THE EFFECT OF PROCUREMENT PRACTICES ON AVAILABILITY OF HEALTH PRODUCTS AND TECHNOLOGIES IN MERU COUNTY, KENYA

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A Research Project submitted in partial fulfillment of the Requirements for the Award of the Master of Science in Health Supply Chain Management at the University of Rwanda.

June, 2023

DECLARATION

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DECLARATION

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SUPERVISORS' APPROVAL

The research project has been submitted for examination with my approval as the University supervisor.

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DEDICATION

This work has been dedicated to my family for the endless support they have given me.

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ABBREVIATIONS AND ACRONYMS

CIDP:	The County Integrated Development Plan (CIDP)
CHMT:	County Health Management Team
EM:	Essential Medicines
HPTs:	Health Products and Technologies
KHIS:	Kenya Health Information System
KNH-UoN ERC:	The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee
LMICs:	low-income and middle-income countries.
MOH:	Ministry of Health
PPDA:	Public Procurement and Asset Disposal Act
SPSS:	Statistical Package for the Social Sciences
SSA:	Sub-Saharan Africa
UHC:	Universal Health Coverage
USAID:	United States Agency for International Development

OPERATIONAL DEFINITION OF TERMS

Availability of health products: This refers to the consistent and reliable presence of necessary medicines, medical supplies, and other healthcare-related products within a healthcare system or setting. It means that these products are accessible and obtainable when needed, in the right quantity, quality, and variety, to meet the healthcare needs of individuals and populations.

Health products: These are products that include human and veterinary medicines, vaccines, medical products, medical devices, medicinal substances, diagnostics, blood products, traditional and alternative medicine, cosmetics and related products, therapeutic feeds and nutritional formulations.

Health technology: It is the use of organized knowledge and abilities in the form of technology, pharmaceuticals, immunizations, procedures, and systems to treat a health issue and improve living quality.

Procurement practices: These refer to the set of processes, policies, and activities involved in acquiring goods, services, or works from external suppliers or contractors. These practices are designed to ensure efficient, transparent, and cost-effective procurement of the required goods or services while adhering to relevant legal and regulatory frameworks.

Procurement: Is the process of locating and acquiring all of the products, services, and works required for a company to function and meet its business model.

ABSTRACT

Introduction: Improved procurement practices may lower costs and minimize shortages of medicines, vaccines and other health products. Availability of health products and technologies (HPTs) is essential to the provision of quality health care to consumers. Public sector health facilities in Meru County experience inadequate supply of essential health commodities, compromising the provision of health care to clients and patients.

Main Objective: The impact of procurement practices on availability of health products and technologies in Meru County, Kenya.

Methodology: The descriptive research design was employed. The study was located in Meru County focusing on all eleven-sub-County and one county referral hospitals which formed the target population. The sample size was 75 respondents comprising respective members of procurement committees. The study used primary data gathered via semi structured questionnaires. Descriptive statistics were largely utilized.

Findings: The study established that about 88% of the facilities indicated consumption data as the most preferred forecasting data. The most preferred electronic tool (78.6%) in procurement in health facilities in Meru County was found to be the District Health Information System (DHIS2). The study revealed that approximately 92% of the respondents indicated that procurement practices were associated with increased availability of health products and technologies in Meru County. Further, the study found that there was weak linkage between quantification plans, procurement plans, and annual budgets. This was followed by inadequate capacity in terms of human resources, tools, and skills for product selection and quantification.

Recommendations: As a form of forecasting data, hospital committees in the county should use data for demand of a service or commodity mostly in the main phases of planning to enhance accuracy of the predictions hence contributing to the success of service delivery in the health sector. There is a need for enhancing the use of the DHIS2 platform by creating much awareness in other departments within the health facility as well as sponsoring staff for the crush training program. The county health management team (CHMT) should consider emphasizing the adherence to laid down procurement practices as they are associated with increase in availability of HPTs. Lastly, the study recommends to the management to clear financial uncertainties at the county levels as it leads to increased challenges associated with delayed procurement cycles.

CHAPTER ONE: INTRODUCTION

1.1 Background

The availability of health products and technologies is a critical component of healthcare systems worldwide (WHO, 2021). It refers to the consistent and reliable presence of necessary medicines, medical supplies, equipment, and innovative technologies that are essential for delivering effective and quality healthcare services. Access to these products is vital to ensure that individuals and communities can receive the necessary treatments, preventive measures, and diagnostic tools to maintain and improve their health (Yadav, 2015).

Availability of health products encompasses various aspects. First and foremost, physical availability is crucial, which means that the products should be present and accessible in healthcare facilities, pharmacies, and other points of care. According to Ilardo and Speciale (2020), this requires maintaining adequate stock levels, ensuring proper storage and distribution, and replenishing supplies on a regular basis. Additionally, geographic availability is important to ensure that people, regardless of their location, can access the required health products and technologies. This is particularly significant in remote and underserved areas, where healthcare facilities may face greater challenges in obtaining and maintaining a consistent supply of essential products.

Furthermore, timely availability plays a crucial role in addressing healthcare needs promptly. Timeliness ensures that health products and technologies are readily accessible when needed, reducing delays in diagnosis, treatment, and overall healthcare delivery (Aceto, Persico & Pescapé, 2020). It involves efficient procurement processes, streamlined supply chains, and effective inventory management. Timely availability is particularly critical in emergency situations and for managing ongoing healthcare conditions.

Effective procurement practices play a crucial role in ensuring the availability of health products and technologies. Procurement practices are the methods and rules for acquiring products and services at a fair price that fulfill an organization's requirements for the best quality, quantity, and location (Akech, 2004; Choi, 2010). By employing sound procurement

strategies, organizations can acquire the necessary products at fair prices while meeting quality standards and quantity requirements. Procurement practices encompass activities such as supplier selection, contract negotiation, and purchase order processing, which are essential for maintaining a steady supply of health products. Timely and efficient procurement processes can help prevent stock-outs, reduce delays in obtaining necessary products, and optimize the overall availability of health products and technologies within healthcare systems.

Enhancing health system efficiency is a crucial approach for increasing health system performance and accelerating progress towards Universal Health Coverage (UHC). Effectiveness of health systems could be hampered by unavailability of and access to health products and technologies including essential drugs. It is argued that access to critical medications and supplies for instance is crucial to the effective performance of the healthcare system (Bhattacharya & Lam, 2020), as sufficient drug supplies including contraceptives, security helps to enhance quality of healthcare. Availability of health products and technology is generally identified as the most significant element(s) of quality by health care consumers, and inability to purchase them in time is a crucial cause in the underutilization of government health services (Aceto, Persico & Pescapé, 2020).

World Health Organization (WHO), asserts that interventions such as increasing access to current therapies for non-communicable diseases, infectious illnesses and maternity and child health could save over 10.5 million lives annually globally, contributing to economic growth and social development (WHO, 2018). The majority of these interventions rely on necessary tools and medications. This implies that technology as well plays a crucial role in healthcare systems across a wide spectrum. The relevance of this, lies in highlighting the diverse range of electronic tools and equipment used in healthcare facilities. From simple devices like temperature gauges and oximeters that aid in basic patient monitoring to advanced equipment like incubators for neonatal care and MRI scanners for diagnostic imaging, technology is integral to modern healthcare and directly impacts the standard of patient care. This underscores the importance of ensuring the availability of a variety of

electronic tools to meet the diverse needs of healthcare facilities and support the delivery of high-quality healthcare services.

If quality is to be valued, these public institutions' procurement practices must be considered (Onyango, 2011). Among other things, procurement practices may involve tendering techniques such as open or closed tendering, supplier selection practices such as single sourcing, multiple sourcing, e-sourcing, and ethical practice. A well-functioning supply chain should be able to anticipate and deliver medications, other health products and vaccines, which account for a significant proportion of overall health expenditures in both low- and middle-income countries (LMICs). Decisions in the system of supply are reliant on the ability to accurately estimate demand (Nikolopoulos et al., 2021). In reality, demand estimations are used across the supply chain, including supply chain design, procurement, operations, inventory management, and sales and marketing.

One of the main significant factors in the health sector is technological innovation which can lead to improved effectiveness and efficiency in tackling diseases (Seidman & Atun, 2016). There is a rising need and need for governments to acquire information on the safety, efficiency, quality, and cost of technology in order to ensure that strategic buying is not adversely impacted. In all European countries, ensuring accessibility to innovative health technologies or electronic tools in health systems is still a challenge (Chiarenza et al., 2019; Jönsson et al., 2019). This is because of fiscal constraints in purchasing increased prices charged for new technologies and the need for innovative electronic tools that would better manage the spurring chronic diseases and comorbidities (Chiarenza et al., 2019). Hence the need for effective and efficient procurement processes. European countries adopted collaboration in public procurement in European countries ensuring economies of scale was attained and there was quality of purchased goods. Further this ensured constant supply and availability of medical devices, vaccines, medicines, and other health products (Espín et al., 2016).

Better procurement and SCM may lower costs and solve the issue of pharmaceutical, vaccine and other healthcare product supply shortages, which account for a significant portion of overall health expenditures in LMIC (Seidman & Atun, 2016). Most of the countries such as

Mexico and other parts of Latin experienced cost saving from national procurement and tendering procedures. They were able to save a lot of resources by purchasing antiretrovirals (ARVs) and other drugs relatively cheap (Chaumont et al., 2015) and hence improving drug availability.

In sub-Saharan Africa (SSA), crucial medicines Stock-outs and other health products at the health facility level are a public health problem. Regular stock-outs at public health centers and dependence on out-of-pocket drug purchases prevent low-income individuals from gaining access to dependable important medications (Ewen et al., 2017). In South Africa's public health system, medication shortages have persisted. This was due to difficulties in the procurement process, such as non-performance by the suppliers, a protracted buy-out procedure, and the computerized inventory management system used in the hospitals being inaccurate. (Modisakeng et al., 2020).

In East Africa particularly in Kenya and Tanzania, access to key medicines and supplies for public healthcare facilities for which low-income individuals depend on still continues to be erratic and problematic. There has been a substantial dependence on private drug purchases and a rise in the globalization of procurement practices (Mackintosh et al., 2018). Meeme, Okero and Muiruri (2015) noted that in Meru County, public hospitals encountered delays acquiring required medications for the health unit compared to mission hospitals and private hospitals. Furthermore, there were frequent stock-outs at public facilities necessitating medical practitioners sending patients to buy some of the health products in private health facilities. The study attributed this to weaknesses in the system of supply.

It is against this background, that this research project is uncovering the effects of procurement procedures on availability of health products and technology in Meru County, Kenya. The outcomes of this research would aid in enlightening stakeholders and policy makers on the adoption of best procurement practices in the health sector.

1.2 Problem Statement

Although the county government of Meru at the time put in place several measures to avert the crisis including installing system that aid in forecasting as well as laying out good

procurement practices to make available health products and technologies, previous experience in most healthcare facilities in the country revealed either absence or inadequate medical supplies in public hospitals, which was not seen in other categories (private facilities) of the hospitals (Kimathi, 2017; MoH, 2019). Promising improvements in the system of health products and technology supply have been made across the counties including Meru County. Unfortunately, many continue to suffer with a combination of inefficient public health sector procurement processes.

Therefore, without the right health commodities and technology, health facilities and health care personnel, the county cannot give the people a complete range of comprehensive services and goods to accomplish these objectives, creating major health hazards to many residents. The procurement difficulties affecting Meru County and sub-county hospitals led to disputes between management and operations staff, resulting in frequent unrests that sometimes lasted for weeks, resulting in the abandonment of patients in hospital beds; with pain and agony, and a trail of preventable deaths (Achoki, et al., 2019; Mbatia, 2021). All these were witnessed amidst heavy national as well as county government investment in making procurement processes efficient and effective. Further, few studies however have been done on effects of procurement practices in health sector (Amemba et al., 2013; Meeme, Okero & Muiruri, 2015; Kimathi, 2017; Bhattacharya & Lam, 2020) compared to those done in manufacturing, financial among other sectors. In this context, this research tries to evaluate the procurement procedures that have the greatest impact on the availability of health products and technology in Meru County. Therefore, this research sought to answer the question; what is the influence of procurement practices on availability of health products and technologies in Meru County, Kenya?

1.3 Objectives of the study

1.3.1 Main objective

To determine the effect of procurement practices on availability of health products and technologies in Meru County, Kenya.

1.3.2 Specific objectives

i. To establish forecasting data used in procurement of health products and technologies in Meru County.
ii. To identify the common electronic tools used in procurement by health facilities in Meru County.
iii. To evaluate the influence of procurement methods on the availability of health products and technologies in Meru County.
iv. To establish procurement challenges influencing availability of health products and technologies in Meru County.

