2 tasks too. They continued to say that, if the work environment does not promote key RHIS attitudes and values, health workers will not understand values required to generate, maintain, and improve the information system.

Study findings on technical factors influencing the use of DHIS2 for objective 3, showed that level of training on DHIS2, and the adequacy of training on DHIS2 were associated with department use of DHIS2 data ($p<0.05$). The bivariate ordinal logistic regression model results show that the respondents who rated their level of training in DHIS2 as good were more likely to rate the departments' use of DHIS2 data as moderate than low or high than low, OR: 3.75 (95% CI: 2.11, 6.67). Similarly, the respondents who rated the adequacy of the training received in DHIS2 as good were more likely to rate the departments' use of DHIS2 data as moderate vs. low or high vs. low, OR: 2.30 (95% CI: 1.32, 3.99). Training on DHIS2 is generally still low in Uasin Gishu County. This challenge was also identified in a study that was carried out in

South Africa by (Garrib et al., 2008) highlighted weaknesses and key barriers as staff shortages of both clinical and health management information staff, shortage of resources such as computers and Internet access, poor feedback, training needs and data quality issues. They continued to say that most of the weaknesses and key hurdles require proper implementation of DHMIS policy, Standard Operating Procedures (SOPs), e-Health strategy and training of staff, due to reported gaps between policy and practice.

Among the technical factors influencing use of DHIS2 system, the study findings identified training as one of the key features by one of the interviewees who said; "*One is training which need to be accelerated to all …. Training also we have to scale up the training then of course support with equipment then internet*," Participant 01. This training should target the staff currently enrolled into the system in order to build on their capacity to deal with DHIS2 system, as explained by participant 03: "*What we might need is training i.e. capacity building of the existing staff*," Participant 03.
Study findings is in tandem with (World Health Organization Independent Expert Review Group, 2012) findings which identified local capacity building for data entry, processing and use for action is a health system issue. It continued to say that this can only be dealt with by involving top management in the sector with corresponding budgetary allocation. Lack of capacity to implement software solutions still persists in Uasin Gishu and most Counties in Kenya.

There was no sufficient evidence from the data to justify whether influence of age on the way health workers adopt and use DHIS2 in the hospital affected the rating on the level of use of DHIS2 data by the department, p = 0.561.

Study results showed that all users had a login user name and password was associated with departments' use of DHIS2 data (p = 0.033). The respondents who acknowledged that they had the log in details had higher odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 2.47 (1.24, 4.93). On the contrary, there was no evidence of association between ease of logging into the DHIS2 and departments' use of DHIS2 data (p = 0.419), and between ease of data entry using DHIS2 and departments' use of DHIS2 (p = 0.170).

The ease of data accuracy check using DHIS2, ease of data validation checks using DHIS2, ease of data analysis using DHIS2, ease of use of DHIS2 analysis tools, ease of using DHIS2 dashboard, and ease of reporting and dissemination using DHIS2 were all associated with departments' use of DHIS2 data (p<0.05). Ability to perform data quality checks in DHIS2 is key in ensuring use of the information in make decisions in public health facilities. Study findings agrees with (MoH, 2016) findings which revealed Data Quality Assessment (DQA) is the confirmation of accuracy, completeness, consistency and timeliness of data. In addition, some of the key informants had ability to perform analysis on data within the DHIS2 system, particularly as a way to monitor progress of key issues within their departments as explained by Participant 05 who said, "*I am good in data use, I can access e.g. PMTCT coverage for comparison see weak areas in Dhis2 and I do good analysis in DHIS*".

The study findings on individual factors for objective 4, demonstrate sufficient evidence to confirm existence of a relationship between individual factors and departments' level of DHIS2 data use (p≤0.05). The bivariate ordinal logistic regression model results from the study show that the respondents who rated high on the use of information on DHSI2 to facilitate evidenced based decision making in the county

health facilities had more than 14 times increased odds of responding that the departments were moderately vs. less or high vs. less likely to use DHIS2 data, OR: 14.34 (95% CI: 5.63, 36.55).

