

## **Factors Influencing Frequent Stock-outs of Essential Medicines in Public Health Facilities in Kisii County, Kenya**

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**Abstract:** *The general objective of this study was to determine the factors influencing frequent stock-outs of essential medicines in public health facilities in Kenya with focus being drawn from public health facilities in Kisii County. The study adopted a descriptive study design with stratified random sampling being used to select a sample of 30% proportion of the target population, that is, 105 public health administrative staff drawn from a target population of 351 public health administrators from the nine sub counties of Kisii County. Data was collected using questionnaires, observation and interviews. The findings of this study indicated that 49.1% changes on the availability of essential medicines could be attributed to the independent variables. ICT was the most significant factor followed by staff qualifications, supply chain design and monitoring and oversight mechanism respectively. The study recommended that the Kisii County Government institute policies that will ensure functionality of the study factors considering that ICT was being used majorly for conventional purposes of filing but not in decision-making in medicines management, poor staffing was evident in terms of unmatched skills placement as well as the existence of a reactive supply chain design signalling poor control.*

**Keywords:** *Essential Medicines, Information Communication Technologies Monitoring and Oversight Mechanism, , Supply Chain Design.*

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### **I. Introduction**

#### **1.0 Introduction**

Health is among the most important indicators of a country's development status. A good and responsive healthcare system is supported by sufficient health facilities with proper staffing and adequate budgetary allocations for stocking at the very least, sufficient essential medicines managed by Information Communication Technologies able to create a responsive supply chain network and support monitoring and oversight of public health management. The health sector thus potentially attracts very huge investments from a country's budget translating into opportunities for mismanagement in terms of wastage and corruption.

#### **1.1 Background Information**

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 Organisation 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. Health systems are particularly susceptible to corruption because uncertainty, asymmetry of information and the large number of actors create systematic opportunities for corruption and hinder transparency and accountability.

According to the United Nations [1], when a health facility temporarily lacks medicine supplies that it ought to have according to national guidelines it is said to be experiencing a stock-out as experienced in the case of low and lower-middle income countries between 2007 and 2012 where the average availability of selected essential medicines was 57% in public sector facilities and 65.1% in private facilities highlighting the extent to which this is a problem in many developing countries.

WHO [2], states that there are large gaps in the availability of medicines in both public and private sectors, as well as a wide variation in prices which render essential medicines unaffordable to poor people. The report states that compared to the private sector, generic medicines in the public health facilities are only available in 38.1% of facilities, and the average cost is 250% more than the international reference price whereas the same are available in 63.3% of private health facilities and cost on average about 610% more than the international reference price.

In December 2006, representatives from DFID, WHO and the World Bank met to discuss the creation of a Medicine Transparency Alliance (MeTA) which was officially launched in May 2008. The objective of MeTA is to increase access to medicines by creating transparency in all steps of procurement of medicines.

Greater transparency will be achieved by bringing together actors from the government, the pharmaceutical industry and the civil society and disclose information about procurement particularly, information about the quality and registration of medicines, the availability of medicines, the prices of medicines, the policies and practices concerning the promotion of medicines. Countries that sign up to MeTA are expected to make formal commitment to the principles of MeTA, and form a national stakeholder group consisting of public, private and civil society actors to decide how to collect and disseminate data between group members. The work undertaken by the stakeholder group will be reviewed by the MeTA International Advisory Group. MeTA also provides participant countries with funding. When MeTA was officially launched, seven countries had signed up inclusive of Ghana, Uganda, Zambia, the Philippines, Peru, Kyrgyzstan and Jordan.

Juma [3] noted that the total value of Kenya's public procurement according to the year 2010 statistics was estimated at 10% of the GDP. In 2008, Kenya's GDP was estimated at Kshs. 2,099.79 billion putting the total expenditure on procurement by the government at around Kshs. 209.9 billion per annum. Argumentatively, even savings of up to 10% due to improvements in procurement practices and controls would mean a yearly gain to the national Treasury of about Kshs. 21 billion that can be channelled to other sectors of development including healthcare.

Elisha Otieno [4] states that in Migori, the County referral hospital, health centres and dispensaries experience severe shortage of medicines and that the drugs are smuggled from public hospitals in Migori County and sold into the neighbouring Republic of Tanzania. He states that through the efforts of the facilities medical staff, the drugs leave the County through the Isebania border point before being sold to Tanzanian traders who quickly stock them in private clinics in Tarime District of Mara Province across the border in Tanzania plunging the County health sector into a crisis due to consistent shortages arising from the theft of drugs and mosquito nets.

In Kisii County, Erick Abuga [5] states that the Governor had promised a modern pharmaceutical centre to curb theft of drugs in public health facilities. This was coming on the back of complaints from the public about shortage of drugs in some health facilities. The governor admitted that his team had a tough time in identifying the culprits while regretting that his administration had not long before this report spent over Sh50 million in medical supplies and that a team of inspectors would be soon dispatched to all sub county hospitals to inspect how medicines bought by his administration were being used.

## **1.2 Statement of the Problem**

The absence of essential medicines in most of Kenya's public health facilities highly increases the country's mortality rate as these 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. It is ironical why there should be such acute shortage so frequently when almost half of Kisii County's budget goes to health, way above the 2001 and 2006 African states pledge of 15% annual budgetary allocation to public health as contained in the WHO Abuja Declarations. The Kisii County health kitty is thus quite huge and lucrative to KCG staff drawn from various departments who harbour unethical practices with those directly involved in handling the medicine selling them to businessmen engaging in pharmaceutical business or even stocking their own private outlets while others involved in the procurement process inflating prices in collusion with suppliers so as to gain kickbacks.

