

**FACTORS INFLUENCING AVAILABILITY OF ESSENTIAL MEDICINES IN PUBLIC
HEALTH FACILITIES IN KENYA: A CASE OF EMBU COUNTY**

BY

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DECLARATION

This project report is my original work and has not been presented in for an award in any other University

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DEDICATION

I dedicate this work to my sister Ruth, Brother Michael and my friend Ismael who have been a strong pillar to my life and more so have always encouraged me through my education.

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LIST OF ABBREVIATIONS AND ACRONYMS

ART	Antiretroviral Therapy
CHW	Community Health Worker
EML	Essential Medicines List
EM	Essential Medicines
FY	Financial Year
MOMS	Ministry of Medical Services
MOPHS	Ministry of Public Health and Sanitation
MSH	Management Science for Health
NACOSTI	National Commission for Science, Technology and Innovation
PHF	Public Health Facility
SPSS	Statistical Package for Social Sciences
TF	Tolerance Factor
UNIDO	United Nations International Development Organization
USAID	United States Agency for International Development
VIF	Variance inflation factor
WHO	World Health Organization
WB	World Bank

ABSTRACT

Healthcare provision involves curative, promotive, rehabilitative and preventative care. Both curative and preventative care involves the use of medicines and medical supplies. In order to provide effective treatment essential medicines and medical supplies must be available at the health facilities. About one third of the world's population lacks access to essential medicines. The situation is worse for the developing continents especially Africa and Asia. Half of the population in Africa lacks essential medicines. This study sought to establish influence of health workers training on availability of essential medicines in public health facilities, to determine influence of health budgetary allocations on availability of essential medicines in public health facilities, to examine influence of supplier stock levels on the availability of essential medicines in public health facilities and to assess influence of disease prevalence patterns on availability of essential medicines in public health facilities. Descriptive Survey design was used to conduct the research. The target population for the study was health workers dealing with essential medicines in the 94 health facilities in Embu County. Of the target population a sample of 49 health workers was used as derived using Yamane's formula. Stratified random sampling and simple random sampling procedures were used to determine how the data collection instrument would be distributed. A Questionnaire was administered to the sampled population to obtain data. Data was first coded then analyzed using the statistical Package for Social Sciences (SPSS) and it was further subjected to Chi Square test analysis. Chi Square test is a test used in research to assist in the assessment of relationship between two or more mutually exclusive variables. This technique helps in comparing proportions observed to what would be expected under an assumption of independence between two variables. The study found that majority of the health workers were females and they were generally young. Most had a diploma level of academic qualification and they were nurses who had worked for less than five years. Majority of the health workers had knowledge on essential medicines with a significant number having attended commodity management trainings. The findings also indicated that a significant number of the respondents had attended short commodity management trainings as they felt that they were very relevant in their practice as health workers and there was need to attend such trainings once annually. Most of the sampled facilities were dispensaries which received a significant budget allocation for the procurement of essential medicines. The budget allocations were done quarterly though disbursement was mainly done half yearly. The study showed that Kemsu was the main supplier for essential medicines for the health facilities. However the suppliers did not stock all the essential medicines and their order fulfillment was averagely good. The study also indicated that there were no new diseases reported in a period of one year although if present a substantial amount of the essential medicines would have been consumed. The common diseases treated in the county were both communicable and non communicable diseases. The study revealed that all the factors investigated had an influence on the availability of essential medicines in public health facilities due to untrained staff, inadequate and untimely disbursements of budgets allocated to the health facilities, no of suppliers and supplier stock factors which were seen to inhibit the stocking abilities for the suppliers and the disease prevalence patterns. The study recommended that the stakeholders in health include commodity management trainings as a core discipline in all major health professions. Other recommendations included timely and sufficient budgetary allocation and disbursements to health facilities, increase the no of suppliers, hold regular meetings to provide feedback to the already existing suppliers and conduct surveillance on current disease patterns and also establish response budgets.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Healthcare provision involves curative, promotive, rehabilitative and preventative care. Both curative and preventative care involves the use of medicines and medical supplies. In order to provide effective treatment essential medicines and medical supplies must be available at the health facilities. Besides having skilled healthcare providers, medicines are the most significant means to prevent, alleviate, and cure disease (United Nations, 2005). The World Bank defines Essential medicines as those medicines that satisfy the priority health care needs of the population. They should be available within health systems at all times, in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at an affordable price (WHO 2002).

Availability of medicines is commonly cited as the most important element of quality by health consumers and the absence of medicines is a key factor in assessing the quality of health services (Chuchu, 2002). Different countries have had several setbacks as pertains to the availability of essential medicines and medical supplies. Bruno et al., 2015 states that the concept of essential medicines was introduced by the World Health Organization (WHO) in 1977. They state that one third of the world's population lacks access to needed medicines. This lack of access is even worse among the world's poorest countries in Asia and Africa. In such countries, up to 50% of the total population lacks this access. Although considerable progress has been made since the World Health Organization (WHO) introduced the concept of essential medicines, the benefits have been unequally distributed across the global population (Tettahi, 2008).

About 30% of the world's population lacks access to the essential medicines. In Africa, almost half the population or 15% of the world total lack access (WHO, 2004a). A study conducted by WHO in 2011 found that poor medicine availability, particularly in the public sector, is a key barrier to access to medicines. Public sector availability of generic medicines is less than 60% across WHO regions, ranging from 32% in the Eastern Mediterranean Region to 58% in the European Region. Private sector availability of generic medicines is higher than in the public sector in all regions. However, availability is still less than 60% in the Western Pacific, South-East Asia and Africa Regions (WHO, 2011).

The situation has not been any better since the start of devolution to date. In Kenya a study found that public facilities experienced stock-outs of basic essential medicines for about 46 days annually (Ministry of Medical Services and Ministry of Public Health & Sanitation, 2009). Kimani, (2002) argues that to improve Kenya's health system access to essential medicines is the key to tackling health complications and reducing mortality rates throughout the developed world. In a study conducted in 39 low and low to middle countries including Kenya it was found that there was a wide variation on average availability which was 20% in the public sector and 56% in private sector (WHO, 2010).

According to Orengo, (2012) public health facilities experience an acute shortage of drugs thereby forcing hospitals to use funds meant for development to buy emergency medicines from local pharmacies. For instance in Nakuru county data obtained from a pharmaceutical agency indicated that in 201 provincial, district and sub district hospitals in that county registered an average of 50% for common class medicines while the lower level facilities had an average of 60% of essential medicines in stock (Ministry of health, 2010). A global study conducted on essential medicines showed that the median availability of essential medicines was suboptimal at 61.5% but significantly higher than non-essential medicines at 27.3%. The median availability of essential medicines was 40% in the public sector and 78.1% in the private sector compared to 6.6% and 57.1% for non-essential medicines respectively. A reverse trend between national income level categories and the availability of essential medicines was identified in the public sector. Although EMLs have influenced the provision of medicines and have resulted in higher availability of essential medicines compared to non-essential medicines particularly in the public sector and in low and lower middle income countries. The availability of essential medicines, especially in the public sector does not ensure equitable access (Bazargani et al., 2014).

1.2 Statement of problem

Unavailability of essential medicines in most of Kenya's public health facilities highly increases the country's mortality rate as the facilities serve majority of Kenyans with low incomes and have to depend on subsidized cost of healthcare promised in public facilities. The shortage of these medical supplies in public health facilities diverts patients hoping for cheaper and government-subsidized rates to private facilities where costs are quite high (Magak and Muturi, 2016).

The counties being the managers of the finances meant for public health facilities have not been keen in providing the requisite essential medicines required by the health facilities. Before devolved system of governance public health facilities had autonomy in the management and utilisation of the revenue they generated. Large proportions of the allocations would go towards the procurement of essential medicines. However this scenario has changed after the onset of devolution the revenue generated is collected and managed centrally by the county government. Public health facilities have experienced difficulties in accessing those funds and hence have had to rely on the county government to supply them with the essential medicines as and when they deem fit.

The patient flow has been diminishing since most of the medicines prescribed are not available in those facilities. This has led to patients seeking services from private hospitals and clinics despite the extra cost. In Embu county for instance since 2013 inconsistent and irregular ordering patterns have been followed. The quarterly ordering cycles previously prescribed by the Ministry of health have not been followed and instead adhoc emergencies have been experienced. In 2013/2014 to 2015/2016 financial years (FY's) Embu county have placed six quarterly orders as opposed to complete twelve quarterly orders (Kemsa, 2017). This has hampered adequate availability of the essential medicines in the facilities leaving the patients predisposed. This has led to unreliable, inefficient, ineffective and non affordable provision of health services and in many cases increased mortality rates due to lack of treatment.

1.3 Purpose of the study

The study sought to investigate the factors influencing the availability of essential medicines in public health facilities in embu county.

1.4 Research objective

The objectives of this study were

1. To establish influence of health worker training on availability of essential medicines in public health facilities.
2. To determine influence of health budgetary allocations on availability of essential medicines in public health facilities.

3. To examine influence of supplier stock levels on the availability of essential medicines in public health facilities.
4. To assess influence of disease prevalence patterns on availability of essential medicines in public health facilities.

1.5 Research questions

The study sought to answer the following questions

1. How does health worker training influence availability of essential medicines in public health facilities?
2. To what extent does the health budgetary allocation influence availability of essential medicines in public health facilities?
3. How does supplier stock levels influence availability of essential medicines in public health facilities?
4. To what extent does disease prevalence influence availability of essential medicines in public health facilities?

1.6 Significance of the study

The study sought to establish how the factors: health worker training, health budget allocations, supplier stock levels and disease prevalence could be improved in order to facilitate availability of essential medicines. Training needed for health workers on commodity management identified and forwarded to the respective departments to facilitate planning for training in order to enhance effectiveness and efficiency towards availability of essential medicines. The study assisted in the identification of the strengths and weaknesses of the suppliers who provide the county with essential medicines. Information gathered assisted in building capacity to enhance an interrupted supply chain. The study assisted in understanding the disease patterns and the influence to stock availability of the essential medicines. This assisted in facilitating proper planning that include establishment of buffer stock to aid in quick responses in cases of emergencies. The policy formulators and implementors drew lessons from the study and as result developed mitigating measures that were adopted towards enhancing and improving availability of essential medicines to the public health facilities. This would be geared towards the achievement of the millennium and sustainable development goals.

1.7 Delimitations of the study

The study was conducted in Embu county which has about 94 Public health facilities of different levels of care that is level 5,4,3 and 2 supported by the county government. It is divided into four subcounties namely Manyatta, Runyenjes, Mbeere North and Mbeere south. The health facilities were chosen based on the level of care. The level 5 and 4 facilities are hospitals superintended by medical officers whereas the level 3 and 2 are dispensaries and health centres superintended by clinical officers and nurses. The hospitals offer both inpatient and out patient services whereas dispensaries and health centres offer only outpatient services. From the sample size drawn the health workers incharge of commodities at each facility level participated in the study.

1.8 Limitations of the study

Due to expansiveness and vastness of the county there were challenges in terms of accessibility to some of the facilities. Inappropriate infrastructure in some parts of the county also hampered the data collection. The facilities layout also hampered the collection of information since some of the respondents were not easily reached due to distance and poor infrastructure. Inorder to collect the data efficiently sensitization and distribution of questionnaire for the hard to reach areas was done centrally during the Health facility Incharges monthly meetings conducted at the Subcounty Headquarters.

External factors such as the organisation of the facility, leadership at the facility interfered with the administration of the questionnaire due to fear of exposing the situation in particular health facilities. To counter the stated challenge authorisation from the Embu county Health Department was sought. The participants were informed about the confidentiality of the information obtained from them. Another limitation observed for the study was, not all health workers participated in the study but only those managing essential medicines at their facilities. It was also difficult to reach them due to the ongoing health workers strike. Inorder to be able to collect the data from these personnel prior communication with the facility incharges was done so that on the scheduled day of data collection they were available to fill in the questionnaire. The subcounty health management teams also offered assistance in follow up to ensure that the respective health workers filled and returned the questionnaire.

1.9 Assumptions of the study

This research assumed that the respondents would provide information based on reality and would not be biased of any situation. That the respondents would be honest and accurate in their answers and that they were well informed about the essential medicines requirements and utilization. It was assumed that the sample would act as a representation of the population and that the data collection instruments would be valid and reliable to give the true results of the study.

1.10 Definitions of significant Terms

Availability:- Means readily accessible with ease. It is characterised by a resource that is committable, operable or usable upon demand to perform its required function.

Disease prevalence:- Is a term that indicates the no of diseases in a population at a given time period

Essential medicines :- Those medicines that satisfy the priority health care needs of the population. They are said to satisfy the priority health care needs of a population. They are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness.

Financial year ;- The period between which the government operates usually from 1st July of a current year to 30th June of the next year.

Health worker:- This refers to an individual who has been trained and has acquired skills to manage and ensure safety of health commodities.

Level of care :- Describes the functions for which a particular facility is able to provide services e.g level 2 is the lowest and gives minimal services as compared to level 5 is the highest where chronic illnesses are usually referred for care

Public health facilities;- This are facilities owned by the government usually providing services to the public

Supplier stock level:-This is a term that describes the stocks that a supplier holds in order to facilitate the acquisition of an order.

