



UNIVERSITY OF NAIROBI

PERCEPTIONS AND PRACTICES ON HOUSEHOLD DISPOSAL PATTERNS OF UNUSED MEDICINES IN SOUTH C AREA OF NAIROBI CITY COUNTY

BY

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N50/69242/2011

**A Thesis Submitted in Partial Fulfillment of the Requirement for Award of the Degree
of Master of Arts in Medical Anthropology of the University of Nairobi**

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DECLARATION

I declare that this thesis is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.

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DEDICATION

To my beloved son, Henry and daughter, Jenna.

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ABBREVIATIONS AND ACRONYMS

BMI	Business Monitor International
CBD	Central Business District
CIHI	Canadian Institute for Health Information
CRA	Commission on Revenue Allocation
GOK	Government of Kenya
HMIS	Health Management Information System
KEMSA	Kenya Medical Supplies Agency
KNBS	Kenya National Bureau of Statistics
KNDRRA	Kenya National Drug Regulatory Authority
MMS	Ministry of Medical Services
MPHS	Ministry of Public Health and Sanitation
NGOs	Non-Governmental Organisations
OTC	Over The Counter
PBC	Perceived Behavioural Control
PPB	Pharmacy and Poisons Board
SPSS	Statistical Package for the Social Sciences
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behaviour
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organisation

ABSTRACT

As access to medicines increase, bulks of medicines become unused and are kept at home. Unsafe drug disposal can have a direct negative impact on public safety, the environment, and the health care services. The responsibility of minimizing the potential health risks associated with unused medicines should not end at the point of sale, but continue to the end of medicine's life-cycle, i.e., from production, sale, consumption and disposal. Consumer perceptions regarding how medicines are stored and disposed therefore becomes paramount.

The general objective of the study was to explore households' perceptions and practices of disposal patterns of unused medicines in South C area, Nairobi City County. A sample population of 164 households were utilized in this study. While the study was exploratory-descriptive in nature, quantitative data collection methods, through semi-structured interviews were conducted to provide insights into the households' perceptions and practices of disposal patterns of unused medicines. Unstructured interviews were done with key informed people, experts and professionals who had adequate knowledge on the household disposal patterns of unused medicines. Both quantitative and qualitative data analysis were used to derive simple summaries on the observations that were made.

The study found that 96% of the respondents do not receive adequate information from healthcare providers related to safe disposal of unused medicines and did not read or follow unused medicines disposal instructions. Lack of structured awareness creation on safe disposal practices of unused medicines (51.2%) and economic reasons (39.6%) featured as the main contributory factors to unsafe disposal practices of unused medicines amongst the respondents. However, 73.78% of respondents were willing to safely dispose of unused

medicines if community outreach and take back programs were put in place and when hospitals/ pharmacies voluntarily provided safe disposal practices information.

The study further revealed that even though 64% of respondents strongly agreed that unused medicines present potential risks and or negative consequences at home and that children are more at danger when exposed to unused medicines, 84.76% of the respondents still opted to keep unused medicines at homes. The dining wall unit (30%) and bedroom cabinet (20%) emerged as the preferred storage locations of unused medicines at homes. Knowingly keeping unused medicines with an intention to share with other family members in case of need (76.83%) and stopping the dosage once they get better (62.80%) featured as the prominent factors that influence respondents decisions to keep medicines at home. Further, the study found out that for those who dispose unused medicines, the predominant disposal practice was throwing in garbage bins, flushing in toilets and disposing in kitchen and hand wash sinks..

These findings raise concerns about how unused medications are stored and disposed by households. It is therefore recommended that a coordinated and systematic public awareness campaigns be initiated by healthcare stakeholders to address the negative and health risks of unused medicines; to promote safe disposal practices of unused medicines; and to set robust institutional and regulatory frameworks to oversee information sharing on safe disposal practices. While the study sample was homogenous, further research should be initiated to cover household knowledge and disposal patterns of unused medicines in rural areas and academic institutions such as boarding schools and universities. Another area that is worth being studied is the common types of household unused medicines, abuse of unused medicines and cases of accidental poisoning by unused medicines.

CHAPTER 1: INTRODUCTION

1.1 Study Background

Medicines constitute a key factor in all health care delivery systems and are now said to contribute highly towards many households recurrent expenditure. Essential medicinal drug consumption in Kenya continue to grow considerably higher than other developing nations over the past decade (Mwathi and Osuga, 2014; Harrington, 2014). Furthermore, an estimate of the Kenyan pharmaceutical market by Business Monitor International (BMI) indicated that expenditure on prescription medicines in 2016 constituted about 72.3 per cent of the total healthcare market share (BMI, 2017). This may have been attributed to the availability and improved access to healthcare facilities and the dire need for healthy living of individuals (Harrington, 2014).

As access to medicines increase, bulks of medicines become unused and are kept at home. This occurs when the patient changes or discontinues medication, poor medication adherence, packaging size poorly adapted to the client particularly in the elderly and by repeated purchase of medicines without assessing home stock (De-Bolle *et al.*, 2008:573). Irrational use of medicines by both health professionals and consumers, drug purchases by consumers especially the over-the-counter (OTC) medicines, expiry of drugs, aggressive marketing by pharmaceutical companies, unbridled advertisements of pharmaceuticals in the media, change in treatment protocols, death of a patient among others also contribute to medicines becoming unused (De-Bolle *et al.*, 2008:573). Furthermore, due to declining economic situations and considering that medicines are costly, people tend to store unused medicines so that they can be reused just in case there is reoccurrence of the disease. As a result, increased access, if combined with poor compliance by patients and inappropriate self-medication, often result to adverse reactions and indeed prolonged suffering (Kiyingi & Lauwo, 2008:381).

Health-care medicines as much as are a means of protecting health, curing patients and saving lives, they can also generate medical waste which can potentially lead to other health related risks. As children learn by exploring, most things go straight into their mouths with reported cases of suspected accidental poisoning from unused medicines commonly found at home (De-Bolle *et al.*, 2008:574). Further, due to free information over the internet on the use of strength boosting, steroids and contraceptive drugs, curious teenagers are tempted to consume such drugs when found in household medicine cabinets. Lives of the unborn and even expectant mothers may also get exposed to risks when unused medicines are accidentally consumed (De-Bolle *et al.*, 2008:574).

Amidst the increasing potential threats of unused medicines, there should be elaborate disposal mechanisms that are supported by legislative regulations and policies to ensure that the risks are managed effectively. There are generic and specific advantages that can be derived from effective disposal of unused medicines. These include; reduction in the risk of poisoning and misuse of medicines, increased rational use of medicine programs, increased pharmaceutical care, re-deploying/recycling wholesome unused medicines to other areas of need, reduction in waste and cost in the health care delivery system, streamlining drug donations to ensure that such donations are really rational, and preventing environmental damage (many pharmaceutical companies are increasingly designing biodegradable products among others) (Tong *et al.*, 2011:297).

1.2 Problem Statement

Drug therapy is the most often used intervention for treatment and prevention of many diseases. However, when they are no longer needed, they remain unused and should be disposed of safely. Unsafe drug disposal do have direct impact on public safety and the environment. Accidental use of unused medicines is often associated with adverse effects and other drug-related problems that can generate increased health care costs, including a need for new consultations with other health care professionals, use of additional drugs, need for more laboratory tests, hospitalization, permanent disability and even death (Sharon *et al.*, 2010).

The responsibility of minimizing the potential health risks associated with unused medicines should not end at the point of sale, but continue to the end of medicine's life-cycle, i.e., from production, sale, consumption and disposal. Consumer perceptions regarding how medicines are handled, contained and disposed therefore becomes paramount. While there is no statistical evidence, the amount of prescription and over-the-counter medicines that go unused at homes has not been precisely determined in Kenya and continues to grow. Unfortunately, cross-sectional review of the drug management and legislation in the country under the Kenya National Drug Regulatory Authority (KNDRRA) and Pharmacy and Poisons Board (PPB) has shown that definitive and consistent guidance on safe disposal of unused medicines is not yet available (Harrington, 2014).

Disposal of unused medicines has evolved to become a health concern. Unfortunately programs advocating for safer unused medicines disposal practices are lacking in Kenya (Harrington, 2014). An understanding of people's knowledge and perceptions on their disposal patterns therefore becomes fundamental in designing safe disposal programs. It is against this backdrop that this study intended not only to bridge the knowledge gap in this

discipline, but also to provide proper and effective solutions in resolving household unused medicines disposal problem. This study therefore sought to answer the following questions:

1. What are households' knowledge with regard to household disposal practices of unused medicines?
2. What are households' perceptions on disposal practices of unused medicines?
3. What are the disposal practices of unused medicines amongst households?

1.3 Study Objectives

The general objective of the study was to explore households' perceptions and practices of disposal patterns of unused medicines in South C area, Nairobi City County. The specific objectives were to:

1. Determine households' knowledge on disposal practices of unused medicines.
2. Determine households' perceptions on disposal practices of unused medicines.
3. Examine the different household disposal practices of unused medicines.

1.4 Study Assumptions

- 1 Households have low awareness on safe disposal practices of unused medicines.
- 2 Households have negative perceptions about safer disposal practices of unused medicines.
- 3 Households have unsafe disposal practices of unused medicines.

1.5 Study Justification

This study explored the perceptions and practices towards disposal of unused household medication in Nairobi. While there is enormous awareness on the importance of medicines in a society, there is little knowledge with regard to safe disposal of unused medicines. It was, therefore, important to study people's perceptions not only of disposal practices of unused medicines but also why unused medicines are kept at home as these are influenced by a number of factors. While relying on people's perceptions on disposal of unused medicines, the study determined the knowledge levels of people with regards to the risks of unsafe disposal practices of unused medicines and also identified practices that lead to unsafe disposal of unused medicines.

The implementation of findings of the study will be useful in creating awareness among people, policy makers and pharmaceutical companies to come up with strategies aimed at minimizing the potential risks associated with unsafe disposal of unused medicines. This will potentially minimize additional costs that are associated with addressing risks associated with unsafe disposal of unused medicines. It will also add to the body of knowledge on the perceptions of people on disposal practices of unused medicines in Nairobi hence providing information which can be built upon by future researchers.

1.6 Scope of the Study

The study explored perceptions and practices with regard to the household disposal patterns of unused medicines. The geographical scope was limited to Nairobi City County, South C area where the primary data was collected from a sample of households. All types of households were examined be it single member households, nuclear or shared households and extended or joint households. The study however did not include provider managed

households such as boarding facilities and collective living households comprising of dormitories in educational institutions and religious centres. Additional primary data collection was collected from, key informants who comprised of personnel from both public and private hospitals, pharmacies, drugs and medicines regulatory authorities and pharmaceutical companies. The genre of unused medicines that formed part of the study comprised of all sorts of prescription and over-the-counter (OTC) medications. Traditional medicines, pesticides, insecticides and cosmetics were however not considered in this study.