There is poor absorption and utilization of data and information generated by the DHIS2 system as revealed by study findings which has made junior officers to become less concerned, as vividly explained by one of the participants, *"What I can say is that we normally have performance review meetings based on dhis2. But what is funny is that the recommendations thereof are not taken seriously by the county managers it has developed an attitude among health workers in that if managers cannot use the information for decision making? So people just go to review meetings for joy ride ... (laughter)."* Participant 02. One of the participants

The respondents who respondent that they were confident when handling DHIS2 tasks while under supervision had more than 12 times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 12.70 (95% CI: 6.13, 26.32). Similarly, the respondents who responded that they were confident when handling DHIS2 tasks without supervision had more than 3 times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 3.05 (95% CI: 1.55, 6.01). The study findings agrees with (Nutley & Reynolds, 2013) who suggested that improving attitudes towards data use is essential towards improving acceptance of the tool and its ultimate impact on data quality, informed decision, and overall functioning of Kenya's HIS.

The respondents who agreed that they were adequately motivated to use DHIS2 data had more than 5 times increased odds of rating the departments as moderate vs. low or

high vs. low users of DHIS2 data, OR: 5.48 (95% CI: 3.07, 9.77). Consequently, the respondents who rated their level of motivation to create and keep health information for use as high had more than seven times increased odds of rating the departments as moderate vs. low or high vs. low users of DHIS2 data, OR: 7.15 (95% CI: 3.91, 13.05). A study in Khyber Pakhtunkhwa identified weaknesses in DHIS2 system to included unacceptable data, lack of integration with DHIS program, lack of motivation and untrained staff, wrong implementation without supervisory mechanisms and lack of information use in decision making process (Nawaz, et al., 2015).

The multivariable ordinal logistic regression model describing the factors associated with department use of DHIS2 data show that the site of the facility, DHIS2 data use for disease surveillance reporting, use of DHIS2 analysis tools, use of information on DHSI2 in facilitating decision in county health facilities, level of confidence when handling DHIS2 tasks, and level of motivation to create and keep health information for use were associated with the departments level of use of DHIS2 data. The adjusted model (model all the aforementioned variables included) finally showed that Kapseret, Moiben, and Turbo were associated with higher odds of rating the departments as moderate vs. low or high vs. low use of DHIS2 data compared Ainabkoi, OR: 4.15 (95% CI: 1.30, 13.20), 3.07 (95% CI: 1.00, 9.44), and 5.51 (95% CI: 1.88, 16.18) respectively.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the study findings, conclusions and recommendations based on the research objectives.

5.2 Summary of the main findings

The purpose of the study was to assess the use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals in Uasin Gishu County. The specific objectives included, to determine level of knowledge on the use of DHIS2 data, organizational, technical and individual factors influencing use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals. Based on the four objectives of the study, the summary of the findings is discussed.

5.2.2 Level of knowledge on the use of DHIS2 data to facilitate decision making

The first specific intention of the study was to determine the level of knowledge as a factor affecting DHIS2 data use, participants reported good, very good or excellent competence levels in data management using DHIS2, verification and validation of using DHIS2, clinical decision making and disease surveillance, timely reporting and dissemination of reports, policy and operational decision making using DHIS2 and use of information in DHIS2 to inform policy and operational decision making respectively. All the key informants believed that DHIS2 is a strong tool that can influence the decisions of CHMT. The key informants also described different levels of ability to utilize the DHIS2 system: Ability to log-in to the system, ability to access information and ability to analyze data within the DHIS2 system. The bivariate analysis on level of

knowledge on use of DHIS2 from the study revealed that all indicators for level of knowledge of DHIS2 data use were significantly associated with the department level of DHIS2 data use (P≤0.05). The bivariate ordinal logistic regression model results indicate that compared to low, a good level of knowledge of DHIS2 data use was associated with higher odds of reporting that the departments were moderate than low or high than low level use of DHIS2 (OR>1 for all the indicators).