## **1.3 Justification of the study**

All medical supplies and equipment must be vetted and authenticated by state agencies like the Pharmacy and Poisons Board prior to their clearance for public use irrespective of whether the procuring facility is listed as private or public. Procurement of medicines and equipment in public health facilities are supposed to be guided by the Public Procurement and Disposal Act of 2005 (PPDA 2005) which outlines the procurement practices that should be adopted in various kinds of acquisition and disposal of goods and services. It is regrettable however that despite this robust legal framework, businessmen have found porous sections of public procurement guidelines which together with public officials they take advantage of thereby earning huge profits from patients who are forced to seek expensive medication at private health facilities rather than from facilities run by their taxes.

## **1.4 General Objective**

The general objective of this study was to determine the factors influencing frequent stock-outs of essential medicines in public health facilities in Kenya.

### **1.4.1 Specific objectives**

- i) To determine the influence of information communication technologies to the frequent stock-outs of essential medicines in public health facilities in Kisii County.

- ii) To determine how the supply chain design influences frequent stock-outs of essential medicines in public health facilities in Kisii County.
- iii) To determine the influence of staff qualifications to the frequent stock-outs of essential medicines in public health facilities in Kisii County.
- iv) To determine the influence of the monitoring and oversight mechanism to frequent stock-outs of essential medicines in public health facilities in Kisii County.

### **1.5 Scope of the Study**

This study was conducted in Kisii County which comprises a total of 9 sub-counties sub divided into 45 Wards aggregately covering an area of 1,332.7 square kilometres. By 2017, it is projected that the County's population will be 1,362,779 persons (650,982 males and 711,797 females). The population is served by 32 community health units, 84 dispensaries, 28 health centres and 14 hospitals. The KCG operates about 65% of the facilities while the rest are managed by the private and mission hospitals. On staffing, the county has 41 Doctors and 504 Nurses among other health workers.

## **II. Literature Review**

### **2.0 Introduction**

A streamlined procurement system allows government to invest more resources in other needy areas such as health and education and improve the quality of life of its citizens, a venture that although optimistic, has the potential of greatly improving productivity and service delivery by public entities.

### **2.1 Theoretical Framework**

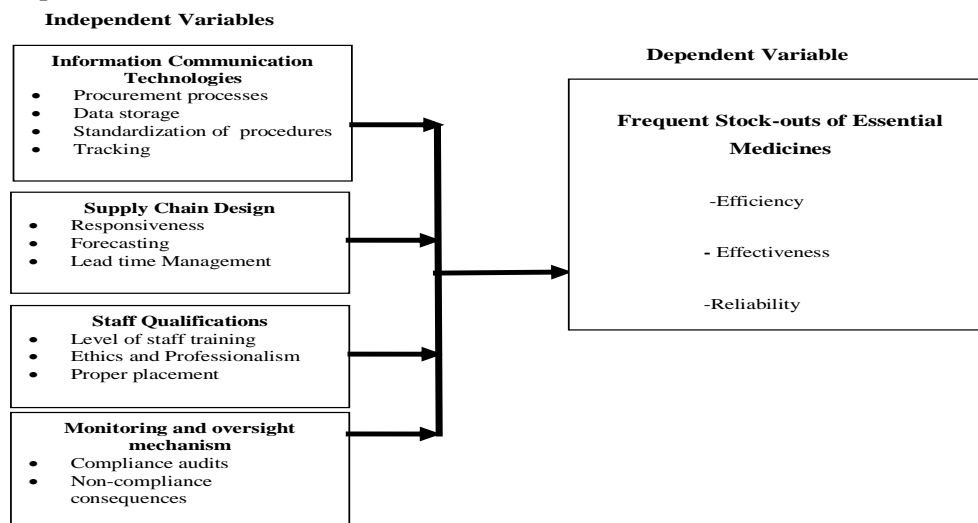
#### **2.1.1 Consequentialist Theory**

According to Jeremy Bentham [6], correct moral conduct is determined solely by a cost-benefit analysis of an action's consequences under the principality of consequentialism which refers to an action that is morally right if the consequences of that action are more favourable than unfavourable. Consequentialist normative principles require that first, both the good and bad consequences of an action are tallied and then follows the determination of whether the total good consequences outweigh the total bad consequences. If the good consequences are greater, then the action is morally proper. If the bad consequences are greater, then the action is morally improper. Consequentialist theories believe the end result of an action as the sole determining factor of its morality. Public finances are meant to benefit all citizens not as a favour but as their right. Public officials charged with the responsibility of manning those resources therefore must act for the common good of all citizens and must be true custodians of the laws put in place to protect those who cannot exercise their rights directly. Diseases are inevitable and medicines used to alleviate them must be easily and always accessible to all citizens especially in public health facilities for which budgetary allocations have been made by the treasury.

#### **2.1.2 Systems Theory**

Systems theory was proposed by Ludwig Bertalanffy who emphasized that rather than reducing an entity to the properties of its parts or elements, systems theory focuses on the arrangement and relations between the parts which connect them into a whole. In order for the whole to perform, its parts must equally perform so that in fact the failure of the individual parts culminates into the failure of the whole. The systems theory well describes the procurement of essential medicines not only in Kisii County but the entire country. Public health facilities should have a collaborative network involving all supply chain players in terms of ordering, stocking and consumption of medical supplies with the aid of information communication technologies under the control of public procurement law because if there were a collaborative network between public health facilities and all the involved stakeholders, there would be no issues such as dead stock and wastage of public finances as information would freely flow back and forth the supply chain leading to timeliness of all procurement activities.