1.7 Definition of Key Terms

Medicine: Any drug product used in preventing, treating disease or relieving pain acquired either through prescription or over the counter (OTC) (Harvey, 2009).

Unused Medicine: In this study, unused medicine is defined as any drug product, either dispensed by prescription or purchased over the counter (OTC) that is never fully consumed. They may include all expired, unusable and damaged medicines. This definition explicitly pertains to partially or totally stored medicines not intended for future use, medicines for possible future use as well as expired medicines (Harvey, 2009).

Medicines Disposal: These entail the procedures by which unused medicines are safely/unsafely handled by individuals and are professionally or terminally discarded as per relevant national laws and regulatory frameworks (Harvey, 2009).

Knowledge: The level of awareness or practical understanding and information that people have regarding disposal practices of unused medicines (Craig, 2002).

Perceptions: The way in which unused medicines disposal is regarded, understood, or interpreted by people (Craig, 2002).

Household: Represents a collection of individuals staying on a distinctive property and or premises who may/not be related to one another (Craig, 2002).

Barriers: These can be defined as factors, reasons and or circumstances that prohibit or prevent people from adhering to particular norms or practices (Craig, 2002).

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section provides an overview of literature relevant to the stated research problem. The literature is logical and consistent with the overall study objectives and is presented under the following themes: Medicine use trends; Contributory factors to unused medicines; Un-safe disposal and risks of keeping unused medicines; Global patterns in disposal practices of unused medicines and Current unused medicines disposal practices. Further, this chapter also provides and discusses the theoretical framework for the study.

2.2 Medicine Use Trends

2.2.1 Global Perspective

The pharmaceuticals' market all over the world has been expanding rapidly. Global drug expenditure in 2015 was estimated at US\$600 billion, having doubled over the previous decade. It is also estimated that it will reach US\$900 billion by the year 2020 (WHO, 2016). In the USA, the annual prescription drug expenditure exceeded US\$300 billion in 2010 (Henry, 2015). In UK, the total expenditure on drugs in 2002 was US\$6.8 billion. On the other hand, the cost of drugs discarded each year in the UK hospitals was estimated to be in the excess of one million pounds. Each year, wasted medicines in the health sector cost the National Health Service over 928 million pounds and such wastage was attributed to over ordering and the non-optimal use of medication (Henry, 2015). This figure should be doubled to accurately account for the total drugs wastage attributed to returns to community pharmacies and drugs placed in domestic rubbish or flushed down toilets.

In Canada, pharmaceuticals have been one of the fast growing components of health system spending (CIHI, 2011). Canadians spent an estimated US\$31.1 billion on pharmaceuticals in

2010. This equals to US\$910 per Canadian. Medication wastage and non-compliance are also major problems facing health care system in Canada where prescribed drugs accounts for the majority of overall drug spending. In Sweden, the proportion of dispensed medicines returned to pharmacies accounted for between 2.3-4.6% of the total volume dispensed (Ekedahl, 2006:353). With population increase and the need for better healthcare, the prescription drug expenditure is projected to grow further.

2.2.2 Developing Countries

In developing countries the wastage of medicines is serious. In these low-income countries, spending on medicines comes largely from household resources and has to be paid out of pocket (WHO, 2004). For instance, in Saudi Arabia payment for drug products and pharmaceuticals constitutes a considerably large percentage of total health costs. Medication wastage was estimated to be 25.8% and 19.2% respectively in terms of the amount of drug products and medication costs. Annually, a total of 12,463 drug products are prescribed with an average of 18 drug products per family with between 25-65% of total health expenditure spent on pharmaceuticals (Abou-Auda, 2003:1277). In Thailand, drug expenditure accounts for 30% of health resources while it accounts for about 25% in South Africa (Orrell & Kishuna, 1997). These figures are therefore a clear indicator that the presence of pharmaceuticals in societies is quite overwhelming.

In Kenya, it has been estimated by Kenya Medical Supplies Agency (KEMSA's) that 37% of all purchases comprise of prescription drugs in the domestic market. Furthermore, an estimate of the Kenyan pharmaceutical market by Business Monitor International (BMI) indicated that expenditure on prescription medicines in 2016 constituted about 65.4% of the total healthcare market share (BMI, 2017). This may have been attributed to improved access to and

availability of healthcare facilities, the dire need for healthy living and economic status of individuals (Harrington, 2014).

Kenya's healthcare system may be analyzed on the basis of the healthcare infrastructure, the players and their roles, financing mechanisms and utilization. There are over 5,000 health facilities across Kenya which are operated by three owner systems, with the government running 41% of the facilities, non-governmental organizations (NGOs) 15%, and private businesses 43% (Harrington, 2014). The government owns most of the hospitals, health centres, and dispensaries, while clinics and nursing homes are entirely in the hands of the private sector. There are a total of 368 health facilities in Nairobi which comprises of Government of Kenya, NGO and Private facilities. However, these numbers have increased significantly hence a clear counterpart to the health utilization trends which have also improved considerably. The Kenya household health expenditure and utilization survey shows that the overall utilization of health services by people reporting being ill is 77.2%, with only 22.8% not seeking healthcare (Harrington, 2014). This trend is a clear indicator that household health expenditure is higher in Kenya. With this, it becomes apparent that disposal of unused medicines presents a health concern which should be tackled and addressed adequately.

2.2.3 Pharmaceutical Services Provision

The results of healthcare performance survey showed that majority of households in Kenya can access health facilities within less than one hour. Overall, about 10% of households had to travel more than one hour to reach the closest public health facility. There is an overall satisfaction with the geographical proximity of the location of the public healthcare facilities. However, there emerged a general dissatisfaction with the level of medicines availability in

these facilities. Overall, the poorest households expressed more satisfaction with the availability of medicines in public health facilities as compared to the wealthy households who expressed dissatisfaction (Harrington, 2014).

Poor households also spend more time travelling to a public hospital. A higher proportion of the poorest households (67%) travel more than one hour to reach the nearest public hospital, compared to 47% of the wealthiest households. However, public health facilities close to households were largely perceived as not meeting households' needs for medicines. Just under one third of respondents perceived the public health facility as having the medicines they needed. The most frequent source of medicines found in homes is from NGO facilities (47% of medicines) followed by government facilities (32%). However, the source of medicines varied by households, with 36% of the poorest households obtaining medicines from public facilities, compared to 10% of the wealthiest households who mostly obtained their medicines from the private sector health facilities and pharmacies (Harrington, 2014).

Medicines have certainly become a significant part of monthly household expenditure although the poorest households perceive themselves as least likely to afford to buy the medicines they need. Over two thirds (67%) of the poorest households perceive that they cannot afford medicines, compared to 34% of the wealthiest households. Medicines' insurance coverage is also very low across all households and virtually non-existent in the poorest households. Only 5% of the poorest households had insurance cover for medicines compared to 16% of the wealthiest (Harrington, 2014).

In South Africa, access to healthcare services is affected by factors such as socio-economic status, language, religion and cultural belief systems (Harrison *et al.*, 2007). Healthcare

comprises of two sectors: the public sector, which serves 80% population of the country and consumes 20% of the country's health expenditure, and the private sector, which serves approximately 20% of the population at 80% health expenditure (Dambisya, 2005:14). The distribution of all resources – financial and human – follows the same pattern and evidence suggests that pharmaceutical services are in short supply in poor rural areas, whereas urban and wealthy areas are over serviced by pharmaceutical service providers (Blecher & Harrison, 2006). Effective medical and primary health care can be practiced only where there is effective medicine management. The pharmacist is therefore a vital member of the health care team and the nature and access to pharmaceutical services may be a proxy for the quality of health services in a particular area. The role of a pharmacist, as defined in the National drug policy of South Africa includes aspects such as quality assurance and safety. And yet, as noted above, many rural, poor areas do not have access to pharmacists or pharmaceutical services (Van Rensburg & Pelser, 2004).

2.3 Contributory Factors to Unused Medicines

Medicines are considered unused when they are expired, improperly sealed, damaged, improperly labelled, counterfeit, substandard and adulterated, prohibited or unauthorized. For quite a long time, disposal of unused medicines in developing countries has not been done systematically and professionally. This has resulted to accumulation of unused medicines not only at health facilities but also at home. The accumulation of these products might have been mainly contributed by lack of adequate knowledge on procedure for safe disposal of unused medicines. Pilfering from a stockpile of waste medicines or during sorting may also result in unwanted medicines being diverted to the market for resale and misuse (WHO, 1999). Stockpiling of expired medications in households is a significant and common public health issue worldwide (Tong *et. al*, 2011). The potential presence of expired medications in

households has, in the last 15 years, received attention due to its impact on health outcomes, health care cost, patient and environmental safety. Unsafe storage of expired medications at home leads to increased risk of toxicity, suicide and accidental childhood poisoning. Whilst pharmaceuticals can enter the environment during the production, consumption and disposal, incorrect disposal from households is considered the second major pathway into the environment. The root causes of unused medicines can in many instances be attributed to either intentional or accidental non-adherence on the part of their users. However these contributory factors can be categorized under various themes as discussed in the sub-sequent sections.

2.3.1 Anthropological Perspectives

Studies incorporating anthropological perspective to understand and provide insights into the ways that people's perceptions, beliefs, and social norms and values interrelate with medicine disposal practices, and how these are, in turn, intrinsically bound up with broader social and economic forces have been done (Thomas and Depledge, 2015). Studies within the social sciences and medical anthropology have demonstrated that variations in medicine disposal can be explained by diverse cultures of prescribing and working practice (Mossialos *et. al*, 2005).

Recognizing that discrepancies exist in disposal practice therefore raises important questions about the perceptions and attitudes that different population groups hold towards what they deem to be appropriate and rational disposal practice to them. This is exemplified in research that shows that people from diverse backgrounds may experience similar levels of difficulty or discomfort in very different ways (Holloway, 2015). It illuminates the value of in-depth qualitative research that explores how people perceive their health and well-being within the

broader context of their daily lives, the cultural value that they accord to particular types of medicines disposal, and the ways that pharmaceuticals can be closely bound up with social relations (Holloway, 2015).

Changes in public expectations and behaviours also play a role in the disposal practices of unused medicines. Research has demonstrated, for example, how socially and culturally defined norms can problematize certain forms of appearance or behaviour (Holloway, 2015). At the same time, public expectations can be influenced by health policy, which in some countries within Europe, now positions households as “experts” active in their own disposal practices. While public expectations play a central role in the rise of disposal practices, understanding more fully what such fundamental changes towards a consumer-oriented culture mean in terms of the ways they perceive are perceived and used– or discarded– by different population groups, would provide a strong foundation on which effective responses to disposal practices could be built (Holloway, 2015).