5.2.3 Organizational factors influencing the use of DHIS2 data

The second objective was to determine the organizational factors influencing the use of DHIS2 data, participants of the study acknowledged there is adequate financial support to run DHIS2, the County Government finances DHIS2, there was adequate support on matters of DHIS2 from Sub-County or County Health Records and Information Officer and the main champions promoting the use of DHIS2 information for decision making in the County were the county health records and information officers.

Moreover, the determinants of use of information in DHIS2 in decision making in Uasin Gishu County were mainly availability of computers, availability of network and internet services, and presence of trained staff. In addition, most study participants agreed or strongly agreed that organizational hierarchy influences use of DHIS2, there is improved staff performance due to utilization if DHIS2 and that data ownership rests with Uasin Gishu County Government. The main external factors influencing the use of DHIS2 were government legislation and customer reaction to DHIS2 services while the major obstacles experienced in use of information in DHIS2 in Uasin Gishu County were lack of management support, poor skills among the users, lack of adequate computers, and poor internet connectivity, lack of power backup and resistance to change.

In addition, key informants interviewed during the study highlighted demand for information, hierarchical utilization of data, Policy, interest in utilization of data, internal and external factors as well as political interference as the main challenges experienced in the utilization of DHIS2. Study findings on organizational factors indicated that all the indicators for the level of organizational factors influencing use of DHIS2 data were significantly associated with the department level of DHIS2 data use (p ≤ 0.05). The bivariate ordinal logistic regression model results indicate that compared to respondents who disagreed, those who agreed that organizational factors influence use of DHIS2 data were associated with higher odds of reporting that the departments were moderate than low or high than low level use of DHIS2 data.

5.2.4 Technical factors affecting the use of DHIS2 data

The third objective was to assess the technical factors affecting the use of DHIS2 data the study found that majority of the participants agreed or strongly agreed that age influences the way health workers adopt and use DHIS2 in the hospitals and that the level of training on DHIS2 was either very poor or poor while training received on DHIS2 was reported as inadequate. Further, a significant number of the participants agree or strongly agree that the County Government has technical capacity to support the DHIS2 without necessarily relying on the Ministry of Health, dissatisfied with the IT Support received from the Ministry of Health, while the network and internet connectivity as well as power supply was reported as a challenge across the six sub county hospitals respectively. Moreover, ICT experts, policy and legal framework were reported to be available by 26 (12.9%), that all the DHIS2 users have log in credentials, that some participants reported difficulty with logging into the DHIS2, data entry in the DHIS2, data accuracy checks, data validation checks, data analysis using DHIS2, use

of DHIS2 analysis tools, the use of dashboard, reporting and dissemination using DHIS2 respectively.

On the other hand, key informants reported the main technical factors influencing the use of DHIS2 system as training, adequate equipment, internet connectivity and power back up, expatriates who maintain the systems and communication. Study findings on technical factors influencing the use of DHIS2 showed that level of training on DHIS2, and the adequacy of training on DHIS2 were associated with department use of DHIS2 data (P ≤0.05). The bivariate ordinal logistic regression model results show that the respondents who rated their level of training in DHIS2 as good were more likely to rate the departments' use of DHIS2 data as moderate than low or high than low (OR>1 for all the indicators).

5.2.5 Individual factors influencing use of DHIS2 data

The fourth objective of this study was to evaluate the individual factors influencing use of DHIS2 data to facilitate decision making in Uasin Gishu Sub County Hospitals, majority of participants reported their level of training on DHIS2 was very low, low or moderate, most had never trained or had the training for two weeks or less. Utilization of information on DHIS2 in facilitating evidence-based decision making in the Uasin Gishu Sub County Hospitals was reported to be moderate to low by more than half of the participants. One third of the participants reported some confidence while handling a task using the DHIS2, and many respondents agreed or strongly agreed that they are adequately motivated to use DHIS2, that level of motivation to create and keep health information for use was either low, very low or moderate while the level of departmental utilization of data in the DHIS2 was reported as low or very low. Additionally, key informants cited the following as the main behavioral factors