## 2.2 Conceptual Framework



### 2.2.1 Frequent Stock-outs of Essential Medicines

The World Resource Institute [7] reinforces Rojo's findings that states that annually, infectious diseases kill about 13 million people translating to about 30,000 deaths per day, the bulk of which originates from developing countries, yet the premature deaths and the incapacity cases associated with infectious diseases could be avoided. The study states that an estimate of between 1.7 and 2 billion people worldwide have inadequate or no access to life-saving essential medicines through the Ghanaian survey, it was revealed that malaria, a curable disease, continued to be claiming the highest number of lives followed by HIV/AIDS, diarrhoeal diseases, lower respiratory infections, and prenatal conditions cumulatively accounting for half of all deaths in Ghana, and 68% of deaths among children under the age of 14.

### 2.2.2 Information Communication Technologies and Frequent Stock-outs of Essential Medicines

Edmiston [8] and Panayiotou et al. [9] identified major advantages with e-procurement including reduction of supply costs, reduction of cost per tender, lead time savings, simpler ordering, reduced paperwork, decreased redundancy, less bureaucracy, standardization of processes and documentation, online reporting, clearer and more transparent processes, ensured compliance with procurement laws and regulations, minimization of errors, and easier access to information. Chang [10] states that the Republic of Korea has adopted the e-procurement system and has so far generated significant benefits and has achieved most of the objective. The system processes the entire procurement procedure through the four major e-procurement sub systems such as electronic bidding, electronic contracting, electronic payment, and the online shopping Mall. In the year 2010, over 60% of Korea's total public procurement amounting to USD124 billion was conducted through e-procurement system.

### 2.2.3 Supply Chain Design and Frequent Stock-outs of Essential Medicines

Mills [11] states that health sector decentralization has become appealing to many because of its several theoretical advantages including development of a more rational and unified health service that caters to local preferences and decreased duplication of services as the target populations are more specifically defined among other benefits. Kinkade S., K. Verclas [12] and WHO [13] concur that in developing countries, the areas of greatest need are overwhelmingly rural; of the one billion people living in extreme poverty, 75% do not live in cities. A decentralized healthcare system as opposed to the conventional health care hubs can improve delivery and improve access by eliminating barriers of time and transportation.

### 2.2.4 Staff Qualifications and Frequent Stock-outs of Essential Medicines

Grant [14] states that the preservation and development of staff competencies are critical issues to companies so as to achieve competitive edge in terms of productivity and efficiency. Training is associated with productivity improvements and softer benefits to organizations. Dearden, Reed and Van Reenen [15] found connections between more training and higher labour productivity across a number of United Kingdom sectors. Collier et al. [16] also found that increasing investment in staff training reduces the chance of firm closure. David and K.S Cameron [17] states that employee performance affects organizational performance and that performance is a function of both ability and motivation (Performance = Ability x Motivation); Ability being the

person's aptitude, as well as the training and resources supplied by the organization whereas Motivation being the product of desire and commitment.

### 2.2.5 Monitoring and Oversight Mechanism and Frequent Stock-outs of Essential Medicines

Stemele [18] reports that a study conducted at the Lejweleputswa District Municipality in South Africa revealed that there was non-compliance with the law, absence of adequate monitoring and policy reviews, absence of an efficient internal control system, failure to uphold policies and keep to procedures, non-compliance with regulations, incomplete tender registers, and poorly defined roles of key players. The findings suggested that laxity in monitoring public procurement agencies, and especially their processes, and in auditing their activities affect public procurement performance considering that the public procurement system must have control measures such as supervision, auditing, and enforcement of the general standards of ethical behaviour in public entities. The WRI [19] states that shortages of essential medicines in public health facilities are a major issue in Tanzania that has persisted despite increasing attention to these issues and numerous reform attempts and initiatives. They state that the stock-outs are the result of not only resource constraints and technical problems, but a series of political logics that allow and reinforce short-term policy making, weak oversight and a lack of meaningful accountability.

## III. Methodology

### 3.0 Research Design

This study adopted a descriptive study design as this enabled the researcher to collect data easily and timely by way of interviews and administering of questionnaires to the selected sample.

### 3.1 Target Population

The target population of this study was Kisii County's 351 public health facilities administrative staff. Table 1 below depicts the distribution per Sub County.

*Table 1: Target Population*

Sub County	Headquarters	Public Health Facilities	Target Population (Public Health Facilities Administrative Staff)
South Mugirango	Nyamarambe	11	44
Bonchari	Kerina	9	25
Nyaribari Chache	Kisii Town	17	69
Kitutu Chache North	Marani	12	48
Kitutu Chache South	Mosocho	11	44
Nyaribari Masaba	Masimba	9	28
Bomachoge Chache	Ogembo	13	31
Bomachoge Borabu	Kenyenya	9	27
Bobasi	Nyamache	10	35
<b>Total</b>		<b>101</b>	<b>351</b>

### 3.2 Sampling

Through stratified random sampling method, the researcher ensured that the sample of 30% of the target population was highly representative.

### 3.3 Data Collection Instruments

Other than interviews and observations, this study majorly depended on data gathered by use of questionnaires. The questionnaires were presented in the form of a 5 point likert scale with responses weighted as 1, 2, 3, 4, and 5 for Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree respectively.