Innovative technological responses to dealing with safe disposal practices of unused medicines exist, but are complex and costly, and do not address the underlying causes of why households choose to keep them at home. Incorporating a cultural perspective, and examining this within the context of wider social and economic forces, can help to understand not just how unused medicines can be more thoughtfully disposed of, but why particular medicines are kept at home, and or disposed unsafely, particular population groups in the first place - insights that are vital for informing responses that can effectively tackle the root causes of the issue (Holloway, 2015).

A considerable amount of research has been conducted to explore the factors influencing keeping medicines at homes, and medicine sharing practices of adults. The findings advance an understanding of medicine sharing and provide further insights into the social, cultural and economic, aspects of medicine sharing. Although the potential risks of medicine sharing are well known to researchers (Makowka *et. al*, 2014) and regulatory authorities, the nonmedical aspects of sharing have been largely unexplored.

A desire to help others (i.e. altruism) is often considered as the main motivator for those who reported keep and sharing medicines. People keep and shared their medicines for what they perceived to be a good reason, to help their loved ones when they were suffering from an illness. Participants' past illness experience could further encourage altruistic behaviour. Although medicines were more often reported to be shared with family members, close friends, neighbours, or work mates, when it came to helping people in urgent need of medicine, social distance was less important. Sometimes the lender used the sharing instance as an opportunity to establish a friendship with the borrower, although the main motivator, in doing so, was often altruism (Makowka *et. al*, 2014).

From the medical perspective, medicine sharing is often considered to be undesirable behaviour (Makowka *et. al*, 2014). However, patients often see their sharing practices as positive and the study indicates that they often have sound justifications for doing so, as described in our findings. In line with other research, a wide range of medicines were reported to be shared (Auta *et. al*, 2011). The findings suggest that medicine sharing may be another coping strategy. This finding is also in line with earlier studies reporting financial hardship as a reason for medicine sharing and underutilisation of available health-care services (Goebel *et. al*, 2011). The habit of sharing medicines with family members, relatives

and friends was cited by 86% of the sample studied throughout the study period in northern United Arab (Sharif *et. al*, 2010).

Van der Geest *et al.*, 1996 in their anthropological study of pharmaceuticals, pointed out that medicines can be exchanged between individuals to facilitate social interactions (Van der Geest *et. al*, 1996). The authors further noted that medicines are representations of ideologies and lifestyle. Prescribing for others and medicine sharing were common practices, and these practices had a positive impact on participants' social relationships. Many of the participants had been offered medicines by friends or relatives for free, and the sharing decision appeared to be influenced by altruistic reasons rather than the expectation of a reward. Therefore, any efforts to design interventions need to consider sharing behaviours within the context of wider social interactions. Inconvenience and embarrassment about seeing a doctor were other reasons why some participants shared medicines. This may be a coping strategy by patients in response to a healthcare system that does not address their needs and expectations (Van der Geest *et. al*, 1996). In a study conducted in Saudi Arabia, 37% of Saudi households indicated that they never checked the expiration date of a medication prior to administration. Self-medication was prevalent among households participating in this study, with a mean of 20.6% of Saudi households citing that family members took drugs prescribed for their friends or other family members and 43.9% purchased medical products based on the advice of friends or family members (Abou-Auda, 2003).

2.3.2 Human Factors

The human factors can only be well understood by eliciting some of the health behaviour theories and models. Studies have found that the root cause of unused medicines is attributed to both intentional and unintentional and linked to factors related to people's perceptions that

are somehow linked to forgetfulness or a lack of routinized behavior and deliberate patient actions (Barber, 2002:82; Horne *et al.*, 2005).

Examples of what might broadly be classified as individual level or motivational risk factors that have the potential to cause unused medicines include a lack of knowledge relevant to why taking a medicine in the recommended way is beneficial. A number of the reviewed literature considered the relationship between knowledge and medicine taking (Ownby, 2005:2). Available evidence shows that improving knowledge levels presents a consistent relationship with behaviors such as adherence (Horne *et al.*, 2005). However, there are clearly occasions when having relevant knowledge is a necessary if not a determining factor in achieving appropriate medicine taking and avoiding waste. It is also the case that appropriate and accurate knowledge is needed by health care professionals seeking to advise patients on effective medicine taking and waste minimization (Byrne *et al.*, 2005).

There is extensive evidence that past negative experiences of medicines taking (and a perceived probability of future unwanted effects) increase the chance of prescribed treatments not being taken as recommended and hence in some instances lead to unused medicines (Jokisalo & Kumpusalo, 2002:581). There is also good research evidence in contexts where there is a risk of patients stopping medicines taking because of factors such as a fear or anticipation of unpleasant side effects (Clifford *et al.*, 2006:167). Because of stigma related fears and/or individuals denying their condition, treatments of some types of diseases occasionally lead to unused medicines (Carter *et al.*, 2005). The reviewed literature indicates that relatively impersonal approaches involving, for instance, monitored medicine taking are unlikely to resolve such essentially social and psychological problems (Eatock & Baker, 2007:127). Beliefs that medicines are ineffective or that alternative interventions are more

effective can also lead to medicines being unused. In adherence research, considerable importance has been attached to quantifying factors that determine the psychological balance between the perceived necessity of medicines taking and individuals' beliefs that it may be unnecessary or harmful (Jesson *et al.*, 2005:123).

Family and employed careers' attitudes and behaviors can directly impact on medicine taking in a variety of ways. For example, there is evidence that parents who are anxious about their children's medicine taking can undermine adherence, even when trying to promote it (Conn *et al.*, 2005:306). Abilities of children to understand and control their medicines use should not be under-estimated (Sanz, 2003:858). Studies have also found that older people with limited cognitive abilities on a large number of medicines are at relatively high risk of over-adherence, that is, of taking their prescribed medicines too frequently (Gray *et al.*, 2001:544).

Limiting prescription durations to a period of four days can reduce medicines wastage (Hawksworth *et al.*, 1996). It is again intuitively reasonable to believe that if prescription periods are limited then material waste and possibly the overall costs of medicines supply will be reduced. Similarly, shortening of prescription duration for patients can reduce adherence rates amongst people who had previously been taking their medicines appropriately (Atella *et al.*, 2006:876).

There is evidence that lifestyles and events can prevent or disrupt the routinization of medicine taking. Individuals who have a well ordered, systemized, approach to medicine taking are more adherent and are less likely to waste medicines than people with less ordered approaches (Ryan & Wagner, 2003:804; Ulrik, 2006:702). There is also evidence that events

which can break routines such as going on holiday or being admitted to hospital can contribute to wastage in the community setting (Bell, 2007:27).

Lack of appropriate medicine use support in home settings can also lead to medicines becoming unused. Examples of interventions in this category range from the supply of medicine taking support devices or calendar blister packs and telephone or text reminder systems to training social care assistants to help with medicines taking (Das Gupta & Guest, 2003; Muszbek *et al.*, 2008:340). Studies also show that medicine costs that have to be met directly by patients have a highly significant impact on usage rates (Elliott & Ross-Degan, 2007:807; Hirth *et al.*, 2008:92). In other instances patients may be afraid of running out of their treatments so they require the assurance provided by the availability of a reserve stock of medicines. Hence they may deliberately over-order, and so might in time become ‘medicine hoarders’. Hoarding and stockpiling behaviors also account for a proportion of unused medicines (Ekedahl, 2006:356; Ruhoy & Daughton, 2007:138).

2.3.3 Sociocultural Factors

According to most studies, there is no consistent correlation between socio-economic status, age, sex, education, occupation, income, or marital status and unused medicines storage and disposal practices (Haynes, 2010). However, these factors can be determinants when a specific region, condition and population are selected. For example, elderly patients do not usually comply with the medical regime and as a result may opt to keep their unused medicines at homes. So disposing of or keeping unused medicines at home and demographic data do not correlate with each other, and may be considered to have predictive aspects.

Social, cultural, and interpersonal interactions influencing participants' keeping and sharing behaviours were captured by Makowka *et. al*, (2014). Although not nationally representative, participants were drawn from different communities, and it was noted that for some participants visiting a doctor and getting their own medicines was not an easy experience, partly because of cultural differences (e.g. communication barriers or differences in the health systems). Those participants considered medicine sharing to be a means of accessing prescription medicines without having to see a doctor. It was also revealed that in some cultures sharing medicine and other commodities is a way of providing social support for others.

2.3.4 Patients' Knowledge and Practices in Relation to Medication

It has been observed that educational attempts alone individually do not demonstrate any consistent effect on household disposal practices (Haynes, 2010). Households especially with those in chronic conditions, and who know all aspects of their illness, symptoms, will always keep medications at home. On the hand, household's information about the purpose of the drugs that have been prescribed for the patient can deter their disposal practices. According to one study, when the patient knows the name of the drug that has been prescribed, there are higher chances that they will buy and keep these medications at home (Haynes, 2010). In a study conducted in the United Kingdom it was found that exploring how patients' drugs worked for them was effective in revealing their beliefs about medicines, and often led naturally on to a candid account of keeping such at homes (Haynes, 2010). In addition to these, elderly patients have difficulty in remembering, understanding the disposal practice and reading written labels on disposal practices (Haynes, 2010) which therefore increases the noncompliance levels.

Over-prescribing of pharmaceuticals by doctors is also a contributor to excess unwanted pharmaceuticals (Ekedahl, 2006). Globally, there is much confusion as to the most appropriate means of disposing of unwanted pharmaceuticals (Tong et al, 2011). A review of the literature on the disposal of unwanted pharmaceuticals by the public found that the most popular methods were in the household garbage or tipped down the toilet or sink (Tong et al., 2011). Liquid formulations were more likely to be disposed of down the sink or toilet whilst solid formulations were more likely to be disposed of in the garbage (Gotz & Deffner, 2010).

Worldwide in most households, medicines are kept for various purposes including emergency use and treatment of chronic or acute illnesses. Drug storage at home is a risk factor in relation to irrational drug use mainly due to the easy access, and improper storage. If the recommendations for storage are not followed, the drug stability can be affected which in turn leads to ineffective drug therapy (Kheir *et. al*, 2011). On the other hand, controlling the use of drugs stored at home is a great task especially from unintentional users such as children which increases the risk of accidental poisoning. Moreover, presence of medicines at home has also been associated with sharing of drugs which further increase the risk of inappropriate drug use and hence the emergence of antimicrobial resistance (Ocan *et. al*, 2014).