influencing the use of DHIS2 data: accessibility, support services, utilization of information, age, support from senior management and infrastructure. The data from the study findings on individual factors demonstrate sufficient evidence to show existence of a relationship between behavioral factors and departments' level of DHIS2 data use. (P ≤0.05) The bivariate ordinal logistic regression model results show that the respondents who rated high on the use of information on DHSI2 to facilitate evidenced based decision making in the county health facilities had more than 14 times increased odds of responding that the departments were moderately vs. less or high vs. less likely to use DHIS2 data (OR>1 for all the indicators).

5.3 Conclusion

Following the research findings, the conclusions are made based on the objectives that were set by the researcher to be achieved at the end of the study. Thus, concludes as follows:

5.3.1 Level of knowledge on the use of DHIS2 data to facilitate decision making

There is evidence to conclude that the level of knowledge on competence levels in managing data, data verification and validation, use of DHIS2 information for clinical decision making and disease surveillance purposes, timely reporting and dissemination of reports as well as policy and operational decision making is fair across the six Sub County Hospitals in Uasin Gishu County. However, utilization of DHIS2 information by county health managers for evidence-based decision making is low in the County.

5.3.2 Organizational factors influencing the use of DHIS2 data

On the organizational factors affecting utilization of DHIS2 data, it was found that the main funder of DHIS2 system is Uasin Gishu County Government while support from National Government is minimal. In addition, the main champions promoting the use

of DHIS2 information in the county are county health records and information officers as well as the Sub-County HRIOs. The main determinants affecting the use of DHIS2 information in Uasin Gishu Sub County Hospitals are: availability of computers, availability of network and internet services, and presence of trained staff which is key ICT infrastructural prerequisites for proper functioning of DHIS2 while legislation was identified as the main external factor influencing the utilization of DHIS2 information. Lastly, the main challenges inhibiting the use of information in DHIS2 in Uasin Gishu Sub County Hospitals are: lack of management support, poor skills among the users, lack of adequate computers, unreliable internet connectivity, lack of power backup and resistance to change.

5.3.3 Technical factors affecting the use of DHIS2 data

On the technical factors affecting the use of DHIS2 study conclude that age influences the way health workers adopt and use DHIS2 in Uasin Gishu Sub County Hospitals. Although the level of training on DHIS2 is inadequate majority of participants believed the County Government have enough technical personnel to support the DHIS2 without necessarily relying on the Ministry of Health. Furthermore, there is significant number of participants who are dissatisfied with the IT Support received from the Ministry of Health besides the inadequate network, internet connectivity and power supply in the County hospitals. Moreover, there is scarcity of ICT experts, policy and legal framework. Although most of the DHIS2 users have log in credentials, there are a considerable number with difficulty logging into the DHIS2, perform data accuracy and data validation checks, data analysis, use of DHIS2 analysis tools and dashboard. Furthermore, there is difficulty in reporting and dissemination using DHIS2.

5.3.4 Individual factors influencing use of DHIS2 data

Lastly, on the individual factors influencing use of DHIS2 data, study conclude that level of training on DHIS2 is generally low. Utilization of information on DHIS2 in facilitating decision making in the Uasin Gishu Sub County Hospitals range from moderate to low. Although a third of the participants had some confidence in handling a task using the DHIS2, there is adequate motivation measures to use DHIS2. Besides, the level of motivation to create and keep health information for use as well as level of departmental utilization of data in the DHIS2 ranged from low to moderate.