1.4 Research Questions

i. What are the forecasting data used in procurement of health products and technologies in Meru County?
ii. What is the common electronic tools used in procurement by health facilities in Meru County?
iii. How does procurement practices influence availability of health products and technologies in Meru County?
iv. What are the procurement challenges influencing availability of health products and technologies in Meru County?

1.5 Justification of the study

The health sector in the devolved system of governance has been captured by the Kenya Health Policy, which lays down a blueprint of the steps and requisite activities that the Kenyan Government can undertake in order to meet its target health goals. This policy is in line with the Kenyan Vision 2030 that has been a reference for various development agenda such as the Kenya National Development Agenda, the Sustainable Development Goals (SDGs), as well as, the constitution. Moreover, the policy clearly identifies and outlines the core objectives, which the Government should predominantly focus on, in order to meet its health targets (Kenya Health Policy, 2012). Some of the resulting policies include enactment of the Public Procurement and Asset Disposal Act (PPDA) which emphasized the importance of adherence to good procurement standards in the public sector among others. In the recent past however, healthcare service delivery across counties or public health facilities compared to private health facilities has not been impressive due to absence or

inadequacy of health products and technologies. Further, it is not clear from empirical exposition how procurement practices in public hospitals influence availability of health products and technologies in Meru County.

1.6 Significance of the study

Significance of the research is the contribution that the study makes in policy, management and enhancement of the literature on availability of health products and technologies. In this case therefore, the study will be useful to management at the county level by establishing vital procurement practices to enhance availability of health products and technologies to emphasize on, also in terms of policy formulation by the critical organs of the institution. This will enhance determination of more comprehensive procurement strategies.

It will assist the scholars in the field of supply chain to understand the role of good procurement practices on availability of healthcare services. This will enhance the literature on procurement practices in devolved systems of governance.

1.7 Delimitations

Scope of the study is the extent or the coverage levels of the study. The scope entailed the content, geographical and time aspects. The study considered identification of forecasting data used in procurement of health products and technology, types of electronic tools, key elements of procurement practice, as well as establishing procurement challenges influencing availability of health products and technologies. Meru County also formed the geographical scope. As part of the inclusion criteria, data was collected from public hospitals (county and sub county hospitals) for the period of one month. In the exclusion criteria, the study will not include private, faith-based and all other levels of health facilities (health center, clinics, pharmacies, and street vendors).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the studies done on the subject matter as well as theories supporting the hypothesis or research questions. It shows the summary of the literature review. It also presents the conceptual framework.

2.2 Theoretical review

DiMaggio and Powell (1983) institutional theory, Jensen and Meckling (1976) agency theory, stakeholder theory by Friedman (1984), and the theory of performance by Edgar Schein (1974) are the specific theories utilized to support these linkages. In the most recent investigations, these hypotheses have also been developed further (Leistner, 2013; Kasapoglu, 2016; Njoki, 2018).

Institutional theory was put forward by Powell and DiMaggio (1983). It used a sociological technique to define the company's behavior in terms of systems of governance and performance. The theory focuses largely on the cultural and social factors that influence a company's decision-making and, more specifically, on how organizations adopt significant or long-standing traditions (DiMaggio & Powell, 1983). Firms accept these myths as rules when making choices, despite the fact that they should not be taken seriously. They become the accepted rationale that guides the conduct of firms (Meyer & Rowan, 1977). This theory's underlying logic may be related with nation public service boards. In selecting and managing their assets, socially responsible public companies use a rationale that takes into account social, environmental, governance, moral, and ethical factors. According to this theory, excellent procurement processes might lead to improved performance (Leistner, 2013). In addition, the streamlined procurement practices are related to processes that initiate and accelerate the purchase of health products and technology that increase their availability.

Jensen and Meckling both backed agency theory in 1976. It may be related with public institution as an organization that administers governments on behalf of the people. Meckling and Jensen (1976) describe it as the legal contract between agents (managers) and principals (owners) to operate the business for the benefit of stakeholders. Adam Smith,

along with other economists, had recognized the existence of such hypothetical agency conflicts. This might often reinforce the current split between ownership and management in organizations.

The theory's basic premise is to reduce stakeholder-management agency conflicts by aligning agents' interests with those of the principal (s). As an alternative, it aims to discourage the expropriation of shareholder assets. A list of instances from the literature on corporate governance demonstrate how such investments can be taken away: executives can misuse internal information for personal benefit (Meckling &Jensen, 1976; Chalevas, 2011); boards of directors can grant themselves own as well needless compensation as salary and wages (Fried &Bebchuk, 2003; Ntim et al., 2012b); and managers can make increased use of corporate properties by consuming more benefits and privileges (Jensen & Meckling, 1976).

To summarize the principle, prudent governance should include sound procurement procedures and governance structures that may lead to better service delivery at lower costs for a business. With this change, procurement processes and organizational performance will be improved as a result of lower costs for monitoring and bonding (Fama & Jensen, 1983; Siddiqui et al., 2013). With regard to the county government, this is especially relevant owing to a large amount of authority concentrated in the senior management team of the county (Republic of Kenya, 2010). Because of the potential for such a competing interest between county stakeholders and those in county management, a large concentration of power in the county's top management team may be detrimental to the rights of those in the county. Understanding the relationship between procedural or ethical procurement and availability of health products or technology is best served by the theory's framework.

On the other hand, Edward Friedman proposed the stakeholder theory, which centers on the investor and the stakeholder as the two most crucial members of a company (Friedman, 1984). This theory is predicated on the idea that corporations exist for the benefit of more than just its shareholders in the form of "stakeholders" (Gibson, 2000). It is the value provided to stakeholders including creditors, workers, communities, governments, and the environment that ultimately determines a company's success or failure (Mulili, 2011). Thus,

the board has a moral and legal duty to ensure is adequately represented in all decision-making processes (Dunphy& Benn, 2003). The public's involvement is essential to the success of such a business (Manville, 2003; Kasapoglu, 2016). It seems that the content of Kenya's Constitution was inspired and affected by the stakeholder approach, particularly Article 20(1) of the Bill of Rights, which applies to all legislation and binds all State institutions and persons. It sets up a comprehensive system to safeguard human rights for both people and businesses. The public is encouraged to take part in all stages of decision making, as outlined in Chapter 6 of the Constitution of Kenya (2010). Affirmative action, gender parity, and regional fairness are only a few examples of topics where the theory is clearly present in the writing. Article 232(1h, I), Constitution of Kenya, 2010, requires state corporate entities and institutions to take affirmative measures to ensure that men and women, ethnic minorities, teenagers, and people with disabilities have equal opportunity for appointment, training, and advancement at all levels of the public sector. Organizations have a responsibility to make sure their goals are consistent with those of their stakeholders. Cases like Enron and Worldcom show what happens when companies don't do this (Kaptein & Van Tulder, 2003). This theory addresses the link between procurement processes and availability of health products and technologies.

Don Edgar's (1974) theory of performance is based on the belief that mankind has an immense capacity to achieve amazing things and objectives, which it does because the goals are difficult and because they help to establish and quantify our energies and abilities. It is considered that performance may be improved by influencing the performer's thinking, immersing them in a stimulating environment, and encouraging them to reflect on their actions to improve themselves. Don Edgar (1974) investigated performance and performance enhancement through the perspective of six concepts: performance context, level of knowledge, identification level, skills, own characteristics, and the degree of performance upon which an individuals or company's performance is based. As a response, performance yields outcomes that may be divided into the eight categories listed below: Quality increases; costs decrease; skills increase; motivation increase; costs decrease; increase in knowledge; ability increases; identity and capacity increases (Conyon & He, 2011).

The theory further describes performance as a multidimensional set of actions that use skills and knowledge to produce a desirable output. It therefore informs learning by investigating the institution's degree of performance (Njoki, 2018). Performance is a journey, not a destination, and the level of progress is determined by where you are on the trip (Brannsford et al., 2000). The efficiency or quality of performance is shown at each level or location. The works of Tomlison et al. (2002), and Bransford et al. (2000), provide literary support for the principles of the theory of performance. They developed a model for operational teaching and learning that included learner, knowledge, assessment, and community-based components. Don Edgar (1974) summarizes performance theory by citing Wiske (1998), who states that as people learn and develop, they are able to deliver results that make a difference because they are empowered.

The idea is significant to our research because it explains how quality and knowledge impact performance, particularly in the public sector. This theory assists the researcher in responding to the following research question: What effect does compliance with procurement practices have on the availability of health products and technology in Meru County public hospitals?

2.3 Empirical review

2.3.1 Forecasting data used in procurement of health products and technologies

Forecasting is a method for predicting the course of future trends by analyzing past data and drawing educated inferences from them (Li, et al., 2019). Data plays a critical role in procurement and supply, whether it be in guiding organizational decisions about what, when, and where to buy, providing organizations with thorough market research, generating spend and risk reports, or guiding management with choices regarding supplier relationships (Chen, Preston & Swink, 2015). Scholars agree that different sets of data for example consumption data, morbidity data, service data or even proxy data within the organizations calls for smart data strategies (Chen, Preston & Swink, 2015; Wang et al., 2016). With such strategies, organizations are more likely to capture a larger market share and keep a higher rate of client retention.

Forecasting data is employed mostly in the main phases of planning to enhance accuracy of the predictions hence contributes to success of service delivery in health sector. Forecasts are of essence being a feeder for budgeting and planning logistics. Kasapoglu, (2016) did a study to establish the predictability of obstetrics and gynecology patient beds in the department using different forecasting techniques. The study used patient volume forecast models in private hospitals and the analysis methods done using various time series methods. The study noted that data on bed requirements in the obstetrics and gynecology departments reflect direct association between the cost of the processes and the number of available beds in the private hospitals.

According to a survey conducted in Meru County, the availability of 32 selected essential reproductive health care commodities in Meru County referral hospital outlets was less than 25%, while only 20% of essential medicines (EM) were available to public patients at Muthara sub county hospital in Tigania East (Meeme, Okero & Muiruri, 2015). Despite years of assistance from implementing partners, research by Mbatia (2021) identified issues in the inventory management of health commodities as well as tracking consumption, which is the key source of information for forecasting and quantifying at Nyambene sub county hospital.

Thuku (2020) discovered that 50% of prescriptions at Meru subcounty hospitals were not serviced in the health facility where the patient had been visited. In addition, a study conducted in 2018 by USAID in partnership with PEPFAR discovered that regular stock-out complaints were received across most sub-counties in Meru County. These shortages affected a wide range of vital medications, not only HIV and TB drugs. The study concluded that there was no capacity to determine the trends on actual use of existing products to make procurement plans in advance.

Globally, one of the weakest associations in health-supply chains is procuring health products is demand forecasting. Forecasts are of essence being a significant feeder for not only budgeting but also logistics planning. Subramanian, (2021), examined how improved forecasting data could lead to increased accessibility of health commodities for both short-term and long-term access. A logical literature review was done which analyzed 71 studies

from content and a descriptive approach. The results revealed that demand pooling and a culture of sharing information led to accurate forecasts making budgeting more predictable, guaranteeing purchase commitment and adherence to standard principles regarding the forecasts leading to availability of health supplies.

2.3.2 Electronic tools used in procurement by health facilities

The health sector has adopted a digitalization strategy of operations, especially in the purchase of technologies and health products, as new technology and innovation have taken center stage globally. This is to enable or to assist healthcare procurement teams with the necessary and frequently challenging strategic decision-making involved in the acquisition process (Rodgers et al., 2022). The strategies include a core set of advanced strategies, such as embedded intelligence, predictive data analytics, and real-time user guidance. It is expected to increase sector-wide efficiency, lower risk, and improve customer service skills (Bakibinga et al., 2020).

By utilizing the increased ICT infrastructure and high mobile penetration rates, the governments are digitizing services and implementing technologies including m-health, e-health, space technologies and telemedicine to hasten the growth of the healthcare sector (Bakibinga et al., 2020). This has been facilitated by increased penetration rates of internet services. In Kenya the listed procurement technologies include electronic Health Information (e-Health) System, Mobile health (m-Health) services, District Health Information System (DHIS2), and Enterprise-wide Resource Planning (ERP) System (Kenya's Medium Term Expenditure Framework, 2021-2025).

Electronic health information systems (EHIS) facilitate provider collaboration and enhance a healthcare professional's capacity to offer personalised care to patients. When it comes to improving diagnosis of illness and treatment at the point-of-care in low and middle-income countries, Tlou, Khubone, and Mashamba-Thompson (2020) conducted a systematic review. It is now more important than ever to study how EHIS may be used for the diagnosis and treatment of both non-communicable and communicable diseases because of the massive amounts of patient data and the need of keeping patients in care. Additionally, the emergence

of the Coronavirus Disease 2019 (COVID-19) pandemic in LMICs with significant disease burdens has heightened the need for a strong EHIS to enable effective pandemic surveillance. EHIS was found to have the ability to facilitate the effective point-of-care (POC) delivery of illness diagnostic services while lowering medical errors.