1.11 Organisation of the study

The study was organized into five chapters.

Chapter one covered the introduction comprising of the background to the study, problem statement, purpose of the study, objectives, research questions and significance of the study. The delimitation, limitations and assumptions of the study were also discussed and the definition of significant terms.

Chapter Two dealt with the review of related literature comprising of the introduction, Concept of essential medicines, healthcare workers training and, health budgetary allocations, supplier stock levels, disease prevalence patterns and their influence on availability of essential medicines. The theoretical and conceptual frameworks as well as the research gaps and a summary of the literature review were also provided.

Chapter Three dealt with the research methodology consisting of the research design, target population, sample size and sampling procedure, methods of data collection, validity and reliability, methods of data analysis, operational definition of variables and ethical considerations.

Chapter Four covers the data analysis, presentation and interpretation. The study closed with Chapter five which presents summary of findings, discussions, conclusions and recommendations. Suggestions for further research have also been presented

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter entails the Concept of Essential Medicines, review of related literature , the study variables healthcare workers training, health budgetary allocations, supplier stock levels, disease prevalence patterns and their influence on availability of essential medicines. The theoretical and conceptual frameworks as well as the research gaps and a summary of the Literature review have also been provided.

2.2 Concept of essential medicines

The World Health Organization defines essential medicines as those that satisfy the priority health care needs of the population and they should therefore be available at all times in adequate amounts and in appropriate dosage forms, at a price the community can afford (WHO, 2002). Essential medicines play an important role in primary health care since they make the health services credible by alleviating symptoms, curing diseases and lowering the mortality rates. Where a population is seeking services that are assured of available and affordable medicines a sense of satisfaction and confidence is created.

Selection of essential medicines is done with due regard to public health relevance, evidence of efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times, in adequate amounts, in appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford. Although the WHO has defined the concept of Essential Medicines List (EML) and regularly publishes the updated lists, implementation of this concept is intended to be flexible and adaptable. The responsibility of determining exactly which medicines are regarded as essential is left to the discretion of the adopting nations based on their requirements. The Model list of the WHO serves as a guide for the development of national and institutional EML. The concept of essential medicines has been accepted worldwide as a powerful tool to promote health equity and its impact is remarkable, as essential medicines are considered to be one of the most cost-effective elements in healthcare (Murray, 2015).

The Millennium Development Goal 8, Target 8.E states that “In cooperation with pharmaceutical companies, provide access to affordable essential medicines in developing countries” (UN, 2003) About 30% of the world’s population, or between 1.3 and 2.1 billion people, are estimated not to have access to the essential medicines. In India, an estimated 499–649 million people (50% to

65% of the population) do not have regular access to essential medicines. In Africa 267 million people (almost half the population or 15% of the world total) also lack access to essential medicines (WHO, 2004a).

In a study conducted in health facilities in Kenya it was found that public health facilities experience stock-outs of basic essential medicines for about 46 days per year. The public sector supply chain was particularly prone to significant interruptions and critical stock outs, extending beyond 30 or even 90 consecutive days (MOMS & MOPHS, 2009). A major factor affecting the quality services is the lack of essential medicines, which is a persistent problem in Kenya. The 2013 SARAM found that non availability of medicines was the most important barrier to quality cited by healthcare consumers, and a key factor in the underuse of public health facilities (MOH, 2013a). The 2012 Health Sector Customer Satisfaction, Employee Satisfaction and Work Environment Survey reported that less than half (47%) of clients were able to obtain all prescribed medicines, with the most common explanations for this being that medicines are “not available” (77%) and cost (22%) (Omondi et al., 2012).

Many factors would be considered to influence the availability of essential medicines in public health facilities. This study sought to focus on the influence of the factors health care workers training, health budgetary allocations, supplier stock levels and disease prevalence patterns to the availability of essential medicines.

2.2 Health worker Training and Availability of essential medicines in public health facilities

Health workers are considered key to providing quality service in public health facilities. Bigdeli et al., (2013) explored access to medicines from a health system perspective, analyzing existing access frameworks. While human resources are one of the building blocks of health systems, they are only mentioned by the World Health Organization (WHO) with reference to prescribing and dispensing of medicines as a core activity of health workers. A health worker training on essential medicines is critical and crucial. It is important that health workers understand how to forecast demand and also be able to prioritize the needs they obtain from their facilities.

According to WHO,(2006) the serious shortage of trained health workers globally has been identified as one of the most critical constraints to achieving health and development goals .The workforce crisis is aggravated by an uneven distribution of the workers within countries and a

generally inadequate level of staffing in rural and remote areas. Health workers are often poorly trained and under-paid, insufficiently supported and equipped, and consequently unmotivated. In addition to the low numbers of health workers providing health care, the quality of services is affected in situations of staff shortage which discourages patients' confidence in the health system. This combination of poor quality of care and limited coverage of health care services inevitably translates into poor health indicators and outcomes (Chen et al., 2004 and Anand et al., 2005).

A report on Global pharmacy work force indicates that the number of pharmacists per 10,000 populations worldwide varies considerably between countries and generally correlates with economic development indicators at country level, ranging from 0.02 in Somalia to 25.07 in Malta. The mean number for all countries is 6.02, while the African region has the most intense pharmacy workforce crisis, with an average of only 0.55 pharmacists per 10,000 population. In 2009, the pharmaceutical human resources report of Tanzania identified a total of 640 pharmacists, 479 pharmacy technicians, and 376 pharmacy assistants with a mean density of pharmacists of only 0.18 per 10,000 population nationally. In addition to a critical shortage of all categories of pharmaceutical workforce, the findings pointed to a skills mix imbalance with a large number of highly qualified staff (pharmacists) relative to the low number of staff with basic training (pharmaceutical technicians and pharmacy assistants). Pharmacists in Tanzania tend to mainly work in urban areas and at higher levels of the health system. Vacancies at lower levels and in more rural regions are most often filled by other cadres without pharmaceutical competencies. This imbalance poses a major challenge to the provision of pharmaceutical services, particularly in rural areas where the majority of the population lives (FIP: Global Pharmacy Workforce report, 2012).

Pharmaceutical care, meant to complement a proper drug supply system, is a key component of a robust health care system and is directly, responsible for the provision of medication-related care designed to achieve definite outcomes that improve a patient's quality of life. Beyond simply dispensing medicine, pharmaceutical care promotes adherence to therapeutic regimens and addresses problems such as over dosage, sub-therapeutic dosage, adverse drug reactions, medication errors, and untreated indications. The shortage of health care workers trained in pharmaceutical care coupled with inadequate access to medications creates multiple disease management challenges in Sub-Saharan Africa (SSA), which has 25% of the world's disease

burden but only 1.3% of the world's health workforce. To prevent and treat HIV/AIDS, TB, malaria, and other diseases, there is an urgent need to train and integrate the contributions of current workers who handle medications for major and minor health problems, especially those in licensed pharmacies and drug shops (King et al.,2010).

In a study conducted in Ethiopia, Malawi and Rwanda to investigate Factors Affecting Availability of Essential Medicines among Community Health Workers(CHWs) it was found that more than 95% of CHWs who manage health products in Malawi and Rwanda had received training in supply chain topics, but only 10% of CHWs in Ethiopia reported being trained. In all three countries, even those CHWs trained in supply chain topics were often unaware of standard operating procedures or did not have them available for reference. In Malawi, 47% of CHWs had standard operating procedures available compared with 4% of CHWs in Ethiopia and Rwanda. The percent of CHWs with standardized stock keeping records such as bin cards or stock cards was low, and reporting forms used by CHWs were often incomplete (Chandani et al.,2012).

A study on Impact of pharmacy worker training and deployment on access to essential medicines and health outcomes conducted in Malawi by Lubinga et al., Showed that lack of trained pharmacy staff at the health center service delivery level to manage medicines and supply chain has become a critical bottleneck in national efforts to improve access to medicines and primary health-care service delivery. The demand for pharmaceutical services, particularly with the advent of the HIV/AIDS epidemic, has increased markedly and points to the need for a comprehensive and sustainable scale up of the pharmaceutical workforce in low-income countries like Malawi. They theorize that addressing human resources constraint would improve medicines management, logistics information flow, and supply chain function at the health facility level, leading to improved medicines availability at public health facilities, access to essential medicines in the community and health outcomes. Although similar programs are already being implemented in Namibia, South Africa, and Tanzania, associated costs and impact on medicines availability at public health facilities have not been reported (Lubenga et al, 2014). An effective medicines supply chain with sufficient numbers of well-trained and motivated human resources is an essential component of a robust health system (MSH, 2012, and USAID Deliver Project, 2013). However, according to the 2011 Malawi Health Sector Strategic Plan (HSSP) (Government of Malawi MOH, 2011),indicated there were only five pharmacists in the country's public health system and only 24% of the established positions for pharmacy technicians were filled.

According to WHO, (2007) functioning pharmaceutical regulatory and supply systems and adequate numbers of qualified pharmaceutical personnel are required in order to ensure that medicines are made available to the population,. The expected roles of pharmaceutical staff at service delivery level including ensuring uninterrupted supply of quality medicines, adequate management and responsible use of these medicines. In a context of staff shortage, the question arises whether the supply of medicines can only be managed effectively by pharmaceutical staff. Lack of adequate pharmaceutical care staff has led to task shifting in order to mitigate the impact of health worker shortfalls and as an opportunity for countries to build equitable and sustainable health systems. Task shifting as defined by WHO refers to the rational redistribution of tasks among health workforce teams, with specific tasks moved from highly qualified health workers to health workers with shorter training and fewer qualifications in order to make efficient use of the available human resources (WHO, 2008). Task shifting has been proposed as a potential solution to increase the number of health workers in Malawi (Palmer, 2006). In their review of task-shifting studies, Mdege et al., 2013 found that task shifting would be an effective and cost-effective approach to expanding access to antiretroviral therapy where the health workforce is limited.

Babigumira et al., (2009) also reckons that task shifting may lead to cost and physician personnel savings in ART follow-up in Uganda and could contribute to mitigating health worker crises. In the absence of qualified personnel, logistics and supply chain functions in pharmacies at health centers are performed by clinical health workers such as medical assistants and nursing aides. There has been a distinct disadvantage of diverting cadres from their core duty of direct patient care (King, 2010). Sometimes, pharmacy work is delegated to untrained hospital attendants or lay community members; this can lead to adverse consequences for patients along with systems inefficiencies (Palmer, 2006).

Most of the studies reviewed indicated that lack of trained health workers on commodity supply chain management is a challenge towards the acute shortage of essential medicines in public health facilities. This is mainly due to non-incorporation of the supply chain commodity management curriculum for all health care workers during their professional careers.

2.3 Health budgetary allocations and availability of essential medicines in public health facilities

Insufficient budgets are a major cause of stock outs for essential medicines in many parts of the world. The 2010 estimates of the Department for International Development (DFID) states that annual global spending on health is approximately USD 3 trillion considering that health spending ranges from 5% of GDP in low-income countries to more than 15% in Organization for Economic Cooperation and Development (OECD) countries implying that the resources spent in the health sectors globally and at country level offer lucrative opportunities for abuse and illicit gain (Magak & Muturi, 2016).

The world health organization states that besides factors such as Rational selection of medicines, affordable prices, reliable health and supply systems, sustainable financing is a key factor that affects the access of essential medicines (WHO, 2004). In India one of the vital components of the health care is medicine, as they account for a substantial part of household expenditure. The overall budget of medicines varies widely in different states in India. The expenditure pattern on medicines of the State Government shows that there are wide-ranging differences across states, from as little as less than 2% in Punjab to as much as 17% in Kerala during 2001-02. The southern states such as Kerala and Tamil Nadu spend over 15% of their health budget on medicines. Many backward states, both in economic and health indicator terms, incurred the lowest expenditure on medicines. States such as Assam, Bihar, U.P., and Orissa spent about 5% or less of their health budget on medicines and medicines. The Central Government's share of medicines in its total health budget is around 12%. In all, roughly 10% of the health budget goes into procuring medicines in India. Even then, availability of medicines often is a big issue. The non-availability of required medicines jeopardizes the credibility of the public health system. Access to essential medicines is closely linked to health system performance and its utilization. The non-availability of essential medicines in the health facilities is not the only issue; there are problems of affordability and accessibility despite spending a large proportion of resources on medicines (Sakthivel, 2005).

China's 13th Five-Year Plan (2016–2020), has put focus on ensuring the improvement of the EM policies. The government is considering establishing the independent financing system for EMs at the same time. However, there is no perfect financing mechanism and updated data of

estimated cost of EMs in China since 2007(Chinese Medical Journal, 2014)In developing countries private expenditures on the purchase of medicines constitute up to 70-90 per cent of total pharmaceutical expenditures as compared to an average of about 40 per cent for the group of OECD countries (WHO, 1997 and OECD, 2000). Much of the problem of access to essential drugs lies in the inadequate purchasing power of most people in low-income countries. At the low level of purchasing power, it is clear that essential medicines will have to be distributed at very low cost for the majority of the world's population. Annual per capita cost estimates of US\$1 or US\$1.60 for the provision of essential drugs sufficient to treat 85 per cent of illnesses in Africa do not appear to have considered the cost of the more expensive drugs required for treating the HIV/AIDS pandemic. Notwithstanding differential pricing by pharmaceutical companies in poorer countries, additional financial assistance would seem necessary if basic needs are to be met. It is not clear how much can be raised domestically, especially by highly indebted nations (World bank, 1993).