### 3.6 Data processing, analysis and presentation

Once the data was collected, the completed questionnaires were edited for completeness and consistency. Data was then coded in readiness for analysis by the Statistical Package for Social Sciences version 17.0 (SPSS). Descriptive data was analysed and presented through frequencies, percentages, mean and standard deviation. Inferential data was analyzed using regression analysis to determine the relationship between the dependent and independent variables and ANOVA was used to test the statistical significance of the model at a 95% confidence level. The Reliability analysis through the Chronbach's alpha was conducted to test the interrelatedness of the independent variables in measuring the dependent variable. The study findings were presented by use of tables, bar graphs and pie charts. The regression equation employed was as below;

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4$$

#### IV. Research Results And Discussion

##### 4.0 Introduction

This chapter presents descriptive analysis and inferential statistics guided by the objectives and research questions of this study.

##### 4.1 Background Information of Respondents

This section presents the gender, age, educational level and level of work experience analyses of the respondents. The study revealed that the Kisii County Government Health department is likely to be staffed by more males than females considering that out of the 90 respondents about 70% were male and 30% were female as shown in Fig 2.

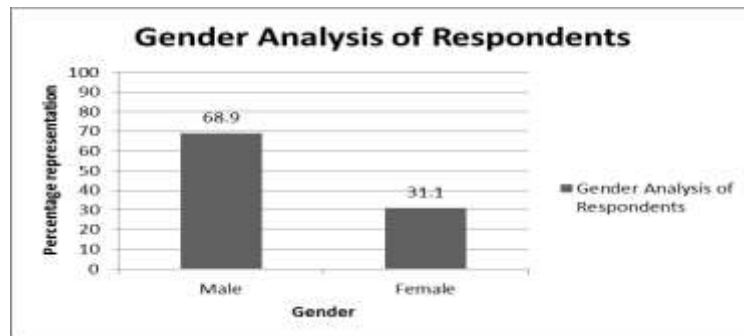


Figure 2: Gender Analysis of Respondents

##### 4.1.2 Age Analysis of Respondents

The study assumed for age brackets of respondents between 18 to 23 years old representing 5%, 24 to 29 years old representing 28%, 30 to 35 years old representing 38% and 29% representing respondents above the age of 35 as shown in Fig 3.

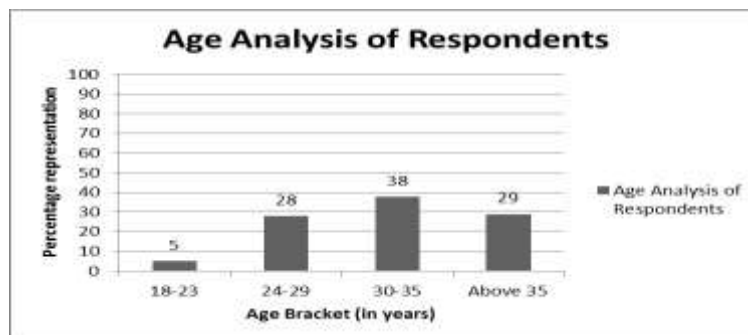


Figure 3: Age Analysis of Respondents

##### 4.1.3 Education Background of respondents

Fig 4 indicates that the Kisii County Health department is majorly staffed with professionals represented by 85% of the respondents with a minority of 15% having secondary level of education and no respondent bears a lower qualification from that.

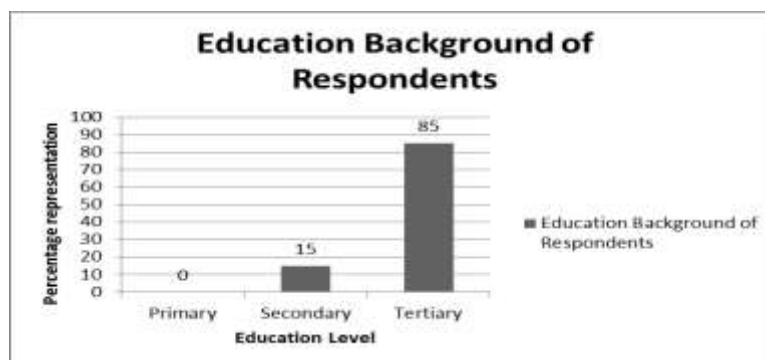
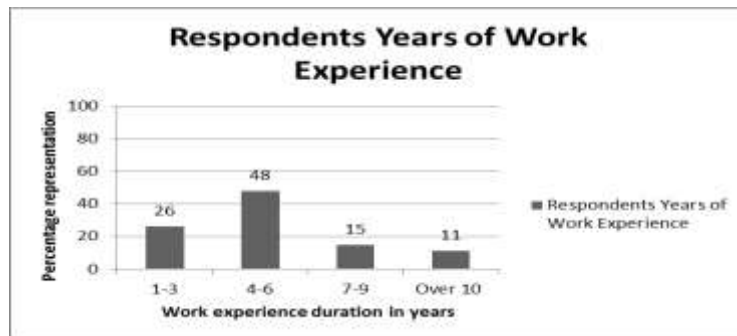


Figure 4: Education Background of respondents

**4.1.4 Analysis of respondents work experience**

Fig 5 shows that a majority of the respondents that participated in the study have sufficient work experience with the majority representing 48% having worked for between 4 and 6 years and those with a maximum of three years being 26%.