The implementation of mHealth applications in healthcare appears to be constrained despite the growing popularity of mobile health (mHealth). Zakerabasali et al. (2021) conducted this systematic review to identify institutional obstacles to healthcare practitioners' adoption of mobile health technology. Studies that have been published between January 2015 and December 2019 were analyzed to determine. Studies were included if they discussed how healthcare providers regarded obstacles to the implementation of mHealth. Researcher expertise and experience were analyzed in a focus group, and the resulting data was used to conduct content analysis and categorize obstacles. Based on the research, 18 works and 18 barriers were picked from the 273 papers that the search approach turned up. Technical, personal, and healthcare system barriers were divided into these three categories. Three of the most significant barriers to the adoption of mHealth as described in the included publications were chosen: privacy and security concerns from the category of technical barriers, economic and financial factors from the category of healthcare system barriers and knowledge and limited literacy from the category of individual barriers. The result of the research was that mHealth adoption is a diverse, complicated process that is commonly employed to enhance access to healthcare services. However, a number of circumstances and obstacles have an impact on it. For these applications to be successfully deployed, it is crucial to recognize the providers' adoption hurdles and include them in the adoption process.

In nations where it is implemented, DHIS records data consistently obtained from all public health institutions. Based on the experiences of 11 nations, Dehnavieh et al. (2019) performed a meta-synthesis and literature analysis of the District Health Information System (DHIS2) to assess its strengths and operational issues. To gather data and evaluate findings regarding the advantages and operational difficulties of DHIS2, the meta-synthesis and a literature review approach were employed. Databases were searched for papers pertaining to DHIS2's advantages and operational difficulties. Three stages were involved in the review

and assessment of the chosen studies: title, abstract, and full text. Key principles were taken out after thoroughly reading each of the chosen papers. These essential ideas were split into two groups: DHIS2's operational strengths and problems. The primary themes and sub-themes were then developed by grouping each category according to conceptual similarities. Data that was extracted was analyzed using content analysis. Out of the 766 recognized citations, the findings revealed that 20 research from 11 different nations were considered and examined in this study. The seven areas (and 21 categories) that make up the DHIS's strengths involve the technical aspects of software, correct data administration, application adaptability, networking and increasing stakeholder satisfaction, enhancing information access, development of data management and financial benefits. Funds, a suitable infrastructure for communication, political, social, the need for appropriate data, cultural, and structural infrastructure, manpower, senior managers, training, the use of academic potentials, the definition and standardization of the deployment processes, the failure to apply criteria and clinical guidelines in the use of the system, data security concerns, stakeholder communication, and other factors were used to categorize operational challenges.

Healthcare professionals use the enterprise resource planning platform to improve service quality in healthcare facilities. Fiaz, Ikram and Ilyas (2018) did a study on the digitization of healthcare service quality where the enterprise resource planning systems. The effectiveness of integrated planning systems as a whole on the caliber of healthcare services has been assessed using individual characteristics, organizational impressions, information, and the system quality of ERP. The triangulation of data was collected and examined using a mixed methods technique. A self-administered questionnaire was used to gather information for the empirical study from 279 medical professionals working for five healthcare institutions in the Pakistani city of Lahore. As methods for data analysis, descriptive statistics squared multiple correlations and reliability coefficients were employed. Additionally, AMOS 20 was used to test the structural model's goodness of fit. It is hypothesized that all of the ERP's specified parameters improve the caliber of healthcare services. The findings show that the implementation of an enterprise planning system has a

favorable effect on people, the accuracy of organizational information, and the effectiveness of the healthcare system.

To eliminate stock outs, diversion, shortages and the penetration of substandard and counterfeit drugs, digital technology that can identify and prevent corruption and fraud are extremely vital. Mackey and Cuomo (2020) conducted a cross-disciplinary analysis of how digital tools might promote integrity, openness, and accountability in the pharmaceutical supply chain. The study performed a multidisciplinary evaluation of the literature in the fields of engineering, computer science, and health/medicine. In addition to terms related to transparency and anti-corruption activities, their search queries included terms related to digital technologies and the procurement of medications. The study defined "digital technology" as communications over the Internet, which includes tools for supply chains, electronic databases and online portals and management systems. Based on their inclusion criteria, the authors selected 37 papers from the findings that focused to employ digital technology to enhance the purchase of medications. A smaller number of articles discussed upcoming technologies like machine learning and blockchain distributed ledger systems, but most of the articles concentrated on e-procurement systems and/or electronic data transfer. The necessity for technical standards establishment, cost savings justification, and delayed adoption were recognized as the main obstacles to current and future use of e-procurement.

2.3.3 Procurement methods influence on availability of health products and technologies

Odhiambo (2014) conducted research on the influence of supply chain management methods on hospital quality of service in Nairobi. Employees from the finance and supply chain management departments of the 7 Public Hospitals in Nairobi County were surveyed. A structured questionnaire was used to gather the data, which was then analysed utilizing descriptive and regression techniques. The findings revealed a significant association between supply chain and management practices (namely supplier relationships, compatibility, delivery, after-procurement services and standards and specifications) and service quality. The author explored supply chain management processes while this study analyses procurement practices specifically linking them to HPTs in health sector. The study

only included the finance supply chain departments whereas this study included more than two departments in the target hospitals.

Utilization of different procurement contracting practices can have either a negative or positive influence on service delivery in government owned entities. Njoki (2018) carried out a research on Impact of competitive procurement methods on service delivery at Nakuru, Kenya's public hospitals. The research included 80 officials who were chief medical officers, department heads and procurement officers from selected health institutions in Nakuru County. For data collection, a questionnaire was used, and inferential and descriptive statistics were used for analysis. The results of the research noted that service delivery in public hospitals was positively influenced by technology and supplier capacity based on experience and knowledge related to procurement practices.

One of the most recent developments in the procurement industry is the rise of online shopping. Rotich and Okello (2015) conducted a correlational study to examine the impact of e-procurement on the efficiency with which county governments fulfilled their procurement responsibilities. There were 120 participants from the accounting, purchasing, finance, and information technology departments in Kericho County, Kenya. Questionnaires were used to gather the data, which was then analyzed using both inferential statistics and descriptive statistics (a correlation analysis). The findings revealed that there was enhanced product compliance with order placed 76.3 percent resulting from the e-procurement that was established in the company. Timely purchase requisition approval and fast bidding process beginning and closure. This leads to better on time purchase order delivery schedules 55 percent. While they focused on performance of the procurement functions of devolved units and e-procurement, this study entirely concentrates on procurement practices and availability of HPTs in the health sector.

Effective procurement practices guarantee that the necessary drugs are accessible at the right time, at affordable rates, and in accordance with identifiable quality standards. Nyarwati, Wanja, and Musa (2020) conducted a cross-sectional investigation of the effect of HR determinants on the pharmaceutical procurement supply chain management cycle in Kenyan non-governmental organizations. The research was done in Nairobi County at the Kenya

Red Cross Society (KRCS). The research population consisted of workers from procurement, finance, and logistics, and questionnaire which was self-administered was used to gather data. Logistic regressions were employed to analyse data. The findings noted that awareness of procurement and logistic policies by human resources had a positive impact and statistically related with the effectiveness of the medicinal supply chain at the Kenya Red Cross Society.

Access of medications, vaccines and other essential health products establish key components of health systems which provide key treatments to the population. Changes in the procurement and supply chain practices can influence health outcomes. Seidman (2017) conducted a study to see whether changes to supply chains and procurement procedures reduce costs and increase the availability of medications, vaccines, and other health products. The research used secondary data from PubMed with the addition of a search keyword for Low- and Middle-Income Countries. Using an Excel-based data gathering tool, the results were recorded. In the the Caribbean, Middle East, Brazil, Mexico, sections of Latin America, and various nations in Africa and Asia, policies such as centralized procurement and competitive bidding led to immediate cost reductions. While supply chain management techniques decrease medicine stock-outs and enhance population access to medications.

2.3.4 Procurement challenges influencing availability of health products and technologies

A complicated global problem, pharmaceutical shortages impact every country. Modisakeng, Matlala, Godman, and Meyer (2020) set out to investigate drug shortages and difficulties in the procurement process in South African public hospitals. Ten pharmacy supervisors working in public hospitals throughout Gauteng Province, South Africa, were interviewed in-depth using qualitative methods. Two of the authors coded the transcripts for a thematic content analysis. Until an agreement was reached, coding was discussed. Themes were created by grouping categories together. The findings revealed that the 'Procurement process' was the overarching theme from the data, and it was founded on three key themes: the buy-out process, which was used to obtain medications from suppliers other than those with whom contracts were in place; suppliers who did not perform, which

contributed to medicine shortages in the hospitals; and difficulties like the hospitals electronic inventory management systems being inaccurate. These results informed the study's recommendation to the provincial department of health: manage supplier contracts efficiently to guarantee that all South Africans have access to and can get their hands on the pharmaceuticals they need. In the future, avoiding medicine shortages will need constant monitoring and reinforcement of the use of computerized inventory management systems.

Procurement problems have a negative effect on the availability and quality of health supplies. Several reasons contribute to insufficient availability of vital medications and health supplies in public health facilities. Yadav (2015) provided an assessment on Health product supply chains in developing nations. In addition, he also aimed to address core reasons of underperformance of Health systems in poor nations. The primary variables that contribute to underperformance of supply chain underperformance were issues in procurement, forecasting and requisitioning by the area. Further uncertainties in finances led to delayed procurement cycles. On the other hand, lack of Supply Chain Planning Data with information regarding consumption of health products was also key determinant which led to lowest level of service and frequent stock outs of health products.

Procurement of medical devices influences service delivery in hospitals in developing countries. Nyokabi, (2021) investigated the impact of the procurement function on the use of medical devices in level 5 public hospitals in Kenya. A sample population drawn from 12 public hospitals comprised medical superintendents, procurement officers, medical device users, biomedical and human resource officers. Structured questionnaires were used to gather data. For data analysis, descriptive as well as regression statistics were used. The results established that procurement decisions were not properly collaborated and poor procurement practices of medical devices led to the low quality of care to the patients by the hospital. Further, illogicality in procurement practices also contributed to the underutilization of medical devices.

2.4 Summary of the literature review

There was a lot of discussion of relevant material in this section of the study. Researchers and academics presented their findings about the measures they had taken. A number of factors, such as forecasting data (Kasapoglu, 2016; Subramanian, 2021), procurement methods (Odhiambo, 2014; Njoki, 2018); Nyarwati, Wanja & Musa, 2020) and other key challenges that institutions face appear to influence the availability of health products and technologies (see, for example: Yadav, 2015; Kasapoglu, 2016; Subramanian, 2021; Nyokabi, 2021).

In the reviewed literature few researches (including Njoki, 2018) have been done relating procurement and availability of health products and technologies compared to those done in manufacturing, finance among other sectors. This creates a gap that hence forms the premise of this study which seeks to assess the effect of procurement practices influencing availability of health products and technologies in Meru County.