Many studies in Africa identified a high prevalence of drug storage at home. In Sudan, about 98% of investigated families had at least one drug product stored at home (Yousif, 2002). Study conducted in Uganda also showed that about 40% of the surveyed households kept medicines at home and 30% of identified antibacterial found in surveyed households were kept for future use (Ministry of Health, 2008). In Ethiopia, a study conducted almost two decades ago in Addis Ababa revealed that 20% of the studied households were found

hoarding drugs, and drug sharing was practiced by 17% of the respondents (Amare *et. al*, 1997). This value seems to be more or less similar to the findings of the other studies (Amare *et. al*, 1997). Taking drugs at home without prescription has become a habit that is often encouraged in the community (Yousif, 2002).

At the top of the health chain is the doctor. Good communication between doctor and patient is of vital importance and as such inadequate information about safe disposal practices provided by the doctor plays an important factor. When the patients do not know the mechanism of action, they tend to abandon the medicines at home (Ambwani and Mathur, 2009). Participants were unsure what to do with unused medicines and many of them mentioned passing their unused medicines on to others. Most of the participants revealed that they received little information from healthcare providers about the safe disposal of leftover medicines (Ambwani and Mathur, 2009).

2.3.6 Dispensing System and Healthcare System

The pharmacists as dispensers have to be aware of their responsibility. A defective system for drug supply, and a disorganized disposal and counselling process can be a cause of unsafe disposal practices (Ambwani and Mathur, 2009). In many countries, patients can buy drugs without the need of a prescription, and self-medication is practiced (Ambwani and Mathur, 2009). Moreover, the presence of a large number of medications on the market is another problem which can be easily be obtained over the counter (OTC) consciously or unconsciously leads to may medicines either being kept at homes and disposed unsafely.

Inadequate access to medical facilities and care is attributed as a reason for keeping unused medicines at homes (Busari *et. al*, 2010). Economic problems of patients who do not have health insurance can also be a reason for keeping unused medicines at home. The cost of medical visits hindered participants with limited resources from seeking medical care and being prescribed their own medicines. Some of them revealed that their health insurance was limited and did not cover all their medical needs. Further, most pharmacies remain closed at night hours, so it is easier to keep medicines at home or get the medicine from someone I know and solve my problem. Participants also reported sharing medicines while travelling when they could not access their regular doctor within a reasonable time.

2.3.7 Health Factors

The family of health factors that may be considered to be contributing to unused medicines at home may result from patients recovering before their dispensed medicines have all been taken, therapies being stopped or changed because, for example, of ineffectiveness and/or unwanted side effects, patients' conditions progressing, so that new treatments are needed and patients' deaths (Jesson *et al.*, 2005:118). Other factors may be those related to medicines being changed or dispensed on a precautionary basis during the final stages of palliative care. Factors relating to repeat prescribing and dispensing processes, which may independently be contributed by patient's condition may lead to excessive volumes of medicines to be supplied; and the healthcare system failures to provide guidance on the safe disposal of unused medicines (Jesson *et al.*, 2005:118).

There is also evidence that other external sources contribute to the existence of unused medicines at homes. These range from prescribing patterns which do not take sufficient account of service user preferences and requirements to changes in patients' conditions which

require alterations in their treatment regimens (Bellingham, 2001:2). Prescription re-ordering processes can also promote excessive repeat medicine supply and are another possible system level cause of unused medicines.

Some diseases such as HIV/AIDS require that the medications become kept at homes. Pediatric conditions is a determinant factor in that leads parents in keeping medicines at homes to assist them in managing their children conditions in case of emergency (Haynes, 2010). With the increase in the number of patients with chronic diseases in the world, drug usage has increased greatly. Hoarding as a habit can cause unused drugs to build up in the home. Hoarding has been defined in cases where multiple drugs were retained in the home, particularly when drugs were no longer needed or had expired (Mackridge and Marriott, 2007).

2.4 Unsafe Disposal and Risks of Keeping Unused Medicines

Unsafe disposal of unused medicines shift the risk from environmental to domestic harm by leaving medications susceptible to interception by children, teens, pets, or other family members (Herring *et al.*, 2008:341). Although there are options for disposing of unused medication, many consumers keep medicines in their possession because they do not want them to go to waste or do not know how to dispose of them safely. Keeping medication at home poses several risks related to diversion, accidental overdose, and consumption of spoilt substances. The presence of unused medicines in the household is likely to contribute to growing rates of prescription drug abuse amongst teenagers in the world. According to the Center for Disease Control and Prevention (CDC), unintentional poisoning is the number two cause of accidental death in US in 2007. Of all unintentional poisonings resulting in death in 2007, 93% of those were caused by unused medicines (CDC, 2007). Further, during 2004 and

2005, approximately 71,000 children (under 18 years of age) were seen in emergency rooms each year because of medication poisonings; these numbers exclude recreational and intentional abuse (CDC, 2007).

Over 80% of these reported emergency department visits were due to unsupervised children finding and consuming medicines in the home. This behavior poses a serious public health problem and is contributing to the steady uptick in poison-related deaths in the United States where it is believed that about 30,000 people die annually due to drug poisoning. Unused medicines continually enter the environment as trace pollutants through unintentional and largely unavoidable unsafe disposal. They also pose acute poisoning risks due to intentional or accidental diversion to others. Humans can be inadvertently and chronically exposed to trace residues of unused medicines from the environment by consuming contaminated drinking water (Daughton, 2007:760).

2.5 Global Patterns in Disposal Practices of Unused Medicines

Proper disposal of unused prescription drugs has become an important public health issue all over the world as rates of prescription drug abuse, accidental poisoning, and the incidence of drugs found in the drinking water having become quite prevalent. Consequently, safe disposal of unused medicines has become a global challenge and confronts policy makers, health professionals, pharmaceuticals companies and the general public. In the United Kingdom, for example, despite advice on pharmaceutical packaging that recommends the return of unused medicines to pharmacies, or occasionally to flush them down the toilet, the predominant method of disposal was found to be via household waste trash.

Consumers lack guidance on how to dispose of their unused medication. In the USA fewer than 20% are ever given advice from a healthcare provider about medication disposal, with only 1.4% returning their medications to a pharmacy, while 54% disposing them in the garbage, 35.4% flushing medications down the toilet or sink, 7.2% do not dispose of unused medications, and only 2% use all medications before expiration (Sharon *et al.*, 2010). Only 5% of the pharmacies have consistent recommendations for their customers on unused medicine disposal. In addition, medicine disposal practices are handled by individual pharmacists only on consumer request and those consumers depend on three primary disposal methods for unused medication: flushing them down the toilet, throwing them in the trash, and returning them to the pharmacy (Sharon *et al.*, 2010). Similarly, in Santa Barbara, California 28% of residents dispose unused medicines in the toilet or sink, 45% in the trash, and 6% return them to the pharmacy (Kotchenet *et al.*, 2009). In Southern Brazil unused medicines are mainly disposed through the municipal collection system (Da Silva *et al.*, 2004:600). In Qatar a majority (65%) throws them in the general rubbish, around 12% usually throw unused medicines in the rubbish or keep them and 6% flush them down the toilet. The rest vary between returning the drug to the pharmacy and using a combination of methods to dispose unused medicines (Kheir *et al.*, 2011:102).

Several countries have disposal of unused medicines programs built into their health systems. Many developed countries (U.K., France, Germany, Sweden, Australia, Canada, U.S.A.) have elaborate disposal programs of unused medicines. In Australia there has been the National Return & Disposal of Unwanted Medicines Project since 1998 fully supported by the government and pharmaceutical industry. Canada's program is also fully supported by the government and pharmaceutical industry and implemented by the pharmacist's associations. Pharmacy take-back programs are more abundant in the UK than the US, notably due to the

lack of stringent controlled substance laws in the UK, which are present and often impede such programs in the USA (Tong *et al.*, 2011:296). Additionally, the UK has long since practiced the precautionary principle when it comes to protecting the environment, often setting precedent with pollution prevention programs such as pharmacy take-back programs. For example, the Royal Pharmaceutical Society of Great Britain promoted safe medicine disposal campaigns throughout the 1990s, advocating that patients should return any unused or expired medications to pharmacies for proper disposal (Tong *et al.*, 2011:296).

It is estimated that 73% of all Swedish citizens return their medicines to a pharmacy because since 1971, Sweden has operated a reverse distribution system run by a major pharmacy wholesaler in conjunction with the state pharmaceutical association (Tong *et al.*, 2011:295). In Switzerland the flushing of unused medicines down sewages reduced from 35% in 1996 to 12% in 2005 and 10% in 2006. Take-back medicines returned to pharmacies under such programs increased from 1% in 1996 to 11% in 2006. People who returned medicines were mainly elderly people or relatives of deceased patients.

In Africa unused medicines disposal management appears to be more critical as reports from around the continent (from Mozambique, South Africa, Kenya and Swaziland) indicate unsafe disposal practices and is characterized by unregulated, illegal and indiscriminate disposal of unused medicines (Manyele *et al.*, 2003; Manyele, 2004:30). The only country in Africa where increased awareness amongst the people and the government with regards to safe disposal of unused medicines has matured is Ghana. The government has introduced a programme that sensitizes people on the need to take back unused medicines to hospitals and chemists through the Disposal of Unused Medicines Programme (DUMP).

In Metropolitan Lagos, Nigeria, basic education on appropriate disposal of unused medicines is lacking (Longe & William, 2006:133). Unused medicines are not returned to pharmacies for appropriate disposal as obtainable in developed countries. In Kenya, there are no national policies that govern the disposal of unused medicines. Further the general public awareness on issues related to storage and disposal of unused medicines is also lacking (Manyele *et al.*, 2003). In addition, steps to address the issue have also not been forthcoming. There is also no published study that documents the patterns of unused medicines disposal practices within households. Given this existing gap, this study intends to assess unused medicines disposal practices, challenges and knowledge on importance of proper handling and safe disposal of household unused medicines.

2.6 Current Unused Medicines Disposal Practices

Following on from the above sections, it can be concluded that globally, a majority of households lack guidance on how to dispose of their unused medicines (Sharon *et al.*, 2010). In Kenya, disposal of unused medicines has not been openly discussed either at a policy level or as a potential public health issue hence needs to be addressed. Nonetheless, a critical review of literature on policies and practices reveal that there are three primary disposal categories for unused medication. These include, flushing them down the toilet, throwing them in the trash, and returning them to the pharmacy (Sharon *et al.*, 2010). These disposal methods are discussed in the following sections.