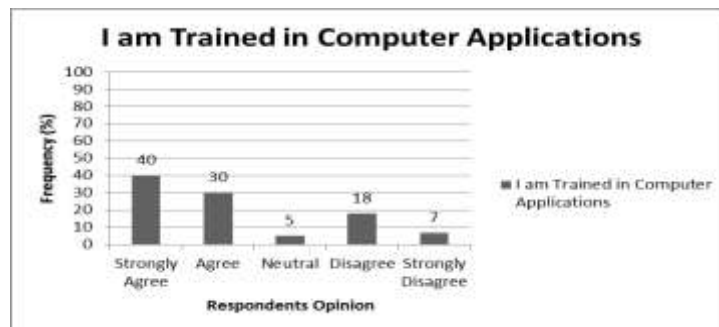
*Fig 5: Analysis of respondents work experience*

**4.2 Descriptive Data Analysis and Presentation**

This section entails analyses guided by the factors affecting the availability of essential medicines in public health facilities in Kisii County.

**4.2.1 Information Communication Technologies**

The respondents were asked to give an indication of their level of computer literacy and certification on computer applications training and 70% of the respondents affirmed to be computer literate, 25% of the respondents admitted computer illiteracy and only 5% of them failed to indicate their computer literacy level as shown in Fig 6.



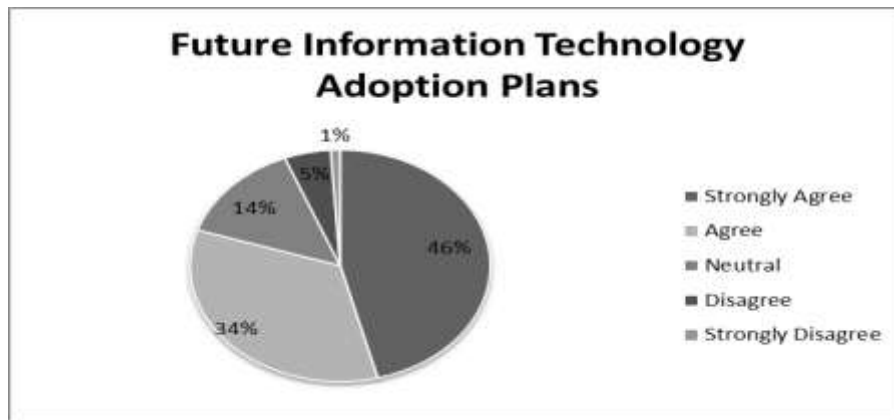
*Figure 6: Computer Literacy of Respondents*

Fig 7 indicates that there is a significant usage of information technology as indicated by 46% of the respondents. 43% of the respondents disagreed that ICT was not used in the management of medicines while 11% abstained from indicating a positive or negative response. Whereas a significant number pointed out the existence of ICT usage in their facilities, the respondents indicated the usage as limited to conventional purposes of filing in terms of storing patients' records. It was also revealed that no facility had commissioned any specialized ICT application for managing the medicine supplies.



*Figure 7: Facility Integration of Information Technologies in managing medicines*

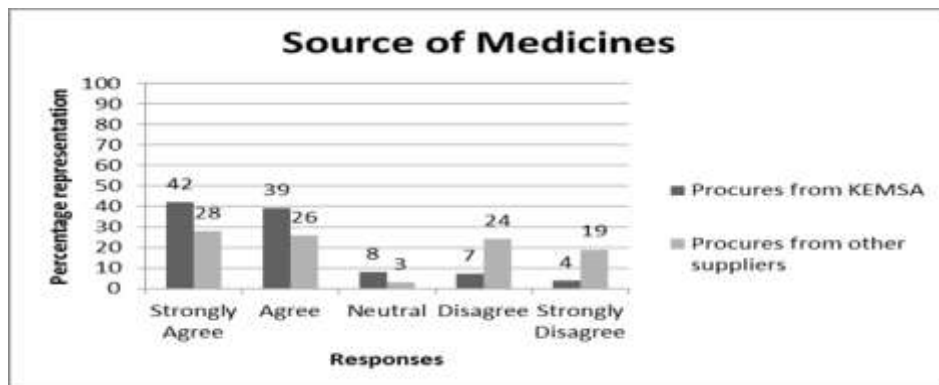
The respondents gave a strong indication of 80% that the public health facilities have plans to integrate technology in their medicines management with only 6% indicating unawareness of such plans and 14% remaining neutral as in Fig 9.



**Figure 8:** Future Information Technology Adoption Plans

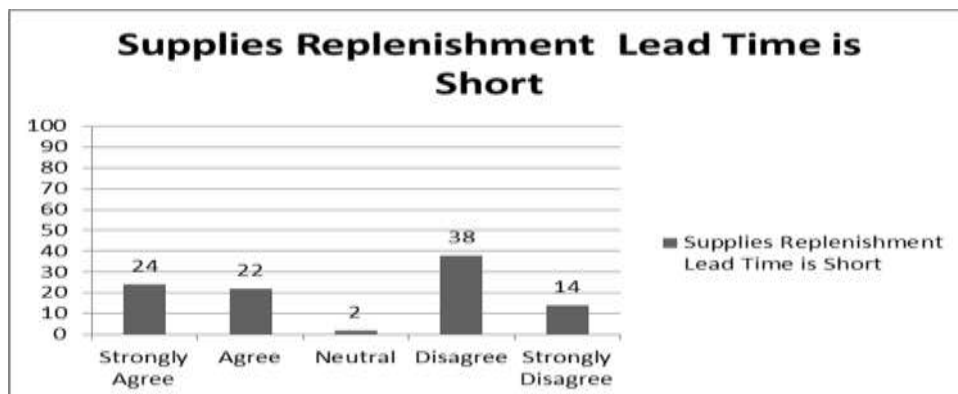
#### 4.2.2 Supply Chain Design

Fig 9 indicates that a majority of the respondents (81%) indicated that their facilities obtain medicine supplies from KEMSA although when asked whether the facility obtains supplies from other suppliers a majority 54% confirmed that as true with 43% still insistent on supplies from KEMSA. This signifies that participation of key stakeholders in the sourcing of medicines is quite weak or absent hence the lack of knowledge on where the supplies are obtained from.



