WASTAGE OF ANTIMALARIAL DRUGS AND ITS PERCEIVED EFFECTS ON HEALTH CARE SERVICE DELIVERY IN PUBLIC HEALTH FACILITIES IN UASIN GISHU COUNTY, KENYA

BY

EVANS SAMBAGARA OTIENO

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DECLARATION

Declaration by the Candidate

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Signature: ……. Date: ……..……

EVANS SAMBAGARA OTIENO.

SPH/PGH/1036/2012

Declaration by Supervisors

This thesis has been submitted for examination with our approval as University Supervisors.

Signature: ……. Date:……

Dr. Timothy Abuya,

Associate Researcher,

Population Council,

NAIROBI-KENYA.

Signature: ……. Date:……

Dr. Bernard Olayo
Senior Health Specialist,
Health, Nutrition and Population Global Practice,
World Bank Group,
NAIROBI-KENYA.

DEDICATION

This Thesis is a special dedication to my dear family for the support and encouragement that they continually offered along the way and the belief and trust they had in me that I could always make it.

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ABSTRACT

Background: Wastage of drugs partly contributes to frequent stock outs of essential medicines in public health facilities in Kenya that negatively affects service delivery.
Objectives: The study aimed to assess the nature of antimalarial drug wastages, estimate levels of antimalarial drug wastages and to illustrate the effects of antimalarial drug wastage in public health facilities in Uasin Gishu County using uncomplicated malaria as the tracer illness.
Methods: Mixed methods design was used. Multilevel mixed methods sampling procedure was adopted whereby facility healthcare providers formed one level of interviewees whereas the facility in charges formed the second level of interviewees. The sampling scheme led to the use of stratified, systematic and purposive sampling of the facilities which achieved 93 questionnaires respondents in public health facilities. Purposive sampling was used to select 11 key informants including health facilities in-charges, a county health official, a Division of Malaria Control Program staff and a KEMSA staff yielding a total of 104 respondents. Data collection methods included structured questionnaires, in depth interviews and documents review. Quantitative data was analyzed using frequency distributions, proportions and cross tabulations with Chi square as the test statistic to compare wastage across the facilities tiers. Statistical significance was considered at $p < 0.05$. This was simplified by using SPSS. Thematic analysis was applied to analyze qualitative data.
Results: The different forms of wastage reported by the questionnaires respondents across the facilities tiers manifested as; expiry wastage 17.6%; $p = 0.133$, channel wastage 4.8%; $p = 0.669$, mix wastage 9.6%; $p = 0.187$. In assessing the levels of the different forms of wastage, most respondents reported that wastage lay between the 1-20% bracket which was the lowest category (81-100% - highest). This was reported as follows across the facilities tiers; expiry wastage, 68.2%; $p = 0.079$, channel wastage, 69.4%; $p = 0.065$, mix wastage, 72.9%; $p = 0.064$. Qualitative data revealed that mix wastage was substantial. This manifested when clinicians prescribed antimalarials irrationally. Some patients insisted on being given antimalarials regardless of the test outcome. Another observation was that drug stock outs resulted from inaccurate data entry onto the District Health Information System (DHIS) platform leading to inefficiencies in drugs ordering. These factors led to out of stock situation of the antimalarials leading to reduced access and increased healthcare costs.
Conclusions: Levels of antimalarials wastage were low except for mix wastage which was substantial. Mix wastage and the systemic challenges of inaccurate data entry onto the DHIS and inefficiencies in drugs ordering led to stock outs of the antimalarials. This resulted in increased health care costs and reduced access to healthcare services in public health facilities.
Recommendations: Instituting measures for strict adherence to guidelines will ensure drugs are prescribed rationally. Additionally, educating patients on the rational use of the antimalarials and ensuring that staff are qualified and adequately trained to make timely orders and provide accurate data in the DHIS. These recommendations will make the greatest impact in minimizing wastage and reducing stock outs of antimalarials in public health facilities.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ADR - Adverse Drug Reaction

AL - Artemether Lumefantrine

ANC - Anti Natal Clinic

DTP- Diptheria, Tetanus, Pertusis

EML - Essential Medicines List

FBHS - Faith Based Health Service

FY - Financial Year

GIZ - Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)

GAVI - Global Alliance for Vaccines and Immunization

GDP - Gross Domestic Product.

HAI - Health Action International

HepB- Hepatitis B

Hib - Haemophilus Influenzae type b

HIV/AIDS - Human Immunodeficiency Virus/Acquired Immune Disease.

HLTF - High Level Task Force on Innovative International Financing for Health Systems.

KACC - Kenya Anti-Corruption Authority.

KEML- Kenya Essential Medicines List

KEMSA - Kenya Medical Supplies Agency.

KEPH - Kenya Essential Package for Health

MEDS - Mission for Essential Drugs and Supplies.

MOH - Ministry of Health

NCAPD - National Coordinating Agency for Population and Development.

OECD - Organization for Economic Co-operation and Development

QoC - Quality of Care

RDT- Rapid Diagnostic Test

RUM - Rational Use of Medicines

SARAM - Services Availability and Readiness Mapping

SPSS - Statistical Package for Social Sciences.

TB - Tuberculosis

THE - Total Health Expenditure

VF - Virologic Failure

WHO - World Health Organization.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The importance of availing essential medicines to all health care facilities in Kenya cannot be overstated considering that such medicines form a central part of the country's ability to deliver effective health services to all citizens. According to the World Health Organization (2014), essential medicines refer to, "…those [drugs] that satisfy the health care needs of the majority of the population; they should therefore be available at all times in adequate amounts and appropriate dosage forms". Essential medicines are needed for the treatment of the most common illnesses such as malaria, HIV/AIDS, pneumonia, and diabetes among others. Similarly, essential medicines are required in the delivery of critical health care services such as reproductive health and vaccination (Masiga, 2010; WHO, 2014). In the selection of essential medicines, it is recommended that one should consider the pattern of diseases, the availability of treatment facilities, the experience and training of health care staff, financial resources, and environmental factors. On the other hand, the medicines included in the Essential Medicines List (EML) must have adequate data from clinical studies to support their respective characteristics in terms of efficacy, safety, stability, bioavailability, quality, pricing, and stock availability among other factors (Masiga, 2010; WHO, 2014).

Pursuant to the World Health Organization's recommendations on the concept of essential medicines and the criteria for selection of drugs to be included in the EML, the Government of Kenya came up with its first Essential Drugs List (EDL) in 1981, which was subsequently revised to enhance the management of drug supplies in the public health sector (Ministry of Health [MOH], 2003). The drugs list was later revised and produced in 2010, and it is referred to as the Kenya Essential Medicines List

(KEML). The KEML was published alongside the Clinical and Referral Guidelines (Volumes I, II, & III) to inform the development and implementation of the Kenya Essential Package for Health (KEPH), which is intended to support the on-going efforts towards addressing the country's overall health status. The most recent revision of the drugs list was undertaken in 2016 with significant changes to the 2010 version (MoH, 2016).

Despite the government's remarkable efforts in the management of medical supplies by developing a comprehensive KEML, it is often observed that essential medicines are not currently available to every Kenyan citizen who needs them. According to an assessment conducted by the Ministry of Health in conjunction with the World Health Organization (WHO) and Health Action International (HAI), it is apparent that the problems in the health care sector in Kenya are occasioned by major stock-outs of essential medicines, particularly in government-based hospitals and health facilities (WHO, 2009). Furthermore, the findings of the assessment revealed that most of the basic essential medicines were available in all primary care level health facilities at the time of the study, but a large set of medicines were less available. In addition, the assessment found out that there were major stock-outs of even the most basic essential medicines in both the public and faith-based health service (FBHS) facilities, which ran up to 46 days and 14 days for public and FBHS facilities respectively. In other public health facilities, the assessment showed that there were critical stock-outs that sometimes extended anywhere between 30-90 consecutive days (WHO, 2009). In a recent report, it's noted that about 47% of patients treated in public facilities report receiving all the medicines prescribed compared to 71% of patients in faith based facilities with two thirds of households indicating their dissatisfaction with the level of medicines availability in the public facility nearest to them (KHSSP 2013-2017). This

data indicates that not everyone who visits a public health facility is likely to receive the prescribed medicines.

A 2016 report by the German agency GIZ revealed that access to medicines and health products in the Kenyan public sector is plagued by several challenges including an underdeveloped state of rural health care infrastructure and shortage of essential drugs due to an inefficient supply chain and understaffing in public health centres. Stock-outs occur frequently due to limited consumption data, low awareness, extended replenishment lead times and a lack of funds. For diagnostics, stock-outs can be high due to the short shelf life of the reagents and unpredictable demand. In 2013, about 48% of 87 public facilities across 5 districts in Kenya were having stock-outs of one or more of the antimalarial drugs and across the country the stock-outs were at 51%. As much as there has been improvements in the reduction of lead times for medical supplies, the financing and cash disbursements for the public sector to the counties need to be enhanced and it's also important to avail all the essential medicines (GIZ, 2016).

Currently, the public financing of the health sector through the government is about US$ 6.2 per capita while the total health expenditure per capita stands at US$ 78. (World Development Indicators, WDI, 2016).This translates to about 197 $ (International dollar) and the government budget allocation towards health stands at 6.4% as a percentage of the GDP. It is estimated that the per capita expenditure on health is set to rise to about 237 $ by the year 2030 and an allocation towards health expenditure of 5.9 % of the GDP. This is based on the ensemble model that is used to estimate future GDP, all sector government spending, and development assistance for health, out-of-pocket and prepaid private health spending. (Dieleman et al, 2017)

The estimated budget allocation towards financing of the health sector of 5.9 % of the GDP by the year 2030 still does not meet the Government of Kenya's commitment to spend at least 15 per cent of the national budget on health as outlined in the Abuja Declarations of 2001 and 2006 (WHO, 2008). Limited funding has reduced the public health sector's ability to provide adequate health care services to those-in-need which leads to health facilities purchasing drugs using user fees revenues which is not sustainable. Patients are also compelled to incur out of pocket payments leading to poor patient outcomes and irrational medicines use such as under dosing which could result in drug resistance (KHSSP 2013-2017). Out of pocket payments lead to financial barriers contributing to impoverishment of households through purchasing medical goods and services resulting to catastrophic expenditures. Household surveys have shown that on average, 100 million individuals are impoverished, and another 150 million individuals face severe financial difficulties during any given year because of these direct health expenditures. (WHO, 2014)

1.1.1 Wastage: Definition of terms

1.1.1.1 Expiration waste

Wastage of drugs is a contributing factor to the high rate of stock-outs of essential medicines in Kenya's public health sector. The term 'wastage' refers to various circumstances when used in the context of medical supplies. According to Lawrence, Qu, and Briskin (2013), wastage occurs when a drug is prescribed, but it cannot be administered or put into proper use because of a host of reasons including the side effects experienced, affordability issues, drug interactions and simple neglect (Lawrence et al 2013). Another reason is drug expiry, which means that when drugs are procured and stored beyond their shelf-life, they become unfit for human use.

1.1.1.2 Mix waste

Drug wastage can occur when physicians provide erroneous prescriptions that will end up being ineffective or when physicians ignore less-expensive drugs and prescribe highly priced brand-name drugs that are less affordable. This is referred to as mix waste (Lawrence et al 2013).

1.1.1.3 Channel waste

Drug wastage can occur in the process of distribution whereby poor handling may contribute to the destruction of essential medicines before use often referred to as channel waste. (Lawrence et al., 2013; Trueman et al., 2010).A summary of the types of wastage is provided in table 1 below.

Table 1: Summary of the Forms of Wastages

Expiration Waste	Where drugs are procured and stored beyond their shelf-life then they become unfit for human use hence they must be destroyed.
Mix waste	When physicians provide erroneous prescriptions that will end up being ineffective or when physicians ignore less-expensive drugs and prescribe highly priced brand-name drugs that are less affordable
Channel waste	Where poor handling in the process of distribution contributes to the destruction of essential medicines before use.

A related concept is fraud which contributes to wastage. According to Lawrence et al. (2013), the term fraud refers to, “the intentional deception or concealment of medical information for financial gain [or the act of willfully misrepresenting] the nature of services to receive higher compensation”. On the other hand, fraud can be manifested in form of illegal acquisition of drugs for personal use or profit. In the Kenyan public

health sector, drug theft is a major problem that contributes to substandard service delivery and is a good example of fraud. According to the Kenya Anti-Corruption Commission (KACC)'s assessment of corruption in the public health sector, there is widespread fraud in the procurement and distribution of medicines (KACC, 2010). Specifically, KACC noted that bureaucratic procurement procedures have led to the delivery of drugs with short expiry, which are stocked for a short period and destroyed thereafter. Moreover, the report by KACC noted that misappropriation or theft of essential medicines is widespread in the public health sector whereby medical personnel acquire drugs to stock their privately-owned health facilities (KACC, 2010).

Drug abuse or the irrational use of drugs is another contributor of drug wastage that afflicts the public health sector in Kenya. The term abuse when used in connection with the supply of essential medicines may refer to the inappropriate use of drugs for non-medical purposes or the purchase of non-essential medicines to substitute over-the-counter options, which are otherwise effective (Lawrence et al., 2013). In general, drug wastage is a major problem across the public health sector in Kenya, and its effects are felt by many as it is closely associated with increased healthcare costs, poor patient outcomes, and other inefficiencies in the delivery of healthcare services.

It is against this background, particularly in relation to the major causes of essential drug stock-outs, that this study seeks to examine the effects of drug wastage on health care service delivery in all levels of public health facilities in Uasin Gishu County. The findings of the study will inform policy formulations and implementation to reverse the worrying trends in the public's health status, which are partly attributable to drug wastage. Due to time and budget constraints, the current study focused on the three

different forms of wastage, that is, expiration waste, mix waste and channel waste and sought to establish their impact on healthcare service delivery in public hospitals.

1.2 Statement of the Problem

The Government of Kenya has put in a lot of efforts in the development of a comprehensive KEML and other related documents intended to streamline the management of the public health sector, particularly in the procurement and distribution of essential medicines.

However, the public health facilities under the management of county governments face several systematic hurdles. According to Luoma et al. (2010), many public health facilities across Kenya are characterized by critical staff shortages, low budgetary allocations, and weak drug distribution systems. Specifically, the continued use of both the push and pull systems has exacerbated the drug supply problems in that on one hand, essential medicines are in short supply while on the other hand, non-essential drugs are oversupplied (Luoma et al., 2010). There has since been a shift to the pull system of drug procurement hence the abolishment of the push system. The introduction of devolution greatly disrupted the pull system of drugs ordering which was in place in most facilities by 2013. While previously they could draw drugs from KEMSA, counties are no longer obliged to get drugs from KEMSA and can now source drugs from other places they prefer. This has opened an avenue for corruption, mismanagement and perennial scarcity of drugs at health facilities. This is the case due to suboptimal and unestablished procurement systems leading to corrupt county personnel procuring drugs of questionable quality and at inflated costs. This not only compromises the list of essential medicines as provided by the Ministry of Health but

also the quality of drugs procured hence leading to wastage and endangering the lives of the population (Kimathi, 2017).

The World Health Report 2010 narrowed down to 10 common sources of inefficiency in healthcare expenditure alluding that 20-40% of total health spending or the sum of between US$ 1.3-2.6 trillion might be lost through waste, corruption and other forms of inefficiency globally (Riku Elovainio et al 2013).In the US, the Federal Bureau of Investigations believes that between 3% - 10% of healthcare expenses are attributed to fraud, waste and abuse. In dollar terms, fraud alone represents a staggering $70 – $234 billion in additional healthcare costs each year. The figures are also said to be modest and that as large as they may appear, probably still significantly understate the size of the problem. Express Scripts, the largest pharmacy benefit management organization in the US, estimates that channel waste and mix waste accounts for US$88 billion and US$258 billion dollars respectively in healthcare costs (Lawrence et al, 2013). It was further estimated that the extent of six major forms of wastes identified as failure of healthcare delivery, failures of care coordination, overtreatment of patients, administrative complexity, pricing failures and fraud and abuse consumed about 21 – 47% of the approximately $ 2.6 trillion annual total health spending in 2011in the US (Bewerick and Hackbarth, 2012).

In the UK, the scale of wastage was unknown but the estimates ranged from less than 1% to up to 10% of total spending on medicines. As a proportion of 2008 medicines spending, that ranged from £82 million up to £827 million (White, 2009).More recently, a report from the Organization for Economic Cooperation and Development (OECD) also revealed the fact that a significant share of health spending in OECD countries was

ineffective and wasteful (OECD, 2017). These examples serve to illustrate how costly the menace of drugs wastage is in relation to healthcare spending.

There was paucity of information on the extent of drug wastage across different public health facilities in Uasin Gishu County. This meant that the hospital managers and policy-makers in the County did not have access to pertinent evidence, which would enable them make informed decisions when addressing the deep-rooted problem of drug wastage. Accordingly, the study sought to estimate the extent of drug wastage through expiration waste, channel waste and mix waste across different public health facilities in Uasin Gishu County. Moreover, the study examined the major factors underlying the problem of drug wastage. Findings from the study will contribute to the development of policies and guidelines to manage the procurement, storage, and distribution of medicines across the county to improve healthcare service delivery.

The county was identified as an appropriate study site since it lies in the malaria epidemic prone areas of western highlands of Kenya where the population is vulnerable and case fatality rates during an epidemic can be up to 10 times greater than those experienced in regions where malaria occurs regularly (Kenya Malaria Treatment Guidelines 2010).

1.3 Justification of the Study

As mentioned earlier, there was limited literature attempting to evaluate and document the level of drug wastage in public health facilities in Uasin Gishu County even though essential drug stock-outs are a common feature in the public health sector. It was important to note that there was need to eliminate the existing drug wastages in public health facilities to make a difference in terms of saving lives, especially in the rural areas whereby essential medicines were not only in short supply, but also unaffordable.

More specifically, previous studies had recommended that drug wastage could be addressed through the strengthening of the existing drug distribution systems, laws, and policies (Luoma et al., 2010). Accordingly, this study played a critical role hence contributing to the improvement of drug distribution systems and policies by providing vital information on different forms of drug wastage in public health facilities. Moreover, the study was important because it sought to identify the major factors underlying the challenge of drug wastage as well as the existing institutional failures in the public health sector, which might have served to promote wastage. Finally, the study recommended ways through which the major stakeholders could minimize or eliminate the challenge of drug wastage in public health facilities which partly contributed to the antimalarial drug stock outs.

1.4 Objectives

1.4.1 General objectives

The main objective of this study was to assess the levels, nature, and effects of drug wastage in public health facilities in Uasin Gishu County using uncomplicated malaria as the tracer illness.

1.4.2 Specific objectives

This study specifically sought to:

1) Assess the nature of antimalarial drug wastage in public health facilities.
2) Estimate the levels of antimalarial drug wastage in public health facilities.
3) Illustrate the effects of antimalarial drug wastage on healthcare service delivery.

1.5 Research Questions

In order to achieve the above-mentioned research objectives, this study aimed to answer the following research questions:

1) What types of drug wastages are prevalent in public health facilities in Uasin Gishu County and what are their levels?
2) How do drug wastages affect access to healthcare and healthcare costs in public health facilities?
3) Which systematic failures are closely associated with drug wastage in public health facilities in Uasin Gishu County and are there ways through which the drug wastage can be minimized?

1.6 Study Scope

The overarching aim of this study was to assess the levels, nature, and effects of drug wastage in public health facilities in Uasin Gishu County and recommend possible ways of addressing the problem. This entailed examining the extent of drug wastage in the County and determining its effect on the accessibility of healthcare services and the cost of services. The study also sought to establish how systematic failures in the procurement and delivery of drugs contribute to wastage of drugs. To achieve this, the study team employed a mixed methods approach using interviews, questionnaires and document reviews to collect relevant data from the participants. Qualitative methods were important in gathering the participants' perceptions and experience towards drug wastage. Quantitative methods were used to determine the magnitude and nature of drug wastage. In addition, it was imperative to note that the public health sector comprises many stakeholders drawn from different specialty areas; hence, this study attempted to incorporate the views of all those involved. This led to the targeting of healthcare providers at facilities across Uasin Gishu County within the month of June

2017 in order to provide balanced recommendations on how best to resolve the problem.

1.7 Conceptual Framework

In the literature, it is well established that the use of drugs is the most salient and cost-effective way of delivering health care services to members of the public, particularly because drugs help to relieve symptoms and cure diseases; hence, they should be sufficiently available and affordable across all public health facilities (Falkenberg et al., 2000; Vazquez, 2003).It is estimated that at least 50 per cent of the population in the third world countries, including Kenya, lacks regular access to basic essential drugs (Vazquez, 2003). This is attributable to many factors including high costs of the available drugs, corruption, and poor governance in the public health sectors.A recent report showed that an estimated 2 billion people have no access to essential medicines, effectively locking them out of the benefits derived from the advances in modern science and medicine. (WHO, 2017). An assessment of public health facilities in Kenya showed that the availability of health products varied with vaccines, malaria commodities, lifesaving commodities and TB products being reported in 80%, 65%, 60% and 55% of the facilities respectively (SARAM, 2013). This points to the gaps existing in terms of access to medicines.

Wastage of drugs through expiration and fraud has been cited as one of the major reasons behind lack of access to essential medicines, poor patient outcomes, and increased healthcare costs in Kenya (WHO, 2009). On the other hand, a study by Luoma et al. (2010) found out that a number of systematic failures such as the continued use of the push system for procurement, weak policy and regulatory frameworks and poor

mechanisms to support the rational use of medicines (RUM) are implicated in wastage of drugs in public health facilities across Kenya.

Luoma et al. (2010) further observed that the continued use of the push system for procurement led to the under-supply of essential medicines and the over-supply of non-essential medicines, which ended up expiring on the shelves. There has since been a shift from the push procurement system to a fully pull system of procurement which has resolved the problem of oversupply of non-essential drugs to the facilities. The bureaucratic procurement procedures have been implicated in the supply of short expiry drugs, which cannot be stored in the health facilities for long periods. In addition, the Kenya Anti-Corruption Commission (2010) noted that the misappropriation of drugs is very rampant in the public health sector in Kenya.

Against this background, this study hypothesized that various systematic failures contribute to increased wastage of drugs, which in turn leads to different negative health care service delivery outcomes, including inaccessible health care services, increased out-of-pocket and house-hold expenditure on healthcare services, increased overall healthcare costs and poor patient outcomes. (See Figure 1, page 15).

The three forms of wastage clearly emerge as having negative effects on healthcare service delivery. Expiration waste which renders drugs unusable due to lapse of the sell by date is a form of wastage that is easier to capture. This form of wastage can be quantified easily since one only needs to check the sell by date of the drugs which is always indicated and see if it has elapsed. It is a clear pointer of whether drugs are supplied based on demand and informed by well worked out needs projections. The study will focus on this form of wastage since its one form that can easily be reduced if

not eliminated if the drugs are ordered and supplied based on established needs projections.

Mix waste emerges from the definition as a subtle form of wastage tending towards the prescriber's side. This is so, since the prescribers are the people expected to give the best medications for any given condition and their decisions may not be challenged. Mix waste may occur when the clinicians knowingly or unknowingly issue certain drugs instead of others that could give better outcomes at lower costs. This may at times be due to necessity since they may sometimes issue the only available medication rather than what is recommended by the standard treatment guidelines. The study will explore factors leading to mix waste and attempt to establish ways of reducing wastage from the prescriber's end.

Channel waste is also a clearer form of wastage since any drugs getting to the health institution in a damaged condition due to handling can easily be picked out. The study will focus on this form of wastage since it's easily quantifiable and could also be addressed to help reduce healthcare costs and improve access to healthcare.

To achieve better focus on wastage, the study narrowed down on uncomplicated malaria as the tracer illness and the wastage of artemether lumefantrine, the first line medication recommended for the management of the disease in Kenya. Even though the cases of malaria had reduced by 30% since the peak number of cases in 2000 and mortality rates had reduced by 47%, malaria is still a substantial global health concern. In 2013, there were approximately 198 million cases of malaria across 97 countries with Africa bearing the highest burden. It's estimated that about 8 million cases of uncomplicated malaria progress to severe malaria annually and that malaria mortality majorly affects children with 78% of the cases occurring in children under the age of five. Through

scaled up international donor funding, progress has been made in improving access to ACTs, slowing the emergence of artemisinin resistance and reducing malaria incidences and mortalities. However, additional efforts are required to address the current gaps in access to ACTs across both the private and public sector in order to ensure high malaria cure rates, reduce transmission and control the spread of drug resistance (UNITAID, 2015). Therefore, addressing any form of wastage in the utilization of the ACTs will contribute in helping to address the access gaps that have been depicted above.

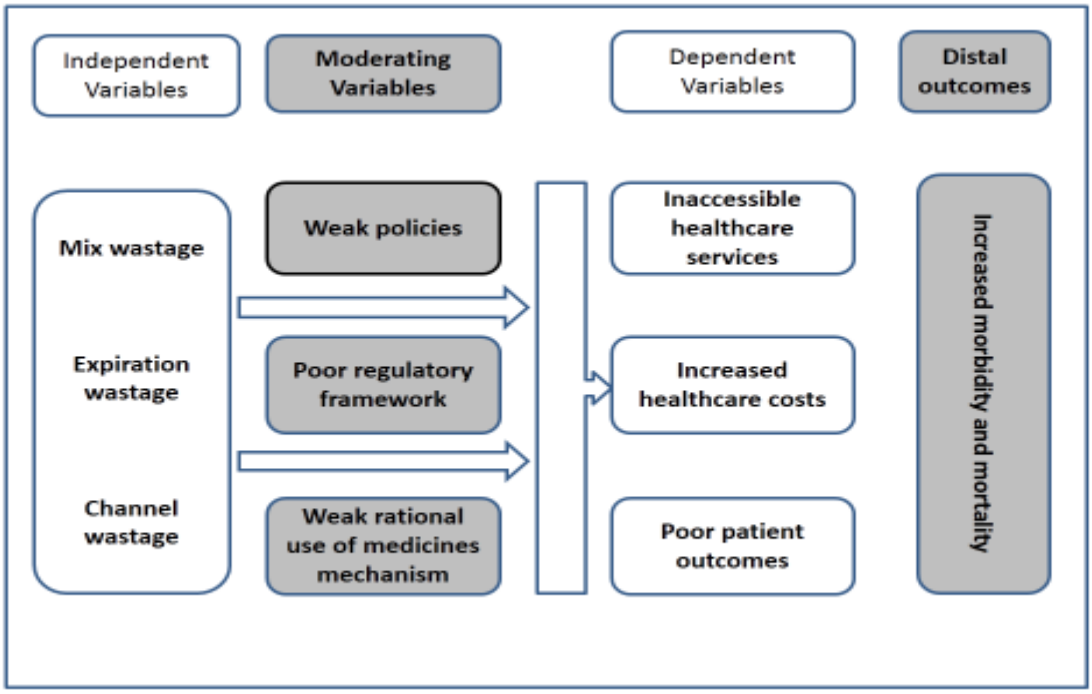

Figure 1.1: A conceptual framework showing independent and dependent variables

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter describes the most recent publications around wastage of drugs in public hospitals and its effect on healthcare service delivery. The chapter generally describes the different forms of medication wastage and then gives a brief overview of the tracer illness, that is, uncomplicated malaria and the medications used in its management after which the specific wastage of antimalarial drugs is also covered. It further illustrates the relationship between the intermediate outcomes and wastage of drugs i.e. accessibility and costs of healthcare services and patient outcomes.