2.6.1 Flushing

This method is a convenient way to ensure that drugs are permanently removed from the home and cannot be diverted. Despite its convenience, this approach nevertheless has raised potential environmental concerns, especially in light of research from the United States, Canada, and Europe that found trace pharmaceuticals in surface, ground, and drinking water (Sharon *et al.*, 2010). In 2002, a geological survey conducted in the USA to determine the organic wastewater contaminants found antibiotics and prescription drugs as among the most frequently detected chemicals (Sharon *et al.*, 2010). These environmental concerns hence have resulted into setting of state guidance approach to flushing medications. Some states have posted their own guidelines that recommend against flushing or pouring medications down drains while others have proposed recommendations that prohibit certain prescription drugs from being flushed.

2.6.2 Trash

Throwing unused medicines in the trash is viewed as another convenient method for removing medications from the household. This method leads to mixing unused medicines with other household wastes such as food, paper or other undesirable substances. Despite its convenience, this method is not considered safe and can lead to drug diversion. Research indicates that this method may lead to unused medicines entering the drinking water supply and leaching into groundwater and waterways when dumped in unlined landfill sites together with other household waste (Sharon *et al.*, 2010). This is a major drawback of this method and can contribute to both environmental and health risks.

2.6.3 Take-Back Programs

Because of the drawbacks associated with the above disposal methods, take-back programs are emerging to address drug abuse and diversion, accidental poisoning, and environmental problems by providing consumers with a safe and environmentally sound option for disposing of unused drugs (Sharon *et al.*, 2010). Take-back programs are state or community-driven initiatives focused on safely collecting and disposing of unwanted over-the-counter, prescriptions and are continuously gaining support as people wrestle with how best to dispose of various types of unused medication.

Most take-back programs have emerged as a response to reducing the potentially negative effects on the environment of flushing drugs or disposing of them in landfills. However, consumer return options are more limited because some regulations prevent pharmacists from taking back drugs from consumers and that only law enforcement officials can receive returned controlled substances from consumers. Despite the promise of these programs, they are currently hampered by numerous challenges that impede their overall effectiveness and sustainability. Among these obstacles are laws that prevent providers and pharmacies from accepting returned controlled substances, lack of adequate and sustained funding, and competing demands and priorities that can limit commitment and collaboration from community stakeholders (Sharon *et al.*, 2010). Given the difficulty of implementing these programs, it is not surprising that they are somewhat rare. And those that do exist often are offered infrequently or at locations, such as household hazardous waste collection facilities, that can make them inconvenient for consumers. Other versions of take back programs that have emerged in the developed world comprise of the following.

2.6.3.1 Drop-off Programs

Under this program, individuals can drop-off their unused medications either at permanent collection sites or one-day events. This program is commonly practiced in the United States (Sharon *et al.*, 2010). Permanent collection programs provide ongoing, year-round drop-off services for consumers at either one or multiple predefined locations, generally at pharmacies, police stations, or household hazardous waste facilities. The most widely used drop-off sites for permanent collections are pharmacies and police stations. Also, depending on the scale of the project, permanent collection programs operate multiple drop-off sites throughout a defined service area. Entities organizing permanent collection programs range from non-profit organizations focused on consumer or environmental issues to counties, municipalities and state boards of pharmacy.

2.6.3.2 Mail/Ship-back Programs

In a mail-back program, households are required to send their unused drugs to a central location via the postal services and other courier services. This is also more common in the USA where the government in partnership with courier services conducts a statewide mail-back program (Sharon *et al.*, 2010). Households are provided with prepaid mailing envelopes that are available at pharmacies, physician offices, and post offices.

2.7 Theoretical Framework

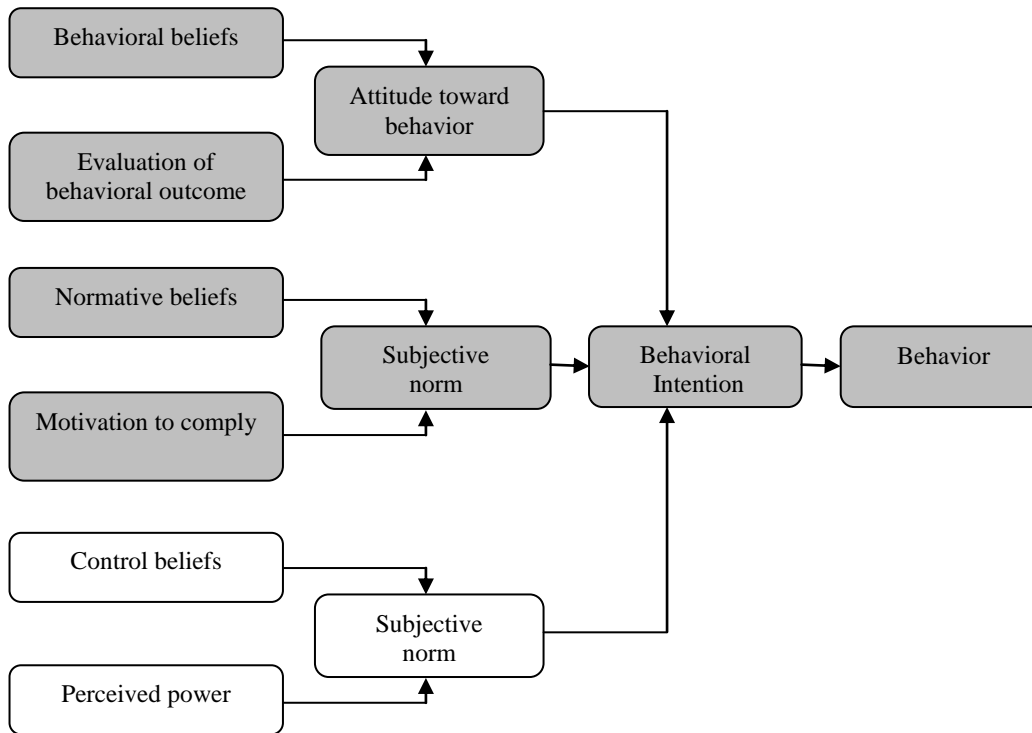
2.7.1 Theory of Reasoned Action and Theory of Planned Behaviour

As this study focused on unused medicines disposal phenomenon, the theoretical framework that supports an understanding of the variables under study is the Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB). These theories have found application in health related behavioural research and has improved the predictability of health-related intentions (John *et al.*, 1999:275). The theory of reasoned action by Ajzen and Fishbein (1969) provides a model that has potential benefits for predicting the intention to perform a behaviour based on an individual's attitudinal and normative beliefs. It was further extended to accommodate developments in the variables and the resulting model was named the theory of planned behaviour (Ajzen, 1991). The theory of planned behaviour (TPB) extends to include the concept of perceived behavioural control (PBC), which influences intentions and behaviour. The addition of PBC attempts to account for factors outside the individual's control including the absence of resources or skills and impediments to behavioural performance. TPB can also predict deliberate behaviour since behaviour can be both deliberative and planned. By way of a brief explanation, the two theories are aimed at exploring the variables that are presumed to be responsible for decision behaviour by individuals.

They place relatively more emphasis on the concept of behavioral intentions which in turn can be predicted by the person's expectancies regarding the outcomes of a behavior, attitudes toward the behavior and normative beliefs the person has with respect to what influential would do in a specific situation (John *et al.*, 1999:275). The core assumptions and statements of the Theory of Reasoned Action indicate that a person's behaviour is determined by his/her intention to perform the behaviour and that this intention is, in turn, a function of his/her

attitude toward the behaviour and his/her subjective norm. The best predictor of behaviour is intention. Intention is the cognitive representation of a person's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour. This intention is determined by three things: their attitude toward the specific behaviour, their subjective norms and their perceived behavioural control.

The theory of planned behaviour holds that only specific attitudes toward the behaviour in question can be expected to predict that behaviour. In addition to measuring attitudes toward the behaviour, we also need to measure people's subjective norms – their beliefs about how people they care about will view the behaviour in question. To predict someone's intentions, knowing these beliefs can be as important as knowing the person's attitudes. Finally, perceived behavioural control influences intentions and refers to people's perceptions of their ability to perform a given behaviour. These predictors lead to intention. As a general rule, the more favourable the attitude and the subjective norm, and the greater the perceived control the stronger should the person's intention to perform the behaviour in question. Figure 2-1 represents a diagrammatic illustration of the Theory of Reasoned Action and Theory of Planned Behaviour.



Note: The upper grey section shows the Theory of Reasoned Action, while the entire figure shows the Theory of Planned Behavior

Figure 2-1: Conceptual Model of TRA and TPB (Adopted from Ajzen, 1985)

2.7.3 Relevance of the Theories to the Study

While a number of theories have been developed to predict and explain behaviour, the theories of reasoned action and planned behaviour were most applicable in conducting this study. These two theories, especially TPB, helped to examine how people’s perceptions and actions are determined by intentions of their behaviour hence the importance of these models in exploring and understanding ways to predict the households’ perceptions and outcomes. For instance, if a person perceives that the outcome from safe household disposal of unused medicines is beneficial and health promoting, then he or she will have a positive attitude towards safe disposal practices. The opposite can also be stated if the behaviour is thought to be negative.

As earlier mentioned, perceived behavioural control which is the third antecedent of behavioural intention also formed the basis in carrying out this study. PBC indicates that a person's motivation is influenced by how difficult the behaviours are perceived to be, as well as the perception of how successfully the individual can, or cannot, perform the activity. If a person holds strong control beliefs about the existence of factors that will facilitate behaviour, then the individual will have high perceived control over behaviour. In this case, the person will have a low perception of control if she holds strong control beliefs that impede the behaviour. For instance if an individual holds strong control beliefs and has high level of awareness with regard to safe disposal of unused medicines, then he or she will consequently have low perceived control. This perception can also reflect past experiences, anticipation of upcoming circumstances, and the attitudes of the influential norms that surround the individual. This construct also defines the individual's belief concerning how easy or difficult performing the behaviour will be.

Therefore these theories are of great importance while conducting the study as they provide a framework for analysing, understanding and interpreting the meanings people attach to their actions. They also helped in determining whether households know, perceive and understand the consequences of unsafe disposal practices. Other factors like people's education level, socio-economic status, age, household compositions and government policies amongst others were also considered.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This Chapter contains an exposition of the research design and research methodology employed for the study. Description of the research site, the choice of research style, strategy, and data-collection methods and procedures are accounted for in this chapter based on the theoretical frameworks highlighted in the previous chapter. The most important objectivity and trustworthiness considerations are also accounted for in this chapter. This chapter ends with the manner of data analysis.