To realize the right to health, countries are required to ensure availability, nondiscrimination physical, economic, and informational accessibility, cultural and ethical acceptability, and quality of health care In general, health services, goods, and facilities must be provided with the requisite requirements without any discrimination to guarantee that everyone's right to health is observed Ensuring economic access to health care is an essential element of the right to health. This means, that this fundamental human right cannot be observed in the absence of effective financial protection mechanisms for health care expenditures. This is because the absence of such mechanisms has enormous economic, psychosocial, and medical consequences. For example, out-of-pocket expenditure on health care is known to cause psychological stress on patients and their family. It also aggravates poverty in an already constrained household and leads to severe medical consequences because patients might forgo vital treatment because of unaffordability. Because it consumes the largest portion of households' health-related expenditure, out-of-pocket expenditure on medicines will have the highest effect, especially on poor households. The situation in Ethiopia, the government is in the last phase of implementing a 20-year Health Sector Development Program since 1996-1997 with the objective of improving the country's health status. So far, remarkable progress has been made, especially in the area of increasing the number of health care facilities and decentralization of the health system. However, the progress made in the health care financing system is a little slow. The Ethiopian health care system still suffers from limited availability of health resources, overreliance on out-

of pocket payments, and inefficient and inequitable use of resources, which limit universal coverage of health care.

In many high income countries, over 70% of pharmaceuticals are publicly funded whereas in low and middle income countries (LMIC) public medicine expenditure does not cover the basic needs of the majority of the population. In these countries 50-90% of the medicines are paid for by patients themselves (WHO 2004b). Kenya is classified as a middle income country by the World Bank. Health care in Kenya is relatively costly, as a result of the widespread user fees at government health facilities together with other out-of-pocket payments at NGO and other private health facilities (Xu 3 et al., 2006). Households are the largest contributors of health funds (35.9%) followed by donors (31%), and then the government (29.3%) (Luoma et al., 2010).

The total government health expenditure as a percent of total government expenditures has continued to decline, from a high of 8.6 percent in 2001/02 to 4.6 percent in 2009/10 (MOMS & MOPHS 2011) Currently, the public health system in Kenya relies on four main sources of financing: General government revenues (taxes), donor funds, user fees and the National Hospital Insurance Fund (NHIF), a government-sponsored health insurance scheme. Government expenditure on pharmaceuticals represents 9.03 % of the total expenditure on pharmaceuticals in the Kenya (MOMS, 2010). Before the devolution of health services, the government procured medicines through Kenya Medical Supplies Agency. KEMSA's 2010/2011 Government budget (not counting donor contributions) for the procurement of essential medicines for public hospitals was US\$ 19.8 million; Out of 343 items on the Essential Drug List (EDL), KEMSA procured only about 117 selected items, based on available funds. Many EDL medicines could not be purchased because of budgetary constraints (UNIDO, 2010).

In order for the facilities to benefit from the Government procured drugs the Ministry of Health allocated hospitals with yearly drawing rights depending on various factors including workload, and the poverty index of the area. Hospitals ordered from KEMSA on quarterly basis using standard order forms. The total value of the order would not surpass the quarterly drawing rights for the hospital. The order forms contained a limited number of essential medicines and supply of orders was characterized by a low fill rate (The World Bank, 2009)

2.4 Supplier stock levels and availability of essential medicines in public health facilities

According to Gateman & Smith, (2011) and Chabner, (2011) Essential medicines shortages, among them generic injectable chemotherapy agents, are causing increasing concern in the United States of America (USA).The problem is far wider, affecting other classes of medicines including injectable anaesthetic agents, such as Propofol, intravenous nutrition and electrolyte products, enzyme replacement products and radiopharmaceuticals (Jensen and Rappaport, 2010, Mintallo,2011 and Sterlinbrook,2009) Quilty et al.,(2011) and Eggentson,(2011) noted that medicine shortages have also been noted in Australia and Canada. A recent commentary in a Belgian pharmacy journal claims that the problem is global– “from Afghanistan to Zimbabwe” listing 21 countries affected by a variety of supply problems. A shortage of the injectable antibiotic streptomycin was reported in 15 countries in 2010, with 11 more countries predicting their stocks would run out before they could be replenished.

From a global perspective, other markets may be particularly “fragile”, failing to meet demands for suitable products, such as paediatric dosage forms for HIV/AIDS and tuberculosis (Waning et al., 2010).A Lancet study conducted in 2010 showed that there is a wide range of causes for medicine supply shortages, some of which could be dealt with by government agencies. However, no medicines’ regulatory agency can mandate that a manufacturer produce a specific product. Manufacturing quality problems have been implicated in shortages of products produced by a limited number of suppliers, such as Propofol, an overall, 43% of 127 shortages investigated by the United States Food and Drug Administration were attributed to manufacturing quality problems.

An Increased global demand, consolidation of generic production at a few sites, and changes in regulatory standards requiring upgrading of manufacturing plants have been cited as possible reasons for shortages of injectable generic medicines in the USA (Chabner, 2011).In Kenya the situation is not different as the demand for essential medicines is not well documented and this has resulted to erratic supplies by suppliers. A study conducted by IMS Institute for Healthcare Informatics showed that two-thirds of the products with supply problems only had three or fewer suppliers(IMS Institute for Healthcare Informatics; 2011).In Kenya the situation is not different and especially for the County level of Government whereby acquisition of medicines should be

from two major suppliers KEMSA and MEDS. Justification of sourcing commodities from other suppliers must be approved especially upon issuance of stocks out report by the key suppliers.

In Kenya there are two major institutions mandated to provide essential medicines that is Kenya Medical Supplies Authority (KEMSA) and Mission for essential drugs (MEDS). KEMSA is a government parastatal mandated to provide the essential medicines to all public health facilities, institutions, NGOs and Faith Based Organisations (FBOs). MEDS on the other hand provides drugs to FBOs and also public health facilities. Before the devolution of health services, the government procured medicines through Kenya Medical Supplies Agency (KEMSA). Hospitals ordered from KEMSA on quarterly basis. The standard order forms contained a limited number of essential medicines and supply of orders was characterized by a low fill rate (World Bank, 2009). Due to a huge no of health facilities in Kenya sufficient and adequate supply of medicines required has not been fulfilled. The demand thereof in Kenya exceeds the supply due to factors such stringent procurement guidelines set by the Public Procurement and Oversight Authority (PPOA), regulatory functions on procurement by the Pharmacy and Poisons Board (PPB). Suppliers therefore must ensure to comply with the two stated bodies in order to provide drugs with minima interruptions. Noncompliance with the two regulator institutions makes the suppliers have inadequate stock to sell to the public health facilities. Inconsistent demands by health facilities are also a key factor that influences supplier stock levels.

According to Bateman and Chris, (2013) The National Health Department has been urgently trying to source and install a countrywide computer software system that will link healthcare facilities with drug depots and suppliers in order to relieve ongoing essential drugs stock-outs which threaten the lives of thousands of patients. The issue has become a national crisis, affecting districts in 8 of the 9 provinces. Reviewed literature indicated that there many factors that affect optimal levels for suppliers to have certain essential medicines. This study sought to explore on the factors that hinder optimal supplier stock levels resulting to unavailability of essential medicines.

2.5 Disease prevalence patterns and availability of essential medicines in public health facilities

This refers to the proportion of individuals in a population having a disease or characteristic. Prevalence is a statistical concept referring to the number of cases of a disease that are present in

a particular population at a given time. Prevalence is a measure of disease that allows us to determine a person's likelihood of having a disease. Therefore, the number of prevalent cases is the total number of cases of disease existing in a population. A prevalence rate is the total number of cases of a disease existing in a population divided by the total population (Le & Boen, 1995). There are too many types of prevalence rates that is Point prevalence which refers to the prevalence measured at a particular point in time. It is the proportion of persons with a particular disease or attribute on a particular date and Period prevalence refers to prevalence measured over an interval of time. It is the proportion of persons with a particular disease or attribute at any time during the interval (Hotchkiss *et al.*, 2011).

Information on disease prevalence rates is not well known and thus a negative influence in terms of medicines demand forecast and quantification is not well captured. As a result there is rampant increase on mortality rates amongst other factors due to insufficient treatment due to lack of essential medicines for the same. In many parts of the world prevalence rates of diseases is not well known and this would hamper the planning on prevention and treatment. As a major public health problem, Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of morbidity and mortality in the United States, with direct and indirect medical costs up to \$24 billion in 1993(Sullivan *et al.*, 2000).In China, respiratory diseases (of which COPD is a major component) are the third leading cause of death in rural areas and the fourth leading cause of death in urban areas, accounting for 1 million deaths and over 5 million disabilities each year. According to an estimation by the World Health Organization (WHO), COPD ranks first among the burdens of diseases in China and is predicted to rank as the fifth burden of diseases in the world by 2020 (Lopez and Murray, 1998).

According to surveys conducted by Halbert *et al.* ,(2003) yielded varied global prevalence of COPD ranging from 0.23 to 18.3% because of disagreements on diagnostic criteria and epidemiologic study designs In China, a previous study reported the prevalence of COPD in the northern and the central rural regions of China (Liaoning, Beijing, and Hubei province) to be 3% for individuals 15 years of age or older, in which only subjects with respiratory symptoms or smoking habits were recruited to receive lung function testing. Another study estimated that the prevalence of COPD was 5.9% in adults 35 years of age or older in Nanjing, China, based on self-reported physician diagnosis rather than spirometry. Thus, asymptomatic or never-smoking patients with COPD could have been overlooked, resulting in underestimation of the prevalence of this disease (Xu *et al.*, 2005 and Ran *et al.*, 2006).

2.6 Theoretical framework

The concept of essential medicines in 1977 as drawn from the world health organization indicates that Essential medicines are those that satisfy the priority health care needs of the population. Their selection is in regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford. The availability of essential medicines focuses on enhancing human life through satisfaction of the basic level of need where health is one of them.

According to Maslow Theory of human needs, (1943) human needs are classified in different levels namely physiological, safety, love and belonging, esteem self-actualization and self-transcendence. Health is classified under the physiological need and it is paramount that treatment is given in order to sustain health. It is a physical requirement for human survival. If not met, the human body cannot function properly and will ultimately fail. Physiological needs are thought to be the most important; they should be met first .From the definition of essential medicines by the WHO it is evident that they satisfy the priority health care needs of the population and they should therefore be available at all times in adequate amounts and in appropriate dosage forms, at a price the community can afford (WHO, 2002).

Availability of essential medicines to protect and promote good health to humans creates a sense of satisfaction to both the patient, health workers, suppliers of the medicines and it also controls disease prevalence. Availability of essential medicines is geared by systems, procedures and people. Motivation to ensure that the required medicines are available in public health facilities can be achieved by ensuring rational selection and use of medicines is done by coming up with national essential medicines lists and hospital formulary lists that guide procurement and use of medicines. Mechanisms that make medicines affordable include promoting bulk procurement, implementing generics policies, eliminating duties, tariffs and taxes on essential medicines and encouraging local production of essential medicines of assured quality.

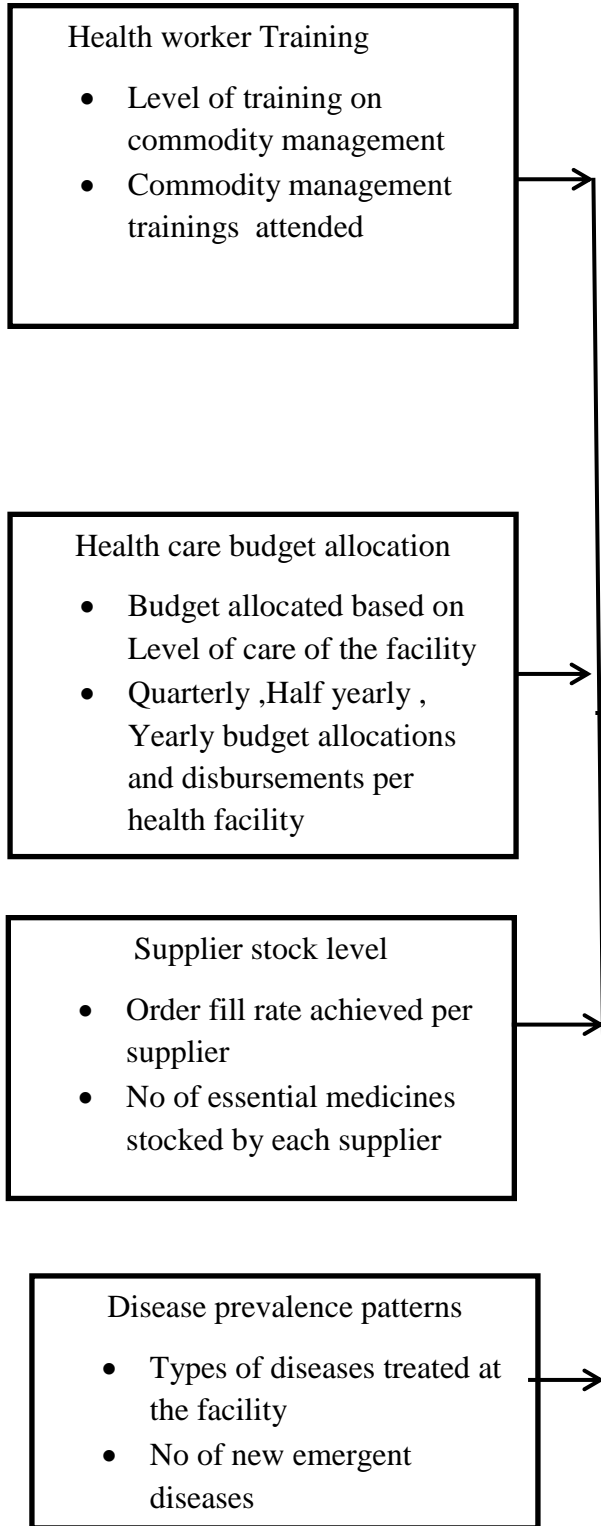
Reliable supply systems that can be realized by public-private-NGO partnerships in supply delivery, proper regulatory control and exploring various purchasing schemes would all enhance

and ensure the physiological need of health is satisfied. Through this, patients' mortality rates are lowered and also health complications are reduced. Where the essential medicines are available the healthcare worker are also motivated to render service as well as ensure they participate in key decision and leadership areas with great emphasis to ensure they obtain the requisite resources and set and adopt remarkable policies that will ensure the essential medicines are available with ease.