In addition, there is sufficient evidence from study findings to show that factors associated with department use of DHIS2 data such as the site of facility, use of DHIS2 data for disease surveillance reporting, use of DHIS2 analysis tools, use of information on DHSI2 in facilitating decision making, level of confidence when handling DHIS2 tasks, & level of motivation to create & keep health information for use were associated with departments level of use of DHIS2 data. It is important to note that Sub County Hospitals are using Health Management Information System (HMIS) internal or localized alongside DHIS2 for purely patient management. However, HMIS have not been fully implemented in all the hospitals and/or all services. The two systems are not integrated. DHIS2 is used for data management and reporting. There is need to integrate the two systems in foregoing future to leverage on strengths of each of the systems in order to avoid running two parallel systems.

5.4 Recommendation

Based on study objectives and findings, study makes the following recommendations:

1. Uasin Gishu County Health Managers need to enhance training for older & entire workforce to encourage them to utilize DHIS2 data.

2. There is need to scale up utilization of DHIS2 information by UGC health managers through policy measures.

3. UGC Government should ensure ample supply of computers, network, internet services to boost ICT infrastructure for proper functioning of DHIS2.

4. There is need for more support and funding from the national government for DHIS2 activities.

5.5 Areas for Future Research

The researcher recommends further research in future in the following areas:

1. Effectiveness of DHIS2 training and utilization among health workers: Opportunities and Challenges.
2. Utilization of DHIS2 in devolved healthcare system in Kenya: opportunities and challenges.
3. Motivation and utilization of DHIS2 information: Opportunities and Challenges.
4. A comparative study on use of DHIS2 data to facilitate decision making in public and private hospitals.

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Kenya Methodist University

P.O. Box 267-60200

MERU, Kenya

SUBJECT: INFORMED CONSENT

Dear Respondent,

My names are Richard Ole Kuyo. I am an MSc student from Kenya Methodist University. I am conducting a study titled: **Assessment of use of District Health Information System to Facilitate Decision Making in Uasin Gishu Sub County Hospitals, Kenya.** The findings will be utilized to strengthen the health systems in Kenya and other Low-in- come countries in Africa. As a result, countries, communities and individuals will benefit from improved quality of healthcare services. This research proposal is critical to strengthening health systems as it will generate new knowledge in this area that will inform decision makers to make decisions that are research based.

Procedure to be followed

Participation in this study will require that I ask you some questions and also access all the hospital's department to address the six pillars of the health system. I will record the information from you in a questionnaire check list.

You have the right to refuse participation in this study. You will not be penalized nor victimized for not joining the study and your decision will not be used against you nor affect you at your place of employment.

Please remember that participation in the study is voluntary. You may ask questions related to the study at any time. You may refuse to respond to any questions and you may stop an interview at any time. You may also stop being in the study at any time without any consequences to the services you are rendering.

Discomforts and risks.

Some of the questions you will be asked are on intimate subject and may be embarrassing or make you uncomfortable. If this happens; you may refuse to answer if you choose. You may also stop the interview at any time. The interview may take about 40 minutes to complete.

Benefit

If you participate in this study you will help us to strengthen the health systems in Kenya and other Low-in- come countries in Africa. As a result, countries, communities and individuals will benefit from improved quality of healthcare services. This field attachment is critical to strengthening the health systems as it will generate new knowledge in this area that will inform decision makers to make decisions that are research based.

Rewards

There is no reward for anyone who chooses to participate in the study.

Confidentiality

The interviews will be conducted in a private setting within the hospital. Your name will not be recorded on the questionnaire and the questionnaires will be kept in a safe place at the University.

Contact Information

If you have any questions you may contact the following supervisors:

1. Lillian Muiruri   wambuikaburi@gmail.com   Supervisor
2. Susan Njuguna   rsmnjuguna@yahoo.com   Supervisor

Participant's Statement

The above statement regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time. I understand that I will not be victimized at my place of work whether I decide to leave the study or not and my decision will not affect the way I am treated at my work place.

Name of Participant………………………………………….

Date…………………………..

Signature……………………………………….

Investigator's Statement

I, the undersigned, have explained to the volunteer in a language s/he understands the procedures to be followed in the study and the risks and the benefits involved.

Name of

Interviewer……………………………………….Date…………………….