3.2 Research Site

3.2.1 Location and Demographic Characteristics

The study was conducted in Nairobi City County. Nairobi being Kenya's capital, covers a total area of 692km² and comprises of 5 main administrative divisions; Westlands, Langata, Kasarani, Makadara and Embakasi. Over the past 50 years, the population of Nairobi has grown almost twelve-fold, from around 293,000 inhabitants in 1960 to about 3.4 million by 2010 (KNBS, 2011). According to the latest Kenya Bureau of Statistics data, Nairobi population currently stands at about four million people comprising of 1.5 million total population of men, 1.6 million of women and 30.3 % of children below the age of 15. Its population density stands at 4,509 per km² with a total of 985,016 households meaning every household in Nairobi has an average of four persons (KNBS, 2011). A majority (90%) of Nairobi households have improved access to water, electricity and sanitation and while the population with primary education was 50.3% and secondary education is 18.1% (CRA, 2010).

The study was conducted in South C area within Langata constituency of Nairobi City County (Figure 3-1). South C covers a total area of 12km² with a population of about 67,200 people and 1,244 households (KNBS, 2016). South C was considered in this study as it represents a strong family dominated residential set-up with well gated communities with a mix of informal settlements which is a representative Nairobi demographic character of the upper middle and lower class categories. The gated communities were to enable easy access during data collection while the middle class represented a population segment with good access to healthcare services and medicines. Households were selected as unit of analysis for this study. Household are viewed as a collection of individuals staying on a distinctive property and or premises who may/not be related to one another (Craig, 2002). The selection of the target population and the convenience sampling for this study is justified below.

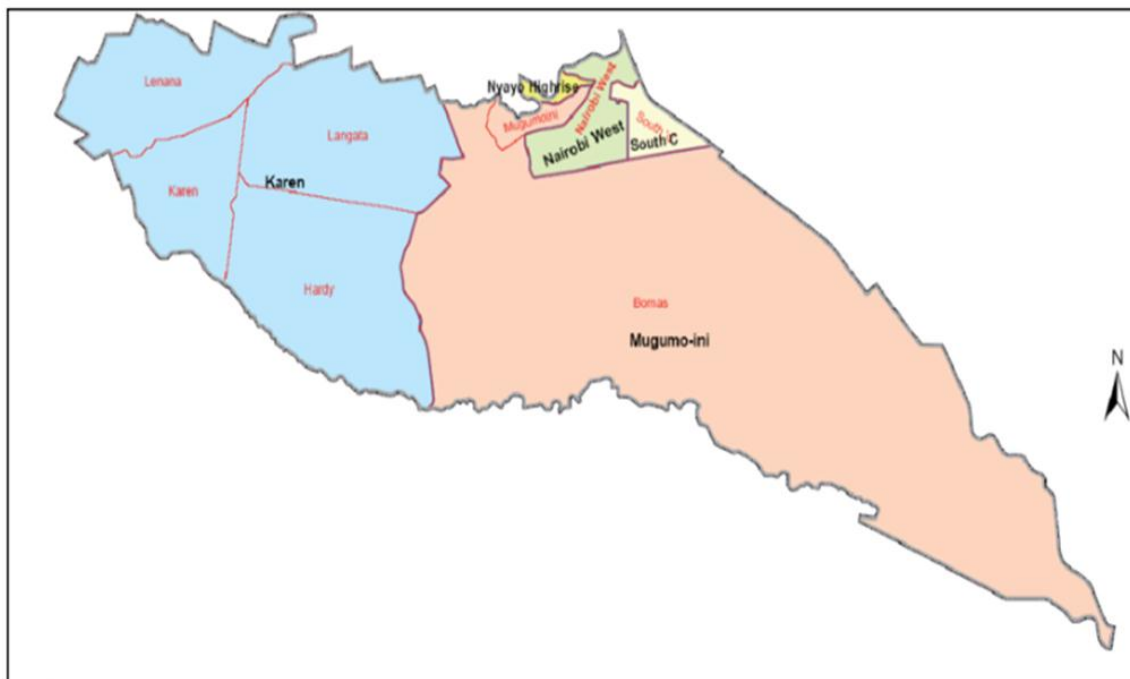


Figure 3-1: Location of South C in Langata Constituency

This rapid population growth, however, has not been matched with an equivalent provision of quality healthcare services which has resulted to poor health outcomes and declining livelihood status within households. One main problem is that the population growth rate is much higher than the possible economic development. Lack of job opportunities further

complicates the situation. Many people in the city are unable to get the scarce well-paying jobs and therefore resort to settling for employment in manufacturing industries and other casual jobs with very minimal wages which leads to major socioeconomic and health challenges (KNBS, 2011). Advances made against poverty and improvements in health indicators in the 1970s deteriorated from the mid-1980s with the growing population and worsening socio-economic and political environment. Poverty levels are very high, with 46.6% of the population living on less than one US dollar a day and the gross national income (GNI) per capita is just US \$680 (KNBS, 2011). According to WHO (2010), people's health is affected by different determinants such as income, employment, access to health services, basic education, water and sanitation, housing, gender, culture, lifestyles and other biological, social and economic factors.

3.2.2 Healthcare System in Nairobi

Nairobi's healthcare system may be analyzed on the basis of the healthcare infrastructure, the players and their roles, financing mechanisms and utilization. There are over 5,000 health facilities across Kenya which are operated by three owner systems, with the government running 41% of the facilities, non-governmental organizations (NGOs) 15%, and private businesses 43% (Harrington, 2014). The government owns most of the hospitals, health centres, and dispensaries, while clinics and nursing homes are entirely in the hands of the private sector. There are a total of 368 health facilities in Nairobi which comprises of Government of Kenya, NGO and Private facilities (BMI, 2017). However, these numbers have increased significantly hence a clear counterpart to the health utilization trends which have also improved considerably. The Kenya household health expenditure and utilization survey shows that the overall utilization of health services by people reporting being ill is 77.2%, with only 22.8% not seeking healthcare (Harrington, 2014). Further, utilization data

from Health Management Information System (HMIS) showed that Nairobi has the highest utilization rate (90.6%) of those seeking treatment in health care facilities. This trend is a clear indicator that household health expenditure is higher in Nairobi as compared to the rest of the areas in Kenya. With this, it becomes apparent that disposal of unused medicines presents a health concern which should be tackled and addressed adequately.

3.3 Research Design

This study utilized a cross-sectional research design that involved both quantitative and qualitative methods of data collection. In order to attain in-depth information to enable a better understanding of the phenomenon under investigation, the study design provided a plan and structure to obtain answers to the stated research questions or problems. Priority was given to a range of dimensions like the importance attached to expressing outcome of interest and understanding households' practices and perceptions with regard to disposal of unused medicines. With cross-sectional design, it was possible to examine characteristics associated with the various research variables; however this did not necessarily determine causal relationships. Both quantitative and qualitative data was collected through interviews: key informant interviews and semi-structured interviews.

Further, both inductive and deductive approaches were used. The formulations of the problem statement, objectives as well as the selection of suitable theoretical perspective or framework were planned, using a deductive approach. A deductive approach means that existing theory is used to plan and define the study (Mouton, 1996:76-77). An inductive approach was followed during the analysis of the data and the subsequent discussions. Household's responses regarding their perceptions and disposal practices of unused medicines were thus used to develop and build new interpretations and theory inductively. The focus of the study

was on rich descriptions of perceptions and experiences of the participants rather than to approach the participants with deductive derived research hypotheses (Babbie & Mouton, 2001:273).

3.3.1 Objectivity and Trustworthiness of the Study

Neuman (2000:125) holds that the opportunity for prejudice, dishonesty, and unethical research will always exist. According to Babbie and Mouton (2001:276) the central considerations regarding objectivity in the qualitative research process is trustworthiness. Trustworthiness refers to whether the instrument used for measuring can provide the same observations or results with different units of analysis under different circumstances (Neuman, 2000:125-126). Although it is not possible to control all the factors that can affect the objectivity and trustworthiness of the study, it is of utmost importance to marginalize these factors where possible (Trollip, 1991b:102). Strategies that were followed by the researcher to control and eliminate factors that could reduce the objectivity and trustworthiness of this study were member checks, triangulation, thick description, purposive sampling, prolonged engagement and recording of raw data.

3.3.2 Conceptualisation and Operationalization of the Study Objectives

Conceptualisation is the refinement and specification of abstract concepts used in a study (Babbie & Mouton, 2001:128). The central concepts contained in the research problem statement, objectives and schematic theoretical framework were conceptualised by using theoretical definitions. The central concepts as well as other relevant concepts that contribute to a better understanding and clarity of the problem to be studied is defined in chapters 1, 2 and 3 and incorporated with relevant theory.

Operationalization is according to Babbie and Mouton (2001:128) the development of specific research procedures that will result in empirical observations representing the defined concepts. According to Mouton (1996:66) the best way to operationalise is to list the operations or rules according to which the phenomenon under study will be determined. In this study the research question pertains to the perceptions and disposal practices of unused household medicines. The objectives formulated for the study were subsequently operationalised:

Objective 1: To determine households' knowledge on disposal practices of unused medicines.

To explore, describe and get a better understanding of the existing knowledge on disposal practice. Disposal practices are almost like production rules (Shoemaker, 1996:43). It also contains complex, sequenced steps, actions as well as typical procedures that households follow or use when they make disposal decision. It also explores the knowledge an individual has acquired through practical participation in certain activities and events. It also pertains to specific events that an individual has live through (Gouws *et. al*, 1984: 207). The way that households experience their disposal practices would relate to the typical activities they engaged in and how they think, feel and talk about them. Households' experiences in terms of knowledge on disposal practices manifest itself in their references regarding how they think, feel and talk about their existing disposal practices.

Objective 2: To determine households' perceptions on disposal practices of unused medicines

Households' perception result from the information (stimuli) they receive from the environment and their interpretation thereof. To form perceptions, the consumer first becomes aware of the disposal information available, such as recommendations by friends or advertisements, or their own experience of it. To make sense of the information, it is

processed in the brain and stored in the memory. This process of making sense from the information takes place against the background of household's socialisation. Households' perceptions on disposal practices manifest itself in the information they receive and their interpretation thereof and are formed from what they read, hear and experience.

Objective 3: To examine the different household disposal practices of unused medicines.

Households' adoption of different disposal practices manifests itself in their identification of positive aspects that they compare with and perceive as better than their existing disposal practices. Households' perception of the relative advantages involved in the adoption of a particular disposal practice when they refer to positive aspects about it as compared to existing aspects. It relates to aspects that are better such as safety, costs, time saving and performance (Hawkins et. al, 2001:251).