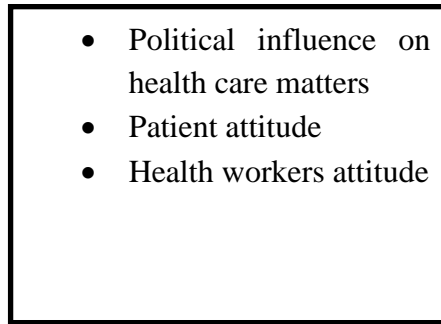
Another theory which is paramount to this study is Joseph Juran's Theory of Total Quality Management. According to Juran quality refers to "fitness for use." He stresses a balance between product features and products free deficiencies. Juran uses the word "product" to refer to the output of any process, and that includes goods as well as services (Juran & Gryna, 1988). Product features in his theory refers to the technological properties the product will give to a customer. In this study the product is essential medicines which must bring a level of satisfaction to the customer in this case the patient. From the World Health Organization definition it is clear that the essential medicines must be able to satisfy the health needs of a given population. It is therefore important to ensure that as the essential medicines are made available to a given population that they first meet the requirements to qualify for fitness for use. In order to ensure essential medicines are available and uninterrupted the Juran trilogy of quality needs to be followed to harness the process of acquisition of essential medicines. The trilogy states that management for quality consists of three interrelated aspects that is quality planning, quality control and quality improvement. (Juran, 1986). Quality planning involves developing a process that will achieve the established goals. This aspect mainly focuses on determining the customer needs and expectations. In this study though much has been done towards identification of the customers' needs fulfillment and enhancement of those needs has not been fully honored. The quality control and improvement aspect are thus being embraced in order to ensure that objectives laid down are fully achieved without waste and instead create a sense of satisfaction. In order to ensure continuous and an interrupted essential medicines supply chain Juran emphasizes on top management support and commitment, continuous education and training and effective communication and team work at all levels. This implies that from the time essential medicines needs and requirements are identified to the time the essential medicines are supplied and the need is fully satisfied all key player involved must be involved and committed towards actualizing that need.

2.7 Conceptual framework

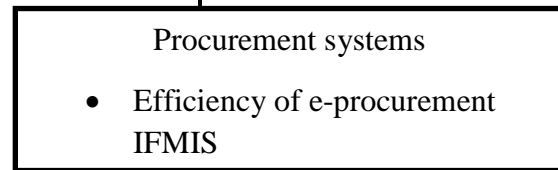
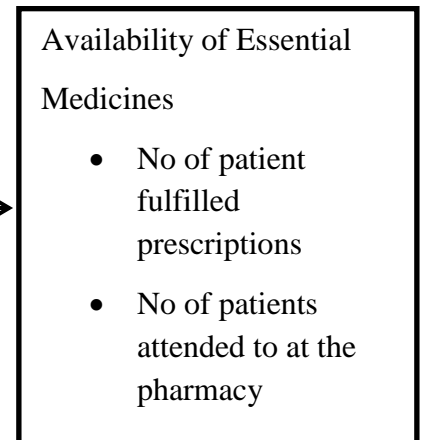
Independent variables



Moderating variables



Dependent variable



Intervening variable

Figure 2. 1: Conceptual framework

The conceptual framework describes the relationship between the independent and dependent variables. The independent variables for this study that includes health worker training, health budget allocation, supplier stock levels and Disease prevalence patterns are perceived to have a direct or indirect influence on the dependent variable availability of essential medicines. The independent variable is said to be the cause variable and is hence seen to influence the outcome of another that is the dependent variable. The outcome of availability of essential medicines is solely dependent on the effect of the independent variables.

2.8 Research Gap

Table 2. 1 Research gap

VARIABLE	INDICATORS	AUTHOR (YEAR)	TITLE OF STUDY	FINDINGS	KNOWLEDGE GAP
Healthcare worker training	Level of training on commodity management; Commodity management trainings attended	Lubinga et al., 2014	Impact of pharmacy worker training and deployment on access to essential medicines and health outcomes conducted in Malawi	The author reckons Lack of trained pharmacy staff at the health center service delivery level to manage medicines and supply chain has become a critical bottleneck in national efforts to improve access to medicines and primary health-care service delivery.	Although the authors indicate training as a bottleneck towards access to medicines in health facilities the level of training on commodity management and the no of trainings on commodity management trainings attended that assist the health worker to efficiently manage medicines has not been addressed. This study seeks to fill that gap.

VARIABLE	INDICATORS	AUTHOR (YEAR)	TITLE OF STUDY	FINDINGS	KNOWLEDGE GAP
Health budgetary allocation	Budget allocated based on Level of care of the facility; Quarterly, Half-yearly, Yearly Budget allocations per health facility; Quarterly, Half yearly, Yearly budget disbursements to respective health facility	Sikika, (2014)	The government needs to increase the budget allocation for essential Medicines, medical supplies and Equipment to prevent stock outs	The author acknowledges that low and erratic budgets have greatly caused the stocked out of essential medicines and medical supplies.	Although the author acknowledges low and erratic budgets as contributing factors to unavailability of essential medicines. The aspect of budget allocations based on the level of care, allocations of budgets per health facility and disbursements of the allocated facilities per facility have not been addressed. This study seeks to fill that gap.
Supplier stock levels	Order fill rate achieved per supplier; No of essential medicines stocked by each supplier	Bateman and Chris ,(2013)	Drug stock-outs: Inept supply-chain management and corruption.	The findings indicate that inadequate stock levels by suppliers is as a result of poor infrastructure and linkages between facilities and suppliers.	Apart from poor infrastructure and poor linkages between suppliers and facilities the order fill rate per supplier and the no of essential medicines stocked by each supplier has not been addressed. This study seeks to fill the gap.
Disease prevalence pattern	Types of diseases treated at the facility; No of new emergent	Sullivan <i>et al.</i> , (2000)	The Economic Burden of Chronic Obstructive Pulmonary Disease	The study findings indicate a rampant increase on mortality rates by diseases due to insufficient treatment due to lack of essential medicines	Although the author acknowledged the rampant increased mortality rates due to insufficient treatment This study seek to fill the gap by gathering information on the type of diseases treated at each facility level and the no of new emergent diseases which in previous studies have not been captured.

2.9 Summary of Literature review

The chapter has covered the concept of essential medicines globally and in Kenya. Literature on studies conducted in the world and Kenya on the study variable health worker training, health budget allocation, Supplier stock levels and Disease prevalence patterns in relation to availability of essential medicines in public health facilities has been reviewed. Maslow theory of hierarchy of needs and Juran Theory of Total Quality Management have been used as anchor to this study. The relationship of the study variables has been drawn through a conceptual framework and study indicators also identified and stated. From the reviewed literature it is cognizant that a knowledge gap has been identified with respect to the study variables. By conducting this study and employing the stated ethical considerations it is assumed that the existing gap could be bridged.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design, target population, sample size and sampling procedure, methods of data collection, validity and reliability of data collection instruments, methods of data analysis, operational definition of variables and ethical considerations used in the research study.

3.2 Research design

The study used descriptive research survey design. This design is a scheme outlined plan that would generate answers to the research problems (Orodho, 2003). This study tried to discover answers to the questions who, what, where, and sometimes how the study variables influence each other. Since certain factors were known to the researcher as causing the problem there was need for the subjects to describe these factors in order to develop frequency of responses to each of those factors (Mugenda and Mugenda 2003). Descriptive survey design involved collecting data through a questionnaire from a sampled population in order to determine the current status of that population with respect to the study variables. This study sought to use descriptive research design since it dealt with clearly defined problems with definite objectives (Kombo & Tromp, 2006).

3.3 Target population

Mugenda and Mugenda, (2003) describes a population as a complete set of individuals, cases or objects with some common observable characteristics while the target population refers to that population to which a researcher wants to generalize the results of the study. The target population for the study comprised of healthcare workers in 94 public health facilities in the county government of Embu.

Table 3. 1 Target population

Facility Level	No of facilities	Target population As a percentage of No of facilities	Target Healthcare Workers Per facility
5	1	1	1
4	4	4	4
3	15	16	15
2	74	79	74
TOTALS	94	100	94

Source Embu County health records (2017)

3.4 Sample size and sampling procedure

According to Benard, (2002) sampling is the part of statistical practice which is concerned with the selection of an unbiased or random subset of individual observations within a population of individuals intended to yield some knowledge about the population of interest, especially for the purpose of making fair generalization of results back to the population from which they were chosen.

Thompson, (2012) also refers to sampling as a procedure that consists of selecting some part of a population to observe so that one may estimate something about the whole population .Gay (2003) suggested that 10% of the accessible population is adequate to serve as a study sample. From the population of 94 Public health facilities in Embu county, the study covered a sample of 52%.The study used stratified sampling and census methods as sampling techniques. The population was divided into three strata namely hospitals, health centres and dispensaries. Since the hospitals and health centres were less than thirty census technique was employed and they were all considered for the study. The no of dispensaries being more than thirty were sampled after obtaining the strata by subtracting the total no of the hospitals and health centres from the sample size obtained using Yamane’s formula.

3.4.1 Sample size

The sample size was drawn from a target population of 94 healthcare workers. Yamane's formula was used to calculate the sample size. The sampled population consisted of 49 health workers. The sample was spread across the different levels of care consisting of five hospitals, fifteen health centres and twenty nine Dispensaries.

The study adopted the Yamane's formula to identify the sample size from the target population (Yamane, 1967) as below;

$$n = \frac{N}{1+N(e)^2}$$

Where;-

N- Target population

n- Sample size

e- Maximum acceptable margin of error (10%)

Therefore sample population is

$$n = 94/1+94(0.10)^2$$

$$=48.45$$

$$=49$$

Table 3. 2 Sample Size

Facility type	Sample of health workers
Hospitals	5
Health centres	14
Dispensaries	30
TOTALS	49

3.4.2 Sampling procedure

Since the facilities were grouped based on the level of care stratified sampling procedure was used. The study used this procedure as the population comprised a number of distinct categories; the frame was organized by these categories into separate strata of hospital, health centre and dispensary. Each strata was then sampled as an independent sub population, out of which individual elements were randomly selected (Kothari, 2000). The strata for this study was the three different levels of public health facilities. A single participant was drawn from the sampled no of health facilities. This implied that five participants represented the hospital category, fourteen participants represented the Health centre category and thirty participants represented the dispensary category.

3.5 Methods of Data collection

The research study used the questionnaire method to collect data from five health workers working at the hospitals managing essential medicines, fourteen health workers working at the health centre managing essential medicines and thirty health workers managing essential medicines at the dispensary level. A questionnaire consisting of a number of questions typed and printed in a definite order on a form or set of forms (Kothari, 2004). A structured questionnaire containing both open and closed ended questions divided into five major sections was administered to the health workers in the respective sampled facilities to collect data. The first section gathered demographic data and the other four sections collected data on health worker training, health budgetary allocation, supplier stock level and disease prevalence patterns. Structured and unstructured form of questions were used as they allowed easier administration of the questionnaire and analysis of the data (Mugenda and Mugenda, 2003).

The questionnaire method was a good data collection instrument for the study since it allowed intensity and richness of individual perceptions in responses as the respondents were given time to answer the questions (Polit and Beck, 2003). The questionnaire was distributed to the sampled health workers in the different levels of health facilities. The study also use questionnaire method due to its flexibility and ease to facilitate the in-depth capturing of knowledge to probe further clarification of issues (Patton, 2002)

3.5.1 Pilot testing of the instrument

Mugenda and Mugenda, (2003) states that once a Questionnaire has been finalized it should be tried in the field to a selected sample which is similar to the actual sample which the researcher plans to use in the study. The questionnaire was pretested prior its actual use in data collection. The questionnaire was administered to five health workers managing essential medicines in different levels of public health facilities in Tharaka Nithi County. A pretest sample of between 1% and 10% is encouraged depending on the sample size. In this study a pretest sample of 10% was used. Five health workers had the study questionnaire administered to them.

$$\begin{aligned}\text{Pretest sample size} &= 10\% \text{ of Sample to be studied} \\ &= 0.10 * 49 \\ &= 4.9\end{aligned}$$

Approximately five health workers working in five health facilities were used as the pretest sample.