**Figure 9:** Source of Medicines

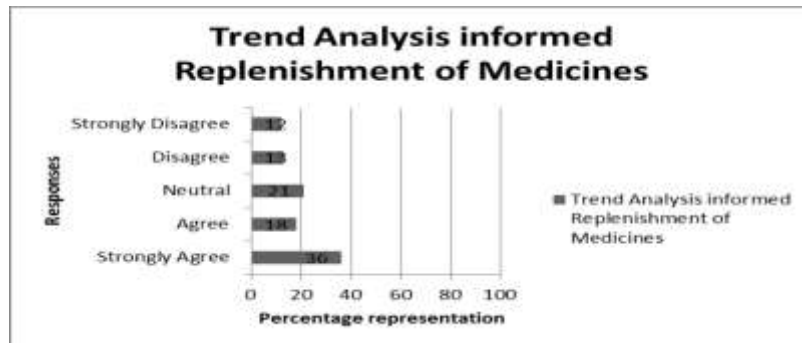
A majority of the respondents concur that their facilities experience delay of supplies with 52% of the respondents disagreeing that their supplies replenishment lead time is short and 46% indicating comfort with the replenishment speed as shown in Fig 10. A long lead time translates to a higher probability of a patient being turned away from the facilities due to lack of medicines.



**Figure 10:** Supplies Replenishment Lead Time



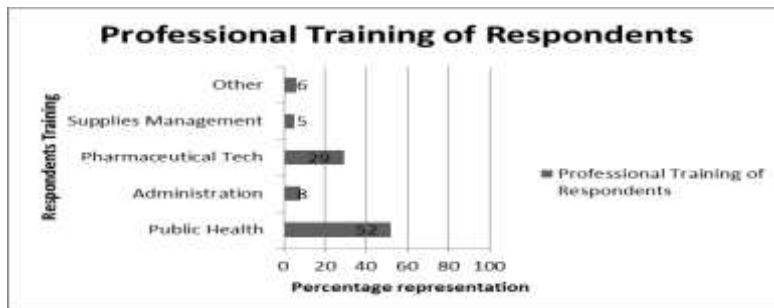
According to most of the respondents, 54%, their facilities rely on previous consumption trends to decide on which medicines to stock and at what time. It is however notable that the remaining 46% comprised 25% respondents disagreeing with previous trend informed replenishment with 21% choosing to abstain as shown in Fig 11. Rather than depending on real time consumption of medicines in order to prepare for acquisition of more medicines, the facilities could benefit more by studying the pattern and specific durations of consumption of medicines so as to not only ensure reliability on the availability of medicines but also to reduce procurement costs as the cycles of buying will have reduced.



*Figure 11: Trend Analysis informed Medicines Replenishment*

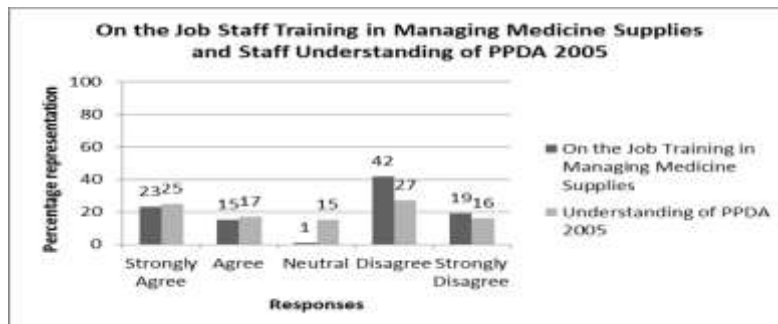
**4.2.3 Staff Qualifications**

The study sought to establish the professional qualifications of the personnel charged with the responsibility of managing medicine supplies at the various public health facilities and 52% of the respondents had training in Public Health, 29% were trained on Pharmaceutical technology, 5% were trained on Supplies management whereas 6% were trained on other courses and 8% on Administration as in Fig 12. However, the bulk of the respondents with tertiary education mainly had Public Health qualifications translating into their placement in the management of medicines in terms of managing procurement is not wise as procurement of medicines should be viewed and handled as a specialized management area that requires skills and techniques of employees with additional training in supplies management.



*Figure 12: Professional Training of Respondents*

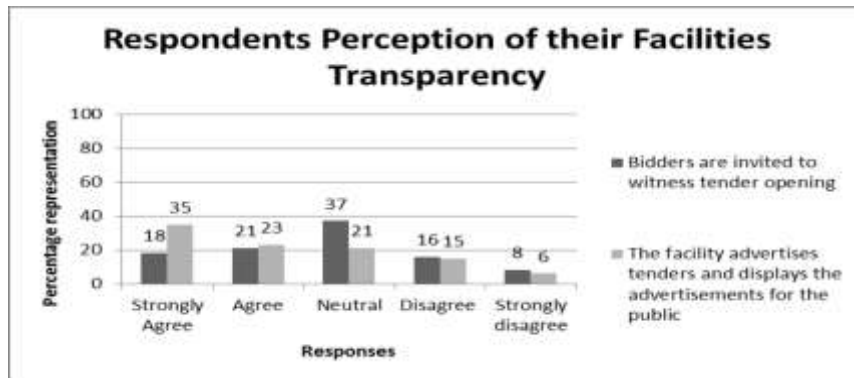
Fig 13 indicates that the respondents have relatively low training and legal information on managing supplies. 38% of the respondents agree that the employer has organized trainings for them on medicine supplies management and 42% also agree that they understand the role of PPDA 2005. A majority of the respondents disagree on having participated on on-the job trainings and that they have no knowledge on the PPDA 2005.