3.4 Sampling Population and Procedure

Given the logistical constraints, it was not possible to survey all the households in South C. As such sampling was done so as to draw a representative population. The sample population was obtained from and comprised of two distinctive groups of households. These were households within the formal settlement and informal settlement areas. The formal settlement comprised of households that are gated and organized into a residential estate while the informal settlement comprised of slums within South C. Given that the number of households in South C area was not easy to get, the sample size formula determination was used. The determination of the appropriate sample size for the study utilized a statistical formula that accounted for the Confidence Level (CL) and a Margin of Error (ME) and a Standard Deviation that was desired. The formula is presented below (Blalock, 1960):

$$\text{Sample Size} = ((Z\text{-Score})^2 * SD(1-SD)) / ME^2$$

The Z-Score values corresponding to specified CL are obtained from statistical tables. Assuming an 80% Confidence Level (with a Z-score of 1.28) and a +/-5% Margin of Error with a Standard Deviation (SD) of 0.5, using the below formulae:

$$\begin{aligned}\text{Sample Size} &= ((1.28)^2 * 0.5(1-0.5)) / 0.05^2 \\ &= (1.6384 * .25) / 0.0025 \\ &= 164\end{aligned}$$

The researcher decided to include a sampling framework of 164 households, because the scope of the study was to understand and describe the phenomenon rather than to find representative data. The unit of analysis was the household. Convenience sampling was used because of the availability of households and their willingness to participate in the study. The households were identified with the assistance of the estate chairpersons. The chairpersons assisted the researcher in gaining access and developing trust with the study population. The chairpersons and researcher had discussions about the estate households sampled for this study. Each chairperson thereafter got in contact with the families and asked them if they would be interested in participating in the study. When the household agreed, the chairpersons scheduled a visit with the households where the participants were informed about the theme and aim of the research as well as what their participation would involve a single interview of between 40 to 60 minutes. After the introduction, the participant's permission was asked and the first interview was arranged with each participant. A suitable date, time and place in accordance with each participant's schedule were arranged.

3.5 Data Collection Methods

The objective of the study (exploratory-descriptive), the nature of the research problem statement, and the resources available determines to a certain extent the data-collection methods to be used in a study (Morse in Schurink, 1998:253). Sellitz in Mouton and Marais (1991:43) emphasizes three methods of data collection applicable to exploratory research studies, such as the present study, namely, an overview of existing and relevant literature, the interviewing of persons with practical experience of the problem (interviewing of key informants) and the interviewing of households to explore on their perceptions and practices.

3.5.1 Interviewing

According to Miles and Huberman (1994) interviewing forms an integral part of a qualitative research style. Interviewing involves the face-to-face interaction between participant and researcher, with the main objective to get insight into the everyday world of participants, expressed in their own words (Schurink, 1998:299). For the researcher to understand the everyday world of the participant, the researcher needs to immerse him/herself in the participant's symbols, terminology, and constructs. This implies that data should be collected in the participant's own words and from his/her frame of reference (Schurink, 1998:260-261). Individual interviews were used as the primary data-collection method for the present study. These included unstructured, individual interviewing according to a schedule and semi-structured individual interviewing (key informant interviews).

3.5.1.1 Semi-Structured Individual Interviews

In general, semi-structured individual interviews contained pre-formulated questions, which were asked in a similar sequence to all the participants. This type of interviewing was followed during the interviews with the participants. The advantage of this type of interview was that data was collected systematically. This was especially helpful in the comparison of data between the participants. The disadvantage of this type of interviewing is that relative little information regarding the participants' everyday world (in-depth experience) can be collected (Schurink, 1998:299). The questionnaire (Appendix A) addressed the three main issues of demography, existence of unused medicines in homes and their disposal practices. Other information that was gathered included usage of the medicines in relation to the instructions for use on their label and degree of satisfaction with the drug information received. The knowledge people had regarding their medicines was also briefly examined.

3.5.1.2 Key Informant Interviews

Unstructured, individual interviewing according to a schedule takes place in a conversation format. The interviewer determines the direction of the discussion by using a general plan or schedule (Trollip, 1991b:76). The schedule provided only a guideline for the researcher and contained themes and open questions relevant to the research. Because questions were not asked in a specific order, an interview schedule ensured that all the relevant themes were covered during the interview (Schurink, 1998:299). It also helped to get the conversation going (Trollip, 1991b:76). The interview schedule as used was designed according to the objectives, the social-cognitive perspective and the diffusion of innovation theory of Rogers (1983; 1995). Unstructured, individual interviewing according to a schedule was used in the interviews held with the key informants.

The advantages of unstructured interviewing according to a schedule are that data is collected in a systematic manner while important and rich data are still collected. Unstructured interviewing provided the interviewer with the flexibility to immediately follow up themes mentioned by the participants (Trollip, 1991b:75). The interviewer suited herself to the situation and thus modified questions she could ask participants to clarify answers as required (Loudon & Della Bitta, 1993:617). Unstructured interviewing can be demanding on the researcher, which could be one of the main disadvantages of the technique. The interviewer's abilities and training in conducting interviews are at stake (Schurink, 1998:300).

3.5.2 Data Collection Procedure

Semi-structured interviews with each of the 164 participating households were adapted for this study. The interviews were conducted at the beginning of February 2016 and lasted between 40 and 60 minutes. The interviews were arranged by the estate caretaker. According to Babbie and Mouton (2001:292) interviews should be held in a relaxed atmosphere. In order to reduce the influence of possible context effects the researcher should be sensitive regarding the time during which and place where the interview will be conducted. Context effects refer to all the factors influencing the objectivity of the data in terms of the environment or time of the interview (Mouton & Marais, 1991:91). The researcher was especially sensitive regarding these factors because professional women are pressed for time and have hectic work schedules. To minimize the effect of the context, the participants were allowed to suggest a suitable venue and time for the interviews.

During the interview, rapport was established by informing the participants of the aim of the research, what was expected of them, the duration and scope of the interviews as well as to the extent that the information provided by them would be kept confidential. Participants

were assured that the information received from them would be used in such a way that their anonymity would be respected. They were also assured that there are no right or wrong answers. The fact that the researcher is also a professional woman, allowed the participants to relate to her and fostered trust.

The participants were encouraged to talk freely. Although the discussions sometimes went off track, allowance was made for the ease of the conversation and the schedule ensured that all the themes were covered. Because the researcher could not keep notes of all the aspects and opinions, which came up during the interview, the interview was tape-recorded to preserve the original data. Field notes were made after each interview to supplement the interview. It was checked with the participants whether they found the tape-recorder intrusive, but this was not the case. All the interviews were supplemented by field notes.

Key informants from one randomly selected pharmacy across the city, one government hospital, one private hospital, and one pharmaceutical company, as well as the Pharmacy and Poisons Board (PPB) and Kenya Medical Supplies Agency (KEMSA) representative were identified and interviewed. The key informants interviewed included:

1. One Pharmaceutical Technologist with the Pharmacy and Poisons Board of Kenya.
2. Two Supply Chain Officers with the Kenya Medical Supplies Agency
3. Two Pharmaceutical Officers with Dawa Limited
4. One Pharmacist with KAM Pharmacy
5. One Medical Doctor and One Pharmacist from Mater Hospital
6. Two medical Doctors from Kenyatta National Hospital

3.6 Data Processing and Analysis

Data processing was done immediately after the interviews. Questionnaire recordings were checked for accuracy. Questionnaire recordings contribute to the reliability of the data, because it allows for the confirmation of the data. The study leaders were responsible for the auditing of the data. The audit comprised of the reviewing of the raw data from the questionnaire to ensure the recordings were accurately done and were complete,, coding of the data and categorising of data into the main themes of research to facilitate analysis process.

The researcher took field notes which not only served as a means to capture data but also served as a means to enhance trustworthiness of the research. Babbie and Mouton (2001:275) suggested that these field notes be studied on a regular basis to develop the study in a way of an emergent design. Only methodological notes (regarding the methods, processes, interpretations and deductions) were made to help the researcher in describing the adoption process during the drawing of conclusions. Hard copies of the corrected, transcribed interviews were used to gain understanding. The objectivity and trustworthiness of the data was further enhanced through member checks to verify the accuracy and interpretations of what they said (Babbie & Mouton, 2001:276). The data-analysis process suggested by Miles and Huberman (1994:10) was followed in this study. It consists of three phases, namely the data-reduction phase, the data-display phase and the drawing of conclusions and verification of data phase.

The presentation and discussion of the findings were done according to the objectives and themes formulated for the study. The researcher then attempted to synthesize the data in new ways. Identifying the concepts, themes and ideas, which were the same or differed for the

various participants and disclosed patterns. The collected data through the open ended questions in both the semi-structured and key informant interviews were analysed qualitatively through content analysis. The aim of this process was to assemble or reconstruct the data in a meaningful and comprehensible fashion (Jorgensen, 1989). The categorizing was typically based on the major research questions of the study. For the key informant interviews, the process of data analysis involved comparing and contrasting the information received from informants by categorising common themes among the informants such as similar stories about their experiences, as well as identification of differences. Additionally, a list of issues/themes by category or type of interviewee that emerged was summarized.

3.7 Data Management Plan

The responsible conduct of research included the proper management and retention of research data. A data management plan comprises of the standards used to describe the data, data ownership, data access, preservation and dissemination of data. It also outlines the ethical protocols, privacy or confidentiality and quality assurance matters that governed the data collection process. Finally, it also describes the roles and responsibilities of key individuals involved and the costs associated with data collection process. The data management plan employed for the study is provided in **Appendix E**.

3.8 Ethical Considerations

Confidentiality, anonymity and informed consent were key ethical concerns that were considered during this study. The researcher first of all obtained an introductory letter from the University of Nairobi to facilitate access into the key informants' premises and households. Ethical clearance and a permit were also sought from Kenyatta National Hospital (KNH)/University of Nairobi (UoN) Ethical Review Committee and the National

Commission of Science, Technology and Innovation (NACOSTI) respectively. During the data collection process, participants were informed of the purpose of the study and assured of confidentiality and anonymity. Every effort was made to inform participants in a manner that would encourage free choice of participation without any physical or psychological coercion. All personal data was secured, concealed and made public behind a shield of anonymity. During this study, all reasonable steps to maintain the confidentiality of participants were taken. This was ensured by conducting the interviews under closed doors within every household and information obtained from the interviews was also not directly attributed to any particular individual. Assuring confidentiality made the informants feel more comfortable in sharing information that might have been controversial or of a personal nature. The research findings will be disseminated through thesis that will be submitted and archived at the University of Nairobi Library for further references and through publications. A paper entitled “Household Knowledge and Perceptions of Unused Medicines in Kenya” has already been published in the Journal of Anthropology and Archaeology Volume 4 (2), (pages 1-20) December 2016.