The health workers were allowed to answer the questions as they made comments and suggestions on the questionnaire. The responses and feedback obtained were used to improve the questionnaire and certain changes on the questions were made depending on the outcome of the piloting.

3.5.2 Validity of the instrument

According to Kothari, (2004) validity refers to utility and indicates the degree to which an instrument measures what it is supposed to measure. Mugenda and Mugenda, (2003) further asserted that validity is the accuracy and meaningfulness of inferences, based on the research results. Validity of the instrument was assured through pilot testing and consultation between the researcher and the University supervisor. The structuring of the questions also ensured the questionnaire remained focused, accurate and consistent. This research study sought to employ content validity done through structuring of questions in consultation with the University supervisor and external validity done during pilot testing to ascertain the validity of the data collection in use for this study.

3.5.3 Reliability of the instrument

Mugenda and Mugenda, (2003) defines reliability as a measure of the degree a research instrument yields consistent results after repeated trials. In this study, the reliability of the research instrument was improved through the use of Split half procedure where the researcher administered the entire instrument to a sample of respondents during the piloting.

The items in the questionnaire were divided into even and odd numbered items and administered to the pilot group. The scores from the two groups of items were correlated using Spearman-Brown prophecy formula.

$$\text{Reliability of scores on total test} = \frac{2 + \text{reliability for } \frac{1}{2} \text{ test}}{1 + \text{reliability for } \frac{1}{2} \text{ tests}}$$

Data with a high Split-half reliability would have a high correlation coefficient. According to Fraenkel and Wallen (2000), if the results produce a reliability coefficient of 0.7 the instrument was considered reliable. The questionnaire had a reliability coefficient 0.72 and was therefore reliable.

3.6 Data collection procedure

An initial visit to the Director Medical Services Embu County to seek an approval to conduct a research in public health facilities in the County was done. A clearance letter was issued by Director Medical Services for the respective respondents in the sampled health facilities. Communication to the health facilities was done through their respective sub county Pharmacists on the days the questionnaire would be distributed. Data was collected from the respondents through a questionnaire which was distributed previously for filling and collected at the agreed date.

3.7 Data analysis technique

The questionnaire were collected and checked for completeness and compilation to eliminate duplication of information and vague responses which would interfere with the outcome of computer analysis. Data coding was done where the variables were noted in form of symbols or numeric characters to reduce the amount of data entry required.

The data was then tabulated into frequency and cumulative tables in preparation for computer manipulation. The quantitative data was analyzed using statistical Package for Social Sciences software while the qualitative data was organized into themes according to the study objectives. Percentages and frequency distribution tables were used to draw inferences between the dependent and independent variables for data presentation. The level of significance was 5%.

The Chi square test was used in establishing relationships between categorical variables (Mugenda and Mugenda, 2003). In this study Chi Square test was used to determine whether there was a significant relationship between health worker training, health budget allocation, supplier stock level, disease prevalence pattern and availability of essential medicine. The study variables were also subjected to multicollinearity test to check the level of predict the target variable.

3.8 Operational definition of variables

Table 3. 3 Operationalization of variables

Objective	Independent variable	Indicators	Measurement scale	Type of data analysis	Dependent variable
Establish influence of healthcare workers training on availability of essential medicines in public health facilities	Healthcare worker training	Level of training on commodity management Commodity management trainings attended	Ordinal	Descriptive survey	Availability of essential medicines in public health facilities
Determine influence of health budgetary allocations on availability of essential medicines in public health facilities	Health budgetary allocation	Budget allocated based on Level of care of the facility Quarterly, Half-yearly, Yearly Budget allocations and disbursements per health facility	Ordinal	Descriptive survey	Availability of essential medicines in public health facilities
Examine influence of supplier stock levels on the availability of essential medicines in public health facilities.	Supplier stock levels	Order fill rate achieved per supplier No of essential medicines stocked by each supplier	Ordinal	Descriptive survey	Availability of essential medicines in public health facilities

Objective	Independent variable	Indicators	Measurement scale	Type of data analysis	Dependent variable
Assess influence of disease prevalence patterns on availability of essential medicines in public health facilities	Disease prevalence pattern	Types of diseases treated at the facility No of new emergent diseases	Ordinal	Descriptive survey	Availability of essential medicines in public health facilities

3.9 Ethical considerations

The identity of the respondents was held with high level of confidentiality and the information gathered was only used for academic purposes. Autonomy to the respondents was also observed. Prior revelation of any information about the research consent was sought from the respondents. A permit to conduct the research was also obtained from NACOSTI and the department of health Embu County.

Upon completion of the research, findings were shared with the respondents in accordance with their expectations. In cases where the findings could contain sensitive information then modalities of releasing that information would need to be sought.

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter entails data analysis, presentation, interpretation and discussion of the findings according to the data collected using the questionnaire with reference to the specific objectives. This includes demographic statistics, multicollinearity test, health workers training statistics, health budget allocation statistics, disease prevalence patterns statistics, supplier stock levels statistics, moderating factors statistics and chi-square analysis. The objective of the study was to investigate the factors influencing the availability of essential medicines in public health facilities in Embu County.

4.2 Questionnaire return rate

The questionnaire return rate was a 100% as tabulated in table 4.1. Despite the ongoing health workers strike the respondents were persuaded through phone calls to fill the questionnaires and return them in their respective Sub County headquarter. According to Mugenda and Mugenda (2003), a return rate of 50% is adequate for analyzing and reporting in social studies, 60% return rate is good while 70% and over is very good.

Table 4. 1 Questionnaire return rate

Facility type	Sample of health workers	Frequency of questionnaire return rate
Hospitals	5	10.2
Health centres	14	28.6
Dispensaries	30	61.2
Totals	49	100

4.3 Demographic statistics

Demographics are characteristics of a population. Demographics considered in this study included gender, age, academic qualification, occupation and length of stay at work. These factors were arrived at after assessment of the groups of respondents.

4.3.1 Distribution of the Respondents' by gender

The study sought to establish the gender distribution of the 49 respondents who participated in the study. The results are presented in Table 4.2

Table 4. 2 Distribution of the respondents by Gender

Gender	Frequency	Percent	Cumulative Percent
Male	19	38.8	38.8
Female	30	61.2	100.0
Total	49	100.0	

As indicated in the table 4.2 above, there were more females (61.2%) than males (38.8%). Thus there was a higher percentage composition of females than males in the public health facilities in Embu County.

4.3.2 Distribution of the Respondents age

Information on the age category of the respondents was analyzed and is presented in the table 4.3

Table 4. 3 Distribution of the Respondents age

Age	Frequency	Percent	Cumulative Percent
26-35	20	40.8	40.8
36-45	14	28.6	69.4
46 and above	15	30.6	100.0
Total	49	100.0	

As shown in table 4.3 above, the percentage response on age is represented. The highest percentage response on age by the respondents was between 26 and 35 years. This revealed that majority of the health personnel are in the youth category.

4.3.3 Distribution of the respondents by Academic qualifications

The respondents were requested to indicate their academic qualifications. The analyzed results are presented in Table 4.4.

Table 4. 4 Distribution of the respondents by Academic qualifications

Academic qualification	Frequency	Percent	Cumulative Percent
Diploma	25	51.0	51.0
Higher Diploma	9	18.4	69.4
Degree	11	22.4	91.8
Postgraduate	4	8.2	100.0
Total	49	100.0	

As shown in table 4.4 above, majority of the respondents (51.0%) had diploma level of academic qualification while the least (8.2%) had reached postgraduate level. This shows that majority of the health workers in public health facilities had attained diploma academic level of education.

4.3.4 Distribution of respondents Occupation

The study sought to establish the professional occupation of the healthcare personnel in public health facilities in Embu County. The analyzed results are presented in Table 4.5.

Table 4. 5 Distribution of respondents Occupation

Occupation	Frequency	Percent	Cumulative Percent
Pharmacist	5	10.2	10.2
Pharmaceutical technologist	7	14.3	24.5
Nurse	24	49.0	73.5
Clinical officer	13	26.5	100.0
Total	49	100.0	

As indicated in table 4.5 above, majority of the respondents (49.0%) were nurses while minority (10.2%) was pharmacists. This shows that majority of the health personnel in public health facilities are nurses.

4.3.5 Distribution of respondents by Period of work at the healthcare facility

The length of time in a health facility of the respondents was established and the results are presented in Table 4.6.

Table 4. 6 Distribution of respondents by Period of work at the healthcare facilities

	Frequency	Percent	Cumulative Percent
Less than 1 year	6	12.2	12.2
1 to 5 years	22	44.9	57.1
6 to 10 years	13	26.5	83.7
11 to 15 years	8	16.3	100.0
Total	49	100.0	

From table 4.6 above, majority of the respondents (44.9%), had worked at the health facility for 1 to 5 years whereas a minority of the respondents (12.2%) had worked in the health facility for less than one year.

4.4 Multicollinearity test

Multicollinearity was tested to determine whether there was correlation between independent variables. The presence of multicollinearity makes it difficult to isolate the impact of each independent variable on the dependent variable and the standard errors for each independent variable become inflated.

Multicollinearity was measured using the Variance Inflation Factor test and Tolerance Factor test. TF value of less than 0.1 and a VIF value that exceed 10 are often regarded as indicating multicollinearity. A summary of the multicollinearity test is shown in table 4.7.

Table 4. 7 Distribution of Collinearity test

Independent variables	Tolerance	VIF
Health worker training	.064	15.658
Health budgetary allocation	.123	8.134
Supplier stock level	.091	11.031
Disease prevalence patterns	.065	15.382

From table 4.7 above health worker training had the lowest tolerance level of 0.064 while health budgetary allocation had the highest tolerance level of 0.123. The tolerance level for all the

independent variables was less than 0.1 which suggests presence of multicollinearity. Health worker training had the highest VIF of 15.658 while health budgetary allocation had the lowest VIF of 8.134. The VIF for most of the independent variables was more than 10 which suggested presence of multicollinearity among the independent variables.

4.5 Health worker training

The study sought to establish the influence of health workers training on availability of essential medicines in public health facilities. The analysis was based on descriptive statistics. The following shows the results obtained.

4.5.1 Awareness of Essential medicines

The study sought to find out if the respondents had ever heard of the term essential medicines. The responses are as shown in table 4.8.

Table 4. 8 Awareness of Essential Medicines

	Frequency	Percent	Cumulative Percent
Yes	34	69.4	69.4
No	15	30.6	100.0
Total	49	100.0	

From table 4.8 above, 69.4% of the respondents had heard of the term essential medicines while 30.6% heard not heard of the essential medicines. This shows that majority of the respondents had knowledge on essential medicines.

4.5.2 Commodity management training

The study sought to find out if the respondents had ever been trained on commodity management. The responses are presented in the table 4.9.

Table 4. 9 Commodity management training

	Frequency	Percent	Cumulative Percent
Yes	17	34.7	34.7
No	32	65.3	100.0
Total	49	100.0	

As indicated in table 4.9 above, majority of the respondents (65.3%) had not been trained on commodity management as compared to 34.7% who reported to have been trained.

In addition the respondents' response on the year of training and topics covered revealed that the respondents had different years of training and as well covered similar topics in their learning. Amongst the core topics covered included ordering guidelines and storage of drugs.

4.5.3 Level of training on commodity management

The study sought to find out the respondents' level of training on commodity management. The responses are shown in table 4.10

Table 4. 10 Level of training on commodity management

Level of training	Frequency	Percent	Cumulative Percent
Certificate	19	38.8	38.8
Diploma	25	51.0	89.8
Degree	5	10.2	100.0
Total	49	100.0	

As indicated in the table 4.10 above, majority of the respondents (51.0%) had attained diploma level of commodity management training whereas 10.2% had attained a degree level of commodity management training.

4.5.4 No of times one has attended short commodity management course trainings

The study sought to establish the frequency with which one had attended short management course trainings. The table 4.11 below shows the respondents' response.

Table 4. 11 Frequency on short commodity management course trainings

Short commodity Management training			
	Frequency	Percent	Cumulative Percent
1 – 3	38	77.6	77.6
4 – 6	11	22.4	100.0
Total	49	100.0	

From table 4.11 above, majority of the respondents (77.6%), had a higher percentage on frequency of short commodity management course training at 1 – 3 years whereas a minority of the respondents (22.4%) had a lesser frequency on training of short commodity management courses.

4.5.5 Frequency of training on commodity management

The study sought to find out how many times the respondents should attend short courses on commodity management. The responses are presented in the table 4.12.

Table 4. 12 Frequency of training on commodity management

Frequency of training	Cumulative		
On commodity management	Frequency	Percent	Percent
Four times in an year	9	18.4	18.4
Thrice in an year	2	4.1	22.4
Twice in an year	15	30.6	53.1
Once in an year		46.9	100.0
Total	49	100.0	

The responses in table 4.12 shows that majority of the respondents (46.9%) said that the short commodity training should be done once in a year while minority (4.1%) said that the short courses training should be done three times in a year.