*Figure 13: Staff on the job training and understanding of PPDA 2005*

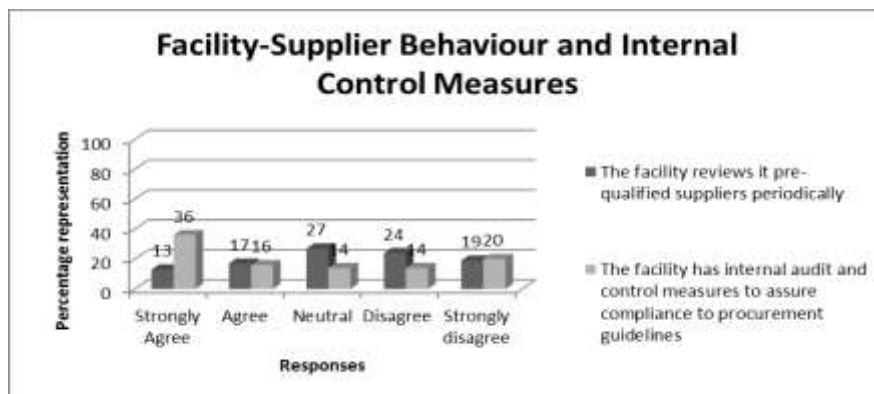
**4.2.4 Monitoring and Oversight Mechanism**

The study sought to find out how the respondents perception of their facilities transparency on the procurement of medicines. Whereas 39% of the respondents agreed that bidders are invited to tender opening, 37% of the respondents remained neutral while 24% disagreed with the same. On the other hand, 58% of the respondents agreed that procurement tenders of their facilities are made aware to the public with 21% abstaining from responding and 21 % disagreeing as shown in Fig 14.



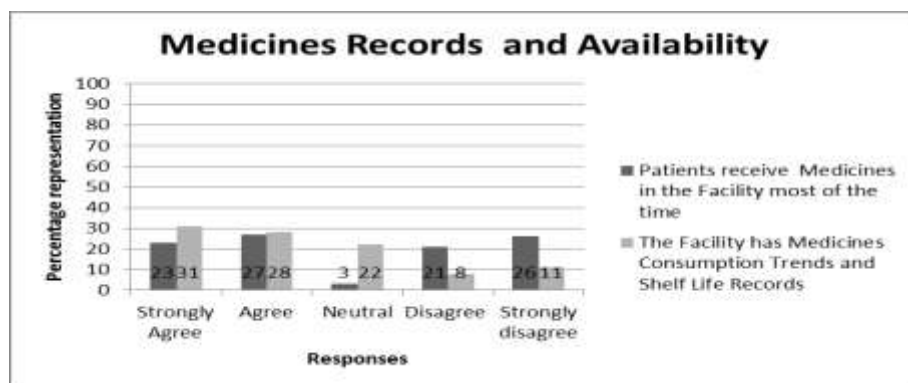
*Figure 14: Respondents Perception of their Facilities Transparency*

30% of the respondents agreed that their facilities periodically review pre-qualified suppliers whereas 43% disagreed while 27% remained neutral. At the same time 52% of the respondents indicated that their facilities had internal control and monitoring measures while 34% disagreed and 14% remained neutral as shown in Fig 15.



*Figure 15: Facility-Supplier Behaviour and Internal Control Measures*

Fig 16 indicates that over 50% of the respondents indicated that patients receive medicines from their facilities most of the time whereas 47% declined that as being true with 3% staying neutral on their response. On their facilities record keeping of medicines 59% of the respondents confirmed the existence of such records, 19% disagreed and 22% remained neutral.



*Figure 16: Medicines Records and Availability*

### 4.3 Inferential Data Analysis and Presentation

#### 4.3.1 Regression Analysis

Table 2 shows an Adjusted R<sup>2</sup> of 0.491 implying that 49.1% changes on stock-outs of essential medicines in public health facilities could be attributed to changes in ICT, staff qualifications, supply chain design and monitoring and oversight mechanism at 95% confidence interval and that the coefficient of determination, R<sup>2</sup> of 50.9% shows the proportion of the variation in the dependent variable that was explained by variations in independent variables.

Table 2: Regression Analysis

Model	R	R <sup>2</sup>	R <sup>2</sup> (Adjusted)	Std. Error of the Estimate
	.713	.509	.491	.887

#### 4.3.2 Regression Coefficients

Table 3 shows that ICT was the most significant variable influencing stock-outs of essential medicines in public health facilities. The overall regression equation obtained was  $Y = 0.0006 + 0.376X_1 + 0.226X_2 + 0.211X_3 + 0.187X_4$  the deduction of which is; all the other factors kept constant, a unit increase in the usage of information and communication technologies by public health facilities in Kisii County leads to an extra 0.376 chances of availability of essential medicines. Staff qualifications, supply chain design and monitoring and oversight mechanism rank after ICT respectively and indicate that other than improving on ICT, these factors require much attention in managing essential medicines in Kisii County public health facilities as their contribution is too low. Their betterment would greatly impact on the availability of essential medicines with also the room to further automate the public health systems.