There are few publications that illuminate wastage of drugs in public hospitals and its effect on healthcare service delivery. This is likely since it's often regarded as a purely managerial and financial problem as opposed to a clinical concern (Trueman et al, 2010). Another reason for this has been pointed out to be a lack of consistency in the terms used in the definition of medication wastage. In fact, a systematic review reported that a search of European health policy documents did not identify a standard definition for related terms of 'medication', 'medicine', 'drug' or 'pharmaceutical' in combination with 'waste' or 'wastage' (Lorna et al 2014). Indeed, a generalized definition of medication wastage captured in one of the articles in the review referred to any drug product that was dispensed after being prescribed or purchased over the counter and was not taken. It further explained that medication wastage could be due to patient's noncompliance, irrational prescriptions, or uncontrolled sales of prescription drugs at community pharmacies. The studies in the review reported the main causes of wastage to be a change in medications, patient's death, resolution of a patient's condition and expired medications. These factors tend to affect chronic conditions

hence may not be generalizable to an infectious condition such as malaria and the medications needed to manage the disease. This necessitated the need to develop working definitions for the types of wastage for the antimalarial drugs for a more focused review.

2.2 Tracer Illness and Tracer Drugs

Uncomplicated malaria was the tracer illness and subsequently the drugs used to manage the condition were used as the tracer drugs. Uncomplicated malaria is defined as a condition in which a patient presents with symptoms of malaria and has a positive parasitological test (Microscopy or Rapid Diagnostic Test, RDT) but with no features of severe malaria (WHO, 2015). The disease is characterized by fever in the presence of peripheral parasitaemia. Other features may include chills, profuse sweating, joint pains, muscle pains, abdominal pain, diarrhoea, nausea, vomiting, irritability and refusal to feed. These features may occur singly or in combination (National Guidelines for the Diagnosis and Treatment of Malaria, 2010).

It is currently recommended to confirm malaria diagnosis in all age groups for all epidemiological settings either by microscopy or using RDTs. (GOK 2010;WHO, 2015). The use of confirmatory tests is expected to reduce the overuse of antimalarial drugs by ensuring that the treatment was targeted at patients with confirmed infection as opposed to treating all patients with fever hence ensuring that wastage of the antimalarial drugs are minimized. The Kenya National Malaria Treatment Guidelines, 2010 pointed out that plans were underway to ensure that diagnostic tests were available at all levels of healthcare and also admitted that the process could take some time. The study evaluated whether this had been affected in Uasin Gishu county health facilities. The local guidelines, being in line with the WHO malaria treatment guidelines

further directs that under no circumstances should a patient with suspected malaria be denied or delayed treatment for lack of a parasitological diagnosis. Clinicians are however advised to endeavor to test patients to confirm malaria even after treatment has been provided. The recommended first line treatment for uncomplicated malaria in Kenya at the point of the study (June 2017) was artemether- lumefantrine (AL) currently available in a co-formulated regular or child friendly dispersible tablet containing 20mg of artemether and 120mg of lumefantrine. This was administered in a 6-dose regimen given over 3 days as illustrated on the table below.

Table 2: Dosing schedule for artemether-lumefantrine

Weight in kg	**Age in years**	**Number of tablets per dose**					
		Day 1		**Day 2**		**Day 3**	
		1st dose	**8 hours**	**24 hours**	**36 hours**	**48 hours**	**60 hours**
5 – 14	5 months ≤ 3years	1	1	1	1	1	1
15 – 24	3 - 7years	2	2	2	2	2	2
25 – 34	8 - 11years	3	3	3	3	3	3
above 34	≥ 12 years	4	4	4	4	4	4

Source: **Kenya Malaria Treatment Guidelines (2010)**

The above recommendation was in line with the WHO recommendation at the point of the study (June 2017) that stated that children and adults with uncomplicated malaria (except pregnant women in their first trimester) should be treated with any of the Artemisinin based Combination Therapies (ACTs); Artemether/lumefantrine; Artesunate /Amodiaquine; Artesunate / Mefloquine; Dihydroartemisinin /Piperaquin or Artesunate / Sulphadoxine-Pyrimethamine. The duration of treatment should be 3 days.

Uncomplicated malaria in pregnancy was also considered in the study. The Kenyan guidelines recommended the use of oral quinine in a 7 day therapy for the management of uncomplicated malaria in the first trimester of pregnancy. The guideline further directs that AL or any other treatment should not be withheld in the first trimester if quinine was not available. This was because malaria could be fatal to the pregnant mother if untreated. Artemether /Lumefantrine is the recommended treatment in the 2nd and 3rd trimesters. Oral quinine could also be used but compliance must be ensured. The dose regimens for quinine and AL were as recommended in the management of uncomplicated malaria schedule above (Kenya Malaria Treatment Guidelines, 2010).

The study focused on the aspects of wastage in the light of the usage of the AL and quinine for the management of uncomplicated malaria. The study also allowed for the exploration of any alternative medications considered in the management of uncomplicated malaria in instances where the national treatment guidelines were not followed or in cases where the first line medications were not available. The study focused on expiry wastage, channel wastage and mix wastage as earlier defined, and they thus form the basis of the literature review.

2.3 Types of Wastage for Antimalarial Drugs

Mix wastage in the context of antimalarial medications is considered as situations leading to over diagnosis and over treatment due to various reasons especially on the healthcare provider's side. Indeed, up to around the year 2001, policy makers, including the WHO, recommended the empiric treatment of malaria in areas where laboratory confirmation for uncomplicated malaria was not available. All patients presenting with fevers were supposed to be treated with antimalarials whether they had signs of other

illnesses and thereby the overuse of chloroquine was accepted because of its low costs and good tolerability. With the introduction of ACTs for the treatment of malaria, cost concerns led to the need for diagnosing and managing other causes of fever and to reduce the wastage of antimalarials (Ochodo et al, 2016). Several reasons have been cited for the overtreatment of uncomplicated malaria that points out to the presence of mix wastage. In some instances, antimalarials were prescribed in the presence of fevers without diagnostic tests being done. This was reported in both Kenya and Uganda, where malaria treatments were commonly obtained over the counters where tests are rarely conducted. A lack of rapid diagnostic test kits (RDTs) has also been cited as another reason. Cross sectional studies in Tanzania, Mozambique and the Democratic republic of Congo reported that several facilities surveyed did not have RDTs in stock. Mix wastage has also been pointed out to result from situations whereby antimalarial drugs were still prescribed despite a negative test result. The justifications for this action from the health workers include; a lack of trust over the accuracy of the tests, fear of the repercussions for missing a true case of malaria, lack of clarity on the shift to new guidelines, pressure by patients to be prescribed for antimalarials and a lack of clarity on ways of managing other causes of fever (Ochodo et al, 2016).

The working definition of expiry wastage is whereby drugs are procured and stored beyond their shelf-life then they become unfit for human use hence they must be destroyed. The challenge of the expiry of drugs in the supply chain is a major concern to the already constrained access to drugs in third world countries (Madinah, 2016). In a study in Tanzania, it was noted that the supply of drugs should be done prudently to avoid all forms of wastage including pilferage, overstocking and expiry. It was concluded that the wastage reduced the amount of drugs available to patients and consequently impacted the quality of healthcare offered (Kagashe & Massawe, 2012).

In the study in Uganda, Madinah noted that the drugs commonly affected by expiry included those used for vertical programmes, drug donations and those with a slower turnover. This adds to the findings from hospitals in Tanzania, where Kagashe observed that some of the reasons leading to expiration of drugs included drugs being procured with their expiry dates nearing, where several drugs with a similar indication are stocked hence one is preferred over the other leading to expiries. Other reasons cited included overstocking of commodities, poor quantification of required drugs and donation drugs received when almost expiring.

In Kenya, a study in Narok indicated that inaccurate quantification of medicines led to excesses or fewer medicines required hence leading to surpluses or lower stocks of supplied drugs. In cases of excesses, this usually resulted in expiries of drugs before being dispensed leading to wastage of medicines and funds since the expired drugs are rendered useless hence have to be destroyed (Muhia et al 2017). The study in Uganda, noted that the affected medications actually included some essential medications. The study further conducted an analysis on the contributing factors to this challenge in the supply chain and noted the main reasons to include; a neglect to the stock monitoring process, ignorance on basic expiry prevention techniques, lack of clinicians involvement in the drugs quantification in the hospitals, profit and incentive based quantification, third party procurement by vertical programmes and overstocking. It was also pointed out that poor coordination also contributed to expiries with an instance cited whereby during a policy change for malaria treatment, a significant quantity of the phased out drugs expired in Uganda (Madinah, 2016).

Regarding the expiry of antimalarial drugs, a study in Tanzania revealed that expiries in public health facilities was a common problem. Reasons cited for the expiries

included donations of drugs with short expiry dates from donors, private medical companies and other medical agencies. Other reasons were overstocking of drugs due to poor projections of required drugs and a preference for the branded ALs over the generic versions which ended up staying longer at the facilities (Silumbe & Kamuhabwa, 2015). These observations are pointers to the existing challenge of expiration wastage of drugs including antimalarial medications and captures the effect it has on healthcare service delivery and a need to address it appropriately.

The working definition of channel wastage is a situation whereby poor handling in the process of distribution contributes to the destruction of essential medicines before use. Approximately 30 million vaccine doses could be saved yearly in third world countries through optimization of the vaccine cold chain. A study by the Global Alliance for Vaccines and Immunization (GAVI), a public private partnership aiming at saving lives via increased access to vaccines in poor countries suggested even more substantial effects. GAVI suggested that for the pentavalent DPT-Heb-Hib vaccine alone, 25-50 million doses with a value of between USD 80-160 million could be saved in these countries by curbing unnecessary wastage from thermal damage, freeze damage or discarding of unused portions of multi dose vials (Hayford et al, 2011). Hayford further notes that the transport and delivery of essential products is usually complicated by several factors including temperature and humidity requirements, value of the product, complexity of the product and the need for skilled personnel to deliver some essential products.

The distribution of essential health products is further complicated by the mix of private and public players consisting of manufacturers, distributors, governments, NGOs and bilateral and multilateral institutions which is also dependent on the product

characteristics, country size, existing distribution networks and the structure of the health system (Hayford et al, 2011). Hayford adds that there would be significant reductions in product wastages, storage space requirements and out of stock situations if essential health products ordering systems achieved a similar level of efficiency as noted with consumer product goods.

For antimalarials, in a study in Homabay County, Kenya, it was observed that a big proportion of level 2-4 health facilities got their drug supplies from a central medical stores headquarters but were not transported in the right vehicles. It was noted that the drugs were exposed to adverse weather conditions which could impact their efficacy and potency. In all the sampled facilities, general purpose vehicles were used to transport the drugs with little regard on ensuring that the environmental conditions were monitored or controlled in the process. This led to a possibility of the drugs being delivered in a damaged condition due to poor transportation, hence reducing their quality. (Angira et al, 2010).

These consequences of reduced drug quality due to improper handling is consistent with a WHO report indicating that reduced drug quality arose from among other things inadequate handling and storage. This ultimately resulted in ineffective treatment and possibly the resistance to antimalarial drugs. They further note that a study in Africa found that Chloroquine stored under realistic tropical conditions had a reduction of up to 10% of its activity in slightly over an year of storage (WHO, 2001). Indeed these are pointers to the gaps that exist and contribute to the challenge of channel wastage.

2.4 Accessibility of Health Care Services

Access to health care services can be defined as the ability of a given population to obtain appropriate health services relative to geographical and transportation factors, financial and medical resources, and cultural appropriateness (Luoma et al., 2010). Although there are limited studies seeking to establish a direct link between wastage of drugs and accessibility of health care services, several studies have related the availability of essential medicines and other medical products to increased utilization of medical services (Chen, Dutta, & Maina, 2014; Muriithi, 2013; Prosser, 2007; WHO, 2009). On the other hand, it has been established that lack of drugs in a healthcare facility is a huge barrier to a population's access to health care services.

In the Service Availability and Readiness Assessment Mapping (SARAM) study, the authors found out that the availability of essential medicines was a key measure of the quality of healthcare services as perceived by the consumers (SARAM, 2013). Moreover, the SARAM study revealed that lack of medicines in health care facilities was a major hindrance to Kenyans' access and use of public health services (SARAM, 2013).

Currently, lack of essential drugs and medical products continues to hinder the public health sector's ability to provide quality and cost-effective services to all those in need. For instance, a maternal and newborn quality of care (QoC) study across different public health facilities in Kenya found out that most ANC facilities did not have sufficient stocks of infection control medicines; a factor that is partly implicated in the worsening maternal and child health trends in the country today (Kagema et al., 2010). Furthermore, the Kenya Service Provision Assessment of 2010 found that there were limited obstetric care services across different public health facilities in Kenya due to

frequent stock-outs of essential medicines, which can be closely linked to embezzlement of public funds and the misappropriation of available medical supplies (NCAPD & MoMS Kenya 2011). Although the government of Kenya is committed toward improving the country's health status by developing comprehensive policy frameworks and strategic plans, the prevailing acute shortages in public health facilities may become a major impediment towards providing 'treatment for all" (Transparency International-Kenya, 2011).

Based on field assessments conducted by Transparency International-Kenya, it was found that the major causes of critical drug shortages in public hospitals included hoarding of drugs by medical personnel, drug theft, over-stocking of non-essential drugs, and selling of drugs that are meant to be given out for free. As a consequence of extensive drug shortages in public hospitals, the assessment by Transparency International-Kenya (2011) revealed that many patients were unable to access basic medical services through public health facilities, but instead, they were forced to spend more money by either buying drugs from privately-owned pharmacies or by attending private hospitals. From the findings of the above-mentioned studies, it is apparent that the wastage of drugs in public health facilities, through theft and other corrupt means, works against the government's commitment toward providing universal healthcare to all by 2030. Hence, this study sought to examine the extent of drug wastage and its effect on healthcare service delivery in public health facilities in Uasin Gishu County, recommend appropriate ways of dealing with the problem and support the local government's efforts towards providing "treatment for all citizens".

2.5 Cost of Healthcare

Kenya's health care sector is partly financed by the government to the tune of approximately 6-8 per cent of the national government expenditure in each financial year. For instance, in the financial year 2001/02, the government's expenditure on health was about 29.6 per cent of the total health expenditure (THE), and in the financial year 2005/06, the total health expenditure was approximately 29.3 per cent (Government of Kenya, 2009). In the financial year 2008/09, the government's total health expenditure was around 35 per cent (Kshs. 34.8 billion or approximately US$11.80 per capita); marking a significant increase compared to previous years (Turin, 2010).

Apart from the government, the public health care sector is financed by a wide range of stakeholders, including private sector, households, and donor agencies (Chuma & Okungu, 2011). For instance, in the financial year 2008/09, households contributed over 24.1 per cent of the total health expenditure, and the donor agencies contributed over 40.6 per cent of the total health expenditure (Government of Kenya, 2009). In 2012, the government allocated 6% of the general government expenditure towards healthcare which translated to 2% of the GDP (WHO, 2014).

From the foregoing statistics, it is evident that health care financing has a substantial economic impact in Kenya. Further studies reveal that a large percentage of public expenditure on health goes to the purchasing of drugs and consumables, which are a valuable health care resource (WHO, 2009). Similarly, a large portion of the household expenditure on health in Kenya covers the purchasing of drugs and other medical supplies. Consequently, any wastage of drugs through expiration and fraud must be discouraged because it not only translates to huge financial losses, but it also

undermines the quality of healthcare services. Here, note that in Kenya just like any other developing country, the availability of drugs is a direct measure of the quality of care; hence, the credibility of any health system in relation to public health and safety is dependent on drugs availability.

Many Kenyans do not receive quality and safe healthcare services because of the prohibitive healthcare costs, which are partly attributable to the high cost of medicines (Chuma and Okungu, 2011). Concurrently, the Ministries of Health (2009) argue that the high user fees and out-of-pocket payments for medicines are the main factors behind the under-utilization of healthcare services in Kenya. This is because a large percentage of the Kenyan population cannot afford the cost of basic healthcare services let alone the cost of essential medicines.

With this in mind, any wastage of drugs in the public health facilities in Kenya will produce catastrophic results because many Kenyans depend on the medicines that are purchased by the government for their basic healthcare needs. Here, note that most of the essential medicines for the treatment of common illnesses such as Malaria, TB, and HIV/AIDS are available for free in all public health facilities across the country (WHO, 2009). Moreover, an assessment by the WHO (2009) found that patients receive essential medicines at a comparatively lower price when they visit public health facilities compared to private and faith-based health facilities. In fact, the WHO estimated that in 2009, the prices of medicines were at least 40 per cent lower in public health facilities compared to FBHS, and about 50 per cent lower than what was charged in private hospitals (WHO, 2009). It is apparent that any wastage of drugs in the public health facilities will not only prevent Kenyans from seeking basic healthcare because

of the high price of medicines, but it will also cripple household and national budgets on health.

2.6 Patient Outcomes

Wastage of drugs through what is termed as the, 'inappropriate use of medicines' is a common problem across the world and Kenya as well. According to the World Health Organization (2002), all kinds of medicines must be used in a rational manner in that, "patients [should] receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost" (p. 1). However, statistics from across the world reveal that over 50 per cent of all medicines are used inappropriately because they are wrongly prescribed, dispensed, sold, and consumed (WHO, 2002).

The most common categories of 'irrational use of medicines' from different parts of the world include the prescription of too many medicines per individual patient; inappropriate or inadequate use of anti-microbial drugs; and over-administration of injections even when oral options are appropriate. Other types of irrational use of medicines include self-medication of prescription-only medicines and failure to use standard clinical guidelines when prescribing and dispensing medications (WHO, 2002). Different studies have examined the prevalence of irrational use of medicines in various countries. In Nigeria, studies have found that most patients practice self-medication when it comes to the use of pain-killers, anti-malarial drugs and antibiotics, which are commonly used singly or in combination (Omolase et al., 2007; Osemene & Lamikanra, 2012; Uzochukwu et al., 2014).

In Kenya and the larger East African region including Ethiopia, studies have shown that most medical personnel do not follow the standards recommended by the WHO in

regard to the prescription of antibiotics, anti-malarial drugs, and injectables (Desalegn, 2013; Hassan et al., 2014; WHO, 2002).These relate to the mix waste as a nature of drug wastage which is mostly attributable to the prescribers' practices. On the other hand, studies conducted in the coastal region of Kenya have shown that most HIV-positive patients do not comply with the recommended standards in relation to the use of antiretroviral drugs; hence, most of these patients end-up with increased cases of acquired drug resistance (ADR) and virologic failures (VF). This relates to the non-adherence wastage that is seen to be due to failure on the patients' side and ultimately leads to higher costs in managing the advanced form of the poorly managed disease conditions. (Hassan et al., 2014). From the above-mentioned studies, it is evident that the problem of irrational use of medicines is quite prevalent in different parts of the world, and if the WHO (2002)'s estimation is anything to go by; the extent of this problem should concern all the interested parties. Of relevance to this study is the effect of drug wastage on various patient outcomes.

In the literature, it is widely established that irrational medicine use has different adverse effects on the quality of therapeutic and medical care as well as on the cost of healthcare. More specifically, inappropriate acquisition and use of medicines can negatively impact the treatment outcomes, especially by increasing the risk of adverse drug reactions and over-dosage as well as the transmission of HIV/AIDS, hepatitis B and C, and other blood borne diseases when injectable products are involved (WHO, 2002). Furthermore, the inappropriate use of drugs has been implicated in the increased burden of anti-microbial resistance across the world. Moreover, the inappropriate use of different medicines has a direct negative impact on the cost of healthcare because it means that both the patients and the health care systems will spend more on drugs than when the use of drugs is based on appropriate clinical uses and quantities.

Finally, the over-prescription of drugs and the self-medication practices tend to encourage patients to rely entirely on medications to treat every condition that they encounter, and in so doing, they can develop drug addiction and dependence, which cause many psychosocial problems (WHO, 2002). Therefore, if medicines are to achieve their right role in terms of relieving symptoms or curing diseases; then all the stakeholders in the public health sector should ensure that different kinds of medications are used according to the laid down standards and regulations regarding the rational use of medicines.

The review indicates that there are few publications that illuminate wastage of drugs in public hospitals and its effect on healthcare service delivery. The review further notes that the existing gaps could partly be attributed to the inconsistencies in the definitions of medication wastage and hence the need for developing working definitions of wastage that were used in the current study. Apart from identifying the different types of wastage as defined, the study sought to capture the levels of these types of wastage with a focus on antimalarial drugs. The study further looked at how the wastage of the antimalarial drugs in public hospitals had impacted the accessibility of healthcare services and the cost implications of this challenge. This aimed to further narrow the knowledge gap that exists around this area.

CHAPTER THREE

METHODOLOGY

3.1 Study Area and Population

Uasin Gishu County is in the former Rift Valley Province, and shares borders with several other counties, including Trans Nzoia, Elgeyo Marakwet, Baringo, Kericho, Nandi, and Kakamega. The county's estimated population size is approximately 981,654 people in 2012 (Uasin Gishu County Government, 2013). The County lies in the malaria epidemic prone areas of western highlands of Kenya, one of the four malaria epidemiological zones as determined largely by the altitude, rainfall pattern and temperatures. Malaria transmission in the western highlands in Kenya is seasonal, with considerable year to year variation. Epidemics are experienced when climatic conditions favor sustainability of minimum temperatures around 18 degrees Celsius. The increase in minimum temperatures favors and sustains vector breeding, resulting in increased intensity of malaria transmission. The whole population is vulnerable and case fatality rates during an epidemic can be up to 10 times greater than those experienced in regions where malaria occurs regularly (Kenya Malaria Treatment Guidelines 2010).

Malaria is thus a major public health concern in the region and the study narrowed down to the wastage of first line antimalarials used in the management of uncomplicated malaria. Currently, Uasin Gishu County has a total of 170 health facilities out of which there are 112 public health facilities, including a tertiary hospital, secondary hospitals, primary hospitals, health centers, and dispensaries (Table 3). Most of these health facilities are in Eldoret Municipality, but others are unevenly spread across the county, and serve Uganda, Rwanda, and South Sudan (Uasin Gishu County Government, 2013). The largest public health facility in the county is the Moi Teaching and Referral

Hospital, and the access to medical services in the county is wanting considering that the average distance between facilities is about 7 kilometers. These public health facilities formed the study sites out of which respondents were drawn, and hence formed the study population.

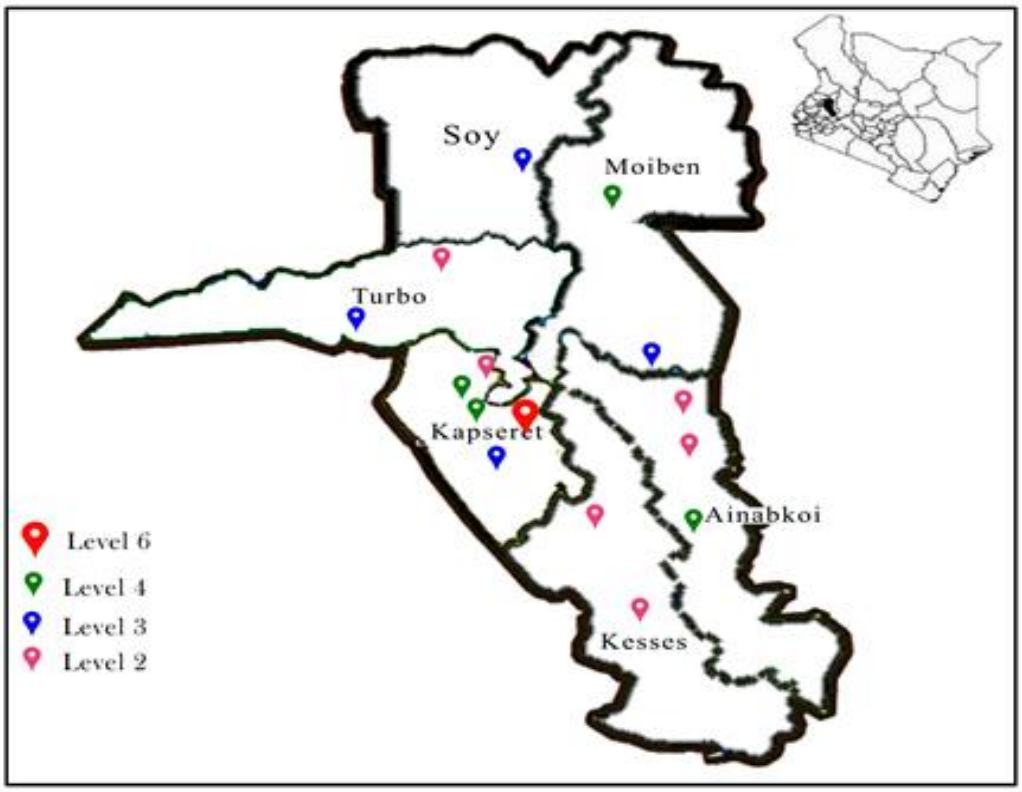

Figure 3.1: A map of Uasin Gishu County

Across the county, at the point of the study (June 2017), there were an estimated 924 health workers, including doctors, clinicians, nurses, and clinical officers who serve the public health facilities. The respondents for the study were therefore drawn from these groups of health workers and other officials within the hospitals i.e. procurement staff and the facilities in charge. These formed the primary study population. Other respondents included staff from relevant bodies such Kenya Medical Supplies Agency (KEMSA) and officials from the ministry of health at regional and national levels who formed the secondary study population. On the other hand, it was generally estimated that the county's doctor to population ratio was about 1:3,704, Clinical officers was 1:

2,703 and nurses to the patient population was approximately 1: 848 (SARAM, 2013). In general, there was a shortage of healthcare workers in the county, both in the technical and clinical service sectors.

Table 3: Number of Public Health Facilities in Uasin Gishu County

Level	Definition of Level	No. of facilities
6	Tertiary Hospitals (National referral services)	1
5	Secondary Hospitals (Provincial hospitals)	0
4	Primary Hospitals (County referral services)	4
3	Health Centers, Maternities, Nursing Homes (Primary care services)	24
2	Dispensaries, Clinics (Primary care services)	83
Total		**112**

Source: **Uasin Gishu County Government, 2013).**

3.1.1 Inclusion criteria

- Specific staff at the health facilities including casualty doctors, clinical officers, pharmacy staff, procurement staff and facilities in charge present during the time of the questionnaire administration.
- The staff should have served at the health facility for at least the past four months. This was to ensure that they had experienced a drug ordering cycle at the facility.

3.1.2 Exclusion criteria

- Specific staff at the health facilities including casualty doctors, clinical officers, pharmacy staff, procurement staff and facilities in charge who were absent during the time of the questionnaire administration.

- Staff who were newly employed and had served less than four months at the facility. This was to ensure that they had experienced a drug ordering cycle at the facility.
- Staff who failed to give informed consent to the study.

3.2 Study Design

This study was based on the principles of mixed methods study design, which entails the use of both qualitative and quantitative methods (Creswell, 2012). Quantitative methods were used to examine the extent of drug wastage while qualitative methods to determine how the wastage of drugs affects different aspects of healthcare service delivery. This offered greater validity of results (Creswell, 2008) and used a convergent parallel design (fig. 2), where both qualitative and quantitative data were collected concurrently, followed by separate analysis of the data before integrating the two sets of data at the interpretation stage (Creswell, 2012).