Interviewer Signature………………………………

SECTION A

Demographic Information

Sub-County Hospital		Put a tick
Age	18-24	
	25-30	
	31-40	
	41-50	
	51-60	
Gender	Male	
	Female	
Level of Education	Certificate	
	Diploma	
	Degree	
	Masters	
Number of years employed	1-5	
	6-10	
	11-15	
	15 and above	
Area of specialization	e.g. Nurse	

SECTION B (Tick your preferred answer in the corresponding field)

Level of Knowledge in the Use of DHIS2 Data

1. Rate your level of knowledge on use of DHIS2 data in a scale of 1-5 in the following areas?

Function	1 Very poor	2 poor	3 Good	4 Very Good	5 Excellent
Use of DHIS2 in data collection, data entry and analysis i.e. competence in data management					
Use of DHIS2 to perform quality checks i.e. Verification and validation of data					
Back up and secure information in DHIS2					
Use of DHIS2 information in clinical decision making					
Use of DHIS2 in disease surveillance reporting					
Use of DHIS2 in timely reporting and Dissemination of reports					
Use of information in DHIS2 to inform policy and operational decision making					
Training on DHIS2 Tools e.g. MOH 705A, MOH 705B, MOH 713 etc.					

SECTION C (Tick your preferred answer)

ORGANIZATIONAL FACTORS INFLUENCING DHIS2

1. There is adequate financial support for the running of DHIS2 functions in the County?

   1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]

2. If you strongly agree/agree to question 1 above, who finances DHIS2?

   1. County Government [ ] 2. Hospital Management [ ] 3. Donors [ ] 4.Any other [ ] specify……. ....

3. There is adequate support on matters of DHIS2 from your Sub County or County Health Records and Information Officer?

   1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]

4. Who do you consider as champion(s) promoting the use of DHIS2 information for decision making in the County?

    1. County Governor [ ]   2. Deputy Governor [ ]   3. County Director of Health [ ]   4. Medical Superintendent [ ]   5. County Health Records and Information Officer [ ]

    6. Sub County Health Records and Information Officer [ ]   7 . Others, specify…………….....................

5. What factors favour the use of information in DHIS2 for decision making in Uasin Gishu County? (Multiple answers accepted)

    1. Availability of computers [ ] 2. Network and internet services [ ] 3. Power backup [ ] 4. ICT Support Supervision [   ] 5. Conducive Policy and Legal Framework [ ]   6. Trained staff   [   ]   4. Management Support [ ] 5. Organizational politics [ ]6. Others, specify………………....................

6. Organizational hierarchy influence use of DHIS2
    1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]

7. Use of DHIS2 has improved staff performance

    1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]

8. Who owns the data?
    1. Government 2. Uasin Gishu County 3. Your Department 4. Patient 5. Other specify………………………………….

9. What external factors influence use of DHIS2 in the County Hospitals?
    1. Market 2. Government legislation 3. Customers' reaction to DHIS2 services 4. Other, Specify………………………….

9. What challenges are experienced in the use of information in DHIS2 for evidenced based decision making in Uasin Gishu County?
    1. Lack of management support [ ]   2.Poor skills sets amongst users [ ]   3. lack of adequate computers [ ]   4. Unreliable internet services [ ] 5. Lack of power back up [ ] 6. Lack of antivirus software [ ]   5. Resistance to change `[ ]   6. Lack   of   accurate   and   quality   data   [   ]   Others, specify……..

SECTION D

TECHNICAL FACTORS INFLUENCING USE OF INFORMATION IN DHIS2

1. Age influence the way health workers adopt and use DHIS2 in your Hospital?
    1. Strongly Agree [ ] 2. Agree [ ] 3. Strongly Disagree [ ] 4. Disagree [ ]
2. How would you rate your level of training on DHIS2?
    1. Very Good [ ] 2. Good [ ] 3. Poor [ ] 4. Very Poor [ ]
3. The training received n question (2) above was adequate?
    1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]
4. The County possesses the required technical capacity to support the DHIS2 without necessarily relying on the Ministry of Health
    1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]