4.5.6 Relevance of short commodity management training

The researcher sought to find out the degree of relevance of the short courses training by the public health personnel. The responses are tabulated in table 4.13

Table 4. 13 Relevance of short commodity management training

Relevance of short commodity	Cumulative		
Management training	Frequency	Percent	Percent
Not relevant	1	2.0	2.0
Somehow relevant	14	28.6	30.6
Relevant	6	12.2	42.9
Very relevant	28	57.1	100.0
Total	49	100.0	

As indicated from the table 4.13 above, majority of the respondents (57.1%) said that the short courses training was very relevant whereas 2.0% of the respondents felt that the short courses training on commodity management were not relevant. In addition the respondents said that financial management training should be a consideration in future trainings.

4.6 Health budgetary allocation

The study sought to establish the response by health workers on health budgetary allocation towards the availability of essential medicines in public health facilities.

4.6.1 Level of care of the facility

The study sought to find out the level of care of the facility for the respondents. The responses are as presented in the table 4.14

Table 4. 14 Level of care of facility

Level of care of Facility	Frequency	Percent	Cumulative Percent	Mean	Std. Deviation
Level 2	30	61.2	61.2		
Level 3	14	28.6	89.8		
Level 4	4	8.2	98.0		
Level 5	1	2.0	100.0	1.5510	.84314
Total	49	100.0			

As indicated in the table above 4.14 majority of the respondents (61.2%) were from level 2(dispensaries) healthcare facilities while a combined percentage of 10.2% fell between level 4 and 5(Hospitals). In addition, the mean response on level of facility was 1.5510 and standard deviation of 0.84314. The standard deviation is a measure of the spread of scores within the set of data. The researcher was interested in the standard deviation of level of care population since it measures spread or dispersion around the mean of a data set. The standard deviations formed a key informant in calculating the margin of error.

4.6.2 Budget allocation for essential medicines for the health facility

The researcher sought to find out the response on budgetary allocation for essential medicines for the sampled healthcare facilities. The results are presented in the table 4.15

Table 4. 15 Budget allocation for essential medicines for the health facility

Budget allocation	Frequency	Percent	Cumulative	Std.	
			Percent	Mean	deviation
Less than 100,000	2	4.1	4.1		
101,000 - 300,000	33	67.3	71.4		
301,000 - 500,000	3	6.1	77.6		
Over 500,000	11	22.4	100	2.4694	.89214
Total	49	100.0			

The mean budget allocation for essential medicines in a facility is 2.4694 while the Std. deviation is 0.89214. In addition, majority of the respondents (67.3%) said that the budgetary allocation for essential medicines in their health facilities was in the range of kshs. 101,000 – 300, 000 whereas minority (4.1) of the facilities had budgets less than 100,000.

4.6.3 Frequency of receiving the budgetary allocation

The study sought to find out how often the health facilities received their budgetary allocation.

The responses are as shown in table 4.16

Table 4. 16 Frequency of budgetary allocation

Budget allocation	Frequency	Percent	Cumulative	Std.	
			Percent	Mean	deviation
Quarterly	22	44.9	44.9		
Half yearly	18	36.7	81.6		
Yearly	7	14.3	95.9		
Never	2	4.1	100.0	1.7755	.84817
Total	49	100.0			

As shown from table 4.16 above, 44.9% of the respondents said that the budgetary allocation was allocated on a quarterly basis. 36.7% said that budgetary allocation was allocated half yearly. In addition 14.3% of the respondents said that the budgetary allocation was allocated yearly while 4.1% said that the budgetary allocation was never done. The mean frequency on budgetary allocation was 1.7755 and the Std. deviation of 0.84817.

4.6.4 Disbursements of budgetary allocations

The study sought to find out if the healthcare facilities' received their budgetary allocations for essential medicines. The responses are as tabulated in the table 4.17

Table 4. 17 Disbursements of budgetary allocations

Disbursement of budgetary Allocation	Frequency	Percent	Cumulative Percent
Yes	32	65.3	65.3
No	17	34.7	100.0
Total	49	100.0	

Majority of the respondents (65.3%) said that healthcare facilities got their budgetary allocations while 34.7% said that they do not get.

65.3% of the respondents were further interviewed to find out how often their facilities got their budgetary allocations. The results are as presented in the table 4.18

Table 4. 18 Budgetary allocation disbursements period

Budgetary allocation disbursement period	Frequency	Percent	Cumulative Percent
Quarterly	9	28.1	28.1
Half yearly	19	59.4	87.5
Yearly	4	12.5	100.0
Total	32	100.0	

As indicated, majority of the respondents (59.4%) said that the budgetary allocation disbursements are done half yearly while 12.5% said the disbursements are done on an yearly basis.

In addition the respondents suggested various improvements on facilities which included ensuring that orders submitted are considered accordingly, timely budgets by county / national government and training of staff on financial management

4.7 Supplier stock level

The study sought to find out whether supplier stock levels influence availability of essential medicines in public health facilities. The following results and discussions shows how supplier stock levels influence availability of essential medicines in public health facilities.

4.7.1 Supplier of essential medicines

The researcher sought to find out the respondents' response on supplier of essential medicines to healthcare facilities. The responses are presented in the table 4.19

Table 4. 19 Supplier of Essential Medicine

Supplier of essential			
Medicine	Frequency	Percent	Cumulative Percent
Kemsa	19	38.8	38.8
Both Kemsa and Meds	15	30.6	69.4
Meds	11	22.4	91.8
Other	4	8.2	100.0
Total	49	100.0	

As presented in table 4, 19 majority of the respondents (38.8%) said that Kemsa was the main supplier of essential medicines to their healthcare facilities while 30.6% said that both Kemsa and Meds suppliers supply essential medicines to their healthcare facilities. 8.2% said that other suppliers supplied essential medicines to the health facilities and 22.4% of the facilities receive their essential medicines from Meds..

4.7.2 Supplier stocking of Essential Medicines

The study sought to find out whether suppliers stock all the essential medicines consumed at health care facilities. The analysis of the results is presented in the table 4.20.

Table 4. 20 Supplier stocking of Essential Medicines

Supplier stocking			
Of essential medicines	Frequency	Percent	Cumulative Percent
Yes	13	26.5	26.5
No	36	73.5	100.0
Total	49	100.0	

As indicated from the table 4.20 above, it is evident that majority of the respondents (73.5%) said that suppliers do not stock all the essential medicines consumed at health care facilities. In addition some of the reasons given for this failure by suppliers included; failure to order for the drugs, lack of essential moderation each time there is stocking, supply of the essential medicines at suppliers' wish. Those in agreement (26.5%) said that all the essential drugs are well supplied by their suppliers. More so, the limiting factors for failure to stock all the essential medicines included high cost of supply, corruption and monopoly and dominance of Kemsas and Meds. Increasing funds from the government strategy can be employed to counter the limiting factors stated above.

4.7.3 Order fill rate fulfillment by supplier

The analysis of the respondents' response on order fill rate for the essential medicines is shown in the table 4.21

Table 4. 21 Order fill rate fulfillment by supplier

Order fulfillment			
by supplier	Frequency	Percent	Cumulative Percent
< 50	9	18.4	18.4
51 – 60	21	42.9	61.2
61 – 70	3	6.1	67.3
71 – 80	13	26.5	93.9
Above 81	3	6.1	100.0
Total	49	100.0	

From table 4.21 above majority of the respondents (42.9%) said that the percentage of order fill rate fulfilled by suppliers is within the range of 51 – 60 while 6.1% said that the percentage of order fill rate fulfilled is above 81.

4.8 Disease prevalence patterns

The study sought to establish the influence of disease prevalence patterns on availability of essential medicines in public health facilities. The analysis was based on descriptive statistics. The following shows the results obtained.

4.8.1 Type of Diseases treated at the health facility

The study sought to find out the type of diseases different facilities administered services on. The results are presented in the table 4.22.

Table 4. 22 Type of disease treated at the health facility

Type of disease treated			
At the health facility	Frequency	Percent	Cumulative Percent
Non Communicable	11	22.4	22.4
Communicable	14	28.6	51.0
Both Communicable and Non communicable	21	42.9	93.9
Other	3	6.1	100.0
Total		100.0	

From table 4.22 above, 42.9% of the respondents said that communicable and non – communicable diseases were treated at their facilities while 28.6% said only communicable and 22.4% said only non – communicable. 6.1% of the respondents said that other diseases treated at their facilities. The most common disease type from the analysis was communicable diseases.

4.8.2 New diseases emergence

The researcher sought to find out whether there was emergence of new diseases in various facilities in the last one year. The following table 4.23 shows the responses.

Table 4. 23 New diseases emergence

New diseases e			
Mergence	Frequency	Percent	Cumulative Percent
Yes	12	24.5	24.5
No	37	75.5	100.0
Total	49	100.0	

The table 4.23 shows that majority of the respondents (75.5%) said that there were no new emergent diseases in their facilities in the last one year while 24.5% said that there were new cases of emergent diseases in the last one year. Borrowing from table 4.23, the 75.5% of the respondents were further questioned on essential medicines usage in treatment of the new emergent diseases. The results are as tabulated in the table 4.24

Table 4. 24 New diseases emergence and use of essential medicines for their treatment

New			
Diseases emergence	Frequency	Percent	Cumulative Percent
Rarely	16	43.2	43.2
Frequently	21	56.8	100.0
Total	37	100.0	

From table 4.24 56.8% of the respondents said that essential medicines are frequently used for treatment of the new emergent diseases in health facilities whereas 43.2% said essential medicines are rarely used for the treatment of new emergent diseases.

4.8.3 Extent of agreement on essential medicines exhaustion by new emergent diseases

The study sought to find out the respondents extent of agreement that new emergent diseases exhaust the available essential medicines stocked in health facilities. The analyzed results are presented in Table 4.25.

Table 4. 25 Extent of agreement on essential medicines exhaustion by new emergent diseases

Extent of agreement	Frequency	Percent	Cumulative Percent
Disagree	13	26.5	26.5
Somehow agree	7	14.3	40.8
Agree	18	36.7	77.6
Strongly agree	11	22.4	100.0
Total	49	100.0	

The responses shows that majority of the respondents (36.7%) agree that new emergent diseases exhaust the available essential medicines stocked in health facilities while 14.3% seem not sure if to agree on the essential medicines depletion. In addition the respondents gave out measures to be taken to handle the issue of new emergent diseases. They include; proper disease surveillance, community sensitization and proper research.

4.9 CHI – Square statistics

The Chi Square statistic is commonly used for testing relationships between categorical variables. The null hypothesis of the Chi-Square test is that no relationship exists on the categorical variables in the population as they are independent.

4.9.1 Chi – square test1 Age and Education level

H₀ = There is no relationship between age and education level

H₁ = There is a relationship between age and education level

Table 4. 26 Age category * Academic qualifications Cross tabulation

		Academic qualifications					
		Diplom Higher					
		a	Diploma	Degree	Postgraduate	Total	
Age category	26-35	Count	20	0	0	0	20
		% within Age category	100.0%	0.0%	0.0%	0.0%	100.0%
		% within Academic qualifications	80.0%	0.0%	0.0%	0.0%	40.8%
36-45	Count	5	9	0	0	14	
		% within Age category	35.7%	64.3%	0.0%	0.0%	100.0%
		% within Academic qualifications	20.0%	100.0%	0.0%	0.0%	28.6%
46 and above	Count	0	0	11	4	15	
		% within Age category	0.0%	0.0%	73.3%	26.7%	100.0%
		% within Academic qualifications	0.0%	0.0%	100.0%	100.0%	30.6%
Total	Count	25	9	11	4	49	
		% within Age category	51.0%	18.4%	22.4%	8.2%	100.0%
		% within Academic qualifications	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4. 27 Chi-Square Test1

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.792 ^a	3	.000
Likelihood Ratio	37.884	3	.000
Linear-by-Linear Association	22.376	1	.000
N of Valid Cases	49		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.55.

The p – value = 0.000, which implies that there is a relationship between the age respondent and education level and hence the null hypothesis was rejected..

4.9.2 Chi – square test2 Age and relevance of training

H₀ = There is no relationship between age and respondents response on the relevance of training

H₁ = There is a relationship between age and respondents response on the relevance of training.

Table 4. 28 Age category * Relevance of training Cross tabulation

			Relevance of training				
			Not relevant	Somehow relevant	Relevant	Very relevant	Total
Age category	26-35	Count	1	14	5	0	20
		% within Age category	5.0%	70.0%	25.0%	0.0%	100.0%
		% within Relevance of training	100.0%	100.0%	83.3%	0.0%	40.8%
36-45	Count		0	0	1	13	14
		% within Age category	0.0%	0.0%	7.1%	92.9%	100.0%
		% within Relevance of training	0.0%	0.0%	16.7%	46.4%	28.6%
46 and above	Count		0	0	0	15	15
		% within Age category	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Relevance of training	0.0%	0.0%	0.0%	53.6%	30.6%
Total	Count		1	14	6	28	49
		% within Age category	2.0%	28.6%	12.2%	57.1%	100.0%
		% within Relevance of training	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4. 29 Chi-Square test2

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	45.917 ^a	6	.000
Likelihood Ratio	62.354	6	.000
Linear-by-Linear Association	33.561	1	.000
N of Valid Cases	49		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .29.