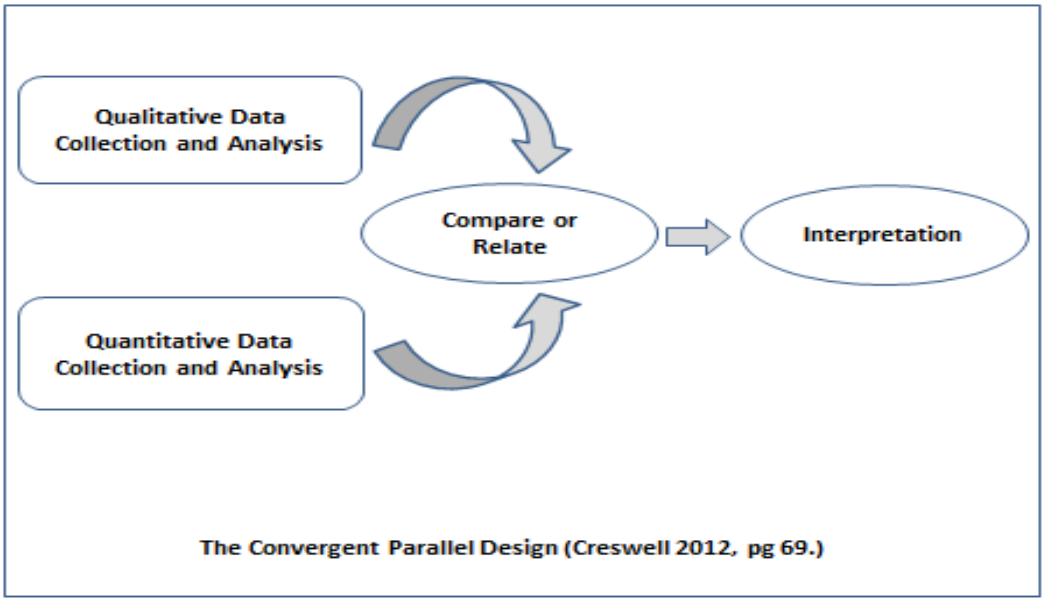

Figure 3.2: Analytical approach to data analysis

3.3 Sampling Method and Sample Size Determination

To achieve representative samples of public healthcare facilities belonging to the different levels and having a good geographical distribution, mixed methods sample design was used. Specifically, the concurrent multilevel design was applied. Multilevel mixed methods sampling is generally considered as a sampling strategy whereby probability and purposive sampling techniques are used at different levels of the study (Tashakkori & Teddlie, 2003).

Multilevel mixed methods sampling strategies are a common strategy in research examining setups in which different units of analysis are ‘‘nested within one another’’ such as schools, hospitals, and various types of bureaucracies. In studies of these nested organizations, researchers are usually keen on answering questions related to two or more levels or units of analysis. (Onwuegbuzie & Collins, 2007).A multilevel relationship involves the use of two or more sets of samples that are extracted from different levels of the study (i.e., different populations). In this study, whereas one phase of the investigation (i.e. quantitative phase) involved the sampling of health workers within a health facility, the other phase (i.e. qualitative phase) involved the sampling of the facilities In-charges.

The sampling scheme applied led to the use of several sampling techniques. The sampling process is illustrated on the figure 4 below. Stratified sampling was the first stage of sampling which involved dividing the target population for this study into preliminary strata representing the different levels of public health facilities in Uasin Gishu County i.e. the level 6, level 4, level 3 and level 2.

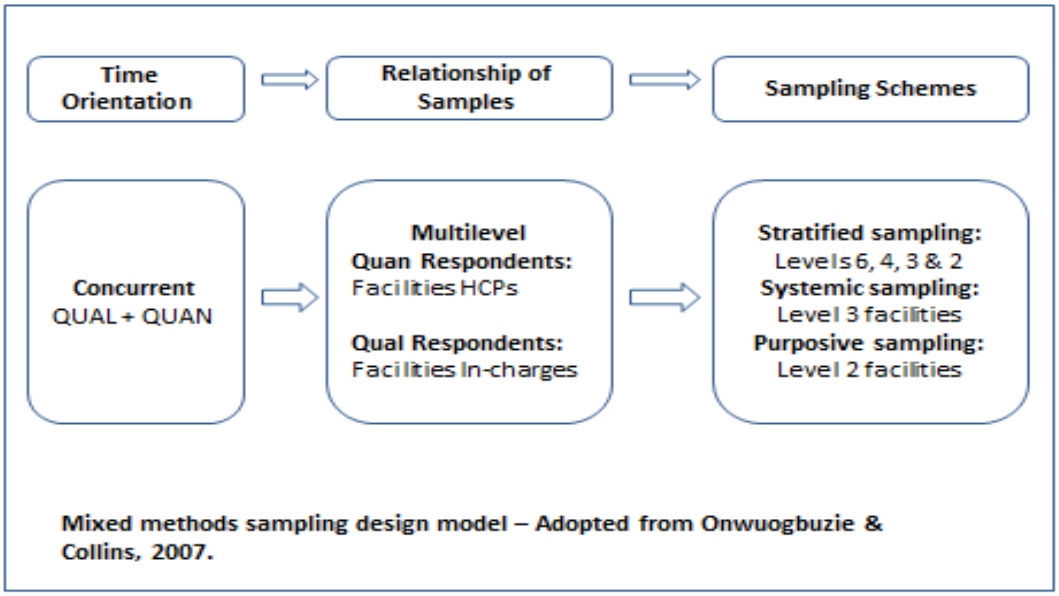

Figure 3.3: Summary of the Sampling Process

From the first two strata identified i.e. levels 6 and 4, full lists of healthcare workers relevant to the study were targeted as the respondents for the study. These included the doctors, clinical officers and pharmacy staff at the out-patient department since these are the relevant staff involved in the management of uncomplicated malaria which is our tracer illness. Other respondents who were targeted at these institutions included the procurement staff and the facilities in-charge.

In the third strata consisting of the level 3 health facilities, systematic sampling was employed. Out of the 24 level 3 health facilities in the county, 4 facilities were considered to overcome budgetary limitations and achieve an adequately representative sample. Using this sampling procedure, every sixth level 3 facility was selected in a systematic circular direction based on their location on the county map to achieve equal probability after making a random start. This yielded four level 3 institutions that were considered for the study. Again, all the relevant healthcare workers in these institutions were considered as respondents for the study the way it was done in the first two strata previously explained in the immediate last paragraph.

Finally, for the level 2 healthcare facilities, purposive sampling was applied to select six level 2 institutions within Uasin Gishu County with two facilities drawn from Eldoret West, Eldoret East and Wareng districts which form the 3 districts near Eldoret town. This was informed by the knowledge that the level 2 facilities usually have few staff that is a clinician and a pharmacy staff both of whom double up to perform several roles at the facility including the procurement role, being in charge of the facility and other administrative functions with few supporting staff. The aim was to achieve a representation of the experience at level 2 facilities but also to avoid unnecessarily having to visit many institutions whose set up does not enrich the data needed for the study.

Other respondents that were targeted to provide additional information included government health officials at the regional and national levels and KEMSA staff. This was informed by the need to target resourceful individuals who would provide quality data and the need to overcome budgetary limitations.

Sample size determination

In calculating the sample size for the quantitative strand, the below formula was applied. (Kirkwood &Stern, 2003). The formula is recommended for studies where the aim is to estimate a quantity of interest with a specified precision for a single proportion.

$$n = \frac{\pi(1-\pi)}{e^2}$$

Where; n = sample size

π = proportion (1%) – estimated prevalence

e = required size of standard error (0.01)

$$n = \frac{0.01(1-0.01)}{0.01^2} = 99$$

The proportion used was based on the lower level of wastage estimates from the UK of between 1-10% of total healthcare spending.(White, 2009) This was used as proxy for prevalence of wastage of drugs.

The respondents for the qualitative strand were selected purposively and they consisted of the facilities in charge for the different facilities that were sampled. Additionally, the county health official, a staff at the Division of Malaria Control and a KEMSA staff were also interviewed as key informants. This aimed to achieve a total of 18 respondents.

The table below provides a summary of the targeted respondents for the study.

Table 4: Target respondents for the study

Respondent	**Level 6**	**Level 4×4**	**Level 3×4**	**Level 2×6**	**Govt Officials**	**KEMSA**	**Type of interview**
Casualty doctor	3	1					Structured Questionnaires
Clinical officer	10	4	2	2			Structured Questionnaires
Pharmacy staff	5	3	2	1			Structured Questionnaires
Procurement staff	2	1					Structured Questionnaires
Medical records staff	2	1					Structured Questionnaires
Facilities in Charge	1	1	1	1			KII
Regional officials					1		KII
National officials					1		KII
KEMSA staff						1	KII
Totals	23	44	20	24	2	1	

3.4 Research Instruments

To gather relevant data regarding the study, different data collection methods including structured questionnaires, semi-structured interviews (face-to-face) and documents review were employed. The target audiences for the different tools, process and data to be collected are summarized on the methodology matrix below (Table 5 Appendix VIII).

3.4.1 Structured questionnaires

Considering that this is a mixed methods research study, the use of structured questionnaires was appropriate in gathering quantitative data. Structured questionnaires are research instruments comprising closed-ended questions, which enable researchers to collect statistically useful data regarding the issues under consideration (Creswell, Fetters, & Ivankova, 2004). For example, in the current study, there was need to collect the views and opinions of the participants with regards to the nature of drug wastage and the levels of drug wastage. To achieve this, the questionnaire was divided into four sections with each addressing a specific aspect of the study. The first section had questions focusing on the availability and utilization of antimalarial drugs. This was aimed at capturing the different types and levels of wastage and efforts being made at the facility level to address them. The second section had questions focusing on the financing of antimalarial drugs at the county level and the costs incurred by patients when seeking treatment for uncomplicated malaria. These questions were aimed at providing information on the cost implications of wastage of the antimalarial drugs. The third section had questions inquiring on access to healthcare at the facility level. These were essential to relate the effects of wastage and the resulting out of stock situations to patients' access of healthcare services. The fourth section had questions focusing on the quality of healthcare and patient outcomes considering wastage of

antimalarial drugs and the resultant out of stock situation. These attempted to uncover the negative effects of wastage of antimalarial drugs on patient outcomes. The last section had questions seeking to obtain the respondents recommendations on ways through which the wastage of antimalarials could be addressed. These questions were important to provide practical solutions on wastage from the respondents who were deemed to have first-hand experience with the challenge of wastage of antimalarial drugs. The tool was used to gather information from the procurement staff, pharmacy staff, and medical records custodians, prescribing doctors and prescribing clinicians. The structured questionnaires were administered to the hospital staff after obtaining a written facility access approval.

The procedure employed was such that the research assistant approached the respondents and explained the research to obtain their consent. The research assistant then administered the questionnaires to the respondents offering guidance on any questions that might have needed further clarification. Much as the study is on wastage, use of the word wastage was avoided and the research assistants trained accordingly. This was because the word wastage may have given a negative connotation with an implied value judgment which could have increased under-reporting. One of the most important advantages of using structured questionnaires is that they are helpful for collecting large amounts of data from a relatively big number of participants. It is important to appreciate the fact that collecting information from many participants is no mean task; hence, the use of questionnaires in this study was appropriate.

3.4.2 Documents review

In this study, it was necessary to collect quantitative data related to the procurement, distribution, storage, prescription, and use of medicines in different public health

facilities in Uasin Gishu County. Hence, the review of different documents was important, particularly in terms of collecting data from secondary sources including published studies, agency reports, monitoring reports, performance evaluations, prescription records, drugs destruction records, drugs supplied to the county and the health facilities and sales and consumption figures (Hardon *et al*., 2004). This tool did not target any specific respondents since it would involve the perusal of specific documents as mentioned above. These documents were accessed through making formal requests to the hospital in-charges and the relevant authorities at the KEMSA offices to grant access to these documents.

The documents were useful for assessing the levels of drug consumption, prescription, and distribution across different health facilities within the area of study. Moreover, the documents enabled gathering of specific information related to the use or misuse of drugs in select public health facilities in the county. Lastly, document reviews helped paint a clear picture on the subject of drug wastage in the county of Uasin Gishu.

3.4.3 Key informant interviews

The use of key informant interviews is the process through which researchers engage respondents in a formal conversation that is guided by a list of questions and topics regarding the subject matter. Furthermore, semi-structured interviews can be used together with structured checklists to provide flexibility in the number and types of questions asked by the interviewer (Hardon, Hodgkin, & Fresle, 2004). In so doing, the researcher can collect a wide range of data including the perceptions, beliefs, opinions, and advice from the people on the ground. For instance, in the current study, the use of semi-structured interviews was useful in collecting information regarding the most common local problems regarding the wastage of drugs as well as the sources of

medicines, the prevailing medicine use problems, the reasons for the irrational use of medicines, and possible solutions to address the problems. Like the questionnaire, the use of the word wastage was also avoided here to avoid giving a negative connotation.

Therefore, key informant tool targeted the facilities in-charges, KEMSA staff and health officials at the regional and national levels. These groups of respondents served as the key informants for the study whose response would supplement the information obtained from the questionnaires and the study of documents. The interviews with the hospital staff was conducted subject to receiving institutional approval granting access to the staff. Approval was also sought from the KEMSA offices to allow access to their staff in order to conduct the interviews. Similarly, appropriate approvals were sought before engaging the health officials at the regional and national levels. Informed consent was also obtained prior to conducting the interviews from the individual staff members after detailing what the study was about.

However, it is imperative to note that the use of semi-structured interviews is time-consuming; hence, this study aimed to interview18 respondents who were more likely to provide much of the information sought.

3.5 Data Processing and Analysis

The data collected in this study using both qualitative and quantitative data collection methods was analyzed separately and then compared or mixed to provide comprehensive answers to the research questions. First, quantitative data was sorted and processed before the commencement of data analysis. More specifically, quantitative data that belonged together were coded and summarized using tables (Greasley, 2008). Moreover, considering that most of the quantitative data was collected using structured questionnaires, the most appropriate analyses that were

employed in this study involved descriptive statistics. Data on the types and levels of drug wastages that formed quantitative data were analyzed using proportions, frequency distributions and cross-tabulations. Chi square was used as the test statistic. Statistical Package for the Social Sciences (SPSS) was used to process the quantitative data.

Data on how drug wastages affect access to healthcare and healthcare costs in public health facilities and the data on which systematic failures are closely associated with drug wastages in public health facilities formed part of the qualitative data. Apart from these, data answering the ways through which drug wastage could be minimized in public health facilities also formed part of qualitative data and these were collected and analyzed concurrently.

Thematic analysis was applied in the analysis of text data. Thematic analysis is a type of qualitative analysis used to generate classifications and present themes (patterns) that relate to the data. It illustrates the data in detail and deals with diverse subjects via interpretations. Thematic analysis allows a researcher to associate an analysis of the frequency of a theme with one of the whole content thus conferring accuracy and intricacy which enhances the research's whole meaning. Thematic analysis also allows the researcher to determine precisely the relationship between concepts and compare them with the replicated data. By using thematic analysis, it is possible to link the various concepts and opinions of a learner and compare these with the data that has been gathered in different situations at different times during the project. All possibilities for interpretation are possible. (Ibrahim, 2012).

Specifically, the framework method to thematic analysis was undertaken which involved a combined approach to analysis where themes were developed both

inductively from the accounts (experiences and views) of research participants and deductively from existing literature. (Heath G *et al*, 2013). The framework method is appropriate for thematic analysis of textual data, particularly interview transcripts, where it is important to be able to compare and contrast data by themes across many cases, while also situating each perspective in context by retaining the connection to other aspects of each individual's account. (Gale N K *et al*, 2013). Based on the foregoing advantages, this study used the Statistical Package for the Social Sciences (SPSS) to process and analyze quantitative data and applied thematic analysis to interpret the qualitative data.

3.6 Ethical Considerations

The study protocol was reviewed by the Moi University Institutional Research and Ethics Committee (IREC). Three potential risks that were faced by the respondents during the study were: First, if the information provided would be potentially shared by others outside the research team. Some respondents found it uncomfortable to give responses on questions that seemed to indicate that their handling of drugs and other processes were inefficient. Finally, the time spent on responding to the interview questions could have alternatively be used in doing other work. The main benefit is that the information generated informs health care policy makers in Uasin Gishu County on the existing challenge on drug wastage that could be improved to make healthcare better for all including the respondents and their relatives.

The research assistants were trained to ensure that the considerations on ethical conduct are well understood and implemented. The training encompassed a thorough understanding on the meaning and process of informed consent, the need to protect the privacy of the respondents and confidentiality on the information obtained. Necessary

considerations were also undertaken in the development of the questionnaire to ensure that negative value judgment was not implied and avoided connotations that would lead to respondents' discomfort and reservations in giving honest answers. The interviews were conducted in private and the respondents were also informed that they needed not to respond to questions that they found to be sensitive.

The research assistants were trained on the importance of confidentiality and the interviews were conducted in private. All data were handled with utmost confidentiality. Respondents' names did not appear on the tools used to capture the information, but instead unique identification codes were used to identify the respondents thus ensuring that no personal identifiers were recorded on the data collection tools. All data were stored separately from the identifying information that were captured in the consent forms. The research data access was limited to the research staff only. No personal identifiers were disclosed in any of the dissemination items such as reports, publications or presentations. The electronic data was stored in a password protected computer in the custody of the principal investigator. There was no compensation to any of the respondents taking part in the study. Individual written consent was obtained from all the respondents in the study using the informed consent letters attached below (Appendix II). Participants were informed about the following items during the consent process; Aim of the study and the methods that would be used; the institutional affiliations of the research; anticipated benefits and potential risk for participating in the study; duration of participation in the study; discomfort that they may be subjected to; any form of compensation; right to refuse to participate from the study or to withdraw from it at any point without any consequences; measures to ensure confidentiality of the information provided and the contact information of the study investigators and the national authorities.

3.7 Data Management Plan

3.7.1 Roles and responsibilities

The principal investigator was fully responsible for the collection, processing, analysis and sharing of the data. The study generated data designed to establish the wastage of drugs and its effects on healthcare service delivery in public hospitals in Uasin Gishu County through a representative sample of 104 respondents drawn from the county, at the national level and relevant organizations i.e. Division of Malaria Control and KEMSA. Since a mixed design approach of data collection was utilized, both qualitative and quantitative data was generated. Thematic analysis was used to analyze the text data. For processing and analysis of the quantitative data, Statistical Package for Social Sciences was used.

The data generated during the project will be made available for use by the research community to enable further research into the project area. The data is available in standard Microsoft Office and PDF formats. An informed consent process detailed to the respondents that the data generated was purely for use with the research community. This ensured that there was no risk of disclosure or any infringement on their confidentiality. Furthermore, the data generated was de-identified and anonymized prior to any publication being undertaken.

3.7.2 Policies and provisions for re-use and redistribution

The sharing of the research data was consistent with the Moi University policies governing intellectual property, copyright and dissemination of research products. Ultimately, it aimed that on completion of the project, the research data and materials were freely available to the research community and the policymakers within the field of public health with three key aims, that is; 1) To engage the policy makers in Uasin

Gishu and other counties in the country on the findings on the wastage of drugs in public hospitals and its effects on healthcare service delivery;2) to make the healthcare policy makers within the country aware of the recommendations made to tackle the menace of drugs wastage to improve on healthcare service delivery by highlighting the findings from Uasin Gishu county; 3) to disseminate the findings to a global audience including the government and development partners on innovative ways of tackling drug wastage in public hospitals to enhance improved healthcare service delivery.

3.7.3 Data storage and preservation

Data and materials generated during the project were stored and secured independently on password secured computers and flash disks by the principal investigator. This was done continuously as the data was being obtained to ensure the safe custody of the data in the long run. The research data generated from this project was handed over to Moi University as the custodians to ensure that the research community has a long-term access to the data.

3.7.4 Study Limitations

The study only dwelled on the wastage of antimalarial medications with uncomplicated malaria as the tracer illness but the findings were able to reveal systemic challenges that plague the healthcare service delivery and indicated that the situation could be worse if other disease conditions and medications that patients had to pay for were put into consideration. This could be a fruitful avenue for future enquiry in that it could be able to reveal how the public healthcare system is faring in terms of managing other disease conditions of public health interest in the absence of donor funding and also illustrate the real cost of wastage and other systemic challenges in relation to the overall health spending.

To balance cost and time limitations, only four level 3 facilities were sampled which might not have adequately represented this level of care. However, the use of mixed methods of inquiry substantially made up for this limitation in that views from the healthcare providers and the facilities in charges together with feedback from the county health officials were captured.

CHAPTER FOUR

RESULTS

4.1 Response Rate and Preliminary Analysis

This chapter provides results of the qualitative and quantitative data. A total of 93 completed questionnaires and 11 interviews with senior officers in the health sector were conducted to explore their experience on levels, nature, and effects of antimalarial drugs utilization in public health facilities.

4.1.1 Facility type

The study aimed to collect data from a total of 114 officers from the health institutions but managed to collect data from 104 respondents. 93 fully completed questionnaires were used for data analysis since 2 questionnaires were not fully filled. 11 key informer interviews (KII) were conducted out of the 18 planned. The 7 KII respondents refused to have their interviews recorded. Respondents were drawn from diverse facilities including referral hospitals (26.9%), sub-county hospital (30.1%), health centers (17.2%) and dispensary (25.8%) representing various levels of care (Table 6). Most of the hospitals, 60.4% were open 24 hours seven days a week, 31.9% were open Monday to Friday from 8.00 a.m. to 5.00 p.m., and 7.7% Monday to Sunday 8.00a.m to 5.00p.m. While the results indicate that majority of the hospitals were available for patients 24 hours, a significant proportion, 31.9% were not operating over the weekends. That means that patients may suffer over weekends or may have to incur more costs to take them to other facilities further away.

Table 6: Characteristics of Facilities Sampled

Facility type	No. of Respondents	(%)
Referral hospital (Tier 6)	**25**	**(26.9)**
Sub county hospital Tier 4)	28	**(30.1)**
Health Centre (Tier 3)	16	**(17.2)**
Dispensary (Tier 2)	24	**(25.8)**
Opening hours		
Monday to Friday 08.00 - 17.00	29	**(31.9)**
Monday to Sunday 08.00-17.00	7	**(7.7)**
24 hours seven days a week	55	**(60.4)**

4.2 Availability of Antimalarial Drugs

The study sought to establish whether the sampled facilities had stocked the recommended first line drugs for managing uncomplicated malaria and the roles of the respondents at the facilities (table 7). Majority of the respondents (93.5%) confirmed that artemether lumefantrine (AL) was stocked in their facilities consistently across the different facility tiers. The respondents also indicated that quinine was also stocked but to a lesser extent as it was reported by 32.9 % of the respondents. Referral hospital was better stocked with both medications for managing uncomplicated malaria.

The proportion of respondents involved in the procurement of the drugs stood at 18.3% and this was similar across the facility tiers. The respondents involved in the storage of drugs stood at 45.2% with the bulk being drawn from the lower facility tires. The staff involved in the management of drugs stood at 51.7% with the bulk again occurring at the lower facility tiers. This illustrates the differences in the staff roles at the different facilities where staff at the higher facility tiers performed defined roles compared to staff at the lower facility tiers had to double up to perform several roles.

Table 7: Availability of medicines

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p values
% of facilities with	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
AL in stock	24(96.0)	25(89.3)	15(93.8)	22(95.7)	86(93.5)	0.741
Totals within facilities	**25**	**28**	**16**	**23**	**92**	
Quinine in stock	15(75.0)	6(23.1)	2(14.3)	4(18.2)	27(32.9)	0.000
Totals within facilities	**20**	**26**	**14**	**22**	**82**	
% of respondents :						
Involved in procurement	4(21.1)	4(14.8)	3(20.0)	4(19.0)	15(18.3)	0.950
Totals within facilities	**19**	**27**	**15**	**21**	**82**	
involved in Storage of drugs in the facility	3(16.7)	9(33.3)	8(53.3)	18(75.0)	38(45.2)	0.001
Totals within facilities	**18**	**27**	**15**	**24**	**84**	
involved in Management of drugs in the facility	7(33.3)	11(40.7)	8(53.3)	19(79.2)	45(51.7)	0.010
Totals within facilities	**21**	**27**	**15**	**24**	**87**	

4.2.1 Management of drugs in public hospitals

This section describes various aspects of management of antimalarial drugs in the facilities including pooling of the public sector procurement of antimalarial drugs, body responsible for its distribution and antimalarial drugs purchased by the facilities. The respondents were asked whether their facilities had a medicine and therapeutic committee and a drug quality management system in place. Majority of the respondents 89.3%, 92.3% and 82.6% from tier 4, 3 and 2 respectively reported that procurement of drugs was pooled at the county level. Only 27.8% of the respondents at the level 6 facility reported that procurement was done at the county level. This illustrates the semi-autonomous status of the level 6 facility in carrying out some of its operations compared to the other tiers which solely relied on the centralized procurement of drugs at the county level. Regarding the distribution of drugs, majority of the respondents (98.7%) reported that this was conducted by the county department of health (table 8).

Qualitative data provided an illustration on the process involved in the procurement of drugs at the facilities. The official at the ministry captured the steps involved in the

requisition of commodities by facilities which is largely a centralized process where requisition is based on the end month reports and as the need arises; **"***They normally do orders as the need arises. It's a pull thing, rarely do we do push but... Occasionally it's done, but by and large it is a pull system. Because the push system will lead to expiry and wastages……..it's now done through the county level, the facility does their reports, they normally do monthly reports… And then when need arises they just do an order to the sub-county, then the sub county people will normally forward to the county, then the county which is the top most level at the county, county pharmacists does that…. They normally now forward the request…. to KEMSA and do a copy to the malaria program, for it to be rationalized, so the malaria program because they receive the reports from the counties, will now do the rationalization based on the reports that we receive; the average monthly consumption. So it's based on actually how you report and then we`ll know the average monthly consumption. From there, there is a logistician who normally does that, he will now rationalize and give you a quantity based on what you consume.[Interviewee 10,p6, 340] "…Antimalarial commodities are supposed to be ordered not strictly on the end month reports….but also as need arises" [Interviewee 10, p7,395]*

The drugs ordering process is summarized below.