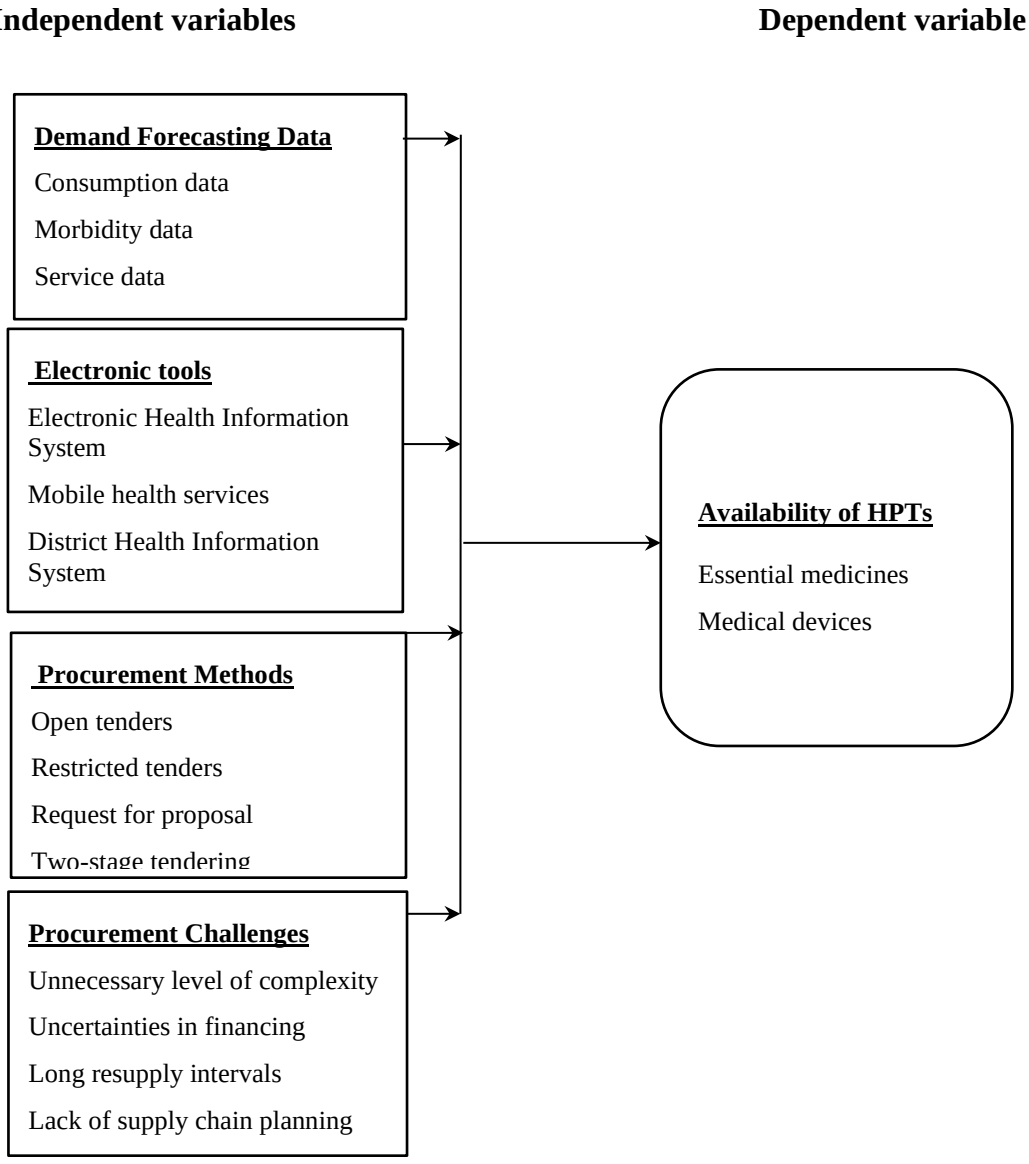
Devolved healthcare systems' success is proved in several elements of health facilities, including the availability of health products and technologies, according to the studies reviewed. It's true that there is an abundance of research on the subject, but few researches have been done in Kenya during the period of devolved government that can back up the assertions made in those earlier studies. This is why this study focuses on Meru County's health institutions in an effort to bridge the knowledge gap.

2.5 Conceptual framework

The framework defines the relationships among the response variables. The predictor variables are the demand forecasting data, type of electronic tools, procurement methods including, tendering practices and procurement challenges. In contrast, the dependent variable is availability of health products and technologies measured as essential medicines and medical devices. Demand forecasting data leads to increased accessibility and availability of health commodities through budget predictability and health commodities required. Hence this leads to improved service delivery. Electronic tool type

(e-health, m-health, ERP etc.) shows the easiness thus preference of the technology in the context of use. Procurement methods like open tenders, restricted tenders, negotiated tendering and selective tendering leads to healthy competitiveness which ensures availability and high quality of health products. Procurement challenges such as unnecessary level of complexity in procuring health products, uncertainties in financing, long resupply intervals and lack of supply chain planning leads to delayed procurement cycles and poor service delivery. This is due to frequent stock outs leading to unavailability of health products.

Figure 2. 1: Conceptual framework



CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the strategy used to attain the research objectives. This chapter describes the study methodology and design that were employed by the researcher. It also includes information on the study's location, demographic, sampling strategy, sample size, research tools, validity, and reliability. It also provides an overview of data collecting, analysis, and ethical concerns.

3.2 Research Design

The researcher used the descriptive cross sectional research design. The design was adopted because it provides the researcher with the opportunity to collect data at a specific point in time (Siedlecki, 2020) to provide an overview of the procurement practices and the availability of health products and technologies in the county. The key advantage of using a descriptive cross-sectional design in this study was its ability to efficiently gather data and provide a comprehensive snapshot of the current state of procurement practices and availability of health products and technologies in Meru County. By collecting data from various sources simultaneously, the design allowed for a comprehensive assessment of the situation without the need for longitudinal follow-up. This enabled researcher to gain insights into the prevailing conditions, identify potential issues or gaps in procurement practices, and inform decision-making processes for improving the availability of health products and technologies.

3.3 Location of the study

The research was conducted within Meru County. All sub counties including Igembe Central, Igembe South, Tigania central, Tigania West, Buuri East, Tigania East, Buuri west, Imenti Central, Imenti North Igembe North and Imenti South were covered. The population of Meru County has been growing steadily to 1, 486, 025 persons in 2017, increasing to 1,517,077 in 2018 and 1,530,043 persons in 2020. Further, the population is projected to 1,723,412 persons in 2023 (CIDP, 2018-2023).

3.4 Target population

The target population is the entire number of individuals of interest. The study targeted public health facilities (county and sub county hospitals) in Meru County. All the eleven sub county hospitals and one county referral hospital were considered as the population. The target population was the associates of the procurement committee(s).

3.5 Sampling techniques and sample size

3.5.1 Sampling Technique

The research applied both census and purposive sampling approaches. They include census of all the County referral hospital and sub county hospitals. In addition, purposive sampling was employed to select the procurement committee(s) members from all the selected hospitals.

3.5.2 Sample Size

Since this is a facility-based study, all 11 sub-county public hospitals and one county hospital were considered. To get the respondents sample size at the sub county level, the study selected the 5 respondents or officers per sub-county hospital (Sub- County pharmacist, sub county medical officer of health, procurement officer, commodity Nurse, laboratory in charge and accountants). At the county referral hospital, the study targeted hospital pharmacists, hospital medical officers in charge, hospital procurement officer, commodity nurses, and laboratories in charge. These form part of the procurement committee and they are considered to have more knowledge on hospital supplies or commodities including medical devices used. Lastly, at the county health department level, the researcher interviewed 3 respondents (county pharmacist, county procurement officer and county budgeting officer). These are tasked with procurement functions in the department of health and also oversee procurement operations at each sub county hospital. Thus, the total sample was 75 respondents.

3.5.3 Inclusion and exclusion criteria

In the study, the inclusion criteria involved selecting specific public hospitals, including county and sub-county hospitals, as the target sample for data collection. These hospitals were chosen due to their significance in the healthcare system and their involvement in procurement processes. On the other hand, the exclusion criteria were used to exclude certain public hospitals from the study. The specific criteria for excluding hospitals involved private hospitals that were excluded from the sample as they may have different procurement practices and systems.

Since the study was specifically examining general procurement practices related to health products and technologies, specialty hospitals that primarily focus on a specific area of healthcare (e.g., maternity, cancer, or orthopedics) may have been excluded from the sample. Depending on the scope and resources available for the study, smaller hospitals with limited patient capacity or lower levels of procurement activities may have been excluded to ensure a more representative and manageable sample.

Regarding the respondents, the study may have selected participants based on specific criteria, such as their roles and responsibilities related to procurement within the selected hospitals. Inclusion criteria for respondents could include procurement officers, hospital administrators, or staff members directly involved in the procurement process. The exclusion criteria could involve individuals who did not hold relevant positions or did not have direct involvement in procurement activities within the hospitals.

By applying both inclusion and exclusion criteria for selecting hospitals and respondents, the study aimed to ensure a focused and representative sample that would provide valuable insights into the effects of procurement practices on the availability of health products and technologies in Meru County, Kenya.

3.6 Research Instruments

The research used primary data where semi-structured questionnaires were used to collect the data. The 5-point Likert scale questions were incorporated. Questionnaires are valuable and beneficial for collecting information that is specific to people, such as attitudes or

knowledge, as well as for protecting the privacy of participants, whose replies may be kept anonymous or secret (Vander-Klok & Conners, 2019). Second, the questionnaire was used since it is simple to administer and interpret after results are collected (Mugenda & Mugenda, 2003). The questionnaires used also have open ended questions capturing qualitative data that was analyzed and used for triangulation purposes.

3.7 Pretest

A pretest, as per Kothari (2008), is the duplication and preparation of the main research and it throws light to the questionnaires' shortcomings (if any) and also to the ways of sampling. A pretest is done when few individuals are given a questionnaire with an objective of pre-testing the questions (Babbie, 2014).

Pretest was done to test reliability and validity of the research instruments. Experts in the procurement department as well as health system strengthening including the supervisor were used to determine the validity of the instrument while Cronbach's alpha was computed to establish reliability of the research tool where 0.7 and above was considered reliable. Pre-testing was conducted in four sub-county public hospitals randomly selected from the neighboring Tharaka Nithi County. The findings of reliability are as shown in table 3.1 below.

Table 3. 1: Cronbach's alpha coefficients

Variable	Cronbach Alpha	Decision
Forecasting data used in procurement of health products and technologies	.745	Reliable
Electronic tools used in procurement by health facilities	.774	Reliable
Procurement methods on the availability of health products and technologies	.721	Reliable
Procurement challenges influencing availability of health products and technologies	.768	Reliable
Availability of health products and technologies	.711	Reliable

From the findings above, in table 3.1, the research tool where 0.7 and above was considered reliable.

3.8 Data collection Techniques

The researcher made visits to the sampled health facilities to distribute the questionnaires and interview the staff members there. The researcher also recruited three research assistants with a minimum of a bachelor degree in any health-related course. The research assistants underwent a two-day training on the content of the tools, administration of the same and ethical issues to be considered. The research assistants and the researcher, then delivered the questionnaires in person. The scholar and/or the research assistants explained the study's intent to the respondents before administering the questionnaires. This approach enhanced the response rate. The research assistants helped in administering the study instrument in some instances whereas in others self-administering was used. To ensure authenticity of collected data, the researcher accompanied and supervised the research assistants to all target health facilities.

3.9 Data analysis

Data from the field was entered to the excel sheet, cleaned and coded. Thereafter data analysis was conducted via use of SPSS version 25. Data was thereafter analyzed largely using descriptive statistics (Frequencies, means, and percentages) which were computed to achieve the study objectives that is; establishing forecasting data used in procurement of health products and technologies in Meru County, identifying Electronic tools used in procurement by health facilities in Meru County, evaluate and ascertain the influence of procurement practices on the availability of health products and technologies in Meru County, and establishing procurement challenges influencing availability of health products and technologies in Meru County.

3.10 Logistical and Ethical Issues

All ethical issues including but not limited to Confidentiality were strictly observed. Participants were informed of the goals of the study so as to gain the confidentiality of the obtained information. Ethical permission was obtained. Before the study begin, a committee on ethics and research (KNH-UoN ERC), the National Council for Science and Technology, the County Government of Meru, and a sample of health facilities were contacted for permission. Respondents retained their rights, which include, but are not limited to, the right to withdraw from or refuse to participate in any aspect of the research, as well as the right of not answering questions and/or not to provide needed data. In addition, clearance was obtained from the Meru County administration and the targeted health institutions. The researcher also deployed research assistants who aided in distribution and administration of the research instrument to minimize biases.

CHAPTER FOUR: RESULTS

4.1 Introduction

The researcher summarizes the study's examination of the data, conclusions, and interpretation in this chapter. The study's aim was to determine how procurement processes affected the accessibility of medical equipment and supplies in Kenya's Meru County. The study's specific goals included identifying the forecasting data used in the procurement of health products and technologies, assessing how procurement practices affected those products and technologies' availability, identifying procurement issues that affected those products and technologies' availability, and assessing those products and technologies' availability. This was to be made possible by comprehensive data collection, validation, and analysis, which has given the results as portrayed by this chapter. The survey instruments used have been attached as annexes as reference and literature on criteria for content and analysis.

4.2 Response Rate

Questionnaires were distributed by the researcher to all sampled sub county hospitals and the county referral hospital. Also, tools were sent to all 11 sub-county public hospitals and one county hospital. At the sub county level, the study sent tools to the Sub- County pharmacist, sub county medical officer of health, procurement officer, commodity Nurse, laboratory in charge and accountants. At the county referral hospital, the study distributed the tool to hospital pharmacists, hospital medical officer in charge, hospital procurement officer, commodity Nurse, and laboratory in charge. Lastly, at the county health department level, the study interviewed county pharmacists, county procurement officer and county budgeting officers. From the total questionnaires distributed (75 questionnaires), all of them (100%) were fully filled and returned back. This success rate was linked to the fact that the researcher had already mapped all target respondents and did prior communication regarding the tool. This was also coupled with the licenses or permits (that is county based or NACOSTI) already sought that made the process seamless.

4.3 Demographic Characteristics

4.3.1 Gender of respondents

The research work sought to establish the gender of the respondents and as indicated in the Figure 4.1 below, male was the majority (53.3%) compared to female population.