The chi square analysis from the table 4.29 above shows that p-value = 0.000, implying that there exists a relationship between age and respondents response on the relevance of training and hence the null hypothesis is rejected.

4.9.3 Chi –square test3 Gender and new emergent diseases

H₀ = There is no relationship between gender and attitude towards new emergent diseases

H₁ = There is a relationship between gender and attitude towards new emergent diseases.

Table 4. 30 Gender * Extent of agreement Cross tabulation

		Extent of agreement				
		Somehow		Strongl		
		Disagree	agree	Agree	y agree	Total
Gender Male	Count	13	6	0	0	19
	% within Gender	68.4%	31.6%	0.0%	0.0%	100.0%
	% within Extent of agreement	100.0%	85.7%	0.0%	0.0%	38.8%
Female	Count	0	1	18	11	30
	% within Gender	0.0%	3.3%	60.0%	36.7%	100.0%
	% within Extent of agreement	0.0%	14.3%	100.0%	100.0%	61.2%
Total	Count	13	7	18	11	49
	% within Gender	26.5%	14.3%	36.7%	22.4%	100.0%
	% within Extent of agreement	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4. 31 Chi-Square Test3

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	45.389 ^a	3	.000
Likelihood Ratio	59.696	3	.000
Linear-by-Linear Association	37.803	1	.000
N of Valid Cases	49		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.71.

As indicated in the table 4.31 above, the value of $p = 0.000$, implying that there exists a relationship between gender and attitude towards new emergent diseases. Therefore the null hypothesis is rejected.

4.10 Moderating factors statistics

The study sought to assess the Political influence, Patient attitude and Health workers attitude on health care matters. The descriptive statistics included frequency, percentage, mean and Std. deviation.

Table 4. 32 Moderating factors' analysis

Responses	Very large extent (%)	Large extent (%)	Moderate extent (%)	Small extent (%)	No extent (%)	Mean	Std. deviation
Political influence on health matters	49.0	24.5	16.3	10.2		1.8776	1.03345
Patient attitude	4.1		20.4	59.2	16.3	3.8367	.85017
Health worker attitude	6.1	10.2	32.7	22.4	28.6	3.5714	1.19024

As shown in the table 4.32 above, the analysis of the moderating factors is presented. Descriptive statistics of the responses were presented in form of percentages. Majority of the respondents (49.0%) to a very large extent agreed that political influence affected healthcare facilities. The respondents agreed that patient's attitude least affected healthcare facilities (59.2%) while 32.7% agreed that health worker attitude moderately affected healthcare facilities. Patient's attitude had the lowest std. deviation of 0.85017 while health worker attitude had the highest Std. deviation of 1.19024.

CHAPTER FIVE:SUMMARY OF FINDINGS , DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of major findings of the study, relevant discussions, conclusions and the necessary recommendations.

5.2 Summary of the study

This study sought to establish influence of health workers training on availability of essential medicines in public health facilities, to determine influence of health budgetary allocations on availability of essential medicines in public health facilities ,to examine influence of supplier stock levels on the availability of essential medicines in public health facilities and to assess influence of disease prevalence patterns on availability of essential medicines in public health facilities. Descriptive Survey design was used to conduct the research. The target population for the study was health workers dealing with essential medicines in the 94 health facilities in Embu County. Of the target population a sample of 49 health workers was used as derived using Yamane's formula. Stratified random sampling and simple random sampling procedures were used to determine how the data collection instrument would be distributed. A Questionnaire was administered to the sampled population to obtain data. Data was first coded then analyzed using the statistical Package for Social Sciences (SPSS) and it was further subjected to Chi Square test analysis. Chi Square test is a test used in research to assist in the assessment of relationship between two or more mutually exclusive variables. This technique helps in comparing proportions observed to what would be expected under an assumption of independence between two variables.

The summary of findings is presented based on the thematic areas

5.2.1 Influence of Health worker training on availability of essential medicines in public health facilities

The study established the influence of health workers training on availability of essential medicines in public health facilities. The analysis was based on descriptive statistics. The following indicators that were analyzed include; awareness of essential medicines statistics, commodity management training analysis, level of training on commodity management, frequency of training on commodity management and relevance of the training.

Majority of the respondents (69.4%) had knowledge on essential medicines with many (65.3%) indicating not to have received training on commodity management. However, most of the respondents (51.0%) had acquired a diploma level of training on commodity management. A significant no (77.6%) indicated that they had attended short commodity management trainings. Majority of the respondents (46.9%) felt that the commodity management trainings should be attended once annually as they were found to be very relevant (57.1%) by a majority of the respondents. In addition the respondents' response on the year of training and topics covered revealed that the respondents had different years of training and as well covered similar topics in their learning. Amongst the core topics covered included financial management, safety management of commodities, rationale use of medicines, quantification and stock management, public procurement and procurement process.

5.2.2 Influence of Health budgetary allocation on availability of essential medicines in public health facilities

The study focused on the following indicators on level of care of the facility, health facility budget of the essential medicines, frequency of receiving the budgetary allocation and disbursements of the allocated budgets. Majority of the sampled facilities (61.2%) were dispensaries. Most of the sampled facilities (67.3%) had a budget allocation of between 101,000 and 300,000Kshs. Majority (44.9%) said that they had their budget allocations done quarterly. Only 65.3% of the respondents said that their facility budgets were disbursed although that was mainly done half yearly(59.4%). The respondents felt that various improvements on facilities which included ensuring that orders submitted are considered accordingly, timely budgets by county / national government and training of staff on financial management should be considered.

5.2.3 Influence of Supplier stock levels on availability of essential medicines in public health facilities

On supplier stock level, the study revealed the respondents' response on supplier stock influence on availability of essential medicines in public health facilities. The respondents' response on essential medicines to health facilities, supply was mainly done by Kemsas and Meds. Majority of the respondents (38.8%) said that Kemsas and both Kemsas and Meds (30.6%) supplied essential medicines to their healthcare facilities. Majority of the respondents (73.5%) reporting that their suppliers did not stock all the essential medicines consumed at health care facilities and as a result an order fulfillment of 51-60 which is equivalent to 42.9% was fulfilled by the suppliers..

Some of the reasons given for this failure by suppliers included; failure to order for the drugs, lack of essential moderation each time there is stocking, supply of the essential medicines at suppliers' wish. More so, the limiting factors for failure to stock all the essential medicines included high cost of supply, corruption and monopoly and dominance of Kemsas and Meds.

5.2.4 Influence of Disease prevalence patterns on availability of essential medicines in public health facilities

Statistical analysis on disease prevalence patterns revealed that 42.9% of the respondents reported that communicable and non – communicable diseases were treated at their health facilities. Although a majority of the respondents (75.5%) said that there were no new emergent diseases in their facilities in the last one year a significant no (56.8%) felt that essential medicines would frequently be used for the treatment of new emergent diseases with a 36.7% of the respondents agreeing that new emergent diseases would exhaust the available essential medicines stocked in health facilities. Some additional responses given by the respondents included;- giving out measures to be taken to handle the issue of new emergent diseases. They includes; proper disease surveillance, community sensitization and proper research.

5.3 Discussion of the Findings

The discussions were done in line with the following objectives establishing influence of health workers training on availability of essential medicines in public health facilities, determining influence of health budgetary allocations on availability of essential medicines in public health facilities ,examining influence of supplier stock levels on the availability of essential medicines in public health facilities and assessing influence of disease prevalence patterns on availability of essential medicines in public health facilities. The discussions of the study are summarized on the thematic areas.

5.3.1 Influence of Health worker training on availability of essential medicines in public health facilities

Lack of trained pharmacy staff at the health center service delivery level to manage medicines and supply chain has become a critical bottleneck in national efforts to improve access to medicines and primary health-care service delivery. Addressing human resources constraint would improve medicines management, logistics information flow, and supply chain function at the health facility level, leading to improved medicines availability at public health facilities, access to essential medicines in the community and health outcomes(Lubenga et al., 2014).The study revealed that most of the respondents were had knowledge on essential

medicines and had been trained on commodity management. Although most of the health workers had not attended short commodity management trainings they felt that attending the short courses once annually was relevant and would enhance their skills as far as commodity management was concerned. This would help ensure that essential medicines were available at their health facilities.

An effective medicines supply chain with sufficient numbers of well-trained and motivated human resources is an essential component of a robust health system (MSH, 2012, and USAID Deliver Project, 2013). The chi square analysis showed a p-value = 0.000, implying that there exists a relationship between age and respondents response on the relevance of training and therefore the Embu county government should continuously provide training to the health workers. Health worker training is statistically significant in explaining availability of essential medicines in public health facilities in Embu County.

5.3.2 Influence of Health budgetary allocation on availability of essential medicines in public health facilities

The world health organization states that besides factors such as Rational selection of medicines, affordable prices, reliable health and supply systems, sustainable financing is a key factor that affects the access of essential medicines (WHO,,2004).The study revealed that financing was provided for health facilities to procure their drugs though the disbursements of the allocated budgets were not done in a timely manner and this was seen to affect the availability of essential medicines in the public health facilities. Magak & Muturi, (2016), further asserted that insufficient budgets are a major cause of stock outs for essential medicines in many parts of the world. Although results indicated a significant budget for the facilities based on level of care with a mean budget allocation for essential medicines 2.4694 indicates a significant relationship between the level of health facility and its budget allocation. As a result higher budgetary allocations should be considered since they are statistically seen to be significant in explaining availability of essential medicines in Embu County.

5.3.3 Influence of Supplier stock levels on availability of essential medicines in public health facilities

According to Gateman & Smith, (2011) and Chabner, (2011) Essential medicines shortages, among them generic injectable chemotherapy agents, are causing increasing concern to healthcare providers. The third objective of the study was to examine influence of supplier stock levels on the availability of essential medicines in public health facilities in Embu County. The

study results indicated that suppliers of essential medicines constituted two major suppliers who did not stock all the required essential medicines for the public health facilities.

The suppliers' failure to stock all the essential medicines largely influenced the availability of essential medicines in healthcare facilities. Furthermore, the lack of moderation, monopoly and dominance especially by Kemsu and Meds negatively influences availability of essential medicines in public health facilities in Embu County. The results reveal that supplier stock level is statistically significant in explaining the availability of essential medicines in Embu County.

5.3.4 Influence of Disease prevalence patterns on availability of essential medicines in public health facilities

Information on disease prevalence rates is not well known and thus a negative influence in terms of medicines demand forecast and quantification is not well captured. As a result there is rampant increase on mortality rates amongst other factors due to insufficient treatment due to lack of essential medicines for the same. In many parts of the world prevalence rates of diseases is not well known and this would hamper the planning on prevention and treatment (Sullivan *et al.*, 2000). The study sought to assess influence of disease prevalence patterns on availability of essential medicines in public health facilities in Embu County. Results indicated that both communicable and non communicable diseases were the most commonly treated diseases in health facilities and also new emergent diseases were believed to consume essential medicines. Although a significant no of respondents agreed that new emergent diseases exhausted the essential medicines. However the county needs to consider the following measures proper disease surveillance, community sensitization and proper research in order to control the prevalence rates. The Chi square Test showed the value of $p = 0.000$ which indicates that there is a relationship between disease prevalence and availability of essential medicines.

5.4 Conclusion

From the study it can be concluded that health worker training was found to have a positive and significant relationship with availability of essential medicines in healthcare facilities. This implies that handling training of healthcare workers was statistically significant in explaining availability of essential medicines in Embu County. Inadequate and untimely disbursements of the budgetary allocations were seen as a major factor influencing the availability of essential medicines in the health facilities. The level of care and allocation of budget for essential medicines contribute to availability of essential medicines. From this study there exists a positive

significant relationship between health budgetary allocation and availability of essential medicines in Embu County. The results reveal that budgetary allocations are statistically significant in explaining availability of essential medicines in Embu County.

The study revealed that there were various supplier stock factors that influence the availability of essential medicines in Embu County. This is because respondents agreed that both the supplier and the supply stock play a key role in enhancing availability of essential medicines due to their correlation. It was possible to infer that the relationship between supplier stock levels and availability of essential medicines is positive and significant. Monopoly by the key suppliers, inadequate stocking levels of essential medicines and order fulfillment capacity by the suppliers some of the key factors influencing the availability of essentials medicines. New emergent diseases were seen to consume the available essential medicines in the health facilities.

5.5 Recommendations

Based on the findings, the study makes the following recommendations

- I. The health stakeholders to introduce commodity management training in all health professions as this will have an added advantage to the health care managers. The county health department to provide the healthcare facilities with finances to facilitate health workers training. The Government to establish more training centers for healthcare facilities in each sub-county to ease access to specialized training by healthcare workers. The Embu county health department and other Key supporting partners of health care provision to conduct and sponsor short commodity management trainings.
- II. The County Government of Embu to provide timely and sufficient budgets to health facilities for procurement of essential medicines. The healthcare department to create more balance and increase budgetary allocations for healthcare facilities to help them meet their budgetary set targets.
- III. The Ministry of health and the County Health Department of Embu to create a wider base of suppliers and provide the suppliers with information on consumption data of commodities.
- IV. The disease surveillance and response team within Embu County to vigilantly conduct surveillance on the current disease prevalence patterns and also plan promptly and set response budgets for any incidents. The stakeholders in the healthcare department to

provide proper disease surveillance measures and sensitize the surrounding community on the emergent of new diseases. Conduct research in order to find out new methods to counter emergent of new diseases.