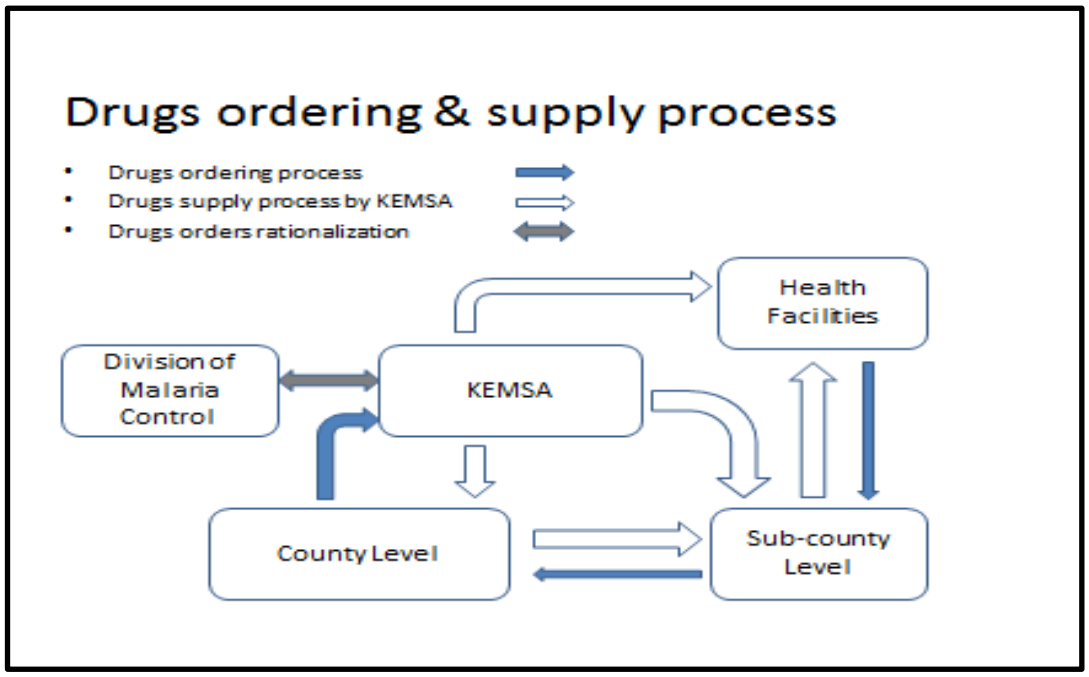

Figure 5: Drug ordering and supply process

It was also revealed that KEMSA played a critical role in the supply chain for the antimalarial commodities to the facilities. KEMSA is the government body tasked with the responsibility of procuring, warehousing and distribution of drugs to the facilities all over the country. "….So our *mandate as KEMSA is to distribute these commodities according to what the program has directed us to do based on their data."[Interviewee 11, p7, 432]*

> *"… KEMSA, we are mandated to distribute these commodities for them. To procure, warehouse and distribute for them*." [Interviewee 11, p8, 488]

Only 30.8% of the respondents reported that they could purchase other antimalarial drugs for use at the facilities besides the first line antimalarial drugs. This is consistent with the understanding that the antimalarial drugs were usually supplied for free to the facilities. More respondents at level 6 and 4 (>75%) reported the presence of a drug and a therapeutic committee and a drug quality management system compared to the levels 3 and 2 (<67%). A difference that was observed to be significant.

Table 8: Management of drugs in public hospitals

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p value
% of respondents :	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
Reporting that procurement of drugs was pooled at the county	**5**(27.8)	**25**(89.3)	**12**(92.3)	**19**(82.6)	61(74.4)	0.000
Totals within facilities	**18**	**28**	**13**	**23**	82	
Reporting that public sector antimalarial distribution was done by;						
County department of health	12(92.3)	26(100.0)	13(100.0)	23(100.0)	74(98.7)	0.184
Totals within facilities	**13**	**26**	**13**	**23**	**75**	
Non-governmental organizations	0(0.0)	0(0.0)	1(50.0)	3(33.3)	4(14.8)	0.066
Totals within facilities	**7**	**9**	**2**	**9**	**27**	
Privately owned organizations contracted by government	3(33.3)	0(0.0)	0(0.0)	0(0.0)	3(12.0)	0.109
Totals within facilities	**9**	**9**	**1**	**6**	**25**	
% of respondents reporting that their facilities;						
Could buy other antimalarial drugs besides the AL drugs and quinine	9(36.0)	9(32.1)	6(40.0)	4(17.4)	28(30.8)	0.004
Totals within facilities	**25**	**28**	**15**	**23**	**91**	
Had a medicines and therapeutic committee	20(80.0)	21(75.0)	9(60.0)	15(62.5)	65(70.7)	0.038
Totals within facilities	**25**	**28**	**15**	**24**	**92**	
Had a drug quality management system	20(80.0)	22(78.6)	8(61.5)	16(66.7)	66(73.3)	0.048
Totals within facilities	**25**	**28**	**13**	**24**	**90**	

The qualitative inquiry gave further insights on the presence of an information system used in the facilities for drug management. The District Health Information System (DHIS) is a key component in decision making in the facilities as it gives an indication of the common conditions managed and the medications used. Some respondents went ahead to explain the DHIS system and its importance to the ministry officials and the staff at KEMSA in streamlining their supply process.*"..... DHIS is a reporting system where we have a server where all the health reports are actually captured and that's the server where we upload our data."[Interviewee 10, p4, 212].*

Other respondents pointed out on the key role that the reports captured at the facilities played in ensuring that sound decisions are made at the ministry level. This saw them

emphasize on the importance of making timely and accurate reports at the facilities including the documentation and quantifications of their drugs usage.

> *"....malaria control unit is relying on the reports they get from the facilities, so... ensuring that we get accurate report and on a timely basis so that we know exactly, because at times the health care workers have a tendency of putting inaccurate figures, maybe they can exaggerate the figures to get more quantities*…." [Interviewee 7 p3, 124]

> *"……if you are supposed to report on time and if you are supposed to ensure that you do your quantifications right, it's actually important that you implement that."* [Interviewee 10, p7, 418]

> *"....so what the National Malaria Control Program does, they look at consumption. There is a platform called DHIS that the county fills the consumption of these commodities. When the counties report wrongly, the program… will just issue according to their reporting. Because everything is pegged on reporting.* [Interviewee 11, p7, 428]

This calls for greater accuracy in capturing data at the facilities. Accuracy in data capture facilitates the acquisition of enough antimalarial drugs to avoid shortages while at the same time ensuring that excess commodities are not ordered which might lead to expiries at the facilities. *"……we don't give very accurate orders because of their reports….they may get excesses there that will end up expiring on them because they quantified wrongly."* [Interviewee 11, p8, 460]

4.3 Utilization of Antimalarial Drugs

Several aspects on the utilization of antimalarial drugs are presented in table 9. Most respondents reported that they always observed the national malaria treatment guidelines and that diagnostic tests were usually conducted for all suspected cases of uncomplicated malaria, 95.7% and 94.6% respectively. This was observed to be consistent across the facilities without a significant difference by level of care (p values 0.580 and 0.319 respectively). Qualitative data provided contrasting views specifically to the adherence of malaria treatment guidelines and the utilization of the diagnostic

tests in managing uncomplicated malaria. It emerged that some of the prescribers would actually prescribe the ALs without doing the confirmatory lab tests: *"…I would say people used to prescribe empirically, instead of finding out first….from the…..lab"* [Interviewee 6, p1, line 30]

> *".....So at times we bypass the lab test……So we end up giving patients antimalarials without really confirming if it is justified to get it."* [Interviewee 7, p1, 43].

The study further inquired about the diagnostic tools available for confirmation of uncomplicated malaria cases. Nearly 14.8% and 34.1% of the facilities had Rapid Diagnostic Tests (RDTs) kits and Microscopy respectively while majority (51.1%) of the institutions had both and none of the health facilities were found to lack at least one of the diagnostic tools. This indicates the commitment by the ministry of health to equip Kenyan health facilities with adequate diagnostic tools. Despite the fact the facilities were equipped with the diagnostic tools, the qualitative data revealed that there were other issues of concern. Some facilities that had the microscopes as diagnostic tools at times lacked the reagents hence it was impractical to conduct the tests. Regarding the RDTs, it was revealed that some of the staff usually doubted the results hence there was a need to emphasize on the reliability of the RDTs as a diagnostic tool for uncomplicated malaria. These observations were captured from the sentiments below.

"*Another thing, reagents for testing malaria may not be available hence AL drugs are just issued"* [Interviewee 6, p1, 31]

> *"….rapid diagnostic tests, they are still a problem….the attitude towards RDTs is still low, people don't trust the outcome…..* [Interviewee 7, p3, 142]

The above statements point out to systematic challenges that continue to plague the public health facilities hence abetting the wastage of antimalarial drugs which ultimately hamper efficient healthcare service delivery at the facilities.

Table 9: Utilization of antimalarial drugs

% of respondents reporting that;	Referral hospital Count (%)	Sub county hospital Count (%)	Health Centre Count (%)	Dispensary Count (%)	Total Count (%)	p values
Health workers Observed The National Malaria treatment guidelines	23(92.0)	28(100.0)	16(100.0)	22(91.7)	89(95.7)	0.580
Totals within facilities	**25**	**28**	**16**	**24**	**93**	
Health workers Conducted tests for all suspected malaria cases	23(95.8)	27(96.4)	16(100.0)	21(87.5)	87(94.6)	0.319
Totals within facilities	**24**	**28**	**16**	**24**	**92**	
Facilities had Rapid Diagnostic Tools Kits (RDTs)	1(4.3)	2(7.1)	1(6.3)	9(42.9)	13(14.8)	0.001
Totals within facilities	**23**	**28**	**16**	**21**	**88**	
Facilities had Microscopy	11(47.8)	9(32.1)	8(50.0)	2(9.5)	30(34.1)	
Totals within facilities	23	28	16	21	88	
Facilities had both RDTs and Microscopy	11(47.8)	17(60.7)	7(43.8)	10(47.6)	45(51.1)	
Totals within facilities	**23**	**28**	**16**	**21**	**88**	
Facilities had mandatory written requirements to promote public education on rational medicines use	20(80.0)	24(88.9)	12(85.7)	20(83.3)	76(84.4)	0.971
Totals within facilities	**25**	**27**	**14**	**24**	**90**	
They were prescribers.	25(100.0)	26(92.9)	16(100.0)	23(95.8)	90(96.8)	0.675
Totals within facilities	**25**	**28**	**16**	**24**	**93**	
A prescriber prescribed antimalarials outside the hospital formulary	6(24.0)	14(51.9)	4(28.6)	9(37.5)	33(36.7)	0.321
Totals within facilities	**25**	**27**	**14**	**24**	**90**	

It was also observed that most of the facilities had mandatory written requirements to promote public education on rational use of medicines as it was reported by 84.4% of the respondents. This was also observed to be consistent across the facilities without a significant difference across the different facilities tiers (p value 0. 971). Most respondents (96.8%) also indicated that they were prescribers without significant difference across the different facilities tiers (p value 0.675).This illustrates a concern that has always existed whereby a majority of health workers prescribe medications. It's only the medical doctors and clinical officers who should be prescribing medications to patients. Pharmacists and pharmaceutical technologists who were also among the respondents are usually termed as dispensers and not really prescribers. The

lower level health facilities such as dispensaries sometimes have nurses managing patients and thus they are the prescribers in such cases. Such scenarios may limit the level of care at such facilities thereby necessitating referral of patients to other facilities in situations where the nurses are not able to manage some conditions. This observation corroborates the findings by Transparency International-Kenya who revealed a general shortage of healthcare providers in line with the established international (WHO) standards for efficient and equitable delivery of healthcare services aimed at meeting community needs. TI-Kenya reported that there was gross understaffing by a range of between 50% and 80% in the provincial and rural health facilities. (TI-Kenya, 2011).The prescribers were asked whether they prescribed antimalarial drugs outside the hospital formulary. Only 36.7% indicated that they did which shows that most of the prescribers wrote prescriptions within the hospital formulary. This was also consistent since there were no significant differences observed across the different facilities tiers as per the p value. (p value 0.321).

4.3.1 Effectiveness of antimalarial drug wastage management

The study also evaluated the sampled facilities' and their drug supply chains effectiveness in managing the antimalarial drugs. A series of questions were asked seeking to establish whether there had been incidences of expiration, mix, and channel wastage for the past one year (January to December 2016). The results are summarized in table 10. Respondents reported that they had observed low incidences of the different forms of wastage. Expiry wastage was reported by 17.6% of the respondents with all the other forms of wastage being reported by <10% of the respondents. This was a common observation across the different facility tiers.

Table 10: Misuse of antimalarial drugs

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p values
% of respondents reporting that;	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
Drug expiries were reported	5(27.8)	4(14.3)	0(0.0)	6(25.0)	15(17.6)	0.133
Totals within facilities	**18**	**28**	**15**	**24**	**85**	
Drugs damaged on transit were reported	1(5.9)	1(3.6)	0(0.0)	2(8.3)	4(4.8)	0.669
Totals within facilities	**17**	**28**	**15**	**24**	**84**	
Theft of drugs was reported	2(11.8)	3(10.7)	0(0.0)	0(0.0)	5(6.0)	0.201
Totals within facilities	**17**	**28**	**15**	**24**	**84**	
Over prescription of first line antimalarial drugs was reported	3(17.6)	4(14.8)	1(6.7)	0(0.0)	8(9.6)	0.187
Totals within facilities	**17**	**27**	**15**	**24**	**83**	
Under prescription of alternative antimalarial drugs was reported	2(11.8)	0(0.0)	0(0.0)	0(0.0)	2(2.4)	0.047
Totals within facilities	**17**	**27**	**15**	**24**	**83**	
oversupply of non-essential antimalarial drugs was reported	3(17.6)	0(0.0)	0(0.0)	1(4.2)	4(4.8)	0.041
Totals within facilities	**17**	**27**	**15**	**24**	**83**	

Further, the respondents were asked to provide a representation of the extent to which they had observed the occurrence of different forms of drugs wastage noted above. The findings are captured in the table 11 and 12. Manifestation of the different forms of wastage majorly lies between the 1-20% bracket as was reported by approximately 70% of the respondents. This was consistent across the facilities since there were no significant differences observed across the different facilities tiers as per the p values (p values >0.05). Qualitative data corroborated observations regarding channel wastage and expiry wastage. These were observed to be low hence were not significantly contributing to the wastage of antimalarial drugs at the facilities. The qualitative data provided further insights on reasons why there were lower incidences of expiry wastage reported above. These are captured in the following statements.

> *"…. but before they expire, we normally call the county pharmaceutical technologist to come collect them*" [Interviewee 4, p1, 25].

The county pharmaceutical technologist normally collected the nearly expiring ALs and would distribute them to other facilities that would need the ALs maybe due to more cases of malaria or even an outbreak. This points out to the fact that even within the county there was evidently differential prevalence of uncomplicated malaria leading to differences in the demand for the ALs from the different facilities. The current system of ordering centrally at the county level for facilities is based on their demand as depicted in their monthly reports on the malaria cases and the amount of ALs dispensed. This has provided a more rational way of ordering ALs without excesses that initially led to expiries. **"…***the previous years we used to have expiries and that was because quantification was a challenge…….....we used to just order drugs like we need ten thousand doses of this without any basis, so that one, used to allow some facilities ordering of drugs which they cannot consume within the stipulated period so they end up expiring"* [Interviewee 7,p1, 47]

This approach of ordering for commodities referred to as the pull system has seen improvements in the utilization of the antimalarial commodities leading to fewer cases of expiries witnessed in the county.

Table 11: Percentage representation of the different manifestation of wastage

Drug expiries	Referral hospital Count (%)	Sub county hospital Count (%)	Health Centre Count (%)	Dispensary Count (%)	Total Count (%)	p values
1-20 %	12(70.6)	22(78.6)	6(37.5)	18(75.0)	58(68.2)	0.079
21-40 %	1(5.9)	0(0.0)	0(0.0)	2(8.3)	3(3.5)	
41-60 %	1(5.9)	3(10.7)	3(18.8)	1(4.2)	8(9.4)	
61-80 %	3(17.6)	3(10.7)	7(43.8)	3(12.5)	16(18.8)	
81-100%	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Totals within facilities	**17(100.0)**	**28(100.0)**	**16(100.0)**	**24(100.0)**	**85(100.0)**	
Drugs damaged on transit						
1-20 %	12(70.6)	23(82.1)	6(37.5)	18(75.0)	59(69.4)	0.065
21-40 %	1(5.9)	0(0.0)	0(0.0)	2(8.3)	3(3.5)	
41-60 %	1(5.9)	2(7.1)	3(18.8)	1(4.2)	7(8.2)	
61-80 %	3(17.6)	3(10.7)	7(43.8)	3(12.5)	16(18.8)	
81-100%	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Totals within facilities	**17(100)**	**28(100)**	**16(100)**	**24(100)**	**85(100.0)**	
Theft of antimalarial drugs						
1-20 %	12(70.6)	22(78.6)	7(43.8)	20(83.3)	61(71.8)	0.135
21-40 %	1(5.9)	2(7.1)	0(0.0)	1(4.2)	4(4.7)	
41-60 %	1(5.9)	1(3.6)	2(12.5)	0(0.0)	4(4.7)	
61-80 %	3(17.6)	3(10.7)	7(43.8)	3(12.5)	16(18.8)	
81-100%	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Totals within facilities	**17(100)**	**28(100)**	**16(100)**	**24(100)**	**85(100.0)**	

Table 12: Percentage representation of the different manifestation of wastage

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p values
Over prescription of first line antimalarial drugs	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
1-20 %	12(70.6)	24(85.7)	7(43.8)	19(79.2)	62(72.9)	0.064
21-40 %	1(5.9)	0(0.0)	0(0.0)	2(8.3)	3(3.5)	
41-60 %	1(5.9)	1(3.6)	2(12.5)	0(0.0)	4(4.7)	
61-80 %	3(17.6)	3(10.7)	7(43.8)	3(12.5)	16(18.8)	
81-100%	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Totals within facilities	**17(100)**	**28(100)**	**16(100)**	**24(100)**	**85(100.0)**	
Under prescription of alternative antimalarial drugs						
1-20 %	12(70.6)	24(85.7)	7(43.8)	19(79.2)	62(72.9)	0.151
21-40 %	1(5.9)	0(0.0)	0(0.0)	1(4.2)	2(2.4)	
41-60 %	1(5.9)	1(3.6)	2(12.5)	1(4.2)	5(5.9)	
61-80 %	3(17.6)	3(10.7)	7(43.8)	3(12.5)	16(18.8)	
81-100%	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Totals within facilities	**17(100)**	**28(100)**	**16(100)**	**24(100)**	**85(100.0)**	
Oversupply of non-essential antimalarial drug						
1-20 %	12(70.6)	24(85.7)	7(43.8)	20(83.3)	63(74.1)	0.086
21-40 %	1(5.9)	0(0.0)	0(0.0)	1(4.2)	2(2.4)	
41-60 %	1(5.9)	1(3.6)	2(12.5)	0(0.0)	4(4.7)	
61-80 %	3(17.6)	3(10.7)	7(43.8)	3(12.5)	16(18.8)	
81-100%	0(0.0)	0.0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Totals within facilities	17(100)	28(100)	16(100)	24(100)	85(100)	

Several respondents reported to having not witnessed any expiries. This reaffirms the earlier noted finding that expiration waste was minimal within the county. Some respondents went ahead to further explain the reasons that they thought led to the low incidences of expiries and the challenges that they were rather grappling with. **"***No, for the last ….one year I've been here, I haven't encountered any expiries of anti-malarials."*[Interviewee 4, p1, 36]

> *"We use what is called pull system for the supply of the commodities and when you use pull system we rarely get expiry of the drugs because you order what you are able to utilize, sometimes we are out of stock for these commodities, so we have never had any expiry"* [Interviewee 9, p3, 175]

> *"….That's a highland epidemic prone county… So it`s also not very easy find expiries, it's not easy…. because a small instance of weather change, there is an epidemic."* [Interviewee 10, p5, 260]

Just like expiration wastage, channel wastage was hardly seen as reported from the respondents which further corroborated the results from the quantitative data. It was commendable that KEMSA, the government body mandated to supply commodities to the facilities had made substantial investments in a fleet of vehicles that are used to deliver commodities to the facilities. One respondent also noted that KEMSA contracts other reliable transporters to deliver commodities to the facilities thus ensuring efficiency in the process. These factors played a role in ensuring that channel wastage did not occur.

> *"....the ACTs (Artemisinin based Combination Therapy) and all the other essential commodities are normally transported by contracted transporters, by KEMSA, actually KEMSA contracts, and sometimes they do deliver with their own trucks so it's on very rare occasions you will find that there is damage upon delivery.....So in very rare occasions that happen."* [Interviewee 10, p5, 264]

The packaging of the antimalarial drugs also emerged as a key factor that limited channel wastage in that the tablets were packed in blister packs with an outer box package hence reducing the risk of any damages.*"….is not likely to occur so much because these are tablets…..Whatever we give as antimalarials for injectables are only artesunates and the packaging is watertight though. So antimalarials it's very rare to get it."* [Interviewee 11, p7, 436].

The results from the qualitative data on the presence of mix wastage contrasted with the quantitative data. Whereas the quantitative data indicated that mix wastage was low, the qualitative data revealed that mix wastage was the main from of wastage that was experienced at the facilities. Mix wastage emerges as a subtle form of wastage which is only evident when we look at the actions of the healthcare providers considering the

guidelines recommendations and was manifested in different ways. One of the ways in which mix wastage manifested was in terms of irrational use of antimalarial medications. It emerged that some of the prescribers would actually prescribe the ALs without doing the confirmatory lab tests: **"…***I would say people used to prescribe empirically, instead of finding out first….from the…..lab"* [Interviewee 6, p1, line 30]

> *".....So at times we bypass the lab test……So we end up giving patients antimalarials without really confirming if it is justified to get it."* [Interviewee 7, p1, 43].

Another way in which irrational use of the ALs manifested was that the prescribers could get negative test results but still proceed to prescribe the ALs: *"….initially we used to just issue even if the BS (blood sample test) is negative but of late we just restrict to those who are tested BS positive."* [Interviewee 1, p1, line 2]

> *"But then again you find that some people still go ahead and treat even when the tests have come out negative. So eventually that will lead to - and it's now across the country - irrational use.* [Interviewee 10, p4, line 239].

One of the interviewees was able to capture the reason for the irrational use of the ALs and actually pointed out a probable solution to addressing the menace; *"….the attitude towards RDTs is still low, people don't trust the outcome, ...if RDTs give a negative result, the healthcare worker will still be tempted to prescribe.....so they need to really emphasize that RDTs give accurate results that's in terms of sensitivity and specificity"* [Interviewee 7, p2, line 144].

Training emerged as a key factor in influencing the presence of mix wastage based on the sentiments from one of the interviewees who pointed out that: *"...initially before the training the clinicians used to believe that any fever was a malaria case and they could give any fever anti-malarial treatment* [Interviewee 8,p3, 164].

This shows that the training for the clinicians got them to appreciate that all fevers were not due to malaria hence the need to conduct further tests and avoid issuing antimalarial medications where it was not warranted. Presence of mix wastage was also implied by an observation made by an interviewee who reported that there were notable discrepancies in the numbers of positive malaria tests captured in the lab results as compared to the doses of the ALs issued which were higher. *"……based on the lab reports, the positivity vis a vis the malarial cases seen; the positivity has been very low in consideration to the utilization….Or the administration of the anti-malarials."….* [Interviewee 8, p3, 165].

This is a clear indicator of the fact that several patients were issued with the antimalarial medications without an accompanying proof of a positive malaria test. Diagnostic tools also emerged as key influencers of mix wastage. This was typified by the fact that some facilities at times would lack the diagnostic tools and the reagents needed. The fact that some of the prescribers don't trust the outcomes normally led to actions that propagated irrational use of the ALs: **"***Another thing, reagents for testing malaria may not be available hence AL drugs are just issued" [Interviewee 6, p1, 31]*.

> *"….rapid diagnostic tests, they are still a problem….the attitude towards RDTs is still low, people don't trust the outcome…..* [Interviewee 7, p3, 142].

Based on the above responses from the qualitative data, mix wastage is rampant and was manifesting in the different ways. This means that understanding that addressing mix wastage and the factors that contribute to it will achieve the greatest impact in reducing the wastage of antimalarial drugs at the facilities.

4.3.2 Medicine stocking, issuance criteria and expiration alert system

An assessment of medicine stocking and issuance was investigated using the minimum shelf-life, how the drugs were shelved and systems to alert relevant officers when drugs were nearing their expiry date. The results were as shown in table 13 below. Respondents reported that most of the drugs stocked at the facilities were between 13 – 24 months (74.7 %). Also, the drugs in the sampled facilities were arranged in shelves with respect to expiry dates (94.8 %), and issuance from shelf was done with respect to expiry dates (68.6 %). There was also a system for alerting the relevant staff that a drug was nearing its expiry date (91.8 %).This illustrates some of the measures in place at the facilities that have served to minimize the risks of expiries of drugs at the facilities.

Table 13: Expiry Wastage

	Referral hospital	**Sub county hospital**	**Health Centre**	**Dispensary**	**Total**	**p value**
% of respondents reporting that procured antimalarial drug's;	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Minimum shelf life was between 6-12 months	0(.0)	0(.0)	2(13.3)	2(8.3)	4(4.8)	0.126
Minimum shelf life was between 13-18 months	5(29.4)	16(59.3)	6(40.0)	13(54.2)	40(48.2)	
Minimum shelf life was between 19-24 months	8(47.1)	8(29.6)	3(20.0)	3(12.5)	22(26.5)	
Minimum shelf life was above 24 months	4(23.5)	3(11.1)	4(26.7)	6(25.0)	17(20.5)	
Totals within facilities	**17(100**	**27(100)**	**15(100)**	**24(100)**	**83(100)**	
Were arranged on shelves based on their expiry dates.	12(92.3)	24(96.0)	15(93.8)	22(95.7)	73(94.8)	0.959
Totals within facilities	13	25	16	23	77	
Issued from the shelves based on their expiry dates	8(80.0)	16(64.0)	13(92.9)	11(52.4)	48(68.6)	0.065
Totals within facilities	**10**	**25**	**14**	**21**	**70**	
Nearing expiry date had an alert system to inform the relevant staff	14(77.8)	25(96.2)	14(100.0)	21(91.3)	74(91.4)	0.220
Totals within facilities	**18**	**26**	**14**	**23**	**81**	

Qualitative data further affirmed the fact that antimalarial drugs supplied to the facilities had long expiry dates. It emerged that KEMSA ensured that commodities supplied to the facilities had long shelf life and that there was a system in place that will not allow products that have a shelf life of below six months to be supplied. *"....we don't give stocks that are below six months to expire. The system cannot allow giving commodities that are below six months to expiry. Whatever we give to counties is over six months, these commodities maybe the shelf life is like three years."*[Interviewee 11, p8, 497]

The above statement conflicted with the 2010 report on corruption in the health sector by KACC. The report revealed that the protracted procurement process sometimes stretched to unusually long periods resulting in expiry and the short life span of some of the drugs supplied to the facilities.

Further, respondents were asked to rate the extent to which they agreed with various statements regarding medicines management to minimize expiration wastage. Respondents were also asked to confirm who bears the cost whenever drugs expired at the facilities. The responses are summarized in the Table 14 (Appendix IX). Respondents did not agree with the statement that poor utilization of drugs at the facilities was a major cause of drugs shortages. This was evident from the fact that only 27.9% of respondents agreed with the statement. This response was consistent across the facilities tiers (p value 0.190).