5. How satisfied are you with the IT Support you receive from MOH?
    1. Very Satisfied [ ] 2. Satisfied [ ] 3. Less Satisfied [ ] 4. Not Satisfied
6. What ICT infrastructure is in place?
    1. Computer hardware and software [ ] 2. Network and internet connectivity
       3. Power supply [ ] 4. ICT experts [ ] 5. Policy and legal framework [ ] 6.
       Others specify……………………………
7. Kenya has put in adequate measures to ensure security of the data collected and processed through DHIS2?
    1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]
8. All DHIS2 users have login user name and password
    1. Strongly Agree [ ] 2. Agree [ ] 3. Disagree [ ] 4. Strongly Disagree [ ]
9. Rate your ease of use of DHIS2 in the following areas (Tick your preferred answer accordingly)

Ease of use of ICT	1 Very Difficult	2 Difficult	3 Fairly Easy	4 Easy	5 Very Easy
Log in					
Data Entry					
Data Accuracy Checks					
Data Validation Checks					
Data Analysis					
DHIS2 Analysis Tools					
Dashboard					
Reporting and dissemination					

SECTION E

INDIVIDUAL FACTORS INFLUENCING USE OF DHIS2

1. What is your level of education?

1. Certificate [ ] 2.Diploma [ ] 3. Degree [ ] 4.Masters 5. PhD [ ]

2. How would you rate your training on DHIS2?

    1. Very high [ ]   2. High [ ] 3. moderate [ ] 4. Low   [ ] 5. Very Low []

3. If you received training in Question 2 above, how long was the training?

    1. One week [ ] 2. Two weeks [ ] 3. One month [ ] 4.
       specify………...................
4. What is your rating on the use of information on DHSI2 in facilitating evidenced based decision making in the County health facilities?
       2. Very high [ ]   High [ ]   moderate   [ ]   Low [ ]
 5. Are you confident when handling DHIS2 tasks?
       1. Not confident [ ] 2. Confident while under supervision [ ] 3. Confident without supervision [ ]

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6. Are you adequately motivated for the use of DHIS2?

     1. Strongly Agree [ ] 2. Agree [ ] 3. Strongly Disagree [ ] 4. Disagree [ ]

7. Rate your level of motivation to create and keep health information for use

     1. Very low [ ] 2. Low   [ ] 3. Moderate [ ] 4. High   [ ] 5. Very high [ ]

8. What are the common challenges experienced in your hospital with regard to use of DHIS2 information in decision making?

     ………………………………………………………………………………………

     ………………………………………………………………………………………

9. What interventions would you propose to improve use of information in DHIS2 for decision making in your hospital?

     ....

     ....

SECTION F

DEPARTMENTS' LEVEL OF DATA USE IN DHIS2

8. How would you rate your Departments' level of data use in DHIS2?

     1. Very low [ ] 2. Low   [ ] 3. Moderate [ ] 4. High   [ ] 5. Very high [ ]

THANK YOU

APPENDIX III: IN-DEPTH INTERVIEW GUIDE FOR COUNTY HEALTH MANAGEMENT TEAM

Questions for the in-depth interview guide:

1. In your opinion, is use of DHIS2 important to the County Health Management in facilitating evidenced based decision making?

2. What kind of information from DHIS2 is used in decision making in the County?

3. What is your level of knowledge in the use of DHIS2 data?

4. What managerial support from the County and MOH is provided for DHIS2 activities?

5. What organizational factors influence the use of DHIS2 in the County?

6. What technical factors influence use of DHIS2 in the County Hospitals?

7. What individual factors influence use of DHIS2 in decision making in the County Hospitals?

8. What intervention(s) do you think if implemented will improve use of information in DHIS2 for decision making at all levels of the County Hospitals?