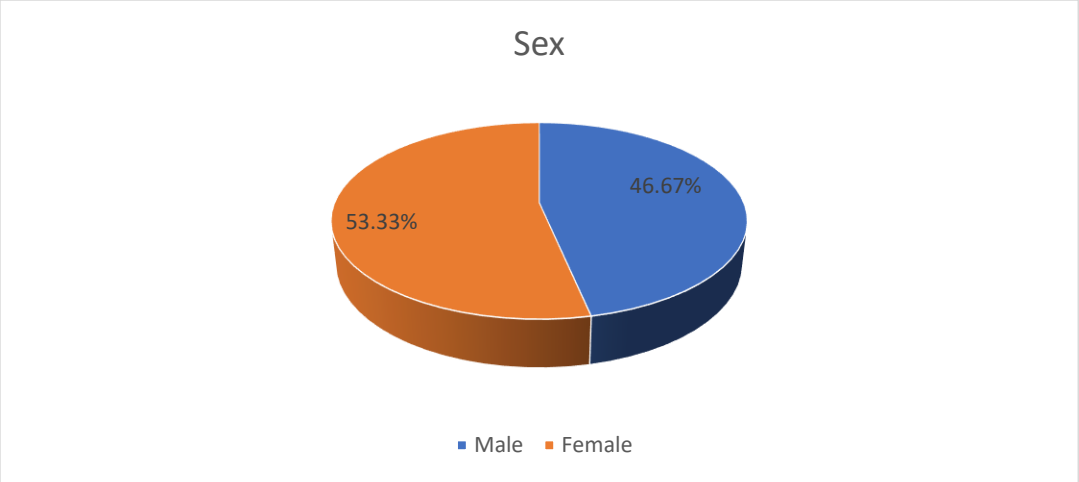


Figure 4. 2: Gender of respondents

4.3.2 Age of the Respondents

The survey results show that the highest response rate was from the 35–45-year-olds, at 53.3% with the lowest being the age group of 56–64-year-olds at 2.7%. The Figure 4.2 below is the tabulated summary of the findings.

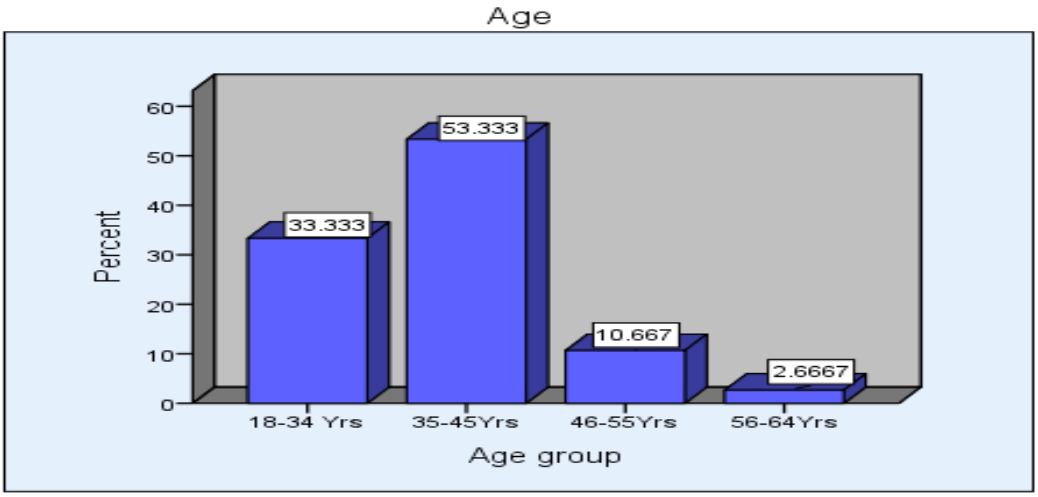


Figure 4. 3: Age group of respondents

4.3.4 Educational Level of Respondents

The majority of those who participated were those who had an undergraduate degree with a representation 53.3%, and lastly those who had a postgraduate (master's) training or degree were 17.3% only. Figure 4.3 provides a graphical overview of the study's findings.

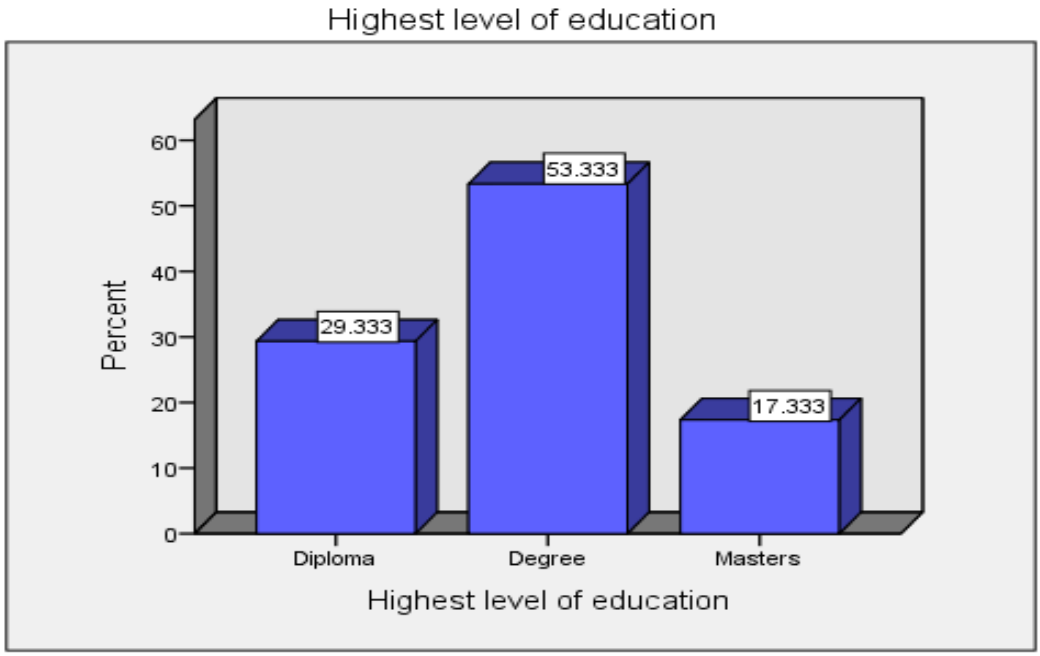


Figure 4. 4: Educational level of respondents

4.3.5 Number of years of experience in the current role

The majority of the participants have been employed in their current role for a moderate period of time. Specifically, many (37.3%) worked for a period of 5-10 years whereas a few (17.3%) had worked for 0-2 years. The Figure 4.4 below shows the summary of the results on respondents by years of experience.

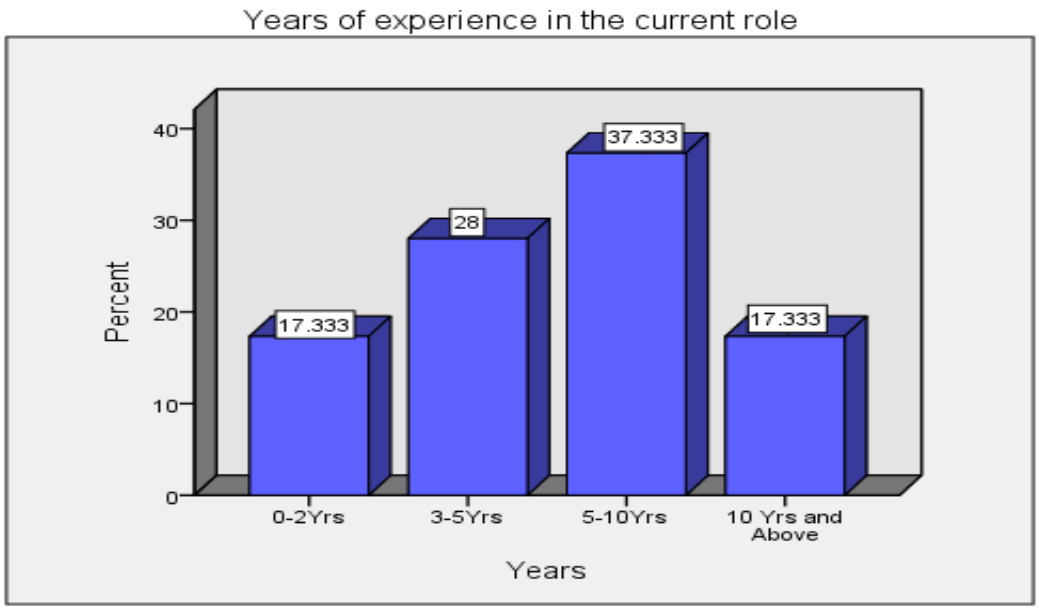


Figure 4. 5*:* Years of experience in the current role

4.3.6 Area of professional specialty

In this case, the highest response was seen in the supply chain profession. This suggested that most of the respondents (54.2%) were working in the supply chain field whereas those who were working in the store had the lowest response at 6.9%. Results are shown in Figure 4.5.

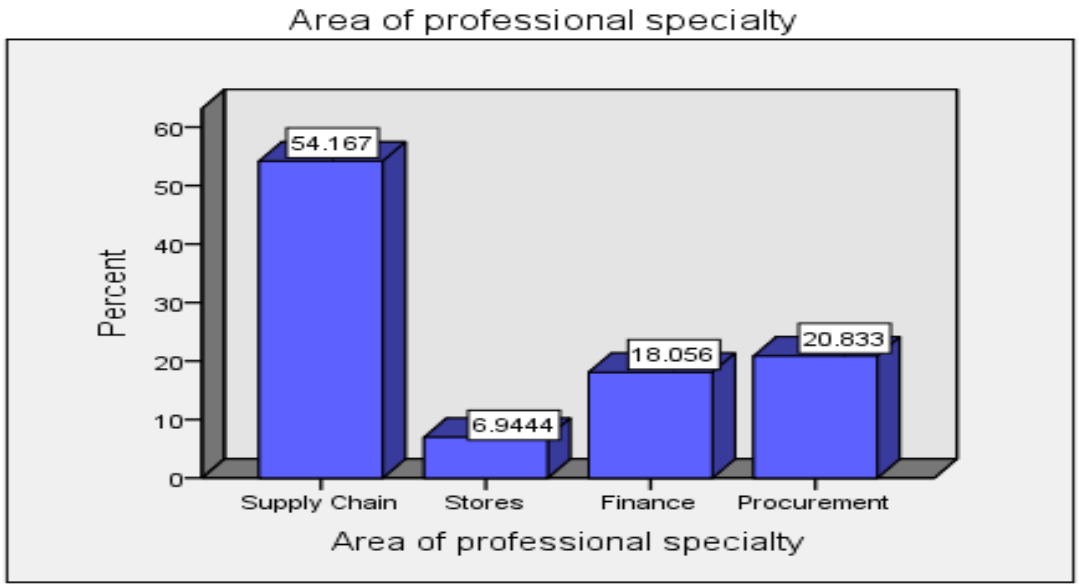


Figure 4. 6: Area of professional specialty

4.4. Forecasting data used in procurement of health products and technologies

The participants were asked to indicate the most or commonly preferred forecasting data used in procurement of health products and technologies in the hospital. A total of 74 responses were recorded on this question where one respondent failed to respond or indicate anything on the same. Results in the Table 4.1 indicated that 87.8% preferred consumption data, 5 while only 2.7% preferred services data.

Table 4. 2: Forecasting data used in procurement

Forecasting Data	Frequency	Percentage
Consumption data	65	87.8
Proxy method	2	2.7
Morbidity data	4	5.4
Services data	3	4.1
Total	74	100.0

4.5 Electronic tools used in procurement by health facilities

The respondents were further asked about the most preferred electronic tool used in procurement in their health facility. A total of 70 responses were recorded on this question where five respondents failed to respond or indicate anything on the same. The outcomes revealed that majority (78.6%) indicated District Health Information System (DHIS2) as their preferred electronic tool. Only a few that is 2.9% opted for Mobile health (m-Health) services as recorded in Table 4.2 below.

Table 4. 3: Electronic tools used in procurement

Type of electronic tool	Frequency	Percentage
District Health Information System (DHIS2)	55	78.6
Electronic Health Information System [e-Health]	10	14.3
Enterprise-wide Resource Planning (ERP) System	3	4.3
Mobile health (m-Health) services	2	2.9
Total	70	100.0

4.6 Procurement practices influence availability of health products and technologies

Majority of the respondents, 91.9% agreed that the health facility or facilities tracked adherence of procurement principles on enhancing availability of county health products and technologies (HPT) and adjusted as appropriate as shown in table 4.3 below. This question attracted a total of 74 responses where only one respondent failed to respond or indicate anything on the same.