Qualitative data offered differing view with regards to poor utilization of antimalarial rugs as a factor the led to the shortages at the facilities. Irrational use of the AL drugs was cited as a cause of the stock out issues experienced at the facilities. This was appropriately captured by one of the respondents who pointed out that indeed irrational use of the antimalarial contributed to the shortages that were experienced at the facilities

at the counties.*".....you find that some people still go ahead and treat even when the tests have come out negative. So eventually that will lead to - and it's now across the country - irrational use. You will find out that there are excesses being used in a facility. Eventually there will be stock outs,...the ripple effect will be that, if there is excess being wasted somewhere, then another part will be missing, so you`ll find stock outs where it's actually needed."*[Interviewee 10, p4, 239]

Most of the respondents (90.3%) across the facilities agreed that by arranging and issuing of drugs whose expiries are closer first, incidences of expiries would be reduced. This observation was consistent since there was no significant difference across the different facility tiers as per the p values. (p value 0.190). They also agreed that having a system in place that would alert appropriate staff that some products were nearing the expiry date and stipulating that all procured drugs needed to have a shelf life of at least 2 years would also help to minimize expiries (94.6%, 87.1%). This was also consistent with no significant difference across the different facilities tiers as per the p values. (p values 0.176 , 0.102 respectively). Majority of the respondents (97.9%) across the facility tiers also felt that the pharmacy staff were well trained to effectively dispense the antimalarial drugs in a way that prevents expiries. This was also consistent with no significant difference across the different facilities tiers as indicated by the p value (p value 0.597).

Regarding the party that bears the costs of the expiries of drugs at the facilities, 51.9% of the respondents reported that the hospital incurs such costs, 46.8% reported that it was the supplier and 1.3% reported that it was the manufacturer. This reveals that it is the hospital that mostly incurs the costs of drug losses and calls for greater vigilance on their part. The respondents seemed to base their answers while considering all other

drugs procured at the hospital. The antimalarial drugs were donor funded and this implied that expiries led to wastage of the donor funds a situation that should not be allowed to happen.

4.3.3 Managing mix wastage

Considering the forms of wastages observed at the facilities and importantly the mix wastage which was the most commonly reported, it was essential to find out whether there were any trainings being provided for the county facilities' staff to curb the challenge. The researcher inquired about the steps put in place by the facilities to minimize wastages arising from the prescriber's end.

First, the respondents were asked to indicate how often the facilities held continuous medical education (CMEs) for the prescribers to ensure that they were updated on the best medical practices and whether there were regular forums in the hospitals to update the prescribers on the drugs available for managing specific conditions. It was reported that the facilities usually conducted the CMEs but with varying frequency across the facility tiers. 48% and 31.3% of respondents at the referral hospital and health centers respectively reported that the CMEs were conducted weekly. Most respondents at the dispensaries (40.9%) reported that the CMEs were conducted monthly. Majority of the respondents (28.6%) at the sub county facilities reported that the CMEs were conducted fortnightly. Up to 78.3% of the respondents agreed that there were regular forums in the facilities to update the prescribers on the available drugs for managing specific conditions.

Table 15: Training on mix wastage

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p value
% of respondents reporting that ;	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
CMEs were conducted weekly	12(48.0)	6(21.4)	5(31.3)	2(9.1)	25(27.5)	0.012
CMEs were conducted fortnightly	5(20.0)	8(28.6)	4(25.0)	8(36.4)	25(27.5)	
CMEs were conducted monthly	5(20.0)	7(25.0)	2(12.5)	9(40.9)	23(25.3)	
CMEs were conducted bimonthly	1(4.0)	7(25.0)	1(6.3)	0(0.0)	9(9.9)	
CMEs were conducted quarterly	0(.0)	0(.0)	2(12.5)	2(9.1)	4(4.4)	
CMEs were conducted semi annually	0(.0)	0(.0)	2(12.5)	1(4.5)	3(3.3)	
CMEs were conducted annually	1(4.0)	0(.0)	0(0.0)	0(0.0)	1(1.1)	
CMEs were never conducted	1(4.0)	0(.0)	0(0.0)	0(0.0)	1(1.1)	
Totals within facilities	**25(100.0)**	**28(100.0)**	**16(100.0)**	**22(100.0)**	**91(100.0)**	
There were regular forums in hospitals to update prescribers on available drugs for managing specific conditions	20(80.0)	21(75.0)	12(75.0)	19(82.6)	72(78.3)	
Totals within facilities	**25**	**28**	**16**	**23**	**92**	0.851

From the qualitative data, it was reported that indeed there were different kinds of trainings undertaken to better equip the staff in the management of uncomplicated malaria. This ranged from CME meetings, in-service trainings, various workshops and updates on malaria case management. *"....we normally have CMEs (continuous medical education), in-service training, people go for workshops, especially for updates on malaria treatment and any other."* [Interviewee 7, p2, 67].

It was also essential to note that the various capacity building initiatives had improved the management of uncomplicated malaria leading to better care and service delivery at the county facilities which ultimately reduced wastage of the commodities. *"....maybe initially, before we did some trainings, for the health workers, but after we did actually malaria case management for most of the health workers that is the lab, pharmacy, the clinicians, there has been a high observation of the protocols in the administration of the antimalarials." [Interviewee 9, p3, 160]....."So to me there was actually an abuse and this is actually what led us to... now train our health workers, on*

like, malaria case management so that they would actually be able to observe the regimen in the administration of antimalarials."[Interviewee 9, p3, 168]

To further investigate the issue of mix wastage, the respondents were asked whether the prescribers normally adhered to the standard treatment guidelines when prescribing antimalarial drugs and the stipulated consequences for noncompliance to the treatment guidelines. The findings were captured in table 16 below. Findings portrayed that all the prescribers normally adhered to the standard treatment guidelines across the different facilities tiers. This was contrasted to the qualitative data which revealed that the prescribers did not always adhere to the treatment guidelines as earlier observed.

It was noted that in some instances antimalarial drugs were issued before conducting the confirmatory tests or in situations where the tests were done, antimalarial drugs were issued despite negative test results. The qualitative data sought to establish whether there were clear laid down policies and guidelines to help the healthcare staff at the facilities in addressing the challenges of wastage of antimalarial drugs. It emerged that wastage of commodities and other challenges observed to be hampering service delivery at the county facilities were prevalent despite the presence of clear policies and guidelines to address the same. One of the respondents clearly explained that there were clear guidelines on management of uncomplicated malaria cases requiring patients to be tested and appropriate management instituted depending on the test results. There was also an essential drugs list in place which guides the requisition of drugs to be used at the county facilities in managing various disease conditions. "*Well as you are aware you are supposed to follow the guidelines where someone has to confirm that the person has parasites and that's through laboratory confirmation either by microscopy or rapid diagnostic test."* [Interviewee 7, p1, 41]

> *"Yes we have a policy …normally when... like for a public facility, we normally use the essential drugs list when we procure the drugs, and that's what we follow."* [Interviewee 7, p2, 89]

This illustrates that good policies are in place and that the challenges observed at the county level are based on other factors. This implies that at the policy level things are quite clear and that the challenges could be arising due to lack of proper implementation and adequate follow ups to ensure adherence.

Table 16: Addressing mix wastage

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p value
% of respondents reporting that ;	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
Prescribers adhered to the standard treatment guidelines when prescribing antimalarial drugs	24(100.0)	16(100.0)	28(100.0)	23(100.0)	91(100.0)	0.279
Totals within facilities	**24**	**16**	**28**	**23**	**91**	
Stipulated consequences for non-compliance to the treatment guidelines led to;						
A verbal reprimand	21(95.5)	24(88.9)	16(100.0)	23(100.0)	84(95.5)	0.209
Totals within facilities	**22**	**27**	**16**	**23**	**88**	
A warning letter	7(53.8)	9(34.6)	6(54.5)	5(33.3)	27(41.5)	0.474
Totals within facilities	**13**	**26**	**11**	**15**	**65**	
A suspension	4(30.8)	3(12.5)	4(36.4)	2(14.3)	13(21.0)	0.291
Totals within facilities	**13**	**24**	**11**	**14**	**62**	
A dismissal	2(15.4)	2(8.3)	1(10.0)	1(7.1)	6(9.8)	0.890
Totals within facilities	13	24	10	14	61	
Banishment as a prescriber	1(7.7)	1(4.2)	1(10.0)	1(7.1)	4(6.6)	0.929
Totals within facilities	**13**	**24**	**10**	**14**	**61**	

Several respondents alluded to the fact that the guidelines were not being adhered to. This was evident when several respondents noted that antimalarial medications were at times issued to patients when it was not warranted. It was also clear that the lack of adherence impacted on wastage leading to poor service delivery at the county facilities.

> *"…….the only thing I can say is that lets follow the guidelines, such that, patients will only be given when they are actually having malaria, not to be given to anyone randomly."* [Interviewee 2, p1, 14]
>
> *"……I would just recommend people to follow strictly the guidelines, the guidelines are good and clear. If people follow all the guidelines, I think inefficiency would not be there……* [Interviewee 6, p1, 38]
>
> *"You find out that ….our health care professionals especially at the counties don't adhere to the guidelines strictly…."* [Interviewee 10, p2, 234]

The above responses provide a glimpse as to why wastage and other challenges were being observed at the county facilities despite the presence of clear policies and guidelines. Non-adherence to laid down policies has the effect of rendering even the best policies ineffective. Having noted that there were clear guidelines in place, yet they were not being adhered to, there was a need to establish why that was the case and whether anything was being done to arrest the situation. The qualitative inquiry established that the behavior of individual staff at the county facilities played a key role in impacting wastage. It was noted that behavior was difficult to control yet it contributed to the way staff at the county facilities handled the antimalarial commodities which ultimately determined whether wastage occurred or not. It was observed that all was not lost since the challenge with staff behavior and attitude and its impact on wastage was appreciated and that there were measures being put in place to address it specifically through trainings. *"Well, the most probable answer to that would be…, especially for, our colleagues at the counties when it comes to their behavior, you know behavior is really hard to control. So for them it`s actually an attitude issue and a behavior issue, and to counter that, we normally have training, capacity building, to actually reduce cases where we get wastage after the behavior of our colleagues at the counties. "*[Interviewee 10, p5, 270].

It was encouraging to note that the staff behavior as a factor contributing to wastage had been noted and was being addressed appropriately. There is a need to come up with better ways to ensure that there was strict adherence to the guidelines and proper implementation of the laid down procedures. This calls for great cooperation between the national level and officials at the county levels to ensure effective communication and adequate supervision of staff at the facilities. Any significant challenge to the implementation of the policy guidelines also needs to be addressed through appropriate training and guidance for the staff.

It was also observed that periodic revisions of the policies were undertaken. This was crucial to ensure any updates on best practices were captured and shared. In clinical care, newer and more effective ways of case management are always being discovered. This calls for regular updates on current practices to ensure the best standard care is always being offered to the patients. It emerged that policy revisions were usually conducted on a quarterly basis based on the outcomes of the quality of care surveys. The surveys informed the areas that needed improvement and also helped to identify the things that were working well at the county facilities. *"....changes are normally done once in a while, and especially for the guidelines. After surveys, especially the various..... quality of care surveys, which are normally done… by the way the quality of care surveys are normally done on a…. I think quarterly..."* [Interviewee 10, p5, 285]. This step is commendable to ensure that the healthcare providers are not stuck in old ways but that they are always up to date and informed on the best standards of care.

Regarding the stipulated consequences for non-compliance to the treatment guidelines, many of the respondents (95.5%) reported that a verbal reprimand was issued. This was consistent across the facility tiers (p value 0.209). Some respondents (41.5%) also

reported that a warning letter was issued, and this was also consistent across the facility tiers (p value 0.474). Suspension consequently for non-compliance was reported by 21% of the respondents and this also did not differ across the facilities tiers (p value 0.291). Dismissal and banishment as a prescriber were the least reported forms of punishment for non-compliance and were reported by <10% of the respondents across the facility tiers (p values 0.890 and 0.929 respectively).

The qualitative data provided further insights on the ways in which non-compliant staff were dealt with in an effort to address the menace of wastage. It was reported that the use of warnings letters was one of the punitive measures which were employed to address such challenges. For staff that were in charge of facilities and were seen to be non-performing, they were usually referred to undergo support supervision. This required them to be moved to work in a different facility where they had to work under someone else to help them improve on their performance. **"***Sometimes we warn them in writing, ...If one is an in charge and has proven to be inefficient, we maybe take them to other facilities to work under someone else...."*[Interviewee 9, p4, 230].

4.3.4 Supply chain effectiveness in managing damage on transit

Several questions were asked to establish the occurrence of channel wastage of the antimalarial drugs and ways in which it was being addressed. This is summarized in table 17. Most of the respondents (81.5%) reported that there were written requirements that all antimalarial drugs delivered to the facilities were in a good condition. This observation varied across the different levels of care as indicated by the p value which showed significant difference across the different facilities tiers (p value 0.025) in this finding across the facility tiers. The difference was mainly driven by the response from the respondents at the referral facility where a significant proportion (37.5%) of the

respondents said that they did not know whether there were written requirements that all antimalarial drugs delivered to the facilities were in a good condition. This was occasioned by the fact that the referral facility has a separate procurement department that was better placed to respond to this query. The prescribers and dispensers who formed the bulk of the respondents at the referral facility were unlikely to give the right information regarding drugs delivered at the facility.

On inquiring whether there were instances where the antimalarial drugs were delivered in a damaged condition, only 10.9% of the respondents gave an affirmative answer implying that the incidences were low. The difference across the facilities was significant (p value 0.001) driven by the response at the sub county facilities where 25% of the respondents reported that there were indeed instances of antimalarial drugs being delivered in a damaged condition. A significant proportion of the respondents (45.8%) at the referral hospital again responded that they did not know if these incidences occurred.

Only 35.8% of the respondents reported that the facilities got replacements for antimalarial drugs damaged on transit. This report was consistent across the facility tiers since there was no significant difference (p value 0.443). On inquiring whether the transporters met the required conditions for transporting the antimalarial drugs, 77.8% of the respondents answered in the affirmative although with a significant difference across the facility tiers (p value 0.005). The difference was again mainly driven by the response from the respondents at the referral facility whereby 41.7% of the respondents answered that they did not know.

Table 17: Managing channel wastage

% of respondents reporting that;	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p value
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
There were written requirements that all the antimalarial drugs delivered were in good condition	14(58.3)	23(82.1)	15(93.8)	23(95.8)	75(81.5)	(0.025)
Totals within facilities	**24**	**28**	**16**	**24**	**92**	
There were instances when antimalarial drugs were delivered in a damaged condition hence couldn't be used.	1(4.2)	7(25.0)	0(.0)	2(8.3)	10(10.9)	(0.001)
Totals within facilities	**24**	**28**	**16**	**24**	**92**	
Facilities got replacements for antimalarial drugs damaged on transit	7(33.3)	7(28.0)	6(42.9)	9(42.9)	29(35.8)	(0.443)
Totals within facilities	**21**	**25**	**14**	**21**	**81**	
Transporters met the required conditions for transporting the antimalarial drugs	14(58.3)	23(85.2)	12(75.0)	21(91.3)	70(77.8)	(0.005)
Totals within facilities	**24**	**27**	**16**	**23**	**90**	
Major shortages of antimalarial drugs at the facility was due to challenges in the delivery channels.	4(16.7)	11(39.3)	6(37.5)	10(41.7)	31(33.7)	(0.008)
Totals within facilities	**24**	**28**	**16**	**24**	**92**	

The respondents were further asked whether the major shortages of antimalarial drugs reported at the facilities were due to challenges in the delivery channels. Only 33.7% of the respondents answered in the affirmative indicating that many of the respondents did not agree with the statement. This finding was significantly different across the facilities (p value 0.008) and was mainly driven by the responses from the referral facility where only 16.7% of the respondents answered in the affirmative.

The qualitative data provided a confirmation that indeed challenges in the delivery channels occasioned the antimalarial drug shortages at the facilities. Several respondents also expressed their frustration at the out of stock situation for the ALs that

was a common feature at the facilities. The devolution of health services at the county was seen to have presented a bag of mixed scenarios whereby on the one hand it's been lauded to have reduced various forms of wastages at the facilities while at the same time increasing the risk of shortages at the facilities. The menace of wastages especially due to expiries had been reduced through the centralized ordering system at the county for the facilities based on the average monthly consumption and the rationalization of quantities at the ministry before supply by KEMSA. Some respondents complained that the new system led to delayed supplies and they at times found themselves without stocks of the antimalarial drugs with uncertainties as to when they will be delivered.

> *".....the problem is that they are not delivered on time especially since when we came under the county.....they delay a lot……..Not reliable, most of the time we run out of the drugs before they bring the others."* [Interviewee 1, p1, 3]

> *".....for example at the moment, where we have a shortage in our county, and most of our facilities do not have this antimalarial at the moment, because the other commodities from KEMSA, we delayed to make these orders, so it will affect, the time we are going to get these commodities. Actually if you ask me right now when we are going to receive, I don't know.....until we get the other commodities"* [Interviewee 7, p2, 81]

It also emerged that commodities ordered from the counties were lumped together consisting of both program commodities and items being purchased. This was noted as a limitation since at times the county government had payment issues and was indebted to KEMSA who would not supply the items being purchased. This led to a situation whereby even the free program commodities would fail to be supplied, an issue that was noted to contribute to the out of stock scenarios of the AL drugs at the facilities that subsequently impacted negatively on service delivery. The respondent was keen to observe that this was an area that needed to be improved on**.**

> *"……especially with the devolved function right now, where we have irregular supply of commodities, ideally it's supposed to be quarterly but now it can stay up to 6 months, ...that's an area that we need to look into so that these commodities can come regardless of whether there is an order done by the counties to KEMSA to deliver the other commodities."*[Interviewee 7, p2, 74]

Interestingly, the county official was quick to absolve KEMSA from any blame regarding the irregular and delayed supplies at the facilities and owned up that the inefficiency was due to challenges at the county level. He was specific that payments were the major challenge impacting on commodities supplies and ultimately compromising on service delivery. He also pointed out that they were making efforts to streamline their processes to improve on this aspect. *"Our commodity requisition is actually based on quarterly basis and in case there is any inefficiency; the inefficiency is actually from us not from the supplier. ....So we have actually streamlined our systems to ensure that we order on time, but maybe when there's failure or issues to pay on time. That is what will actually delay the delivery but for the anti-malarials actually it is supplied for free."*[Interviewee 9, p4, 192].

The above response from the county official vindicates the KEMSA official who expressed her frustration at the negative feedback that is usually received whenever people go to collect feedback from the counties. There are normally complaints that commodities are not available yet the challenges are usually at the county level. **"***But when people are going out there to give the feedback and they end up finding that the counties don't have the commodities and yet they are not told not to order.....I don't know, maybe negligence or something"*[Interviewee 11, p8,471].

The efforts by KEMSA to ensure efficiency in supply are confirmed by the ministry official who was attesting to their improved delivery timelines. *".....usually facilities complain that time is always an issue… That they have ordered and it has taken so*

long to be delivered. So but… maybe speaking on behalf of KEMSA, I can attest that there has been a huge improvement in terms of the timelines…"[Interviewee 10, p6, 321]

The above revelation calls for a need to review the ordering procedure considering that the facilities are finding themselves without essential commodities which are meant to be available for free. The systemic challenges of payments to KEMSA by the county governments are reversing the gains made in availing the antimalarial commodities at the facilities through the donor funding.

It was sad to note that the out of stock situation for the antimalarial commodities being experienced at the facilities was in stark contrast to the abundant stock cover confirmed by the ministry official.

> *"....these are commodities that are already in the country at the KEMSA stores if not at the KEMSA stores, some of them are at the facilities. And the supplies are already there for the three years of the 2014-2017. Supplies are there in the country, all these commodities are normally... and it's not an exact amount, they are normally given slightly in excess just to cover for an event of out breaks… So at no one point will you find there are no malaria commodities in the country. They are always there."* [Interviewee 10, p7, 398].

The observations above calls for the need to have better coordination and communication between staff at the county levels and ministry officials to ensure that patients can access the commodities considering that they were already fully funded. It might be worth considering having a clear written communication to the county and to the facilities also, clarifying that the program commodities can be ordered for whenever needed regardless of the other orders to KEMSA which might be delayed in delivery pending payment. This might necessitate some policy revisions by the relevant stakeholders to ensure there's an improvement in the commodities supply system.

Another respondent provided additional information on another systemic issue that led to shortages of drugs at the facilities in the counties. He pointed out that inaccurate capturing of data at the facilities into the DHIS system was a contributing factor. He explained that this usually arose due to a host of reasons such as the employment of unqualified staff and lack of proper training during on boarding of new staff. He went further to recommend regular trainings for the health workers as a means of addressing this concern.

> *".....and what the malaria control program, wants from the recipients is actually, report that is supposed to be actually filled in the DHIS and KEMSA usually uses the DHIS report to supply the commodities so there are some facilities that have not been using the right tools to report and failure to use the right tool means that the information will not actually be captured in the DHIS, failure to capture in the DHIS means they are not actually getting these drugs and that's what sometimes causes shortage in these facilities. Sometimes we are forced to do redistribution of the antimalarial drugs."* [Interviewee 9, p4, 186].

> *".....when you employ, sometimes you've not taken them through the due process of training or recommended qualifications - that's what actually creates inefficiency because when the officers are not fully trained, you don't expect much in terms of uploading of data. And failure to upload data means it will create the shortage, so what I can actually say is that we need regular trainings for health workers."*[Interviewee 9, p4, 216].

Periodic reshuffles of staff into different roles at the county facilities was usually undertaken. This was also noted to contribute to some inefficiency which impacted on wastage. It was noted that staff could be asked to undertake different roles separate from what they were doing without proper induction or handover onto the new roles. This was especially critical for staff who were required to capture data onto the DHIS and had probably not undertaken that duty for an extended period. This led to a situation whereby the new staff ended up providing inaccurate data which impacted on the decisions about the county facilities at the national level which led to either wastages

or shortages of the commodities supplied to the counties. One respondent pointed out that it would be crucial to always ensure that the new staff were properly inducted into the new roles to ensure seamless transition. This was vital since it ensured continuity in all processes between the county facilities and the national levels including the supplier, KEMSA. **"***I think its capacity… maybe today you are employed then they redeploy you, so you get someone who has not reported for a period like 8 months because they have not got someone to take them through reporting."*[Interviewee 11, p8, 446].

> *".....for the counties, when they are doing their reshuffles or maybe giving transfers we should look at what this person was doing and when they are bringing the next person they should also know what they are supposed to do. Not just bringing someone there and they just leave them"* [Interviewee 11, p9, 518].

Considering the many reports of drugs shortages by the different respondents at the facilities, the qualitative inquiry sought to establish how the staff at the facilities were impacted by this situation. It was disheartening to note that some staff at the facilities had resigned themselves into accepting that the inefficiencies were synonymous with the public system. This was exemplified with one respondent confirming that they had to ensure that they always had the RDTs to conduct the malaria tests since microscopy which is the gold standard test could not be conducted at times due to power blackouts at the facilities and a lack of reagents. *"...we made sure that these Rapid Diagnostic Tests, are available so that in case we have a blackout, or when the microscope is not functioning because of lack of reagents, because you know it's a public system, we have erratic supply of those reagents...."*[Interviewee 7, p2, 108].

Such statements should serve as a wakeup call to the officials at the county to get their staff out of this mindset whereby poor service delivery becomes acceptable as the norm. This can actually be achieved by ensuring that the commodities are seamlessly availed

and in the right quantities to ensure out of stock situations are the exceptions and not the norm. It would also be helpful to ensure effective communication detailing on the expected timelines of delivery for the commodities and in case any delays were expected, appropriate communication was relayed so that there is a better understanding of any prevailing situation. This will empower the staff at the facilities such that they are able to relay the same message to the patients at the facilities and inspire some confidence in them that the public system is actually working and any stock out situations are exceptional cases. This will avoid scenarios noted from earlier respondents where staff at the facilities were totally unaware of the times when they expected to receive the commodities and felt that the counties supplied the commodities whenever they felt like.

4.4 Medicines Financing

The study also sought to discover the financing of antimalarial drugs by the facilities and the costs incurred by the patients at the facilities when seeking treatment for uncomplicated malaria and the findings are summarized in table 18 below. Regarding the fees that were charged to the patients, the study established that patients were mainly charged registration fee. This was reported by 80% of the respondents although a significant difference was reported across the facilities (p value 0.002). This was mainly driven by the responses from the dispensaries whereby 54.2% of the respondents reported that patients were made to pay for the registration fees. 45.8% of the respondents at the dispensaries reported that patients did not pay for registration fee, indicating that patients did not pay for the registration fees at some dispensaries.

Table 18: Pricing Policy

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p value
% of respondents reporting that facilities charged patients for;	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Registration	21(91.3)	26(92.9)	12(80.0)	13(54.2)	72(80.0)	(0.002)
Totals within facilities	23	28	15	24	90	
Consultation	13(68.4)	3(11.5)	0(.0)	1(5.0)	17(22.1)	(0.000)
Totals within facilities	19	26	12	20	77	
% of respondents reporting that the amount of fees charged to patients would be increased due to						
AL drugs frauds	7(46.7)	2(7.1)	1(6.7)	5(22.7)	15(18.8)	(0.008)
Totals within facilities	15	28	15	22	80	
Irrational AL drugs use	4(28.6)	1(3.6)	0(.0)	6(26.1)	11(13.9)	(0.018)
Totals within facilities	14	28	14	23	79	
AL drugs damages	2(15.4)	2(7.1)	0(.0)	4(19.0)	8(10.5)	(0.269)
Totals within facilities	13	28	14	21	76	
AL drugs expiration	2(15.4)	1(3.6)	0(.0)	5(22.7)	8(10.4)	(0.073)
Totals within facilities	13	28	14	22	77	
% of respondents agreeing that the county government should;						
Monitor the retail price of drugs sold to the patients	4(26.7)	6(21.4)	4(26.7)	7(29.2)	21(25.6)	(0.008)
Totals within facilities	15	28	15	24	82	
Adjust the retail price of drugs when faced with major shortages	3(21.4)	6(21.4)	5(33.3)	9(37.5)	23(28.4)	(0.017)
Totals within facilities	14	28	15	24	81	

The referral hospitals were seen to charge the consultation fees as well since 68.4% of the respondents reported that patients were required to pay for this. Facilities in the lower tiers seemed not to charge patients for the consultation fees. The qualitative data corroborated the results from the quantitative data and provides further information regarding the funding of antimalarial drugs. It emerged from the respondents that the ALs were issued to the patients for free at the government facilities and mission hospitals. It was pointed out that the facilities did not incur any costs in obtaining the drugs and hence the reason why they needed to pass them on to the patients at no cost.

> *".....No….for anti-malarial it's free."*[Interviewee 7, p2, 98]

> *"... These antimalarials go to public health facilities and faith based organizations. So the facilities will not incur any charges of procurement…..they get from us for free and they are supposed to give for free to patients as well"*[Interviewee 11, p9, 508]

As much as the AL drugs were free to the patients, it was essential to establish the bodies that made this possible. It emerged that a number of international bodies were instrumental in ensuring that the commodities were available for free to the patients. Global Fund was cited as the major donor in availing the antimalarial commodities in the country. A few instances were cited whereby the county government was called upon to procure some antimalarial drugs when the county was facing a shortage on the background of an outbreak. This illustrates a lack of total dependence on the donor funded drugs which is commendable on the part of Uasin Gishu county government.