THANK YOU

KENYA METHODIST UNIVERSITY

P. O. BOX 267 MERU - 60200, KENYA   FAX: 254-64-30162   TEL: 254-064-30301/31229/30367/31171   EMAIL:INFO@KEMU.AC.KE

27TH APRIL, 2017

Richard Ole Kuyo

HSM-3-5571-3/2012

Dear Richard,

SUBJECT: ETHICAL CLEARANCE OF A MASTERS' RESEARCH THESIS

Your request for ethical clearance for your Masters' Research Thesis titled "The Influence of District Health Information System on Decision Making in Uasin Gishu County, Kenya" has been granted to you in accordance with the content of your Thesis proposal.

As Principal Investigator, you are responsible for fulfilling the following requirements of approval:

1.   All co-investigators must be kept informed of the status of the Thesis.

2, Changes, amendments, and addenda to the protocol or the consent form must be submitted to the SERC for re-review and approval <u>prior</u> to the activation of the changes. The Proposal number assigned to the Thesis should be cited in any correspondence

3. Adverse events should be reported to the SERC. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for SERC review. The SERC and outside agencies must review the information to determine if the protocol should be modified, discontinued, or continued as originally approved.

4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by subjects and/or witnesses should be retained on file. The SERC may conduct audits of all study records, and consent documentation may be part of such audits,

5. SERC regulations require review of an approved study not less than once per 12-month period. Therefore, a continuing review application must be submitted to the SERC in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion will result in termination of the study. at which point new participants may not be enrolled and currently enroiled participants must be taken off the study.

Please note that any substantial changes on the scope of your research will require an
Approval.

approval.

Thank You,

Dr. Wamachi
Chair, SERC
Cc: Dean RD&PCS

CC: Dean. RD&PCS

APPENDIX V: NACOSTI RESEARCH AUTHORIZATION

**NATIONAL COMMISSION FORSCIENCE,
TECHNOLOGY ANDINNOVATION**

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax: +254-20-318245,318249
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Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/10331/17154**   Date: **7th August, 2018**

Richard Ole Kuyo
Kenya Methodist University
P.O. Box 267- 60200
MERU.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"The influence of District Health Information System on decision making in Uasin Gishu County, Kenya,"* I am pleased to inform you that you have been authorized to undertake research in **Uasin Gishu County** for the period ending **22nd June, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Uasin Gishu County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

**DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner
Uasin Gishu County.

The County Director of Education
Uasin Gishu County.

National Commission for Science. Technology and Innovation is ISO9001:2008 Certified

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APPENDIX VI: RESEARCH AUTHORIZATION LETTER –UASIN GISHU

COUNTY

RICHARD OLE KUYO,
P.O BOX 3,
ELDORET.

19TH MAY, 2017.

COUNTY DIRECTOR OF HEALTH,
UASIN GISHU COUNTY,
P.O BOX 40 – 30100,
ELDORET, KENYA.

Dear Sir/Madam,

REQUEST TO CONDUCT RESEARCH STUDY IN UASIN GISHU COUNTY

I am Richard ole Kuyo from Kenya Methodist University, MERU Pursing a Master's Degree in Health Systems Management. In that regard, I am kindly requesting for permission to conduct my research study in the County from May to June, 2017.

Research Topic: The Influence of District Health Information System on Decision Making in Uasin Gishu County, Kenya.
Student Registration Number: HSM-3-5571-3/2012.

During my study, I will interact with health workers in the six Sub County Hospitals: Ainabkoi, Kapseret, Moiben, Soy, Kesses and Turbo where 283 participants will be given questionnaires to fill for the quantitative study. In addition, 10 members of the District Health Management Team (DHMT) will be interviewed for the qualitative study.

The Researcher will share the findings with the County upon completion of the study.

Attached, please find the copy of the Research Proposal, ethical approvals from KEMU Scientific Ethics Research Committee (SERC) and NACOSTI.
Yours faithfully,

RICHARD OLE KUYO
CC:
CEC, Health
Chief Officer, Health

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APPENDIX VII: MAP OF UASIN GISHU COUNTY

Source: (County Government of Uasin Gishu, 2013)