Table 4. 4: Procurement practices influence availability of HPTs

Agree?	Frequency	Percentage
Yes	68	91.9
No	6	8.1
Total	74	100.0

Table 4.4 had a total of 73 responses recorded on the question regarding the frequency procurement committee undertakes monthly review of stock reports. Two respondents did not respond or indicate anything on the question. From the analysis, 43.8% of respondents indicated that the procurement committee regularly conducts a monthly assessment of inventory reports against quantifications used to monitor performance objectives by HPT

categories and make corrections. Approximately 38% of respondents agreed with the idea that the procurement committee should sometimes conduct a monthly evaluation of inventory reports against quantifications used to measure performance objectives by HPT categories and make appropriate adjustments. About 6% and 1% of respondents indicated that the procurement committee performed a monthly assessment of inventory reports against quantifications used to measure performance objectives by HPT categories and make corrections very often and never, respectively. The results are shown in Table 4.4 below.

Table 4. 5: Frequency procurement committee undertakes monthly review of stock reports

How often?	Frequency	Percentage
Frequently	32	43.8
Occasionally	28	38.4
Rarely	8	11.0
Very Frequently	4	5.5
Never at all	1	1.4
Total	73	100.0

The respondents were asked to establish how adherence to procurement practices influences availability of health products and technologies in Meru County. The responses were scored using a Likert scale, and the results are shown in table 4.5, where D=Disagreed, N= Neutral, and A=Agreed. It is worth noting that these statements represent areas where the majority of respondents agreed, indicating a consensus among the participants. The high agreement ratings suggest that these procurement methods and practices for Health Products and Technologies (HPTs) are generally accepted and acknowledged within the context of the study.

The overall mean scores accompanying each statement further emphasize the level of agreement among respondents. Higher mean scores indicate stronger agreement with the

statement, reflecting the importance and relevance of these procurement methods in the participants' perceptions.

Table 4.6: Assessment of respondents' knowledge about different procurements methods

Open tenders	**D**	**N**	**A**	**Overall Mean Score**	**N**
The firm must be accessible to all qualifying bidders, as stipulated by the tendering rules.	1.4	8.2	90.5	4.46	73
It lets enterprises to submit bids for items in an open auction or solicitation	9.6	4.1	86.3	4.15	73
Encourages effective competition to obtain goods with an emphasis on the value for money	2.8	12.3	84.9	4.12	73
Restricted tenders					
The procuring organization creates a set of criteria for choosing the suppliers and service providers who will be invited to submit proposals.	4.1	13.7	82.2	4.07	73
Limits the number of requests for proposals that can be submitted by a supplier or service provider.	15.3	8.3	76.4	3.89	72
It is utilized to save time and money throughout the selecting procedure by the procurement team.	15.1	19.2	65.7	3.62	73

Table 4.5 Continued…

Request for proposal					
It is employed when suppliers or service providers submit their goods or services for consideration to a procurement team.	18.1	16.7	65.3	4.17	72
Understanding the specifics of quality service management is crucial for our providers to win their bids.	12.5	25.0	62.5	3.65	73
The most competent and relevant proposal is chosen regardless of cost.	36.1	20.8	43.1	3.13	72
Two-stage tendering					
The basis for awarding a contract to a bidder is the aggregate score of the technical and financial proposals.	4.2	26.8	69	3.89	71
At the first step, the procurement team gets a proposal with two envelopes: one containing the proposal itself and the other containing the related financial data.	11.5	22.9	65.7	3.73	70
In the second approach, rather than providing a fully-completed technical proposal, the bidder submits a partial proposal.	24.6	30.4	44.9	3.30	69

Table 4.5 Continued…

Request for quotations					
The procurement team chooses at least three suppliers or service providers from which to solicit bids.	5.5	5.5	89	4.33	74
Comparison of bids is performed, and the best pick based on compliance with specifications is selected.	1.4	6.8	91.9	4.41	75
Request for quotation is the least sophisticated technique of procurement accessible.	15.1	12.3	72.6	3.99	73
Single-sourcing					
The circumstances which call for this approach apart from emergencies include if a certain product or service is only accessible from a sole supplier	4.0	2.7	93.3	4.43	75
This method when used, it undergoes a strict approval process from management before being employed	1.3	6.7	92	4.36	75
It occurs when the procurement team seeks to purchase products or services from a single vendor.	5.3	5.3	89.3	4.39	75

Table 4.5 provides an overview of the procurement methods and availability of Health Products and Technologies (HPTs). The results indicate the respondents' ratings for each method and their overall mean scores. For open tenders, respondents agreed with the statement that "The firm must be accessible to all qualifying bidders, as stipulated by the tendering rules." This statement received a high agreement rating of 90.5%, with an overall

mean score of 4.26, indicating a consensus among the respondents. Regarding restricted tenders, respondents showed agreement with the statement that "The procuring organization creates a set of criteria for choosing the suppliers and service providers who will be invited to submit proposals." This statement garnered a significant agreement rating of 82.2%, with an overall mean score of 4.07, indicating the perceived effectiveness of this method.

In the case of request for proposal, respondents agreed that "Understanding the specifics of quality service management is crucial for our providers to win their bids." This statement received an agreement rating of 62.5%, with an overall mean score of 3.65, suggesting a moderate level of agreement among the participants. For two-stage tendering, respondents agreed that "The basis for awarding a contract to a bidder is the aggregate score of the technical and financial proposals." This statement obtained an agreement rating of 69.0%, with an overall mean score of 3.89, indicating a moderate level of agreement.

In the context of request for quotations, respondents agreed with the statement that "Comparison of bids is performed, and the best pick based on compliance with specifications is selected." This statement garnered a high agreement rating of 91.9%, with an overall mean score of 4.41, demonstrating the perceived effectiveness of this method. Lastly, for single-sourcing, respondents agreed that "The circumstances which call for this approach apart from emergencies include if a certain product or service is only accessible from a sole supplier." This statement received a strong agreement rating of 93.3%, with an overall mean score of 4.43, highlighting the consensus among the participants.

These findings provide valuable insights into the attitudes and perspectives of the respondents towards different procurement methods and their availability for HPTs. The high agreement ratings and overall mean scores suggest that these methods are considered effective, practical, and beneficial within the context of the study. It is important to consider these results when evaluating and developing procurement strategies for HPTs. Understanding the preferences and opinions of the stakeholders involved can guide decision-making processes and ensure that procurement practices align with the needs and expectations of the participants. Overall, these findings shed light on the perceptions and agreement levels among respondents regarding various procurement methods for HPTs,

contributing to a comprehensive understanding of the subject matter in the context of the study. These insights can inform policy-making and implementation efforts aimed at improving the availability and procurement of essential health products and technologies.

4.7 Procurement challenges influencing availability of health products & technologies

The findings in Table 4.6 approximately 88.0% of the respondents experienced challenges many times while acquiring HPTs in their health facilities. On the other hand, findings further revealed that only 2.7% never at all experienced challenges while acquiring HPTs in their health facilities.

Table 4. 7: Procurement challenges while acquiring HPTs

Any procurement challenges?	Frequency	Percentage
Many times	66	88
Once	7	9.3
Never at all	2	2.7
Total	75	100

The respondents were asked to establish what were the procurement challenges influencing availability of health products and technologies in Meru County. The responses were rated on a Likert scale and the results are as presented in Table 4.7 below, where D=Disagreed, N= Neutral, and A=Agreed. The researcher discusses the statement with the highest agreement rating and the statement with the lowest agreement rating while providing an overall view of the challenges faced.

Table 4. 8: Procurement challenges influencing availability of HPTs

Challenges	D	N	A	Overall Mean score	N
Annual budgets, procurement strategies, and measurement plans are only loosely connected.	10.9	9.5	79.8	4.68	74
Consumption, stock, and service demand data on a national, county, and facility level are insufficient to provide quantitative assessments.	14.9	13.5	71.6	3.68	74
Not relying sufficiently on quantification-derived supply plans to guide real purchases	18	11.1	70.8	3.67	72
The dispersion of HPT-quantification capacity-building efforts.	13.9	18.1	68.1	3.61	72
Insufficient capability for product selection and quantification due to a lack of personnel, equipment, and expertise.	20	12.0	67	3.52	75
Coordination deficiencies for predicting and quantifying at the program, national, county, and facility levels.	17.6	20.3	62.1	3.59	74
Inadequate application of Standards Treatment Guidelines	21.7	17.6	60.8	3.50	74

Table 4.7 highlights the key challenges that influence HPT availability. A notable challenge with a high agreement rating was the loose connection between annual budgets, procurement strategies, and measurement plans. A substantial 79.8% of respondents agreed, highlighting a significant disconnect. This emphasizes the need for better alignment and integration among these elements to improve the procurement process. The overall mean score of 4.68

further reinforces the consensus among participants. Inadequate application of Standards Treatment Guidelines (STGs) received a relatively lower agreement rating. While 60.8% of respondents agreed, the overall mean score of 3.50 suggests a less pronounced consensus. The fact that only a slight majority agreed with this statement indicates that there may be variations in the understanding and implementation of these guidelines among healthcare providers.

The procurement challenges outlined above have notable implications for HPT availability. Addressing the loose connection between budgets, strategies, and measurement plans are crucial for enhancing procurement processes. By addressing these challenges, healthcare systems can optimize their procurement strategies and ensure the timely availability of essential health products and technologies.

4.8 Availability of health products and technologies

The respondents were asked to rate performance of the suppliers prequalified to tender at this facility. They were rated good by 40.5% of the respondents, while 2.7% rated them poor. The findings are a shown in Table 4.8.

Table 4. 9: Performance of the suppliers prequalified to tender at the health facilities

Rate	Frequency	Percentage
Good	30	40.5
Fair	23	31.1
Very Good	16	21.6
Excellent	3	4.1
Poor	2	2.7
Total	74	100.0

The respondents were asked to evaluate the status of availability of health commodities and technologies in Meru County. The responses were rated on a Likert scale and the results are as presented in Table 4.9 below, where D=Disagreed, N= Neutral, and A=Agreed.

Table 4. 10: Status of availability of HPTs in Meru County

Availability of HPTs	**D**	**N**	**A**	**Overall Mean Score**	**N**
Possibilities to improve product choice, quantity, acquisition, and distribution by expanding upon existing best practices	4.1	18.9	77.1	3.91	74
Improving data accessibility, usability, and availability throughout the whole HPT supply chain is a top priority for optimizing HPT information management systems.	12.2	18.9	68.9	3.77	74
Sourcing of HPTs from local producers has increased	30.7	18.7	50.7	3.31	75
There is adequate technical capacity to undertake HTA exercise	52	11.0	37	2.77	73
The health goods and technology have a defined HTA deployment road map.	45.3	26.7	28	2.75	75
There is adequate funding for research on HPT	77	14.9	8.2	1.97	74

Table 4.9 shows the statements with the highest agreement rating and overall mean score was "Possibilities to improve product choice, quantity, acquisition, and distribution by expanding upon existing best practices." An overwhelming majority of 77.1% of respondents agreed with this statement, indicating a strong consensus on the potential for improvement in these areas. The high overall mean score of 3.91 further highlights the significance and relevance of this statement to the participants. This suggests that there is widespread recognition among respondents of the need to enhance product selection,

quantity management, acquisition processes, and distribution mechanisms by building upon existing best practices.

In contrast, the statement with the lowest agreement rating and lowest mean score was "There is adequate funding for research on HPT." Only 8.2% of respondents agreed with this statement, indicating a lack of consensus on the availability of adequate funding for research in health products and technologies. The extremely low overall mean score of 1.97 underscores the concerns raised by the respondents regarding insufficient funding for research activities. This highlights a critical area of concern where efforts should be directed to secure adequate financial resources to support research initiatives in the field of health commodities and technologies.

These divergent results demonstrate the varying perceptions and opinions among respondents regarding the availability of health commodities and technologies in Meru County. While there is a consensus on the potential for improvement in product choice, quantity, acquisition, and distribution, there is a clear disparity in the perception of adequate funding for research. These findings emphasize the importance of addressing funding gaps to foster research and development in the field of health commodities and technologies. By focusing on enhancing funding opportunities, policymakers and stakeholders can promote innovation and improve the availability and effectiveness of healthcare interventions in Meru County.

CHAPTER FIVE: DISCUSSIONS

5.1 Introduction

This chapter provides in-depth analyses of the research results presented in the previous chapter. On the basis of these findings, major policy recommendations are developed.

5.2 Forecasting data used in procurement of health products and technologies

Data plays a critical role in procurement and supply, whether it be in guiding organizational decisions about what, when, and where to buy, providing organizations with thorough market research, generating spend and risk reports, or guiding management with choices regarding supplier relationships. In this objective, the research sought to establish the forecasting data used in procurement of health products and technologies in Meru County. Here respondents agreed on the most or commonly preferred forecasting data used in procurement of health products and technologies in the hospital. The listed methods include; consumption data, proxy data, morbidity data, and services data. The study concluded that the most preferred one was the consumption data as supported by the majority (>87 per cent) of the respondents.