> *"We normally rely on KEMSA, you know these are donor funded….."*[Interviewee 7, p3, 121]

> *"Global Fund…….Maybe sometimes I can say Global Fund or sometimes when we go into shortages, we as a county are forced to procure…. we at times procure like recently we had some upsurge in Turbo and the county had to procure a few commodities."* [Interviewee 9, p4, 206]

Apart from the antimalarial commodities, it emerged that there were other commodities supplied to the facilities through KEMSA for free. These were termed as the program commodities which were funded through the donors and were meant to be issued for free to the facilities and eventually to the patients for free as well. The program commodities include those used in the management of malaria, HIV and TB. Three key donors were pointed out to be the major funding bodies which included Global Fund, USAID and Presidents Malaria Initiative (PMI). A key observation that was made was that these commodities were at times out of stock at the facilities despite the fact that they were free. This was attributed to a situation whereby the facilities had incurred

debts to KEMSA on other items and now felt uneasy ordering the program commodities from KEMSA with their outstanding debt. A ministry official made it clear that debts arising from procuring other items at KEMSA should not have a bearing on the supply of program commodities stating that the only challenge would be that KEMSA may not deliver to the facility level but would at least deliver at the county headquarters from where the facilities can organize for their collection.

> *"We get things for free and we are supposed to issue them for free like ARVs and TB commodities…. we issue for free"* [Interviewee 11, p9, 511]

> *The commodities which are procured by KEMSA are program commodities, funded by Global Fund, so they are free. Global fund, funds these commodities including other partners like the USAID, and all the other partners. PMI (Presidents Malaria Initiative). [p5, 297] ".....for program commodities.....the ACTs and diagnostics ….especially for RDTs.... are already funded. The counties are not supposed to pay anything for these particular commodities and the same for NASCOP HIV commodities and TB.....so these commodities are free and that's what we emphasize to the counties..... just go to KEMSA because you will not pay anything to them. Transportation will be done.... up to….Sub county level, and even facility level, because the issue normally is that some counties fear ordering because of debts. They have debts with KEMSA."* [Interviewee 10, p5, 307]

The respondents were further asked whether they thought that the amount of fees charged to the patient would be increased due to antimalarial drugs frauds, irrational use, drug damages or expiries. Only 18.8% and 13.9% of the respondents reported that AL drugs frauds and irrational drugs use respectively would increase the fees charged to the patients. The findings were significantly different (p value 0.008 and 0.018 respectively) across the facility tiers driven by greater response from the referral hospital and the dispensaries (46.7%, 28.6% and 18.8%, 13.9% respectively).

Only 10.5% and 10.4% of the respondents reported that AL drugs damages and expirations respectively would lead to an increase in the fees charged to the patients.

This was seen to be consistent across the facilities without a significant difference (p values, 0.269 and 0.073). This indicates that most of the respondents did not agree that AL drugs damages and expirations would lead to an increase in the fees charged to the patients.

The respondents were asked whether they agreed that the government controlled the retail prices of medicines sold to the patients. Only 25.6% of the respondents reported that the government actually controlled the retail price of medicines. This implies that the majority of the respondents did not agree with this statement. This finding was not consistent across the facility tiers (p value 0.008). The respondents were further asked whether they agreed that the county government should adjust the retail prices of AL drugs when faced with major drugs shortages. Only 28.4% of the respondents agreed that this should be done implying that a majority of the respondents did not agree with this statement. The finding was also not consistent across the facilities tiers (p value 0.017).

4.5 Health Care Access

The study further investigated the effects of AL drugs shortages and prices increase on access to healthcare by the patients and the healthcare workers approach during times of AL drugs shortages and the findings are captured in table 19. The respondents were asked whether patients were turned away from the facilities during periods of major AL drugs shortages. Only 23.1% of the respondents agreed with the statement implying that a majority stated that that was not the case. This finding was consistent across the facility tiers (p value 0.363).

The respondents were asked whether they recorded low patients' numbers during periods when the facilities were experiencing AL drugs shortages. Only 28.6% of the

respondents reported that that was the case. The finding was not consistent across the facilities (p value 0.018). Dispensaries had 54.2% of the respondents agreeing that they indeed had lower patients' numbers to the facilities during periods of AL drugs shortages. At the sub county facilities 28.6% of the respondents also agreed with the statement. The referral and health center facilities had only 12.5% and 13.3% of the respondents agreeing that lower patients' numbers were observed during periods of AL drugs shortages.

The respondents were asked whether they agreed that utilization of healthcare services by patients would reduce due to an increase in the AL drugs prices. 54.4% of the respondents answered in the affirmative and this was consistent across the facility tiers (p value 0.107) implying that most respondents agreed with the statement.

Table 19: Healthcare access

% of respondents at the facilities who agreed that patients;	**Referral hospital**	**Sub county hospital**	**Health Centre**	**Dispensary**	**Total**	**p value**
	Count (%)	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
Were turned away during major AL drugs shortages	3(12.5)	8(28.6)	5(33.3)	5(20.8)	21(23.1)	(0.363)
Totals within facilities	**24**	**28**	**15**	**24**	**91**	
Numbers were low during AL drugs shortages	3(12.5)	8(28.6)	2(13.3)	13(54.2)	26(28.6)	(0.018)
Totals within facilities	**24**	**28**	**15**	**24**	**91**	
Utilization of healthcare services reduced due to an increase in AL drugs prices	16(69.6)	16(57.1)	4(26.7)	13(54.2)	49(54.4)	(0.107)
Totals within facilities	**23**	**28**	**15**	**24**	**90**	
Number of hospital visits would reduce due to increased fees charged on AL drugs	15(65.2)	16(57.1)	4(26.7)	13(54.2)	48(53.3)	(0.112)
Totals within facilities	**23**	**28**	**15**	**24**	**90**	
Would seek alternative treatment in case of increased medical fees due to drug shortages.	17(73.9)	16(57.1)	4(26.7)	15(62.5)	52(57.8)	(0.080)
Totals within facilities	**23**	**28**	**15**	**24**	**90**	

Respondents were also asked whether they agreed that the number of patients visits to the facilities would reduce incase of an increase in the AL drugs prices. 53.3% of the respondents agreed with the statement and this was also consistent across the facilities (p value 0.112).Respondents were asked whether they agreed that patients would seek alternative forms of treatment due to increased medical fees occasioned by AL drugs shortages. 57.8% of the respondents answered in the affirmative implying that most of the respondents agreed with the statement. This finding was consistent across the facility tiers (p value 0.080).

4.6 Quality of Healthcare and Patient Outcomes

Quality of healthcare and patient outcomes during periods of AL drugs shortages occasioned by poor utilization of AL drugs were assessed by asking specific questions to the respondents. The findings are captured in table 20. Respondents were asked whether they agreed that AL drugs shortages due to poor utilization led compromised quality of care. 72.8% of the respondents gave a positive response. This was consistent across the facility tiers (p value 0.088) implying that most of the respondents were in agreement.

When asked whether they agreed that AL drugs shortages due to poor utilization led to poor patient outcomes, 37.8% of the respondents answered positively (p value 0.011). The responses varied across the facility tiers with the lowest response from the health centers where only 13.3% of the respondents agreed. At the referral, sub county facility and the dispensaries, the responses were at 43.5%, 35.7% and 50% respectively. Respondents were then asked whether they agreed that AL drugs shortages due to poor utilization led to patients experiencing severe side effects due to the use of therapeutic alternatives.

Table 20: Quality of healthcare and patient outcomes

% of respondents who reported that shortage of AL drugs due to poor utilization led to patients having ;	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p value
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Compromised quality of care	23(92.0)	18(64.3)	9(60.0)	17(70.8)	67(72.8)	(0.088)
Totals within facilities	25	28	15	24	92	
Poor outcomes	10(43.5)	10(35.7)	2(13.3)	12(50.0)	34(37.8)	(0.011)
Totals within facilities	**23**	**28**	**15**	**24**	90	
Severe side effects for using therapeutic alternatives	13(52.0)	4(14.3)	2(13.3)	7(29.2)	26(28.3)	(0.006)
Totals within facilities	25	28	15	24	92	
Refused to take alternative AL drugs	8(32.0)	7(25.0)	1(6.7)	11(45.8)	27(29.3)	(0.106)
Totals within facilities	**25**	**28**	**15**	**24**	92	
Anxiety when AL drug prescription was changed to the alternative drugs	8(47.1)	11(40.7)	2(14.3)	8(36.4)	29(36.3)	(0.260)
Totals within facilities	**17**	**27**	**14**	**22**	**80**	
Confusion when AL drug prescription were changed to the alternative drugs	7(41.2)	4(14.8)	0(.0)	7(31.8)	18(22.5)	(0.024)
Totals within facilities	**17**	**27**	**14**	**22**	**80**	
Frustration when AL drug prescription were changed to the alternative drugs	6(33.3)	2(7.4)	3(20.0)	2(8.7)	13(15.7)	(0.082)
Totals within facilities	**18**	**27**	**15**	**23**	**83**	
Anger when AL drug prescription were changed to the alternative drugs	3(15.0)	3(11.1)	3(20.0)	2(9.1)	11(13.1)	(0.778)
Totals within facilities	**20**	**27**	**15**	**22**	**84**	
Increased visits to the facilities at the same period of drugs shortages	3(12.5)	5(19.2)	7(46.7)	7(33.3)	22(25.6)	(0.015)
Totals within facilities	**24**	**26**	**15**	**21**	**86**	
% of respondents reporting that AL drugs shortages at the facilities led to;						
Procedure delays	10(45.5)	18(66.7)	2(13.3)	11(45.8)	41(46.6)	(0.011)
Totals within facilities	**22**	**27**	**15**	**24**	**88**	
Cancellations	2(9.5)	3(11.5)	2(13.3)	4(18.2)	11(13.1)	(0.085)
Totals within facilities	**21**	**26**	**15**	**22**	**84**	
Prolonged hospital stays among the patients	9(37.5)	7(26.9)	3(20.0)	4(18.2)	23(26.4)	(0.457)
Totals within facilities	**24**	**26**	**15**	**22**	**87**	
Increased patient safety issues due to the use of therapeutic alternatives	1(4.2)	7(25.9)	0(.0)	9(37.5)	17(18.9)	(0.001)
Totals within facilities	**24**	**27**	**15**	**24**	**90**	

Respondents who gave a positive response were 28.3% with varying opinions across the facility tiers (p value 0.006). 52% of the respondents at the referral facility were in agreement with the statement. The sub county facility, health centers and dispensaries had 14.3%, 13.3% and 29.2% respectively of the respondents agreeing with the statement.

Respondents were asked whether they agreed that AL drugs shortages due to poor utilization led to patients refusing to take alternative to the AL drugs. Respondents that gave a positive response to the question were only 29.3% and this finding was consistent across the facility tiers (p value 0.106) implying that most respondents did not agree with the statement.

Several questions were asked to assess the patient's feelings whenever AL drugs shortages led to prescriptions being changed to alternatives. Respondents were asked whether this led to patients having feelings of anxiety, confusion, frustration and anger. The feelings of anxiety, frustration and anger were reported by 36.3%, 15.7% and 13.1% of the respondents respectively and this was consistent across the facility tiers (p values 0.260, 0.082 and 0.778) respectively implying that a majority of the respondents did not agree with the statements. The feeling of confusion was reported by 22.5% of the respondents and this finding was varying across the facility tiers (p value 0.024). None of the respondents at the health facilities agreed that patients had a feeling of confusion whenever AL drugs shortages led to prescriptions being changed to alternatives. At the referral hospital, sub county facility and the dispensaries, 41.2%, 14.8% and 31.8% respectively of the respondents reported that they agreed that patients had a feeling of confusion whenever AL drugs shortages led to prescriptions being changed to alternatives.

The qualitative data provided a pointer on the need to better utilize the antimalarial drugs at the facilities as a means of improving healthcare services. There was a great call for the rational utilization of antimalarial commodities in order to improve service delivery to the population at the facilities. Rational use of the commodities would translate into less wastage of the items such that more people were able to access the commodities whenever they visited the facilities. "*We over emphasize the importance of the rational use of antimalarials and all the commodities in Kenya. Because our aim is actually just to improve the services to the population in the counties*."[Interviewee 10, p7, 414].

Any wastage at the facilities implies that shortages of drugs will be experienced leading to poor services. Patients presenting with uncomplicated malaria will certainly be prescribed for the AL drugs which if not available at the facilities will compel the patients to purchase them elsewhere. The out of pocket costs of the antimalarial drugs definitely impacts the households negatively especially in the rural areas of the counties where most households struggle to meet their basic needs. Some may not afford the costs of the medications risking a progression of the disease condition which becomes costlier to manage and even increasing the risk of death.

4.7 Recommendations

Considering the different forms through which the wastage of antimalarial drugs manifested at the public health facilities, the respondents were asked whether they agreed with a number of recommendations as ways of improving antimalarial drugs utilization at the facilities. Their responses were as captured on table 21. Respondents who agreed that prioritizing patients' needs in the AL drugs supply chain stood at 97.8%. This recommendation was consistent across the facility tiers (p value 0.608)

implying that majority of the respondents concurred. The respondents were next asked whether they would recommend the expansion of the pharmacist's responsibilities to procure AL drugs as a way of improving the utilization of AL drugs at the facilities. 74.7% of the respondents' answered in the affirmative. This response was consistent across the facility tiers (p value 0.714) to indicate a general agreement with the recommendation. The respondents were then asked whether they agreed with the recommendation that ensuring drug dispensers were able to advise patients on how to use AL drugs more rationally would help improve antimalarial drug utilization at the facilities. 98.9% of the respondents agreed and this response was consistent across the facilities (p value 0.163). This also indicated a majority agreement with the recommendation.

Table 21: Recommendations

	Referral hospital	**Sub county hospital**	**Health Centre**	**Dispensary**	**Total**	**p value**
% of respondents who recommended;	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	
Prioritizing patients' needs in the AL drug supply chain	23(95.8)	28(100.0)	15(100.0)	23(95.8)	89(97.8)	(0.608)
Totals within facilities	**24**	**28**	**15**	**24**	**91**	
Expanding responsibilities of pharmacists to procure AL drugs	19(79.2)	19(67.9)	13(86.7)	17(70.8)	68(74.7)	(0.714)
Totals within facilities	**24**	**28**	**15**	**24**	**91**	
Ensuring drugs dispensers are able to advise patients on how to use AL drugs more rationally	24(100.0)	28(100.0)	14(93.3)	24(100.0)	90(98.9)	(0.163)
Totals within facilities	**24**	**28**	**15**	**24**	91	
Investigating and prosecuting those who steal AL drugs from the hospitals	22(91.7)	27(96.4)	11(73.3)	19(79.2)	79(86.8)	(0.323)
Totals within facilities	**24**	**28**	**15**	**24**	91	
Identifying safe and effective therapeutic alternatives for the first line antimalarial drugs	23(95.8)	27(96.4)	11(73.3)	22(91.7)	83(91.2)	(0.138)
Totals within facilities	**24**	**28**	**15**	**24**	**91**	

Respondents were then asked if they would recommend the investigation and prosecution of staff who steal the AL drugs from the health facilities. 86.8% of the respondents agreed with the recommendation and this was consistent across the facility

tiers (p value 0.323). This implied that the respondents were in agreement with the recommendation. The respondents were finally asked whether they would recommend the identification of safe and effective therapeutic equivalents of the first line antimalarial drugs as a means of improving antimalarial drugs utilization at the facilities. 91.2% of the respondents were in agreement with the recommendation and this was also consistent across the facility tiers (p value 0.138). This indicates an agreement with this recommendation as a way of improving antimalarial drug utilization at the facility. The qualitative inquiry provided additional recommendations from the respondents on the ways through which wastage of drugs at the public health facilities could be reduced to improve healthcare service delivery. These are summarized below.

i. The need to follow guidelines – issue AL to positive cases only

The fact that mix wastage was the most predominant form of wastage, most of the respondents had their recommendations pointing towards the need to follow the guidelines in order to curb the menace.

> *" ....I'm seeing, the only thing I can say is that lets follow the guidelines, such that, patients will only be given (AL drugs) when they are actually having malaria, not to be given to anyone randomly."*[Interviewee 2, p1,14]

> *".....and giving only anti-malarial drugs to those that have been tested positive. To avoid dispensing antimalarial drugs to those who are negative."*[Interviewee 3, p1, 23]

> *"I think, I would just recommend people to follow strictly the guidelines, the guidelines are good and clear. If people follow all the guidelines, I think inefficiency would not be there, including the suppliers.* [Interviewee 6, p1, 38*]*

> *"……It's not a reprimand, it's just a request that please let's adhere to the guidelines."*[Interviewee 10, p7, 420]

ii. Administration to be also involved in the trainings to help enforce the guidelines

> *".....the administration, whenever there are these trainings, it's good to engage the administration because they are the ones who will be having a third eye. To be checking on what's happening on the ground but if they are not informed on the updated guidelines and anything, it will be difficult to enforce these things so we will have guidelines but people will be doing what they think."*[Interviewee 7, p3, 137]

This comment is also suggestive of the need to address the menace of mix waste.

iii. Emphasize on the accuracy of the RDTs

> *".....the attitude towards RDTs is still low, people don't trust the outcome, and you know if RDT give a negative result, the healthcare worker will still be tempted to prescribe……so they need to really emphasize that RDTs give accurate results, that's in terms of sensitivity and specificity"*[Interviewee 7,p3,144]

iv. Public sensitization and patient education

It also emerged that there was need to sensitize the public on the importance of being tested to confirm positive malaria cases before the antimalarial drugs are issued and the need to adhere to their prescribed medications.

> *"First, the public has to be sensitized, secondly, tests have to be done. Not that….I feel like I have malaria, and then antimalarials are issued…..and then make sure that after that, appropriate medicine is given like the first line….and ensure that the patient has taken the drug for the duration….. That's basically adherence"* [Interviewee 8, p3,155]

This is critical, since it also emerged that some patients also drove the mix wastage challenge when they are seen to present to the facilities with a preconceived belief that they have malaria and insist to be prescribed for the antimalarial drugs regardless of the test outcome.

v. Regular trainings for the health workers

The need for capacity building forums also emerged as a key recommendation among the respondents to the semi structured interviews. It emerged that continuous trainings were key in ensuring that the staff are able to easily transition to following new guidelines or any shift in the medical practices. The trainings were also suggested to be a channel through which negative habits and behaviors among the health workers that drive wastage could be improved.

> *"…….so what I can actually say is that we need regular trainings for health workers and also to have data quality audits to be able to establish……. the existing tools so that they are updated"* [Interviewee 9, p4,219]

> *"If it's a behavioral change that's needed, we just go down there, do a support supervision; sensitize our colleagues at the counties just to make them improve; call them for trainings - the capacity building trainings."*[Interviewee 10, p7, 412]

CHAPTER FIVE

DISCUSSION

The aim of this mixed methodology study was to assess the levels, nature, and the perceived effects of drug wastage in public health facilities in Uasin Gishu County. More specifically, semi structured questionnaires and face to face interviews were conducted to estimate the levels and nature of drug wastages in public health facilities that can be attributed to failures in the public health care systems, examine the perceived effect of drug wastages on healthcare service delivery in terms of accessibility and cost and to generate evidence for policy recommendations on how best to mitigate drug wastages in public health facilities in Uasin Gishu county. In this study, the semi structured interviews were used to provide further insights on the findings that emerged from the questionnaires. Several reasons have been suggested for the use of mixed methods design in conducting research including the need to offer completeness, enhancement and triangulation among others. Completeness indicates that a more complete answer to a set of research questions can be achieved by including both quantitative and qualitative methods. It implies that the gaps left by one method can be filled by another (Bryman, 2012). Enhancement or building upon quantitative/qualitative findings entails the reference to making more of or augmenting either quantitative or qualitative findings by gathering data using a qualitative or quantitative research approach (Bryman, 2012). Triangulation implies that the results of an investigation employing a method associated with one research strategy are cross checked against the results of using a method associated with another strategy. It is documented that qualitative interviews can be conducted to check and correct the quantitative data and make the survey data more robust. (Bryman, 2012). The above justifications for mixed methods design were put into considerations when selecting the

study design in view of the information that the study sought to collect. The research on wastage, in spite of efforts to avoid the usage of the word “wastage” was likely to elicit bias response since the respondents would have been more inclined to give a positive outlook of things and to give the impression that they were not being wasteful. This led to the need to employ both methods of inquiry as well as the fact that the mix wastage component was a subtle form of wastage that could not have been easily picked up by the questionnaires only.

Integration for the two strands of data was achieved using the narrative approach. This is whereby a description of the qualitative and quantitative findings is done through a single or a series of reports. Specifically, the weaving approach to integration through narrative was utilized which involved writing both the qualitative and quantitative findings together on a theme-by- theme or concept-by-concept basis as presented below.(Michael *et al*, 2017).

5.1 Level and Nature of Drug Wastages in Public Health Facilities

The findings from the quantitative data illustrate that the respondents reported that they had observed low incidences of the different forms of wastage. Expiry wastage was reported by 17.6%, mix wastage by 9.6% and channel wastage by 4.8% of the respondents. This was a common observation across the different facility tiers since there were no significant differences noted as per the p values. Further, the respondents were asked to provide a percentage representation of the extent to which they had observed the occurrence of the different forms of drugs wastage noted above. According to the findings, the percentage manifestation of the different forms of wastage majorly lies between the 1-20% bracket, the lowest category, as was reported by approximately 70% of the respondents. This was consistent across the facilities since there was no significant difference observed as per the p values. This serves to reinforce

the observations made in the table 5 above whereby few respondents reported the occurrence of the different forms of wastage. Most respondents reported that they always observed the national malaria treatment guidelines and that diagnostic tests were usually conducted for all suspected cases of uncomplicated malaria, 95.7% and 94.6% respectively. This was observed to be consistent across the facilities without a significant difference (p values 0.580 and 0.319 respectively).

These findings illustrate that generally the levels of wastage were not very high but that there was need to address the fact that it occurred to some extent. This is because the facilities were observed to experience periods of stock outs of the antimalarial medications and this was partly attributed to the menace of wastage and other systemic challenges.

The qualitative data provided a detailed illustration on the ways through which the different forms of wastage were manifested and the key drivers of the figures observed from the quantitative data. Out of the three different forms of wastage; mix, channel and expiry wastage, mix wastage emerged as the most common form of wastage occurring at the health facilities and it was manifested in different ways.

One of the ways in which mix wastage manifested was in terms of irrational use of antimalarial medications. It emerged that some of the prescribers would actually prescribe the ALs without doing the confirmatory laboratory tests and at times even prescribed the antimalarial drugs after a negative test result for uncomplicated malaria. Mix wastage was also implied by the notable discrepancies in the numbers of positive malaria tests captured in the laboratory results as compared to the doses of the ALs issued which were higher indicating that a number of patients were issued with the antimalarial medications without an accompanying proof of a positive malaria test.

Diagnostic tools also emerged as a factor influencing mix wastage. Some facilities reported facing periods of lack of reagents and power blackouts hence not being able to conduct microscopy. It was noted that some clinicians did not believe in the outcomes of the RDTs hence there was need to provide further reassurance that the RDT outcomes were reliable and measures put in place to ensure that the reagents for use with the diagnostic tools were available. It would also be important to ensure that power blackouts are not common at the health facilities and that there were power backups just in case. Patient factors also played a role in facilitating mix wastage. It was reported that some patients would present to the facilities convinced that they had uncomplicated malaria based on their symptoms and would insist on being prescribed with the antimalarial medications regardless of the test outcomes. Some prescribers allowed the patients to have their way and would prescribe the antimalarial drugs.

Presence of mix wastage has also been reported in the US healthcare system with common manifestations as reported in the health facilities in Uasin Gishu. From the analyses in the US, much of the waste in clinical care resulted from failure to comply with established and accepted clinical practices and underuse of cost effective diagnostic tests. It was also reported that patients would present with preset ideas and expectations regarding their management which contradict guidelines – as in the example where a patient would demand for antibiotics to treat respiratory infections, which could lead to a physician straying from the established guidelines. (Jules *et al*, NEHI 2018)

This calls for the need to emphasize on the importance of rational use of the ALs drugs such that they could only be prescribed after conducting a diagnostic test with a positive outcome.

The qualitative data gives us insights on the presence of mix wastage which did not clearly emerge from the quantitative data. The reason for this discrepancy could be attributed to the fact the respondents for the qualitative data were the facilities in charges who provided a less biased response. The respondents for the quantitative data were likely to give a picture that they were adhering to the guidelines despite the fact that they were not doing so.

This is consistent with the literature on outcomes from sensitive research studies such as wastage of drugs in public health facilities. Socially sensitive researches were defined as studies in which there were potential consequences or implications, either directly for the research respondents or for the class of individuals represented by the study (Sieber & Stanley 1988). For the fear of social isolation, respondents desist from portraying information or acts that are contrary to the social norms, leading to a cycle of non-response or respondents may also be inclined towards a tendency to make a good impression on the researcher by underreporting their negative actions. This is termed as the bias of social desirability. (Condomines & Hennequin, 2014).

It was noted that training played a key role in that after the trainings, the clinicians were able to appreciate that not all fevers were due to malaria and that there was need to conduct further tests to confirm other possible causes of the fevers to avoid issuing antimalarial drugs when it was not warranted.

Expiration wastage emerged as a form of wastage that was rarely reported among the interviewees and could appropriately be considered to minimally contribute to the wastage of ALs within Uasin Gishu County. This was attributed to several factors. First, the facilities would usually inform the county officials of any impending expiry of the AL drugs which would then be taken to other facilities where there was a greater

demand. Secondly, the pull system of ordering drugs at the facilities based on the average monthly consumption as captured in the DHIS reduced the risk of oversupply hence minimizing the risk of expiry. A third reason was the fact that KEMSA usually supplied drugs with long dated expiry and that facilities had systems alerting them of the drugs nearing expiration.

Channel wastage was noted as being minimal since KEMSA had a reliable system of transportation that ensured there were no damages on transit. The packaging of the AL drugs in blister packs and the fact that they did not require specialized handling also reduced the risk of channel wastage. These observations confirm that tackling mix wastage would make the greatest impact in helping to reduce wastage and provide an opportunity for reducing stock outs of the antimalarial drugs at the facilities hence improving healthcare service delivery.

5.2 Outcomes of Drug Wastages on Service Delivery

Effects of antimalarial drug wastages on service delivery was assessed by considering patient outcomes and the general feelings that the patients expressed whenever they visited the facilities and could not get the antimalarial drugs due to shortages. According to the quantitative data, a majority of the respondents across the facilities (72.8%; p value 0.088) agreed that AL drugs shortages due to wastage led to a compromised quality of care. These results concurs with a study in Saudi Arabia where up to 88% percent of hospital pharmacists reported that drugs shortages led to a compromise in patient care (Al Ruthia, 2017).

The fact that AL drugs shortages due to poor utilization led to poor patient outcomes was expressed differently across the facilities. This was reported by 37.8% of the respondents across the facilities (p value 0.011). The lowest response was from the

health centers where only 13.3% of the respondents were in agreement. At the referral, sub county facility and the dispensaries, the responses were at 43.5%, 35.7% and 50% respectively. The difference in the responses across the facilities could be attributed to the fact that the antimalarial drugs shortages at the facilities was commonplace to the extent that the respondents were not able to expressly attribute the poor patient outcomes to shortages due to wastage or other systemic challenges in the public health facilities which also led to out of stock situation for the antimalarial drugs. These outcomes are consistent to a study in Egypt which revealed that a shortage of general medicines led to negative patient outcomes (Abdelrahman, 2016).