5.6 Suggestions for further research

An in-depth, boarder-based study, covering a wider geographical region and embracing greater demographic, ethic, political, economic and social diversity than what was achievable in this study would be valuable, to establish whether the conclusions can be generalized. A study should be carried out to find out other types of factors for instance remunerations, working environment effect on availability of essential medicines. Since the study was concentrated in Embu County, future researchers should consider widening the scope of the population in different locations that were not covered in this study. The researcher further recommends that future researchers should conduct studies to determine the relationship between essential medicines and the overall healthcare service delivery.

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APPENDICES

APPENDIX I: LETTER OF TRANSMITTAL OF DATA COLLECTION INSTRUMENTS

CAROLINE WAMBUI MUIRURI,
P.O BOX 47715-00100,
NAIROBI.

Dear Sir/Madam,

RE: REQUEST FOR YOUR PARTICIPATION IN A RESEARCH STUDY.

I am a final year Master of Arts in Project Planning and Management student at the University of Nairobi currently undertaking a research on “**Factors Influencing Availability of Essential Medicines in public health facilities in Embu County**”. I humbly request for your participation through filling in a questionnaire at your own convenience. All the information provided will be used for research purpose only and your identity will be treated with utmost confidentiality. Your contribution and cooperation will be highly appreciated.

Yours faithfully,

Caroline Wambui Muiruri.

APPENDIX II: RESEARCH QUESTIONNAIRE

Please answer the questions below by ticking or by writing your responses in the space which has been provided. Please do not write your name on the questionnaire and give honest responses to the best of your ability. Your identity will be kept confidential and information you provide will be used for research purpose only.

A. DEMOGRAPHIC INFORMATION

1. Kindly state your gender

Male Female

2. Which age category do you fall under?

18- 25

26-35

36-45

46 and above

3. State your academic qualifications

Postgraduate

Degree

Higher Diploma

Diploma

Other

4. What is your current occupation?

Pharmacist

Pharmaceutical technologist

Nurse

Clinical officer

Other

1. How long have you worked in this facility?

Less than 1 year

1 to 5 years

6 to 10 years

11 to 15 years

More than 15 years

B. HEALTH WORKER TRAINING

6. Have you ever heard of the term Essential Medicines?

Yes

No

Don't Know

7. Have you ever been trained on commodity management?

Yes

No

If yes kindly state the year and topics covered

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

8. What level of training on commodity management have you acquired?

Post graduate

Degree

Diploma

Certificate

9. Kindly indicate the no of times you have attended short commodity management course trainings

1-3

4-6

7-9

10 and above

10. Kindly suggest how often one should attend short courses on commodity management

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

11 Kindly indicate how relevant the training was to you

Very relevant []

Relevant []

Somehow relevant []

Not relevant []

Kindly explain other areas you would wish to be trained on

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

C HEALTH BUDGETARY ALLOCATION

12 What is the level of care of your facility?

Level 2 []

Level 3 []

Level 4 []

Level 5 []

13 What allocation of budget for essential medicines does your facility get

Less than 100,000 []

101,000 -300,000 []

301,000- 500,000 []

Over 500,000 []

14 How often does your facility get a budgetary allocation for essential medicines?

Quarterly []

Half yearly []

Yearly []

Never []

15 Does your facility get disbursements of its budgetary allocation for essential medicines?

Yes []

No []

If yes how often

Quarterly []

Half yearly []

Yearly []

Never []

16 Explain how else you think your facility can improve on its budget allocation

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

D. SUPPLIER STOCK LEVEL

17 Who supplies essential medicines to your facility?

Kemsa []

MEDS []

Both Kemsa and Meds []

Other []

18 Does your supplier stock all the essential medicines consumed at your facility?

Yes []

No []

Kindly explain your answer

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

19 What do you think could be the limiting factor(s) for not stocking all the essential medicines

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

20 What strategies can be employed to counter the limiting factors stated above?

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

21 Based on your supplier what percentage of order fill rate do they fulfill for the essential medicines

<50% []

51-60 []

61-70 []

71-80 []

Above 81% []

E.DISEASE PREVALENCE PATTERNS

22 What type(s) of diseases does your facility treat?

Communicable []

Non communicable []

Both communicable and Non communicable []

Other []

Of the types listed above which are the most common in your facility

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

23 Have there been new emergent diseases in your facility in the last one Year?

Yes []

No []

If yes are essential medicines used for their treatment?

Rarely []

Frequently []

None at all []

24 To what extent do you agree that new emergent diseases exhaust the available essential medicines stocked at your facility?

Strongly agree []

Agree []

Somehow agree []

Disagree []

Strongly disagree []

25 How well can the issue of new emergent disease be handled

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

E). MODERATING FACTORS

26. The following issues are seen to have an effect on the factors influencing availability of essential medicines in public health facilities. Kindly indicate the extent of each factor.

Very large extent (1) Large extent(2) Moderate extent(3) Small extent (4)

No extent (5)

	1	2	3	4	5
Political influence on health matters					
Patient attitude					
Health worker attitude					

27. In your own opinion how do the above stated issues affect the factors influencing availability of essential medicines in public health facilities ?

.....

.....

.....

.....

.....

.....

APPENDIX III: NACOSTI RESEARCH AUTHORISATION PERMIT



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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

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

Ref. No. **NACOSTI/P/17/83389/18250**

Date: **18th July, 2017**

Caroline Wambui Muiruri
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “*Factors influencing availability of essential medicines in public health facilities in Kenya,*” I am pleased to inform you that you have been authorized to undertake research in **Embu County** for the period ending **18th July, 2018.**

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

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Embu County.

The County Director of Education
Embu County.

APPENDIX IV: COUNTY HEALTH RESEARCH AUTHORITY

EMBU COUNTY GOVERNMENT



OFFICE OF COUNTY DIRECTOR OF HEALTH

Mobile: +254 771 204 003/+254 707 192 924 Tel: 254 48 30686/30656
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Our Ref No: ECH/ADM/17/VOL.I/

Date: 3rd July 2017

TO WHOM IT MAY CONCERN

**RE: RESEARCH AUTHORIZATION
FOR: CAROLINE WAMBUI MUIRURI**

The above subject matter refers.

This office acknowledges receipt of research authorization letter for the above named Student studying at University of Nairobi to carryout research on topic shown against her name, (Ref. No.Uon/Cees/Memc/3/5 dated 8th July 2017.

S.No.	Name	Topic
1	Caroline Wambui Muiruri	Factors Influencing Availability of Essential Medicines in Public Health facilities in Embu County

This office has no objection and requests your office to accord the student cooperation and necessary support she requires.

**DR. STEPHEN KANIARU
AG. COUNTY DIRECTOR OF HEALTH
EMBU COUNTY**

COUNTY DIRECTOR OF HEALTH
EMBU COUNTY
P. O. Box 34, Embu
Kenya
Tel: 254 48 30686
Email: ech-embu@gmail.com

APPENDIX V: LIST OF HEALTH FACILITIES EMBU COUNTY

County	MFL No.	FACILITY	CATEGORY	OWNER(GoK, CHAK, KEC, SUPKEM)
1	12007	Ena Dispensary	Dispensary	GOK
2	12032	Gatumbi Dispensary	Dispensary	GOK
3	12038	Gichiche Dispensary	Dispensary	GOK
4	16853	Gikuuri Dispensary (CDF)	Dispensary	GOK
5	12039	Gitare Dispensary (Embu)	Dispensary	GOK
6	16854	Kaathari Dispensary (CDF)	Dispensary	GOK
7	16855	Kasafari Dispensary (CDF)	Dispensary	GOK
8	12227	Kathanjuri Dispensary	Dispensary	GOK
9	12239	Kathunguri Dispensary	Dispensary	GOK
10	12298	Kigaa Dispensary	Dispensary	GOK
11	12300	Kigumo Dispensary	Dispensary	GOK
12	12550	Mufu Dispensary	Dispensary	GOK
13	12553	Mugui Dispensary	Dispensary	GOK
14	12564	Mukuuri Dispensary	Dispensary	GOK
15	12820	Ugweri Disp	Dispensary	GOK
16	12179	Kanja Health Center	Health Center	GOK
17	12203	Karurumo RHTC	Health Center	GOK
18	16856	Nyagari Dispensary	Dispensary	GOK
19	17367	Njeruri Dispensary	Dispensary	GOK
20	20508	Kanduri Dispensary	Dispensary	GOK
21	20505	Kithunguthia Dispensary	Dispensary	GOK
22	20633	Nduuri dispensary	Dispensary	GOK
23	21429	Rukuriri Dispensary	Dispensary	GOK
24	11984	Dallas Dispensary	Dispensary	GOK
25	12033	Gatunduri Dispensary	Dispensary	GOK
26	12045	GK Prison Dispensary (Embu)	Dispensary	GOK
27	12095	Itabua Police Dispensary	Dispensary	GOK

28	12172	Kangaru Dispensary (Embu)	Dispensary	GOK
29	12223	Kathangari Dispensary	Dispensary	GOK
30	12225	Kathangariri Dispensary	Dispensary	GOK
31	12353	Kithegi Dispensary	Dispensary	GOK
32	12359	Kithimu Dispensary	Model Health Center	GOK
33	12361	Kithunguriri Dispensary	Dispensary	GOK
34	12453	Makengi Dispensary (Embu)	Dispensary	GOK
35	12549	Muchagori Dispensary	Dispensary	GOK
36	12718	Rukira Dispensary	Dispensary	GOK
37	12130	Kairuri Health Center	Health Center	GOK
38	12198	Karau Health Center	Health Center	GOK
39	12287	Kibugu Health Center	Health Center	GOK
40	12642	Nembure Health Center	Health Center	GOK
41	16238	Embu MTC	Dispensary	GOK
42	20502	Karurina Dispensary	Dispensary	GOK
43	19224	CDF kiriari	Dispensary	GOK
44	21109	Itonguri Dispensary	Dispensary	GOK
45	21110	Kevote Dispensary	Dispensary	GOK
46	12164	Kamumu Dispensary	Dispensary	GOK
47	12185	Kanyuambora Dispensary	Dispensary	GOK
48	12226	Kathanje Dispensary	Dispensary	GOK
49	12271	Kiambere Dam Dispensary	Dispensary	GOK
50	12333	Kirie Dispensary	Dispensary	GOK
51	12590	Muthanthara Dispensary	Dispensary	GOK
52	16468	Riandu Dispensary	Dispensary	GOK
53	18269	Muchonoke Dispensary	Dispensary	GOK
54	18268	Kogari dispensary	Dispensary	GOK
55	18452	karerema dispensary	Dispensary	GOK
56	18453	Gatiruri dispensary	Dispensary	GOK
57	11987	Don Bosco Dispensary	Dispensary	CHAK
58	20497	Ciakanthukure Dispensary	Dispensary	GOK

59	20498	Kiogogo Dispensary	Dispensary	GOK
60	20499	Kanyangi Dispensary	Dispensary	GOK
62	12022	Gacabari Dispensary	Dispensary	GOK
64	12194	Karaba Wango	Dispensary	KEC
65	12023	Gachuriri Dispensary	Dispensary	GOK
66	17843	Gltaraka dispensary	Dispensary	GOK
67	12122	Kabuguri Dispensary	Dispensary	GOK
68	12193	Karaba Dispensary (Mbeere)	Dispensary	GOK
69	12274	Kiamuringa Dispensary	Dispensary	GOK
70	12441	Machang'a Dispensary	Dispensary	GOK
71	12454	Makima Dispensary	Dispensary	GOK
72	12501	Mbita Dispensary	Dispensary	GOK
73	12505	Mbondoni Dispensary	Dispensary	GOK
74	12506	Mbonzuki Dispensary	Dispensary	GOK
75	12645	Nganduri Dispensary	Dispensary	GOK
76	12711	Riachina Dispensary	Dispensary	GOK
77	12712	Riakanau Dispensary	Dispensary	GOK
78	12722	Rwika Dispensary	Dispensary	GOK
79	17912	Kamunyange Dispensary	Dispensary	GOK
80	17913	kirathe Dispensary	Dispensary	GOK
81	12838	Wachoro Dispensary	Dispensary	GOK
82	16463	Gategi Health Center	Health Center	GOK
83	16465	Kiambere Health Center	Health Center	GOK
84	20511	Malikini Dispensary	Dispensary	GOK
85	20510	Karura Dispensary	Dispensary	GOK
86	20749	Ngiori Dispensary	Dispensary	GOK
87	20509	Kamweli Dispensary	Dispensary	GOK
88	22269	Kangungi Dispensary	Dispensary	GOK
89	17164	Embu-Mbeere Hospice	Dispensary	GOK
90	12004	Embu PGH	Hospital	GOK
91	12719	Runyenjes DH	Hospital	GOK

92	16467	Mbeere Dh	Hospital	GOK
93	12279	Kianjokoma Sdh	Hospital	GOK
94	16464	Ishiara Sdh	Hospital	GOK