The finding may imply that this type of forecast data, specifically consumption data, holds significant value and reliability in the procurement of health products and technologies in Meru County. The high agreement among the respondents regarding its preference suggests that consumption data is perceived as a reliable indicator of the demand and utilization patterns of these products and technologies within the hospital setting. The research findings concurred with the research results obtained by Kasapoglu, (2016) who did research to establish the predictability of obstetrics and gynecology patient beds in the department using different forecasting techniques. The author used patient volume forecast models in private hospitals and the analysis methods done using various time series methods. The study concluded that data on bed requirements in the obstetrics and gynecology departments forecasts on the cost of the processes in the private hospitals. These results were also supported by those findings obtained by Mbatia (2021) identified issues in the inventory management of health commodities as well as tracking consumption, which is the key source of information for forecasting and quantifying at Nyambene sub county hospital.

5.3 Electronic tools used in procurement by health facilities in Meru County

The health sector in Kenya has been on record as having adopted a digitalization strategy of operations, especially in the purchase of HPTs, as new technology and innovation have taken center stage worldwide. The Electronic tools used in procurement according to the literature include Electronic Health Information System [e-Health], Mobile health (m-Health) services, District Health Information System (DHIS2), and Enterprise-wide Resource Planning (ERP) System. In this objective, the study sought to identify electronic tools used in procurement by health facilities in Meru County. The descriptive analysis revealed that the most preferred electronic tool used in procurement in health facilities was the DHIS2 with over 78 percent support.

Data gathered regularly from all public health institutions may be recorded in a District Health Information System in countries that employ the system. This conclusion is supported by research conducted by Dehnavieh et al. (2019), who analyzed DHIS2 data from 11 countries to identify its advantages and disadvantages. In addition to its obvious financial benefits, the DHIS has been shown to excel in the areas of software engineering, data management, application flexibility, networking, and stakeholder satisfaction. Recorded operational challenges include a lack of resources; a lack of suitable infrastructure for communication; the need for suitable data; a lack of structural infrastructure, social, cultural and political; a lack of senior managers; a lack of training; a lack of academic potential; a lack of standardized deployment processes; a lack of application of criteria and clinical guidelines in the use of the system; a lack of data security; difficulties in communicating with stakeholders.

5.4 The influence of procurement practices on the availability of health products and technologies in Meru County.

This objective was meant to determine how procurement processes affect the availability of health items and technology in Meru County. Open-source tendering, two-stage tendering, request for proposal, restricted tendering, request for quotes, and single-sourcing are among the procurement methods under consideration. Most respondents concurred that the health facility or facilities tracked adherence of procurement principles on enhancing availability

of county HPT and adjusted as appropriate. The majority of respondents (91.8%) further concurred that the assessed methods of procurement were associated with increased availability of health products and technologies in Meru County. These findings were affirmed by Seidman (2017) who conducted a study to see whether changes to supply chains and procurement procedures reduce costs and increase the availability of medications, vaccines, and other health products. They concluded that while supply chain management techniques decrease medicine stock-outs and enhance population access to medications.

5.5 Procurement challenges influencing availability of health products and technologies in Meru County

Procurement problems have a negative impact on the availability and quality of health supplies. Lastly, the research sought to determine the procurement challenges influencing availability of health products and technologies in Meru County. The study findings from descriptive analysis showed that approximately 88% of the respondents acknowledged to have experienced challenges many times while acquiring HPTs in their health facilities. In determining the specific challenges experienced in procurement influencing availability of health products and technologies in Meru County. Most respondents concurred to experience weak linkage between procurement plans, quantification plans and annual budgets. This was followed by inadequate capacity in terms of tools, human resources and skills for product quantification and selection.

The findings are supported by the research results obtained by Yadav (2015) who did an assessment on health product supply chains in developing nations. The study concluded that uncertainties in finances led to delayed procurement cycles. On the other hand, the author showed that lack of supply chain planning data with information regarding consumption of health products was also a key determinant which led to lowest level of service and frequent stock outs of health products. Further, Nyokabi, (2021) concurred with the study finding while investigating the effect of the procurement function on the utilization of medical devices in public level five hospitals in Kenya. The study concluded that procurement decisions were not properly collaborated and poor procurement practices of medical devices led to the low quality of care to the patients by the hospital. Further, the study noted that

illogicality in procurement practices also contributed to the underutilization of medical devices.

5.6 Limitations of the study

i. Lack of collaboration was anticipated to arise from participants leading to low response rate.
ii. There were expected challenges related to terrain of Meru County while locating respondents.
iii. Again, respondents were expected to decline or withhold critical information fearing reprimand from the employer.

The study countered the above limitations by embracing various approaches. The scholar explained the purpose of the research as strictly meant for academic purposes. This enhanced cooperation from the respondents. In addition, local research assistants were recruited, trained and deployed to aid in collecting data. They were better placed to understand how to navigate the local terrains. This assisted the researcher to locate the respondents without many challenges across the county. Lastly, the researcher obtained all approvals right from the university, ethical boards as well as the county government of Meru to allow him conduct this research. These approvals led to reduced resistance by respondents or their withholding of the critical information fearing reprimand from the employer.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter summarizes the findings of the study in context of its objectives, the literature it examined, and the major variables — including procurement procedures — that were found to affect the availability of health items and technologies in Meru County, Kenya. After discussing the results in depth with a view on the study's objectives, it concludes with a set of concrete policy recommendations. Also included are suggestions for further research.

6.2 Conclusion of the findings

In the first objective, the research concluded that the most preferred forecasting data was the consumption data as supported by the majority (>87 per cent) of the respondents. The survey showed that the District Health Information System was the most favored electronic procurement instrument in Meru County health institutions (DHIS2). From the analysis, the study concluded that all procurement practices were associated with increased availability of health products and technologies in Meru County.

In the last objective, the research concluded that most of the respondents acknowledged to have experienced challenges many times while acquiring HPTs in their health facilities. In determining the specific challenges experienced in procurement influencing availability of HPTs in Meru County. It also concluded that most respondents concurred to experience weak linkage between procurement plans, annual budgets and quantification plans.

6.3 Recommendations of the findings

6.3.1 Recommendations for policy and practice

The research made suggestions based on the conclusions made. The research suggests for the management to strategize and embrace consumption data as the type of forecasting data in the planning process. As a form of forecasting data, hospital committees at the lower cadres in the county should use consumption data mostly in the main phases of planning for HPTs to enhance accuracy of the predictions hence contributing to the success of service

delivery in the health sector. It is considered to be of essence being a feeder for budgeting and planning logistics

The study suggests for the need of enhancing the use of DHIS2 platform by creating much awareness in other departments within the health facility as well as sponsoring staff for the crush training program. The CHMT needs to facilitate staff with both hardware and software to increase access as well as intensify training. This is to enable or to assist healthcare procurement teams with the necessary and frequently challenging strategic decision-making involved in the acquisition process. The department of health in the county government system should utilize the increased ICT infrastructure and high mobile penetration rates, so as to hasten the process of digitizing services and implementing technologies including DHIS2 and space technologies meant to stimulate the growth of the healthcare sector.

In the third objective, the study recommends that the CHMT and other departments in the health sector should consider adhering to effective procurement practices as they are positively associated with availability of HPTs. Effective procurement practices would guarantee that the necessary drugs are accessible at the right time, at affordable rates, and in accordance with identifiable quality standards.

Insufficient availability of vital medications and health supplies in public health facilities can be attributed to factors such as financial uncertainties at the county level, leading to delayed procurement cycles. To address this issue, it is recommended that management focuses on resolving financial uncertainties to ensure stable funding and minimize delays. Additionally, enhancing supply chain planning data by incorporating information on the consumption of health products is crucial. By considering consumption data, healthcare facilities can better anticipate demand, prevent stockouts, and ensure a consistent supply of medications and supplies, ultimately improving accessibility and meeting the healthcare needs of the population.

6.3 2 Recommendations for further research

This study mainly concentrated in analyzing the procurement practices influencing availability of health products and technologies in Meru County, Kenya. The study used

primary data gathered from across selected health facilities in Meru County. The research did not consider secondary data as well as data from other health facilities especially those in the lower cadres as well as the private health facilities. Thus, there is a need for a comprehensive study using secondary data and/or focusing on these populations.

In addition, it is recommended that comparable research be conducted, with other counties, not only Meru County, serving as comparisons. Future research should highlight additional key variables, such as county size (in terms of population), culture, and political climate (for example, political goodwill), that are necessary in determining procurement practices influencing availability of health products and technologies in Meru County. The study suggests further research be conducted estimating procurement methods using other modeling criteria to the structural approach.

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APPENDICES

APPENDICES

Appendix I: Consent Form

PARTICIPANT INFORMATION AND CONSENT FORM FOR ENROLLMENT IN THE STUDY

Title of Study: The Effect of Procurement Practices on Availability of Health Products and Technologies in Meru County, Kenya.

Principal Investigator and institutional affiliation: Anthony Ngera (University of Rwanda)

INTRODUCTION

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in medical research: i) Your decision to participate is entirely voluntary ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? Yes ☐ No ☐

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No. _____.

WHAT IS THIS STUDY ABOUT?

The researcher above will interview individuals who are involved in procurement of health products and technologies. The purpose of the interview is to find out the procurement practices used and how they affect availability of health products and technologies. Participants in this research study will be asked questions about general demographics, level of education, forecasting data, types of health technologies, availability of HPTs, procurement practices and procurement challenges within the scope of the subject matter.

There will be approximately 63 participants in this study chosen from Subcounty and County

Hospitals as well as the department of health or county level. We are asking for your consent to consider participating in this study.

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, the following things will happen:

You will be requested to fill in a questionnaire. You will also be interviewed on some aspects of the study.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will keep all of our paper records in a locked file cabinet. However, no system of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you.

Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview.

WILL BEING IN THIS STUDY COST YOU ANYTHING?

Despite your participation being voluntary, it will add on to the body of knowledge in this area and give the researcher and other stakeholders valuable information that may be of significance in addressing any identified gaps.

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study:

[ ] Yes [ ] No

Participant printed name: _____

Participant signature / Thumb stamp Date: _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name: Anthony Ngera

Date: _____

Signature: _____

Role in the study: Research Student

Research supervisors:

1. Dr. Peter Karimi, PhD.

   Senior lecturer

   University of Rwanda & University of Nairobi

   Email: ndirang15@gmail.com

   Tel. no: +254722436019

Appendix II: Questionnaire

This questionnaire was created with the goal of gathering information about the impact of procurement procedures on availability of health products and technologies:

Name of sub county: _____

Your current position: _____

Part A: Demographic Information

Please select the most appropriate in the boxes provided (tick)

1. Gender of respondent

    1. Male [ ], 2. Female [ ]

2. Please indicate your age bracket

    1. 18 – 34 Yrs [ ],
    2. 35 – 45 Yrs [ ]
    3. 46 – 55 Yrs [ ]
    4. 56 – 64 Yrs [ ]
    5. 65 Yrs and Above [ ]

3. Highest level of education

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

5. PhD [ ]

4. How many years of experience do you have in your current role?

1. 0 – 2 Yrs [ ]
2. 3 – 5 Yrs [ ]
3. 5 – 10 Yrs [ ]
4. 10 Yrs and Above [ ]

5. Kindly indicate your area of professional specialty

1. Supply Chain [ ]
2. Stores [ ]
3. Finance [ ]
4. Procurement [ ]

Part B: Forecasting data used in procurement of health products and technologies

6. Kindly indicate the most or commonly preferred forecasting data used in procurement of health products and technologies in this hospital.

1. Consumption data [ ]
2. Proxy data [ ]
3. Morbidity data [ ]
4. Services data [ ]

7. What do you think should be done to improve forecasting of HTPs apart from the confectionary way of forecasting?

_____

_____

Part C: Health technologies used in procurement by health facilities

8. Kindly indicate the **MOST** preferred health technology used in procurement in your health facility (tick one):

i. Electronic Health Information System [e-Health] [ ]
ii. Mobile health (m-Health) services [ ]
iii. District Health Information System (DHIS2) [ ]
iv. Enterprise-wide Resource Planning (ERP) System [ ]

In the selected technology, what features makes it most suitable in your context_____
_____
_____

Part D: The procurement methods on the availability of health products and technologies

9. Does the health facility or facilities track adherence of procurement principles on enhancing availability of county health product and technologies (HPT) and adjust as appropriate?
   1. Yes [ ], 2. No [ ]

10. How frequent do the procurement committee undertake monthly review of stock reports against quantifications undertaken to track performance targets by HPT categories and make corrective actions?

    1. Very Frequently [ ]
    2. Frequently [ ]
    3. Occasionally [ ]
    4. Rarely [ ]
    5. Never at all [ ]

11. Specify your level of agreement with the following statements regarding the procurement methods on the availability of health products and technologies where (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.
12.