The respondents reported that AL drugs shortages due to poor utilization led to patients experiencing severe side effects due to the use of therapeutic alternatives (28.3% ; p value 0.006). This observation varied across the facility tiers with 52% of the respondents at the referral facility being in agreement while the sub county facility, health centers and dispensaries had 14.3%, 13.3% and 29.2% respectively of the respondents agreeing with the statement. The referral hospital had most respondents being in agreement and this could be attributed to the fact that the referral hospital could readily access other alternatives for the antimalarial drugs in cases when the county supply of the AL was delayed. This is due to the fact that they were better resourced in comparison to the lower tier facilities thus being able to express the experience from patients that had to be put onto alternative antimalarial medications. This observation on patients experiencing side effects due to the use of therapeutic alternative is consistent with the observation made in an Egyptian study which reported that analogues and alternative treatments were perceived to cause increased side effects and not give the same effect as the shortage medications (Abdelrahman, 2016).

To further assess the level of satisfaction with the services offered at the public health facilities, several questions were asked to assess the patient's feelings whenever AL drugs shortages led to prescriptions being changed to alternatives. Respondents were asked whether this led to patients having feelings of anxiety, confusion, frustration and anger. The feelings of anxiety, frustration and anger were reported by 36.3%, 15.7% and 13.1% of the respondents respectively and this was consistent across the facility tiers (p values 0.260, 0.082 and 0.778) respectively implying that only a small percentage of the respondents agreed with the statements. The feeling of confusion was reported by 22.5% of the respondents and this finding was varying across the facility tiers (p value 0.024). None of the respondents at the health centres agreed that patients had a feeling of confusion whenever AL drugs shortages led to prescriptions being changed to alternatives. At the referral hospital, sub county facilities and the dispensaries, 41.2%, 14.8% and 31.8% respectively of the respondents reported that they agreed that patients had a feeling of confusion whenever AL drugs shortages led to prescriptions being changed to alternatives. From the above, it emerges that a small section of the patient population expressed negative feelings whenever AL shortages at the facilities led to prescriptions being changed to alternatives. According to an Australian review on the impact of medication shortages on patient outcomes, it is worth noting that the observations on these humanistic outcomes were reported by healthcare professionals, just like on this wastage study. They could have been biased and these were their perspectives and not that of the patients themselves who are subjected to the treatment changes due to the shortages (Jonathan *et al*, 2019).

This is a pointer that the patients' experiences at the facilities could be improved if the challenge of AL drug shortages due to wastages was addressed. Several studies have evaluated the humanistic outcomes of drug shortages on patients. A study interviewing

key stakeholders in the Fijian medicine supply chain reported that patients were angry with pharmacists due to shortages in general medicines (Walker, 2017). In a UK study on the shortage of glaucoma medicines, it was reported that patients were confused, distressed, frustrated and angry about the situation and anxious about reactions to alternative drops (Shah, 2015).

The qualitative data provided further insights to the effect of drug wastage to service delivery at the public facilities. There was a great call for the rational utilization of antimalarial commodities in order to improve service delivery to the population at the facilities. Rational use of the commodities would translate into less wastage of the items such that more people would be able to access the commodities whenever they visited the facilities. There was an overemphasis on the importance of the rational use of antimalarial drugs and all the commodities in the country because the aim was actually just to improve the services to the population in the counties. It was noted that some staff at the facilities had resigned themselves into accepting that inefficiencies were synonymous with the public system. One respondent confirmed that they had to ensure that they always had the RDTs to conduct the malaria tests since microscopy which is the gold standard test could not be conducted at times due to power blackouts at the facilities and a lack of reagents which were erratically supplied simply because it was a public facility. Such statements should serve as a wakeup call to the officials at the county to get their staff out of this mindset whereby poor service delivery becomes acceptable as the norm.

The above are some pointers to compromised service delivery at the facilities and factors that compound the situation. Poor patient outcomes and compromised quality of care are manifested in the fact that patients presenting with uncomplicated malaria

are not able to receive the required medication. This often leads to some patients who are unable to access the drugs at the retail pharmacy outlets lacking medication. Untreated uncomplicated malaria could progress to severe malaria that is usually more costly to manage and with an increased risk of mortality. It is estimated that approximately 8 million cases of uncomplicated malaria progress to severe malaria each year and this represents only a minority of cases worldwide, hence reducing severe malaria is critical to reducing malaria mortality. (WHO, 2013).

The AL drugs have been recommended as the first line treatment for uncomplicated malaria due to their proven efficacy in treating uncomplicated malaria and their favorable side effects profile. Whenever the AL drugs are not available the alternatives are prescribed which may have unfavorable side effects profile. This also points out to poor service delivery considering that the patients would have received better care in case the AL medications were available. A study from Egypt confirms that clinicians felt that that analogues and alternative treatments were perceived to cause increased side effects and not give the same effect as the shortage medications (Abdelrahman, 2016). In South Africa, a study gathering opinions and perceptions of parents and guardians of children on availability children medications showed that they were concerned if the generic medications were going to have the same effect as the "proper" medication (Perumal-Pillay, 2017).

Looking at the different challenges that plague the public health facilities leading to out of stock situations for the antimalarial drugs hence compromising healthcare service delivery, addressing the menace of wastage becomes a more pragmatic way of improving the situation. This is because the actions of the staff at the facilities can help reduce the extent of mix wastage which would ultimately lead to greater availability of

the antimalarial drugs at the facilities hence improving healthcare service delivery. Staff at the facilities have little control over the other systemic challenges that lead to out of stock challenges at the facilities. These might call for policy revisions and other higher level decisions which usually take longer to effect hence might not provide immediate solutions to the prevailing challenges.

5.3 Outcome of Drug Wastages on Access to Healthcare and Costs.

The quantitative data sought to establish the outcome of drug wastage on access to healthcare. Drug wastage has been shown to contribute to the out of stock situations at the facilities and the study sought to establish its impact on patients' access to healthcare services. Up to 28.6% of the respondents reported that they recorded low patients numbers during periods when the facilities were experiencing AL drugs shortages. The finding was not consistent across the facilities (p value 0.018). Dispensaries had 54.2% of the respondents agreeing that they indeed had lower patients' numbers to the facilities during periods of AL drugs shortages. At the sub county facilities 28.6% of the respondents also agreed with the statement. The referral and health center facilities had only 12.5% and 13.3% of the respondents agreeing that lower patients' numbers were observed during periods of AL drugs shortages. The dispensaries had the highest response implying that they were able to note the impact of the AL drugs shortages at their facilities in terms of reduced patients' numbers. Other facilities tiers had a different experience with fewer respondents pointing out that AL drugs shortages led to lower patient numbers. This could be explained by the fact that there is such a high demand for the healthcare services at the public health facilities such that patients would still turn out to the facilities regardless of whether the medications were available or not. This points out to the great need to always have the facilities stocked up with the medications to ensure that this population seeking

healthcare services at the public facilities is managed appropriately. This is indeed consistent with the outcomes of the SARAM study which revealed that lack of medicines in health care facilities was a major hindrance to Kenyans' access and use of public health services (MOH, 2013). In the UK, the challenge of access due to shortage of medications has been captured as a complaint from patients having to travel longer distances to obtain the shortage medication. (Shah, 2015). In the US, studies have reported that shortages usually necessitates patients needing to be referred to and from facilities or having to send medicines to patients in other institutions or accept patients from other institutions who could not access the shortage medication (Goldsack, 2014), (McBride, 2013).

A majority of the respondents noted that utilization of healthcare services by patients would reduce due to an increase in the AL drugs prices (54.4%; p value 0.107). This was consistent across the facility tiers. This confirms that patients were sensitive to the costs incurred whenever they had to make payments for services which they would ideally be able to get for free. Whenever the free antimalarial drugs were not available at the facilities, patients were compelled to seek for the prescribed medications at the retail pharmacy outlets where they had to pay for them. From review of documents, including facilities and retail pharmacies price lists, the study was able to establish that there were significant differences in the costs of the antimalarial drugs and other charges at the public facilities as compared to the faith based facilities and the private health facilities. At the public facilities, the AL drugs were issued for free to the patients whereas the malaria tests were also free. The patients were only required to pay a minimal fee of Kes 50/= for registration on the first visit after which they don't pay any fee on a subsequent visit. The inpatient charge per night ranged between Kes 200/= to Kes 300/=. At one of the key faith based facilities in the county, the patients paid Kes

200/= for consultation and Kes 100/= for the malaria test and Kes 90/= for the AL medication. The inpatient charge per night was Kes 1000/=. The same AL drugs were retailing at between Kes 100/= to Kes115/= while the originator AL drug retailed for about Kes 469/= at the pharmacy outlets. The same originator AL drug was sold at Kes 1000/= whereas the malaria tests were charged at Kes 350/= at the main private facility within Eldoret town and the patients paid Kes 1500/= for consultation. Inpatient charge per night ranged between Kes 4000/= to Kes 5000/=. From this, it is clear that the patients incur additional cost burdens whenever they can't access certain services at the public health facilities.

Increased out of pocket expenses due to medications shortages is not unique to Uasin Gishu County alone and has been reported globally. In S. Africa, it was shown that the free pediatric medications were not always available in government facilities and so patients were forced to purchase the drugs from private pharmacies where the medications were usually priced higher. (Perumal-Pillay, 2017).In Europe, it was shown that the shortage of some general medications led to increased out of pocket costs for the patients (Pauwels, 2015). In Australia, pharmacists reported that patients had increased expenses trying to acquire medications in shortage. (Tan, 2016).

The reduction in the utilization of healthcare services due to additional costs implies that some patients would not afford purchasing the medications from the retail pharmacy outlets or going to the private facilities and would rather wait until the free medications are availed. This could have the net effect of worsening some medical conditions such as uncomplicated malaria which could progress to severe malaria that is more costly to manage if we consider the inpatient costs to be incurred and also presents higher risks for mortality. The above serves to illustrate the impact of the out

of stock situations of the antimalarial drugs at the public health facilities in terms of limiting access to better healthcare and increasing costs of healthcare to households. Many households in the rural areas have limited resources and any additional costs to meet healthcare expenses provide an additional burden to an already constrained economic situation and hence the need for better utilization of the available drugs. The qualitative data also confirmed the fact that the antimalarial commodities which were termed as program commodities were actually available to the patients for free at the faith based and public health facilities. Other items categorized as program commodities included HIV and TB medications. The three key donors who were the major funding bodies for the program commodities are the Global Fund, USAID and Presidents Malaria Initiative (PMI). This is consistent with the world malaria report which confirmed that the Global Fund was the main organization through which international funds for malaria were channeled to endemic countries accounting for up to 57% of the total funding for malaria control and elimination. The USA and UK bilateral channels accounted for most of the remainder of international funding at 34% and 7% respectively. In 2016, total funding for malaria control and elimination was estimated to be US $ 2.7 billion with 38% of this coming from the US through its multilateral and bilateral contributions. 31% came from governments of endemic countries with 11% being contributed by the UK (World Malaria Report, 2016).

It was established that the funding for the antimalarial commodities were sufficient enough to ensure adequate coverage for the public health facilities for the entire 2014-2017 period. Despite this assurance it was sad to note that the public facilities in Uasin Gishu County still endured periods of AL drugs shortages attributable to wastage and other systemic challenges in the drug supply chain. A study in Kenya on the high frequency of shortages of antimalarial drugs noted that the reasons for this was likely

to be diverse and underscored the persistent challenges facing weak health systems in developing nations trying to map out procurement needs, manage stock movements with limited information from the facilities level or address gaps in funding. (Kangwana *et al*, 2009).

It is of great importance for the relevant officials at the county to ensure that the available antimalarial commodities are well managed and an efficient supply chain is established to ensure that the general public in Uasin Gishu County are able to access good healthcare services at the lowest cost possible. This will serve to inspire confidence among the donor communities in that they will realize that the counties are good custodians of the resources availed to them and they will be able to see that the general public is benefiting from better access to affordable healthcare services and an improved health for the population.

5.4 Respondents Recommendations

Several recommendations were made by the respondents from both the questionnaires and the semi structured interviews touching on various ways through which they thought that wastage experienced could be minimized in an effort to improve healthcare service delivery. From the quantitative data, several recommendations arose regarding ways through which the menace of drug wastage and the associated out of stock situations for the antimalarial drugs that compromised healthcare service delivery could be improved. Respondents agreed that prioritizing patients' needs in the AL drugs supply chain was important (97.8%; p value 0.608). This recommendation was consistent across the facility tiers as per the above p values.

The respondents further recommended the expansion of the pharmacist's responsibilities to procure AL drugs as a way of improving the utilization of AL drugs

at the facilities (74.7%; p value 0.714). This recommendation was consistent across the facility tiers.

The respondents also recommended that ensuring drug dispensers were able to advise patients on how to use AL drugs more rationally would help improve antimalarial drug utilization at the facilities (98.9%; p value 0.714) and this response was consistent across the facilities.

The respondents finally recommended the identification of safe and effective therapeutic equivalents of the first line antimalarial drugs as a means of improving antimalarial drugs utilization at the facilities (91.2%; p value 0.138) and this was consistent across the facility tiers.

The qualitative data provided further recommendations from the respondents on the ways in which they thought that wastage of drugs at the public health facilities could be reduced to improve healthcare service delivery. Since mix wastage was the most predominant form of wastage, most of the respondents had their recommendations pointing towards the need to follow the guidelines in order to curb the menace. This is in line with the WHO core interventions of promoting more rational use of medicines where it was noted that the availability of evidence based clinical guidelines were essential since they provided a benchmark for satisfactory diagnosis and treatment against which comparison to actual treatments can be made. The WHO further recommended that such guidelines should be developed in an all-inclusive way involving end users, be legible, introduced with an official launch and capacity building, broad dissemination and emphasized by prescription audit and feedback. This will help ensure credibility and buy in of the guidelines by the practitioners (WHO, 2012). Further to this, it was recommended that there was a need for the facility

administrators to be involved in the different trainings which the staff undertook in order that they are better placed in enforcing the guidelines and updated case management practices.

There was a recommendation to ensure that the staff were reassured of the reliability of the RDTs as a diagnostic tool since it had emerged that some staff did not believe in their outcomes hence proceeded to prescribe the antimalarial medications despite negative RDT test results.

It was also recommended that there was need to sensitize the public on the importance of being tested to confirm positive malaria cases before the antimalarial drugs are issued and the need to adhere to their prescribed medications. This was critical, since it emerged that some patients also drove the mix wastage when they are seen to present to the facilities with a preconceived belief that they have malaria and need to be prescribed for the antimalarial drugs regardless of the test outcome.

The need for capacity building forums also emerged as a key recommendation. It emerged that continuous trainings were key in ensuring that the staff were able to easily transition to following new guidelines or any shift in the medical practices. The trainings were also suggested to be a channel through which negative habits and behaviors among the health workers that drive wastage could be improved and to also improve on the accuracy with which staff could input facility data onto the DHIS.

5.5 Systemic Failures Associated with Drug Wastages and Out of Stock Situations in Public Facilities

Through the qualitative data, the study was able to establish that several systemic failures were associated with drug wastages and the out of stock situations experienced

at the public health facilities in Uasin Gishu County. Mix wastage emerged as the most common form of wastage encountered at the facilities and several factors were seen to perpetuate the menace as noted earlier. A lack of an implementation framework to ensure a strict compliance with the guidelines for the management of malaria was seen to contribute to the irrational use of the antimalarial drugs at the facilities which led to mix wastage. The challenge of mix wastage was also noted in analyses in the US where it was observed that some of the waste in clinical care resulted from failure to comply with established and accepted clinical practices and underuse of cost effective diagnostic tests (Jules *et al*, NEHI 2018).

Staffing issues also emerged to contribute to mix wastage in that some staff were seen to have a negative attitude and behavior which led them to engage in practices that led to mix wastage. It emerged that some staff involved in loading data onto the DHIS were ill equipped to undertake the role due to inadequate training and handover after staff reshuffles that were occasionally done at the facilities. A study on factors affecting procurement of pharmaceutical drugs at the Narok county Referral Hospital revealed that poor quantification was evident as the monthly reports had inaccurate data and instead approximations were done at times due to inconsistency in capturing data on the daily activity register. Poor quantification of drugs occasioned the overestimation or underestimation of the drugs needed thus resulting in excess or lower supply of drugs. During excess supply, it usually led to a risk of drugs expiring before utilization leading to the wastage of drugs and funds as expired drugs had to be disposed. When drugs supplies are low, this led to drugs shortages hence some patients are compelled to purchase the medication (Muhia *et al*, 2017).

Some respondents pointed out that the supplies of antimalarial drugs to the facilities were based on a quantity that had been rationalized based on the monthly consumption as captured in the DHIS. A study in Malawi focusing on the deficient supplies of drugs also revealed that there were guidelines stating that the drugs ordered to a facility should be based on the previous month's consumption. The practicability of this approach was questioned since there were drug stock outs at the facilities thus supply should instead be based on demographic and morbidity data (Lufesi *et al*, 2007). The most credible way of quantifying future pharmaceutical demand is to begin with accurate past consumption data, and ensuring that the supply pipeline has been consistently full. The information should be considered in light of factual or anticipated fluctuations in morbidity patterns, seasonal factors, service levels, formulary changes or changes to prescribing patterns and patient attendance. Unfortunately, in many countries, past consumption data are inaccurate or doesn't provide the real picture because the supply pipeline has never been full. Due to this, the morbidity based and adjusted consumption techniques become crucial for estimating procurement demand (MSH, 2012).

Another concern was understaffing which meant that some staff, especially at the lower tier levels had to double up and perform several roles ranging from administrative duties and managing patients as well. This situation reduces efficiency and ultimately compromises healthcare provision. It was noted that there were continuous trainings aimed at addressing the above staffing issues in order to reduce the challenge of wastage. The study in Narok revealed that there was a need for skilled personnel to ensure efficiency and accurate quantification of pharmaceutical drugs. Specifically, the study pointed out on the need for inventory management training by government to build capacity among the staff with knowledge and skills on the utilization of the various registers and forms for accurate quantification (Muhia *et al*, 2017).

The county system of ordering commodities was also faulted and seen to play a role in the out of stock situations for the antimalarial commodities. It was noted that the county pharmacist would order the antimalarial commodities together with the other commodities that needed to be paid for. It emerged that the counties frequently ran into debts with KEMSA hence could not order for more commodities. The study in Narok also cited the challenge in resourcing as a key impediment in the procurement of drugs and the resultant delays in payments to the suppliers occasioned by bureaucracies in obtaining funds from the county offices. This was noted to adversely impact on healthcare service provision since delayed supplier payments led to delays in the delivery of drugs which led to shortages at the hospital (Muhia *et al*, 2017).It was pointed out that the debt situation of the county was not supposed to have a bearing on the supply of the program commodities hence the counties were encouraged to order for them since they were donor funded.

Addressing the above systemic challenges will go a long way in ensuring that drug wastages are minimized and the associated out of stock situations at the facilities are also minimized and hopefully totally eradicated.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1 Level of drug wastages in public health facilities

From the analysis of both quantitative and qualitative data obtained through interviews and questionnaires, antimalarial drugs wastage was considered in light of how it manifested and the three categorizations were mix, expiration and channel wastage. It generally emerged that the levels of expiration and channel wastage were low at the facilities but mix wastage was significant. The fact that the facilities experienced periods of antimalarial drugs stock outs called for a need to ensure that any form of wastage was eliminated.

6.1.2 Prevalent types of drug wastage in public health facilities

There was need to explore the forms through which wastage of the antimalarial drugs manifested in order to have a more directed approach in addressing the issue. Mix wastage was the predominant form while expiration and channel wastage were minimal in comparison. The study concludes that there is need to put in place measures that will help to curb mix wastage especially by focusing on ways in which the health workers can be made to use the antimalarial drugs rationally and strictly adhere to the guidelines which was the focus of most of the recommendations from the respondents.

6.1.3 How drug wastages affect access to healthcare and healthcare costs

The result of the analysis revealed that wastage of antimalarial drugs and the subsequent out of stock situation led to reduced access to healthcare and increased costs of healthcare services. Reduced access to healthcare services was manifested by the fact that patients' visits to the facilities will be reduced once the patients realize that the

facilities perennially lack the essential medications. The increased costs of healthcare is evident due to the fact that patients will have to pay for the antimalarial drugs at the retail pharmacies which they could have accessed for free at the public health facilities. Worst still patients who are unable to access the antimalarial medications due to affordability issues or any delays in accessing the medications at of the public health facilities may have their disease condition progressing. Untreated uncomplicated malaria normally progress into severe malaria which normally requires hospitalization which leads to an increase in the costs of management of the disease. Severe malaria also carries a greater risk of mortality which is an indicator of poor patient outcomes. Therefore, drugs wastage is associated with increased costs and reduced accessibility of healthcare services which ultimately leads to poor patient outcomes.

6.1.4 Systemic failures associated with drug wastages and out of stock situations at the public facilities

The analysis revealed that the out of stock situation of the antimalarial drugs at the public health facilities in Uasin Gishu county was as a result of mix wastage and several systemic failures within the health sector in Uasin Gishu county. It emerged that there were clear guidelines for the management and treatment of malaria but a poor framework for its implementation. This led to the irrational use of the antimalarial drugs which was seen as a driver of mix wastage. Staff attitudes and behavior was also associated with mix wastage in that some healthcare workers were seen to prescribe the antimalarial drugs without testing or even after getting negative malaria test result especially with the RDTs. It was explained that some staff did not trust the RDTs outcomes hence there was need to provide a reassurance of the reliability of their results. Some staff provided inaccurate data onto the DHIS system leading to the supply of few drugs that usually occasioned drugs shortages at the facilities and a lack of

reagents for use with the diagnostic tools. An inefficient supply chain system that was characterized by delayed supply of commodities also played a role in causing the shortages. It also emerged that the county health budget was underfunded leading to debts with KEMSA resulting in a lack of supply for drugs. Since program commodities such as antimalarial drugs were ordered together with the other medications, the county officials tended to avoid making orders to KEMSA altogether whenever they had some outstanding debt leading to a shortage of the antimalarial drugs as well despite the fact that they were already funded.

In conclusion, the combined use of questionnaire data and semi structured interviews provided an exhaustive view on the issue of wastage of antimalarial drugs at the public health facilities in Uasin Gishu County and its impact on healthcare service delivery. A key feature of the study was the fact that it was able to draw feedback from both the healthcare providers at the facilities and other officials undertaking supervisory roles who had fewer tendencies to give any biased feedback on the different aspects of wastage and how they thought it impacted healthcare service delivery. The study provided a holistic view of the different manifestations and drivers of wastage and how it impacted healthcare service delivery in terms of patients' outcomes, access to healthcare and the overall costs of healthcare. The study further explored other systemic challenges that plague healthcare service delivery at the public facilities in Uasin Gishu county and suggested avenues through which improvements could be made to achieve the greatest impact. The study only dwelled on the wastage of antimalarial medications with uncomplicated malaria as the tracer illness but the findings were able to reveal systemic challenges that plague the healthcare service delivery and indicated that the situation could be worse if other disease conditions and medications that patients had to pay for were put into consideration. This could be a fruitful avenue for future enquiry

in that it could be able to reveal how the public healthcare system is faring in terms of managing other disease conditions of public health interest in the absence of donor funding and also illustrate the real cost of wastage and other systemic challenges in relation to the overall health spending. Generally speaking, the study reveals that wastage and other systemic challenges within the healthcare system are contributing to compromised healthcare service delivery at the public health facilities in Uasin Gishu County. This is a pointer to what could be happening in public facilities in other counties and calls for concerted efforts among all the players in the healthcare sector to help improve the situation and ensure that the general public is able to access good quality care in these facilities.

6.2 Recommendations

In consideration of both the quantitative and qualitative data, the following recommendations would be most impactful as a means of addressing the issue of drug wastage in an effort to improve healthcare service delivery at the public health facilities. Provision of regular trainings for the healthcare workers and the facilities administrators would be a key intervention point. This would be critical since the trainings could be geared towards addressing the numerous gaps identified to be contributing to mix wastage and the systemic challenges that led to antimalarial drugs shortages. Trainings targeted at reinforcing the need to provide accurate data on the DHIS platform and strictly adhering to the guidelines by conducting appropriate diagnostic tests and prescribing the right medications would make a great impact and also equip the administrators to help in the implementation of the same. Another recommendation is that there was a need to sensitize the public and educate the patients on the need to get the appropriate management whenever malaria was suspected and the importance of adherence to the prescribed medications. The study also recommends the need to

prioritize the patients' needs throughout the antimalarial drug supply chain to ensure the antimalarial drugs are always available at the facilities since they were donor funded. The study further recommends the expansion of the responsibilities of facility pharmacists to procure antimalarial drugs directly from KEMSA to minimize the delays often associated with multiple players in a supply chain. The final recommendation is on the need to identify other alternative antimalarial drugs to be considered in case of shortages of the first line antimalarial drugs. Identifying safe and effective therapeutic equivalents for the first line antimalarial drugs would help the health officers to have a guided alternative to use when AL drugs are out of stock.

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APPENDICES

Appendix I: Request Letter

Evans Sambagara,

P.O Box 964, 00517.

Nairobi.

20th Feb 2016.

The County Director of Health,

Uasin Gishu County.

Dear Sir/ Madam,

RE: REQUEST TO CONDUCT STUDY AT THE HOSPITALS WITHIN THE COUNTY.

I would like to make a humble request to be allowed to conduct a research at the hospitals within the county.

I am a second year Masters in Public Health (MPH) student at Moi University, AMREF Campus and will be conducting a research on poor utilization of drugs and its effects on healthcare service delivery in public hospitals in Uasin Gishu county.

Kindly find herein attached a copy of my proposal and student ID for your perusal. I intend to submit the same to the University's approving body (IREC) for approval and will submit a copy of the approved document to your office.

I look forward to your favourable response with regard to my request.

Yours Sincerely,

Evans Sambagara.

Appendix II: Informed Consent Letter.

Evans Sambagara,
SPH/PGH/1036/2012.
Moi University, AMREF International Training Centre.
P.O Box 27691, 00506.
Nairobi, Kenya.

Dear Respondent,

REFERENCE: INFORMED CONSENT

Greetings to you!

I am Evans Sambagara, a student at Moi University and currently conducting a research aiming to assess the extent and effects of poor utilization of drugs on healthcare service delivery in public health facilities in Uasin Gishu County. The research is a requirement for the partial completion of a Masters in Public Health degree at Moi University.

Your institution has been randomly selected and I wish to have you as a respondent but your participation is completely voluntary. Kindly provide your honest responses to the questions in all sections. Your responses will be treated confidentially and will not be used for any other purpose apart from the intended research.

It will take you between 20 – 30 minutes to complete the questionnaire / interview.

Are you willing to participate?

1. Yes ☐ **2. No** ☐

…….

(Signature of Interviewer certifying that the informed consent has been given verbally by the respondent.)

Questionnaire Identification Information.