Table 3: Regression Coefficients

Model	Coeff.	Std. Err.	t	Sig (95% CI)
Constant	.00056371	.04556541	8.083	.000
ICT	.37574521	.05546054	6.775	.000
Staff Qualifications	.22641927	.05678938	3.987	.001
Supply Chain Design	.21136582	.06770206	3.122	.000
Monit & Oversight	.18730519	.18545068	1.010	.003

## V. Conclusion

### 5.0 Introduction

This chapter presents a summary of the findings, conclusions and recommendations that will help in ensuring availability of essential medicines in public health facilities in Kisii County and in the entire health sector in Kenya with an outline of areas that researchers could explore in future in improving public healthcare.

### 5.1 Summary of Findings

#### 5.1.1 Information and Communication Technologies

ICT was the most significant factor ( $b=0.376, P=0.00<0.05$ ) in determining the availability of essential medicines in public health facilities in Kisii County. All factors kept constant, a unit increase in the usage of ICT by public health facilities in Kisii County leads to an extra 0.376 chance of availability of essential medicines. The study found out however that ICT usage was mainly for patient records as the public health facilities greatly relied on manual records on medicines, the net effect of which frustrated the ability to forecast timely through computer software that can make it even easy to compare the past and current data thus formulating a trend in the consumption of medicines for effective stocking decisions.

#### 5.1.2 Supply Chain Design

The public health facilities in Kisii County revealed the existence of relatively poor responsive supply chain designs as the lead time from KEMSA and other sources was long and the predictability of consumption trends frustrated by largely manual registers and records of medicines that do not allow for prompt stock-outs warnings to allow for the arrangement of replenishment. Keeping all factors constant, a unit increase in the efficiency of the supply chain leads to an extra 0.211 chance of availability of essential medicines in KCG public health facilities. This factor recorded a low significance ( $b=0.211, P=0.00<0.05$ ) in contributing to the availability of essential medicines indicating that the Kisii County Government Health Department needs to strategize on how to develop a reliable supply chain inputs from which can be drawn from this study.

#### 5.1.3 Staff Qualifications

The study findings indicate that majority of the staff in Kisii County public health facilities are trained in Public Health while Pharmaceutical Technologists, Supplies Management professionals and General

Administration professionals cumulatively account for less than half of the staff in those facilities. Stocking of medicines is specialised supplies management thus suffers staffing in the facilities which could be better managed by personnel trained in pharmaceutical technology and supplies management. Next to ICT however this was the most significant factor ( $b=0.226$ ,  $P=0.01<0.05$ ) and all factors kept constant, a unit increase in proper staffing of KCG public health facilities is most likely to increase by 0.226 chances of essential medicines being available in the facilities.

#### **5.1.4 Monitoring and Oversight Mechanism**

The study revealed that the public health facilities have in place moderate monitoring and oversight control measures with periodical review of pre-qualified suppliers and records to inform replenishment. Public invitation to tender is however poor which waters down control measures as this is non-compliance to PPDA 2005. This factor had the lowest significance ( $b=0.187$ ,  $P=0.03<0.05$ ) and requires the most effort and attention as compared to the factors in terms of improvement by the Kisii County Government. Keeping all factors constant even a unit increase in efficient monitoring and oversight of the public health facilities medicines procurement activities would increase by 0.187 chances of essential medicines not running out of stock.

## **5.2 Conclusions**

This study concluded that public health facilities lack essential medicines because there is no manipulation of ICT to predict consumption trends and alert on when supplies are dangerously low and whereas staff are well educated, most of them in the tertiary level, they have been poorly placed in departments with a majority of them qualified in public health but not necessarily have training in managing supplies. Restocking delays were also found to emanate from the procedures of law commencing after the delay of establishing an imminent shortage of supplies. ICT was the most significant factor influencing essential medicines availability followed by staff qualifications, supply chain design and monitoring and oversight mechanism respectively. Proper usage of ICT however has the capacity of making all the factors effective.

## **5.3 Recommendations**

Grounding recommendations of this study on its findings, it is recommended that to shorten the lead time of replenishing supplies to its public health facilities and curb the associated corruption, the Kisii County Government (KCG) should make payment arrangements between KEMSA and the national government ex-chequer for its medical supplies in such a way that on the basis of trend analysis and research, KCG should issue to KEMSA an order requisition at the beginning of the financial year so that when the ex-chequer is realising funds to national government agencies and County Governments, the value or cost of the requisition is subtracted from the KCG allocation and credited to KEMSA directly. This will allow the KCG to benefit from economies of scale and largely reduce the procurement frauds that occur during procurements occasioned by shortages as the medicines acquisition roles will have largely been transferred to KEMSA. In order to also closely monitor the consumption of the procured medicines, a real-time ICT infrastructure that links all the public health facilities in KCG, their patients, the medicines issued to them and the associated cost should be put in place to avoid leakages in terms of stolen medicines and enable arrangements for restocking at re-order level as consumption will be visible at a glance. Moreover, ICT applications like the Vendor Managed Inventory System should be put in place to link KEMSA to the consumption points in KCG so as to ensure that at no time will stock-outs occur unless intentionally required. In overall, a digitized system linked to the supplier (mostly KEMSA) as revealed in this study to the consumer (public health facilities through KCG) will allow for non-cash transfers only between government agency accounts thereby discouraging corrupt dealings involving private firms and individuals.

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