Open tenders	1	2	3	4	5
It allows firms to bid on goods in an open competition or open solicitation manner					
Tendering requirements call for the company to be open to all qualified bidders					

Encourages effective competition to obtain goods with an emphasis on the value for money					
Restricted tenders					
Only places a limit on the amount of request for tenders that can be sent by a supplier or service provider.					
Procuring entity establishes a set of guidelines to use when selecting the suppliers and service providers that will be on the invitation list.					
It's employed as a way for the procuring team to save time and money during the selection process					
Request for proposal					
It is used when suppliers or service providers are proposing their good or service to a procurement team for review					
The understanding the in's and out's of quality service management by our suppliers is key to winning their bid					
The most qualified and appropriate proposal, regardless of price, is selected					
Two-stage tendering					
The procurement team receives a proposal with two envelopes in the first stage, one with the proposal itself and one with the associated financial information					

In the second procedure, instead of the bidder submitting a fully-completed technical proposal, a partial proposal is submitted					
The combined score of both the technical proposal and the financial proposal are the grounds on which a bidder is contracted					
Request for quotations					
Request for quotation is by far the least complex procurement method available					
The procurement team selects a minimum of three suppliers or service providers that they wish to get quotes from					
A comparison of quotes is analyzed and the best selection determined by requirement compliance is chosen					
Single-sourcing					
It occurs when the procuring team(s) intends to acquire goods or services from a sole provider					
The circumstances which call for this approach apart from emergencies include if a certain product or service is only available from one supplier					
This method when used, it undergoes a strict approval process from management before being used					

13. How do procurement methods influence availability of health products and technologies in Meru County?

_____

_____

Part E: Procurement challenges influencing availability of health products and technologies

14. How many times have you ever faced challenges acquiring HPTs in your hospital?

    1. Never at all [ ]
    2. Once [ ]
    3. Many Times [ ]

15. Specify your level of agreement with the following statements regarding challenges influencing availability of health products and technologies where (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.

Challenges	1	2	3	4	5
Inadequate application of Standards Treatment Guidelines					
Inadequacies in coordination for forecasting and quantification at national, program, county and facility levels					
Fragmentation of capacity building initiatives on quantification of HPT					
Weak linkage between quantification plans, procurement plans, and annual budgets					
Inadequacies in availability of high quality national, county and facility data on consumption, stocks and service demand to support quantifications					
Inadequate capacity in terms of human resources, tools, and skills for product selection and quantification					
Failure to fully utilize the supply plans resulting from quantification exercises to inform actual procurements					

Part E: Availability of health products and technologies

16. How do you rate performance of the suppliers prequalified to tender at this facility?

1. Excellent [ ]
2. V. Good [ ]
3. Good [ ]
4. Fair [ ]
5. Poor [ ]

17. Evaluate the availability of health products and technologies in Meru County.

Specify your level of agreement with the following statements regarding availability of health products and technologies (essential medicines and medical devices) where (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.

Statements on availability of health products and technologies	1	2	3	4	5
Opportunities to optimize product selection, quantification, procurement, and distribution building on promising practices					
Optimization of HPT information management systems to improve data availability, accessibility, and utilization across the entire HPT supply chain					
There is adequate funding for research on HPT					
There is a clear HTA implementation pathway for the health products and technologies.					
There is adequate technical capacity to undertake HTA exercise					
Sourcing of HPTs from local producers has increased					

End

Appendix III: The Dummy Tables

Objective 1: Most or commonly preferred forecasting data used in procurement of health products and technologies

Forecasting data	**Freq.**	**Percent.**
Consumption data		
Proxy data		
Morbidity data		
Services data		
Total		

Objective 2: Commonly preferred health technology used in procurement in your health facility:

Health technology	**Freq.**	**Percent.**
Electronic Health Information System		
Mobile health		
District Health Information System		
Enterprise-wide Resource Planning System		
Total		

Objective 3: The procurement process on the availability of health products and technologies

Open tenders	**Mean**	**Std. Dev**
It allows firms to bid on goods in an open competition or open solicitation manner		
Tendering requirements call for the company to be open to all qualified bidders		
Encourages effective competition to obtain goods with an emphasis on the value for money		
Restricted tenders		
Only places a limit on the amount of request for tenders that can be sent by a supplier or service provider.		
Procuring entity establishes a set of guidelines to use when selecting the suppliers and service providers that will be on the invitation list.		
It's employed as a way for the procuring team to save time and money during the selection process		
Request for proposal		
It is used when suppliers or service providers are proposing their good or service to a procurement team for review		
The understanding the ins and outs of quality service management by our suppliers is key to winning their bid		

The most qualified and appropriate proposal, regardless of price, is selected		
Two-stage tendering		
The procurement team receives a proposal with two envelopes in the first stage, one with the proposal itself and one with the associated financial information		
In the second procedure, instead of the bidder submitting a fully-completed technical proposal, a partial proposal is submitted		
The combined score of both the technical proposal and the financial proposal are the grounds on which a bidder is contracted		
Request for quotations		
Request for quotation is by far the least complex procurement method available		
The procurement team selects a minimum of three suppliers or service providers that they wish to get quotes from		
A comparison of quotes is analyzed and the best selection determined by requirement compliance is chosen		
Single-sourcing		
It occurs when the procuring team(s) intends to acquire goods or services from a sole provider		

The circumstances which call for this approach apart from emergencies include if a certain product or service is only available from one supplier		
This method when used, it undergoes a strict approval process from management before being used		

Objective 4: Procurement challenges influencing availability of health products and technologies

Challenges	**Mean**	**Std. Dev**
Inadequate application of Standards Treatment Guidelines		
Inadequacies in coordination for forecasting and quantification at national, program, county and facility levels		
Fragmentation of capacity building initiatives on quantification of HPT		
Weak linkage between quantification plans, procurement plans, and annual budgets		
Inadequacies in availability of high quality national, county and facility data on consumption, stocks and service demand to support quantifications		
Inadequate capacity in terms of human resources, tools, and skills for product selection and quantification		
Failure to fully utilize the supply plans resulting from quantification exercises to inform actual procurements		

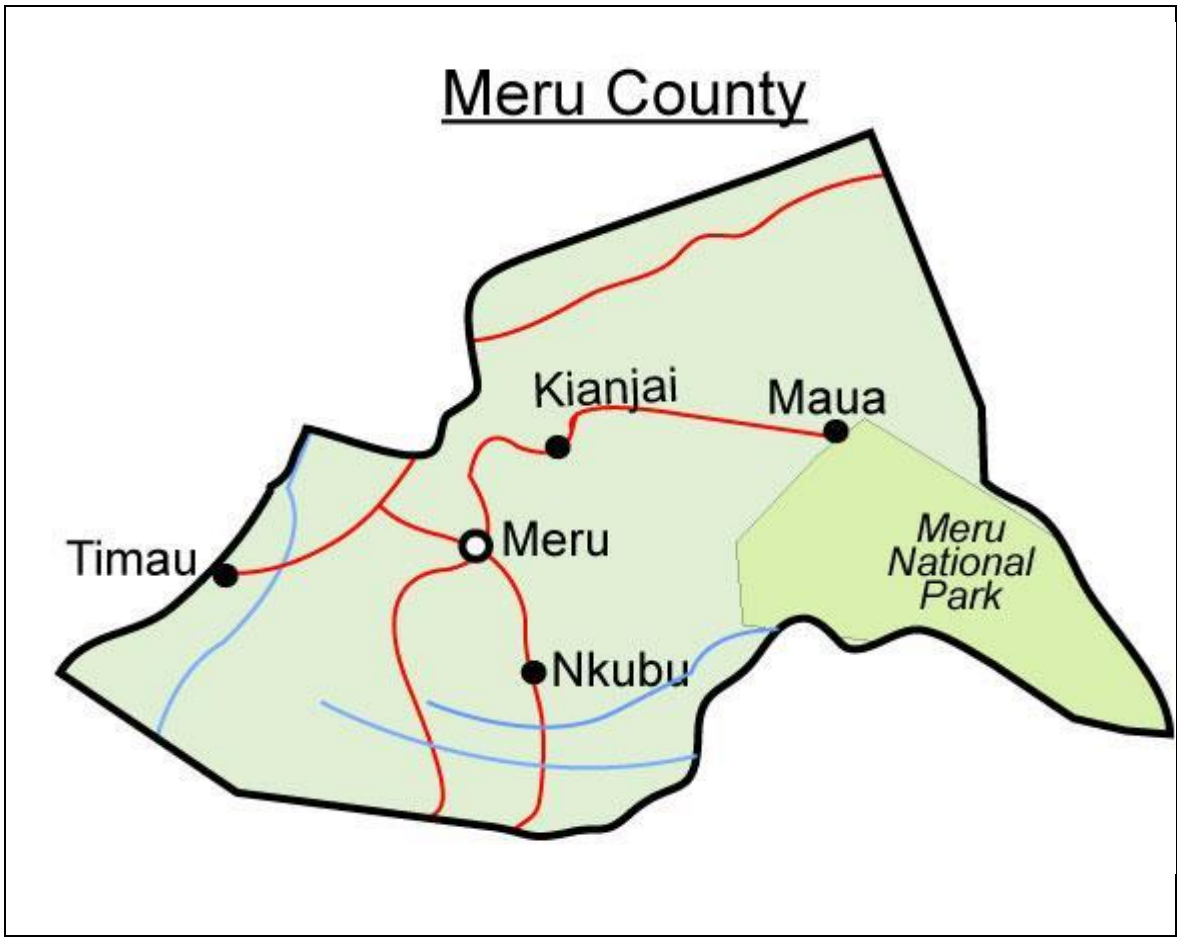
Appendix IV: Work Plan

Activity	Time schedule							
	2022/23							
	Jan-Feb	Mar-April	May	June	July-Aug	Sept -Dec	Jan-Feb	Mar-May
Identification of title and background information								
Literature review								
Methodology								
Oral defense of Proposal								
Ethical review and Corrections of suggested changes to proposal								
Data Collection								
Data analysis and interpretations								
Report writing and submission for examination								
Defense of final report								
Corrections and submission of final report								

Appendix V: Budget

ITEMS	DESCRIPTION	AMOUNT(KSHs)
Transport (car hire services)	-clearance purposes (NACOSTI and ethic boards)	5, 000.00
	-To and from the target hospitals (researcher and research assistants)	30,000.00
Ethical research processing charges	Ethical board(s) fee and logistics	5,000.00
Internet Services	Data Bundles	3,500.00
Data Analysis	1 Professional statistician	10,000.00
Data collection	3 Research Assistants	6,600.00
Telephone	Communication Charges	4,000.00
Stationary	1 ream of foolscaps	200.00
	1 ream of printing paper	500.00
Other services	Photocopying	5,000.00
	Binding	600.00
	Typesetting	5,000.00
Miscellaneous	-	8,000.00
TOTAL		**83,400.00**

Appendix VI: Map of Meru County, Kenya



Source: CIDP-Meru (2018-2022)

Appendix VII: KNH Ethics Approval Letter

UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/395

11th October, 2022

Anthony Ngera
Reg.No. 221028876
School of Public-Health Supply Chain Management
College of Medicine & Health Sciences
University of Rwanda

11 OCT 2022

Dear Anthony,

RESEARCH PROPOSAL: THE EFFECT OF PROCUREMENT PRACTICES ON AVAILABILITY OF HEALTH PRODUCTS AND TECHNOLOGIES IN MERU COUNTY KENYA (P482/06/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P482/06/2022.** The approval period is 11th October 2022 – 10th October 2023.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH-UoN ERC

c.c. The Dean, Faculty of Health Sciences, UoN
The Senior Director, CS, KNH
The Assistant Director, Health Information Dept., KNH
The Chairperson, KNH- UoN ERC
The Director, School of Public Health-Health Chain Management, University of Rwanda
Supervisors: Dr. Peter N Karimi, Dept of Pharmacy, UoN/University of Rwanda
Dr. Shital M Maru, Dept of Pharmacy, UoN/University of Rwanda

Appendix VIII: Research Permit NACOSTI-P-22-21493

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **917846**

Date of Issue: **21/November/2022**

RESEARCH LICENSE

This is to Certify that Dr.. ANTHONY KIAMA NGERA of University of Rwanda, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Meru on the topic: THE EFFECT OF PROCUREMENT PRACTICES ON AVAILABILITY OF HEALTH PRODUCTS AND TECHNOLOGIES IN MERU COUNTY,KENYA for the period ending : 21/November/2023.

License No: **NACOSTI/P/22/21493**

917846

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and
Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke

Appendix IX: Turnitin Report

THE EFFECT OF PROCUREMENT PRACTICES ON AVAILABILITY OF HEALTH PRODUCTS AND TECHNOLOGIES IN MERU COUNTY, KENYA

ORIGINALITY REPORT

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