001 INTERVIEWER: Code [__ | __] Gender **……**

002 DATE OF INTERVIEW: **……./……../ 2016.**

Appendix III: Uasin Gishu County Facility Questionnaire

Facility survey to determine the Utilization of Antimalarial Drugs in Public Hospitals and its effects on Healthcare Service Delivery in UG County

Sub County:			
Facility name:			
	Type	**Code**	
Facility type	Referral Hospital	01	[___|___]
	Sub-county hospital	02	
	Health Centre	03	
	Dispensary	04	
Facility Tier	Tier 1	01	[___|___]
	Tier 2	02	
	Tier 3	03	
	Tier 4	04	
Managing agency	Government	01	[___|___]
	NGO	02	
	Private	03	
	Faith-based/mission/church	04	
	Other specify	88	
Official opening Hours	Monday to Friday 08.00 - 17.00	01	[___|___]
	Monday to Saturday 08.00 – 17.00	02	
	Monday to Sunday 08.00-17.00	03	
	24 hours seven days a week	04	
	Other specify	88	
Interview outcomes	Completed	01	[___|___]
	Partially completed	02	
	Refused	03	
	Other specify	88	
INTERVIEW DATE(DAY, MONTH, YEAR E.G. 02/06/15			[___|___/___|___/___|___]
Interviewer's name			[___|___/___|___|___]
Supervisor's name			[___|___/___|___|___]

INSTRUCTIONS TO DATA COLLECTOR

This assessment should be completed through discussions with the appropriate healthcare providers such as doctors, pharmacists, clinical officers, pharmacy assistants and personnel at the drugs store and procurement department. Others to include are in charge of facility or heads of departments such as Outpatient department, pharmacy or health records on the day of the visit. IN ALL CASES, you should verify that these are bonafied staff by actually checking their staff badges yourself. If you are not able to confirm then code accordingly.

SECTION I: Availability and Utilization of Antimalarial drugs. **Preferred Respondent: Doctors, Clinicians, Pharmacists, Procurement staff, facilities in charge**		
No.	**Question**	**Value**
	Actual respondent	
(Please mark only **ONE** answer**)**		
1.	Does your facility stock all or some of the essentials medicines listed in the Essential Drugs List (EDL) for the management of uncomplicated malaria?	**1 = All** **2 = Don't know** **3 =Some**
2.	Are you involved in the procurement, storage, and management of drugs in this facility?	**1 = Yes** **2 = Don't know** **3 = No**
3.	Are you the one dispensing medicines to the patients?	**1 = Yes** **2 = No**
4.	Is public sector procurement of drugs pooled at the county level?	**1 = Yes** **2 = Don't know** **3 = No**
	If yes in question 4, who is responsible for public sector medicines distribution? **(Circle all that apply)**	
5.	County department of Health	**1**
	Non-governmental organizations (NGOs)	**2**
	Privately-owned organizations contracted by government	**3**
	Individual health institutions (Please mark only ONE answer)	**4**
6.	Is your facility allowed to purchase antimalarial drugs not on the Essential Medicines List?	**1 = Yes** **2 = Don't know** **3 = No**

7.	Is there a medicines and therapeutic committee in your facility?	**1 = Yes** **2 = Don't know** **3 = No**
8.	Does your facility have a drug quality management system in place?	**1 = Yes** **2 = Don't know** **3 = No**
9.	Do you observe the National Treatment guidelines for the Diagnosis, Treatment and Prevention of Malaria in Kenya at your facility? (If **'Yes' ,** request to see a copy of the guidelines document)	**1 = Yes** **2 = Don't know** **3 = No**
10.	Is the facility equipped with microscopy tools or RDTs for confirming malaria cases?	**1 = Yes** **2 = Don't know** **3 = No**
11.	If 'No' above, how are the cases of suspected uncomplicated malaria handled?	**1 = Treated emperically** **2 = Reffered to other facilities** **3 = Others explain**
12.	Does the facility conduct diagnostic tests for all suspected malaria cases?	**1 = Yes** **2 = Don't know** **3 = No**
13.	Are there mandatory written requirements to promote public education about rational medicines use in your facility? (If **'Yes' ,** request to see a copy of the document) (If 'No' , kindly ask for the reason why this does not happen)	**1 = Yes** **2 = Don't know** **3 = No**
14.	Are you a principal prescriber in your facility?	**1 = Yes** **2 = Don't know** **3 = No**

15.	If yes in question 11, do you prescribe medicines outside the hospital formulary in your practice? (If 'Yes' , kindly give the reasons for doing so)	**1 = Yes** **2 = Don't know** **3 = No**
16.	In the last FOUR MONTHS, did you encounter any of these incidences related to antimalarial drugs in your facility? **(Circle all that apply)**	
	Drug expiries	**1**
	Drugs damaged on transit	**2**
	Theft of drugs	**3**
	Over-prescription of essential antimalarial drugs	**4**
	Under-prescription of alternative antimalarial drugs	**5**
	Over-supply of non-essential antimalarial drugs	**6**
17.	If you are to give a percentage representation of how the above incidences are observed at your institution, how would you rate them? **(** Please mark only **ONE** answer**)**	**1 = 1% - 20%** **2 = 21% - 40%** **3 = 41% - 60%** **4 = 61% - 80%** **5= 81% - 100%**
	Drug expiries	
	Drugs damaged on transit	
	Theft of antimalarial drugs	
	Over-prescription of essential antimalarial drugs	
	Under-prescription of alternative antimalarial drugs	
	Over-supply of non-essential antimalarial drugs	
18.	Is there a requirement for a minimum shelf life of an antimalarial drug product that is procured? (Please only circle one answer)	**1 = Yes** **2 = Don't know** **3 = No**
19.	Is the arrangement and issuance of antiamalarial drugs from the shelves based on any order in relation to their expiry dates? (Please only circle one answer)	**1 = Yes** **2 = Don't know** **3 = No**
20.	Is there a system in place to alert the relevant staff that a drug is nearing its expiry date? (Please only circle one answer)	**1 = Yes** **2 = Don't know** **3 = No**

Please indicate your agreement or disagreement with the following statements by marking only **ONE** answer. **(1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree)**		
21.	Poor utilization of drugs is a major cause of drug shortages in this facility.	
22.	By arranging and issuing drugs whose expiries are closer first, incidences of expiries would be reduced.	
23.	A system that alerts the appropriate staff that some products are nearing their expiry date would help in reducing the incidences of expiries.	
24.	Stipulation that all procured drugs must have at least a 2 years shelf life etc. would help reduce the incidence of expiries.	
25.	Do you think that the pharmacy staff is well trained to effectively dispense the antimalarial drugs in a way that prevents expiries (Please only circle one answer)	**1 = Yes** **2 = Don't know** **3 = No**
26.	In the case of expired antimalarial drugs, who bears the cost of the losses incurred?**(Circle all that apply)**	
	The Hospital	**1**
	The drugs supplier	**2**
	The drugs manufacturers.	**3**
(Please circle only **ONE** answer from the options on the next column **)**		
27.	How often does the hospital hold continuous medical education (CMEs) for the prescribers to ensure they are updated on the best medical practices?	**1 = Weekly** **2 = Fortnightly** **3 = Monthly** **4 = Bi monthly** **5 = Quarterly** **6 = Half yearly** **7 = Annually** **8 = Never**
28.	Are there regular forums within the hospital to update the prescribers on all the available medications within the hospital for managing specific conditions?	**1 = Yes** **2 = Don't know** **3 = No**

29.	How often do you adhere to the Standard Treatment Guidelines that the hospital has adopted when prescribing antimalarial drugs? (Please only circle one answer)	**1 = Almost always** **2 = Often** **3 = Sometimes** **4 = Seldom** **5 = Never**
30.	From the above question, what are the stipulated consequences for non-compliance? **(Circle all that apply)**	
	Verbal reprimand	**1**
	Warning letter	**2**
	Suspension	**3**
	Dismissal	**4**
	Other (specify	**5**
31.	Are there written requirements to ensure that all the antimalarial drugs delivered from the distributors are confirmed to be in a good condition? (If 'Yes' , kindly request to see the document)	**1 = Yes** **2 = Don't know** **3 = No**
32.	Are there instances where you receive some antimalarial drugs in a damaged condition hence cannot be used?	**1 = Yes** **2 = Don't know** **3 = No**
33.	Does the hospital get replacements for the antimalarial drugs damaged on transit?	**1 = Yes** **2 = Don't know** **3 = No**
34.	Do the transporters meet the required conditions for the transportation of antimalarial drugs to the hospital?	**1 = Yes** **2 = Don't know** **3 = No**
35.	Do you often encounter major shortages of essential antimalarial drugs in your facility due to challenges in the delivery channels?	**1 = Yes** **2 = Don't know** **3 = No**

Section II: Medicines Financing **Preferred Respondent: Facility in Charge.**		
Actual Respondent :		
1.	What is the hospitals pricing policy for antimalarial drugs? **(Circle all that apply).**	
	All antimalarial drugs are subsidized to the patients by the hospital.	1
	Antimalarial drugs are priced at the cost price	2
	The antimalarial drugs prices are marked up to realize some profits	3
	Antimalarial drugs are issued for free to the patients	4
2.	Are there some patients who are allowed to access antimalarial drugs for free? **(Please circle only one answer)**	**1 = Yes** **2 = Don't Know** **3 = No**
3.	If you answered 1, in the question above, which types of patients are allowed to access free antimalarial drugs? **(Circle all that apply)**	
	Poor patients	**1**
	Children under 5 years	**2**
	Older children	**3**
	Pregnant women	**4**
	Elderly persons	**5**
	All patients	**6**
	Others (specify)	**7**
4.	What kind of fees do you charge patients in your facility? **(Circle all that apply)**	
	Registration	**1**
	Consultation fees	**2**
	Dispensing fees	**3**
	Flat fees for medicines	**4**
	Flat-rate co-payment for medicines	**5**
	Percentage co-payment for medicines	**6**

Please indicate your agreement or disagreement with the following statements by marking only **ONE** answer.		
5.	Poor utilization of drugs due to fraud, irrational drug use, expiration, and damages can lead to an overall increase in the amount of fees charged on patients for antimalarial drugs.	**1 = Strongly Disagree** **2 = Disagree** **3 = Undecided** **4 = Agree** **5 = Strongly Agree**
6.	Health facilities spend more on medicines when there is poor utilization of drugs through damages, expiration, fraud, and irrational drug use.	**1 = Strongly Disagree** **2 = Disagree** **3 = Undecided** **4 = Agree** **5= Strongly Agree**
7.	The county government monitors retail prices of medicines sold to the patients.	**1 = Strongly Disagree** **2 = Disagree** **3 = Undecided** **4 = Agree** **5 = Strongly Agree**
8.	The county government adjusts the retail prices of medicines when faced with major drug shortages.	**1 = Strongly Disagree** **2 = Disagree** **3 = Undecided** **4 = Agree** **5 = Strongly Agree**

SECTION III : Healthcare Access. Preferred Respondent: Hospital in Charge		
Actual Respondent:		
No.	**Question**	**Value**
Please show your agreement or disagreement with the following statements by marking only ONE answer.		**1 = Strongly Disagree** **2 = Disagree** **3 = Undecided** **4 = Agree** **5 = Strongly Agree**
1.	When faced with major antimalarial drug shortages, we turn patients away.	
2.	We encounter low patient numbers when our facility does not have enough antimalarial drugs.	
3.	Any increases in the price of antimalarial drugs can lead to a reduction in healthcare service utilization per patient.	
4.	Any increases in the fees charged on antimalarial drugs can contribute to a reduction in the number of hospital visits per patient	
5.	Medical fee increases due to drug shortages can motivate some patients to seek alternative means of treatment.	

Section IV: The Quality of Healthcare and Patient Outcomes. **Preferred Respondent: Prescribers**		
Actual Respondent:		
No.	**Question.**	**Value**
Please mark only ONE answer.		
1.	Do you believe that poor utilization of antimalarial drugs leading to drug shortages in your facility can compromise the quality of patient care?	**1 = Yes** **2 = Don't know** **3 = No**
2.	Based on the incidences relating to antimalarial drugs that were earlier mentioned to have been encountered at the hospital in the last four months (Qsn 13, Section 1), do you often encounter poor patient outcomes when therapeutic alternatives for the antimalarial drugs are out-of-stock?	**1 = Yes** **2 = Don't know** **3 = No**
3.	Do you often come across patients who have suffered severe side effects arising from the use of therapeutic alternatives due to lack of first line antimalarial drugs?	**1 = Yes** **2 = Don't know** **3 = No**
4.	Have you ever encountered patients who refuse to take alternative medications when the first line antimalarial drug of choice is out-of-stock due to poor utilization of drugs?	**1 = Yes** **2 = Don't know** **3 = No**
5.	What is the most common patient concern when your facility is forced to change antimalarial drug prescriptions to alternatives due to major shortages of first line antimalarial drugs? **(Circle all that apply)**	
	Anxiety	**1**
	Confusion	**2**
	Frustration	**3**
	Anger	**4**

6.	Do you often encounter increased patient visits at the same period when your facility is facing major antimalarial drugs stock-outs? **(Please mark only ONE answer)**	**1 = Yes** **2 = Don't know** **3 = No**
7.	Does a major antimalarial drug shortage in your facility lead to any of the following outcomes? **(Circle all that apply)**	
	Procedure delays	**1**
	Cancellations	**2**
	Prolonged hospital stays among the patients	**3**
8.	Does the use of therapeutic alternatives due to lack of first line antimalarial drugs cause increased patient safety issues in your facility? **(Please mark only ONE answer)**	**1 = Yes** **2 = Don't know** **3 = No**

SECTION VI : RECOMMENDATION

Actual Respondent	

Which of the following recommendations will help improve antimalarial drug utilization in this facility based on your own assessment?
(Please mark only ONE answer using the following criteria)

Prioritizing patient needs in the antimalarial drug supply chain	**1 = Yes** **2 = Don't know** **3 = No**
Expanding the responsibilities of pharmacists to procure antimalarial drugs	**1 = Yes** **2 = Don't know** **3 = No**

Ensuring drugs dispensers are able to advise patients on how to use antimalarial drugs more rationally	**1 = Yes** **2 = Don't know** **3 = No**
Investigating and prosecuting those who steal antimalarial drugs from hospitals	**1 = Yes** **2 = Don't know** **3 = No**
Discouraging arbitrage of antimalarial drugs among retailers.	**1 = Yes** **2 = Don't know** **3 = No**
Identifying safe and effective therapeutic equivalents for the first line antimalarial drugs.	**1 = Yes** **2 = Don't know** **3 = No**
Would like to add anything else regarding this study?	
********THANK YOU FOR YOUR PARTICIPATION*******	

Appendix IV: Key Informer Interview Guide.

Utilization of Drugs and its effects on Healthcare Service Delivery in Uasin Gishu County.

General Introduction

Please identify a private and quiet setting for the interview.

Informed Consent

I would like to thank each of you for agreeing to be a part of this discussion. My name is …….. I am working as a research assistant with Evans Sambagara, a student of Moi University undertaking a Master's degree in Public Health. The aim of the project is to assess the extent and effects of poor utilization of drugs on healthcare service delivery in public health facilities in the county. We are talking to hospital staff and other relevant officials in the government and NGOs to learn about their experiences with drugs wastage and how this can be addressed to improve the quality of health care. We would like to talk to you because you are the experts. We are here to learn from you. Please do not be anxious about any of the questions we will ask you. This is not a test - there are no wrong answers. We only have a few questions because we would like this to be like a conversation, not an interview. So please feel free to talk freely. Your views are very important to us. We also request you to allow the session to be audio-taped so that we do not miss any of your valuable ideas. Anything you say will be confidential. Your names will not be recorded in the notes.

Do you have questions at this point about this discussion? **Y/N**

After an introduction, open up the discussion by using the guide below.

Respondents for the KII: Hospital in-charges, KEMSA and MEDS staff and government representatives at the regional and national levels.

Date of discussion:	Interviewer and Note-taker:
Start time:	End time
Venue:	Sub County (Name):
Name of interviewee:	Position:

Ice breaker	**Probes and follow on questions**
Q1: Tell us about the ways in which you have observed the first line antimalarial drugs being poorly handled in the course of your work?	- Expiry of antimalarial drugs - Antimalarial drugs damaged on transit - Over prescription of first line antimalarial drugs - Under prescription of alternative antimalarial drugs
Q2: What would you consider to be the major reasons leading to the forms of poor utilization of first line antimalarial drugs encountered here?	Explore whether the causes might be due to - Ignorance /lack of capacity - Bad attitudes - Infrastructure - Poor policies etc.
Q3: How would you describe the antimalarial drug supply system to the hospital in terms of its reliability and effectiveness?	Seek to find out whether : - the delivery of antimalarial drugs is timely - the transporters meet the conditions under which the antimalarial drugs are supposed to be transported - the contractual arrangement that the hospital has with the suppliers and transporters of antimalarial drugs.
Q4: What is the scale of losses to the institution due to poor utilization of antimalarial drugs encountered in terms of the monetary value and the effects on healthcare service delivery to the public?	***Seek to have the interviewee quantify the extent of losses in monetary value for*** - expired antimalarial drugs - antimalarial drugs damages - lost income due to low hospital attendance etc.
Q5: Has the institution had concerns about the state of affairs and what has been their response in an effort to mitigate or curb the effects of poor utilization of antimalarial drugs and its effects on healthcare service delivery?	***Recap on the losses and effects mentioned in Q3 above and explore all the possible solutions.***
Q6: Which are the key sources of funding for the hospital antimalarial drugs and how adequate have they been in meeting the hospital's drugs requirements?	-Seek to establish if the funding for medicines is external e.g. by the county government or if the funds are obtained from the fees charged from the hospital's various services and how sufficient this has been.

Q7: Please could you tell us about your recommendations on ways through which the menace of poor antimalarial drugs utilization could be addressed to reduce losses at the hospitals and generally improve healthcare service delivery in the public hospitals.	
Q8: Is there anything else you would like to tell us about the topic we have been discussing?	

Many Thanks for Your Participation, we have learnt many things from you and we have very much enjoyed meeting you.

Appendix V: IREC Approval.

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET

Reference: IREC/2016/30
Approval Number: 0001783

13th October, 2016

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
13 OCT 2016
APPROVED
P. O. Box 4606-30100 ELDORET

Mr. Evans S. Otieno,
Moi University,
School of Public Health,
P.O. Box 4606-30100,
ELDORET-KENYA.

Dear Mr. Otieno,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

"Wastage of Drugs and Its Effects on Health Care Service Delivery in Public Health Facilities in Uasin Gishu County, Kenya."

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 1783*** on 13th October, 2016. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 12th October, 2017. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

Appendix VI: Uasin Gishu County Government Approval

REPUBLIC OF KENYA

Website;
www.uasingishu.go.ke

Email;
ugcountyhealthdirector@gmail.co

When replying, please Address to;
THE COUNTY DIRECTOR OF HEALTH
PREVENTIVE & PROMOTIVE SERVICE
PO. BOX 5665 – 30100
ELDORET, KENYA

COUNTY GOVERNMENT OF UASIN GISHU
DEPARTMENT OF HEALTH SERVICES

REF:UG/CDOH/PP/RESEARCH/2016(4) DATE: 16th November 2016

EVANS SAMBAGARA
P.O. BOX 964 – 00517
NAIROBI

Dear Evans,

RE: REQUEST TO CONDUCT RESEARCH

Your letter dated 8th November 2016 on the above subject refers.

Your request to conduct a research study on the ***"Utilization of drugs and its effects on healthcare service delivery in public hospitals in Uasin Gishu County"*** is hereby approved.

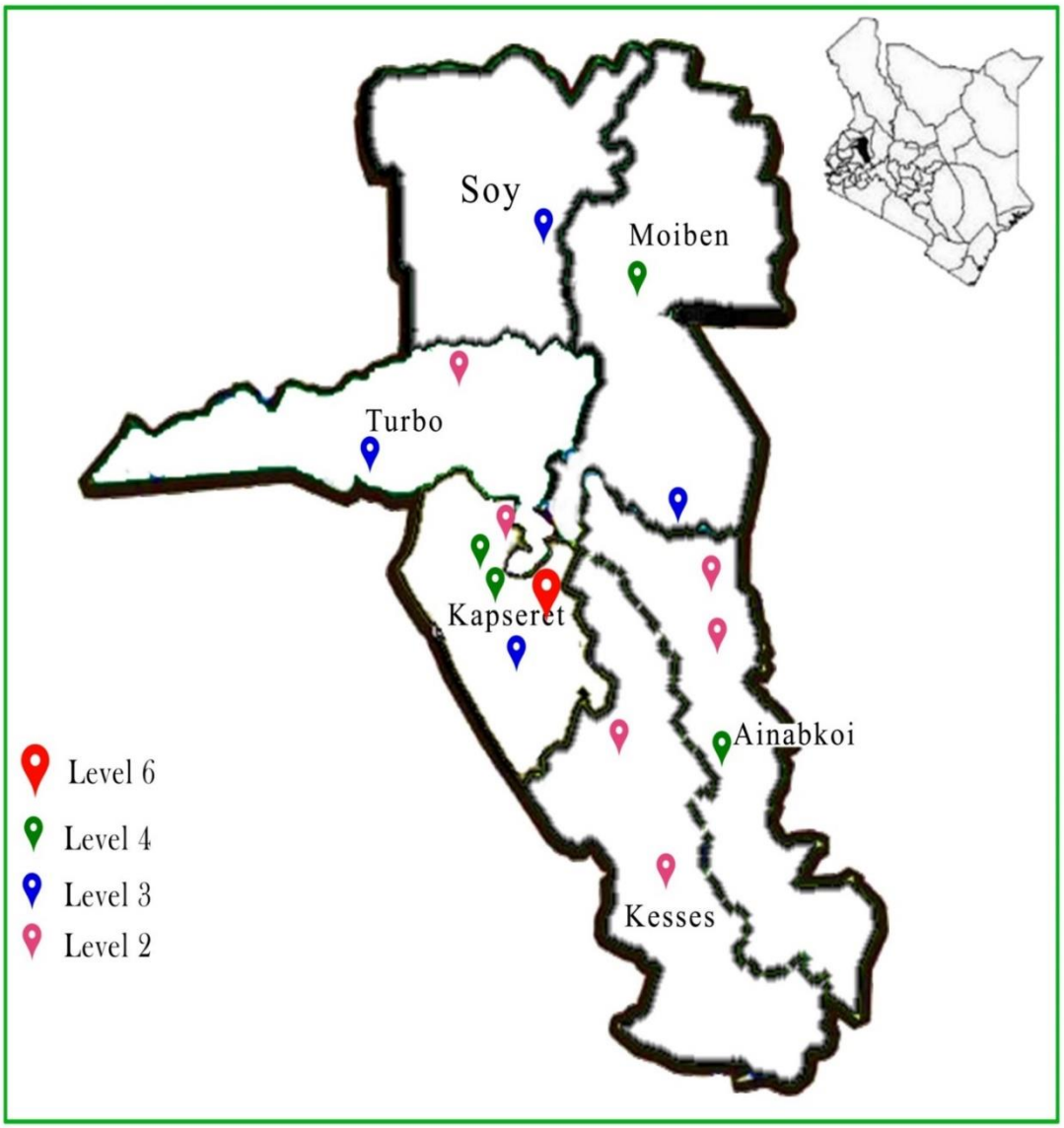
Our department will accord you the assistance you may require.

Thank you.

COUNTY DIRECTOR
PREVENTIVE & PROMOTIVE SERVICES
16 NOV 2016
UASIN GISHU COUNTY
P.O. Box 5665-30100, ELDORET

DR. EVANS KIPROTICH
COUNTY DIRECTOR OF HEALTH
PREVENTIVE & PROMOTIVE SERVICES
UASIN GISHU COUNTY

Appendix VII: Uasin Gishu County Map.



Appendix VIII: Table 5: The methodology matrix

Issues/Indicators	Data Sources	Methodology/Tool	Respondents/ Actors	Tracer Illness
Objective 1: To demonstrate the nature of antimalarial drug wastage in public health facilities.				
Nature of drug wastage -Expiration waste	-Procurement department records -Pharmacy records	- Study of the documents -Structured Questionnaires	-Procurement staff -Pharmacy staff	- Uncomplicated malaria
-Mix waste	- Pharmacy prescription records -Hospital prescriptions guidelines	-Study of the documents -Structured questionnaires -Semi-structured interviews	- Prescribing doctors -Prescribing clinicians	- Uncomplicated malaria
-Channel waste	- Procurement department records -KEMSA records	-structured questionnaires -semi-structured interviews -study of the documents	-Pharmacy staff -Procurement department staff -KEMSA staff	- Uncomplicated malaria
Objective 2: To estimate the levels of antimalarial drug wastage in public health facilities.				
Percentage representation of expired drugs	- Procurement department records -Pharmacy records	-structured questionnaires -semi-structured interviews -study of the documents	- Pharmacy staff -Procurement department staff	-None
Percentage representation of damaged drugs	- Procurement department records -KEMSA records	-structured questionnaires -semi-structured interviews -study of the documents	-Procurement staff -KEMSA records	-None.
Objective 3: To examine the effects of drug wastages on healthcare service delivery in terms of accessibility and cost.				
- Fluctuation in patient numbers when drugs are out of stock.	-Medical records for attendance	-Study of documents -Semi-structured interviews	-Medical records staff -Facilities in-Charge	- Uncomplicated malaria.

-Cost differences in consultation fees in public compared to private and FBHS	-Hospitals user fee tariff	-Study of documents	-Facilities in-charge	- Uncomplicated malaria
-Cost differences of drugs at the public hospitals compared to the private, FBHS and retail pharmacy shops.	-Pharmacies price lists	-Study of documents	- Pharmacies staff	- Uncomplicated malaria
-Differences in costs in managing uncomplicated compared to severe malaria.	-Hospitals user fee tariff	Study of documents	- Facilities in-charge	- Uncomplicated malaria.

Appendix IX: Table 14: Managing expiry wastage

	Referral hospital	Sub county hospital	Health Centre	Dispensary	Total	p value
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
% of respondents who agreed that;						
Poor utilization of antimalarial drugs was a major cause of drug shortages at the facility	7(28.0)	9(32.2)	1(6.3)	9(37.2)	26(27.9)	(0.190
Totals within facilities	**25**	**28**	**16**	**24**	**93**	
Arranging and issuing drugs whose expiries are closer first, would reduce expiry incidences.	23(92.0)	27(96.4)	14(87.6)	20(83.3)	84(90.3)	0.190
Totals within facilities	25	28	16	24	93	
Having a system in place alerting staff of products nearing expiry date would reduce expiry incidences	23(92.0)	28(100.0)	13(81.3)	24(100.0)	88(94.6)	0.176
Totals within facilities	**25**	**28**	**16**	**24**	**93**	
Stipulation to have procured drugs with at least 2 years shelf life would reduce expiries	18(72.0)	27(96.4)	14(87.6)	22(91.7)	81(87.1)	0.102
Totals within facilities	**23**	**28**	**16**	**24**	**91**	
Pharmacy staff were well trained to dispense antimalarial drugs in a way that prevents expiries.	24(96.0)	28(100.0)	16(100.0)	24(95.7)	92(97.8)	0.597
Totals within facilities	**24**	**28**	**16**	**23**	**91**	
% of respondents reporting that for expired drugs;						
The facility bore the costs incurred	7(46.7)	11(42.3)	11(68.8)	11(55.0)	40(51.9)	0.313
Totals within facilities	**15**	**26**	**16**	**20**	**77**	
The drug supplier bore the cost	7(46.7)	15(57.7)	5(31.3)	9(45.0)	36(46.8)	
Totals within facilities	15	26	16	20	77	
The drug manufacturer bore the cost	1(6.7)	0(0.0)	0(0.0)	0(0.0)	1(1.3)	
Totals within facilities	15	26	16	20	77	