3.9 Conclusion

The research design, which is basically the plan according to which the research was executed, was discussed in this chapter. The selection of the target population and sampling frame, data-collection methods and procedures, as well as the data analysis was also accounted for. The strategies followed to enhance the objectivity and trustworthiness of the study was discussed and elucidated where applied by the researcher. The display of the data was organised according to the research objectives in such a way that it allows for the drawing of conclusions. The data analysis and discussion of findings are provided in the proceeding Chapters.

CHAPTER 4: PERCEPTIONS AND PRACTICES ON DISPOSAL PATTERNS ON UNUSED MEDICINES

4.1: Introduction

This Chapter provides a detailed analysis of the data collected from the survey and is divided into two sections. The first section presents the demographic profile of respondents of the study population in relation to the study's main objective. In the second section, findings are presented in alignment with the three specific research objectives, which focused on households' knowledge, perceptions and disposal practices of unused medicines.

This chapter has an exposition of the data analysis and discussion of the findings. The findings are presented according to the objectives and formulated for the study. The data collected were systematically constituted and organised according to the objectives. Firstly, data were coded to identify relevant categories and subcategories. Some of the categories were already predetermined from relevant theory while various new categories and sub-categories were identified through coding. Secondly, certain themes, relationships and patterns were identified through these categories and sub-categories. These themes, relationships and patterns were described in the discussions. Lastly, the discussions were verified by using relevant or applicable verbatim responses from the participants.

4.2 Demographic Profile of Respondents

A total of 164 survey questionnaires were completed. The geographical distribution of the sampled households within each residential estate of the study area and the key informants is presented in Table4-1 while Table 4-2 displays the demographic information of the respondents and key informants.

Table 4-1: Surveyed Study Area Households and Key Informants

Estate	Number (N)		Percentage (%)
Rangers	16		9.75
Akila III	16		9.75
Liban	10		6.10
Mugoya	10		6.10
Amana	10		6.10
Leeks	10		6.10
Mtumba	44		26.83
KPA	38		23.17
Key Informants	Institution	Number	Interviewee/Role
	Pharmacy and Poisons Board	1	Pharmaceutical Technologist
	Kenya Medical Supplies Agency	2	Supply Chain Officer
	Dawa Limited	2	Pharmaceutical Officer
	KAM Pharmacy	1	Pharmacist
	Mater Hospital	2	Medical Doctor and Pharmacist
	Kenyatta National Hospital	2	Medical Doctor

(Source: Compiled by Author)

Table 4-2: Demographic Profile of Respondents

Group	Attribute	Number	Percentage
Gender	Male	28	17
	Female	136	83
Age	20 and under	20	12
	21 - 30	35	21
	31 - 40	59	36
	Above 40	50	30
Marital Status	Married	142	87
	Unmarried	22	13
Children	With children	138	84
	Without children	12	7
Number of Children	1	26	16
	2	37	23
	3	55	34
	4	20	12
	Above 4	8	5
Children below 18yrs	1	28	17
	2	58	35
	3	37	23
	4	16	10
	Above 4	7	4
Education Level	Did not attend	0	0
	Primary	34	21
	Secondary	83	51
	Tertiary	47	29
Occupation	Unemployed	50	30
	Employed	37	23
	Self-employed	43	26
	Unskilled	34	21

(Source: Compiled by Author)

It is noted that a significant number of respondents were female which can be attributed to the fact that many female were available at homes during the survey timing (5.30PM to 7.30PM) and even where both the male and female were available, the female were more willing to participate in the interview than their male counterparts. A considerable number of respondents were above 30 years of age and were married with children, though the number of children varied with a majority having 2 or more children. A significant number of respondents (80%) had attained either secondary or tertiary education with 49% either employed or self-employed. All the respondents indicated that they had children below 18 years of age – which was therefore ideal for the study considering the vulnerability of children to medicines.

4.3 Knowledge on Safe Disposal Practices of Unused Medicines

The survey revealed that knowledge on safe disposal practices of unused medicines is lacking amongst a majority of respondents irrespective of their education level and profession. As presented in Figure 4-1, 96% of the respondents did indicate that they do not receive information related to safe disposal practices of unused medicines. Similarly, an almost equivalent number of respondents (93%) did not also read and follow disposal of unused medicines disposal instructions.

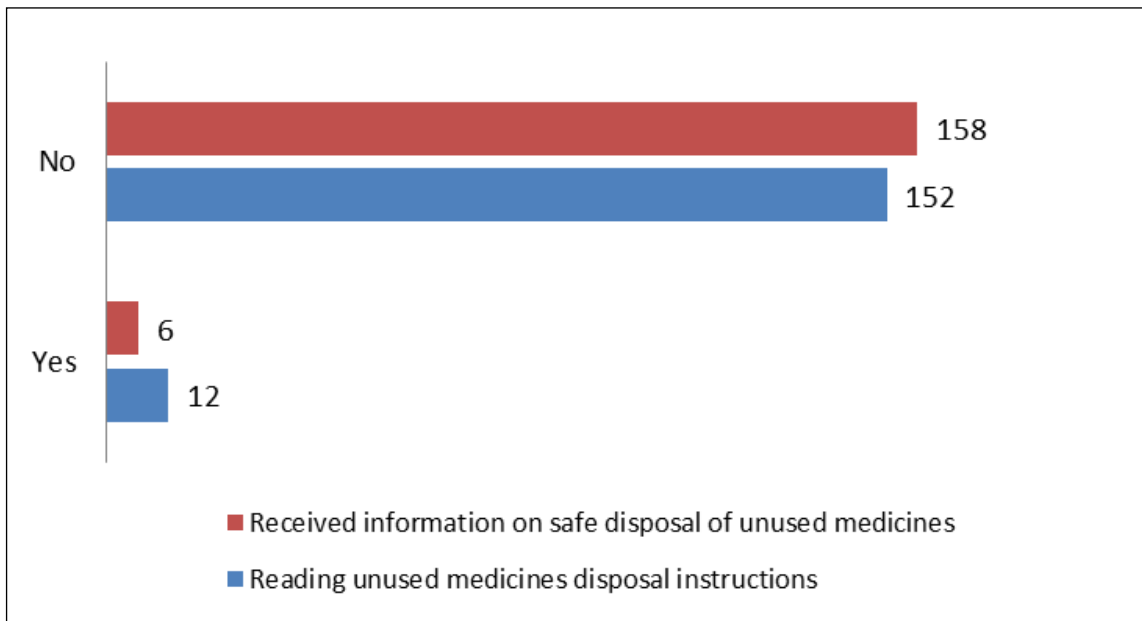


Figure 4-1: Knowledge on Safe Disposal Practices of Unused Medicines

(Source: Compiled by Author)

When questioned on where appropriate information related to disposal of unused medicines should be obtained, the results as presented in Table 4-4 shows that a majority of respondents preferred to obtain such information from hospitals and pharmacies, while some were in favour of NGO's and community groups. It was also evident that the respondents were willing to safely dispose unused medicines if programs like community outreach programs and take back programs were put in place and easily accessible.

Table 4-3: Sources of Unsafe Disposal Practices Information

Source of disposal information	Score	%
Hospitals	57	34.76
Pharmacies	49	29.88
NGO	29	17.68
Community groups	21	12.80
Others (schools)	8	4.88
Total	164	100

(Source: Compiled by Author)

Lack of education and awareness on safe disposal practices of unused medicines (51.2%) and economic reasons (39.6%) featured as the main contributory factors to the persistence of unsafe disposal practices of unused medicines amongst respondents. Further, key informants also indicated that their individual institutions have not been able to provide valuable education and awareness on safe disposal of unused medicines. This is illustrated in the following excerpts;

“There is a general lack of education and awareness creation systems within Kenya Medical Suppliers Association to sensitize citizens on safe disposal practices of unused medicines and that we will only be able to address the issue of unsafe disposal practices of unused medicines if community outreach programs were in place and all medical practitioners in their own capacities begin to educate households on safe disposal practices”.

Male pharmacist: KEMSA.

“We have not been able to fulfil our fundamental objective of creating awareness of disposal of unused medicines in Kenya as we do it developed world”.

Female medical representative: DAWA pharmaceutical company.

“As medical practitioners and hospitals in general, we do not go beyond the practice of providing healthcare services and advise our patients on how to safely dispose their unused medicines at home”.

Medical doctor: Kenyatta National Hospital.

All the key informants indicated that whereas unused medicines present significant public health and safety concern, the subject has received little attention both at community and national levels and therefore presented a risk. This was confirmed by the following excerpt:

“Lack of unused medicines disposal programs do present health and safety concerns within communities. The government should therefore ensure that adequate legislative and regulatory framework for safe disposal practices are put in place to address the issue”.

Male pharmaceutical technologist: Pharmacy and Poisons Board (PPB).

A lack of adequate labelling of medical packages with legible disposal instructions was also confirmed to contribute to unsafe disposal practices as highlighted in the following excerpt:

“Pharmaceutical companies should uphold high standards of corporate and social responsibility in ensuring that they also engage the public in sensitizing the need for safe disposal of medicines”.

Female pharmacist: KAM pharmacy.

Introducing the subject (disposal practices of unused medicines) as part of the curriculum as early as primary schools levels can ensure that kids grow up knowing the dangers of unwanted medicines and advantages of safe disposal of unused medicines. There emerged a common theme amongst the key informants that hospitals and pharmacies should play a key role in not only dispensing the right medicines to patients but also providing guidance on safe disposal of unused medicines; and the media should play a critical role in disseminating information related to safe disposal practices of unused medicines.

As provided in Table 4-4, it was also evident that 80.49% of the respondents were willing to safely dispose unused medicines if programs like community outreach and awareness programs were in place. 93.90% of the respondents were also in favour of safe disposal programs such as take back programs as one of unsafe disposal practices risk reduction measures, while 35.98% of the respondents were of the opinion that hospitals and pharmacies should voluntarily provide safe disposal practices information.

Table 4-4: Corrective Actions of Minimizing Risks of Unsafe Disposal Practices

What can be done to minimize risks	Number	% of Respondents
Community outreach to create awareness	132	80.49
Safe disposal programs	154	93.90
Free medicines	78	47.56
Hospitals and pharmacies should provide proper advise	59	35.98

(Source: Compiled by Author)

All the key informants indicated that whereas unused medicines present significant public health and safety issue, the subject has received little attention both at community and

national levels. There also emerged a common belief amongst them that there is inadequate legislative and regulatory framework to address the issue. Further, all the key informants indicated that each of their individual institutions have not been able to provide valuable education on safe disposal practices of unused medicines. This finding was reflected in the following excerpt:

“Safe disposal programs of unused medicines do not only enhance safety within communities, but are also platforms for examining the causes of medication waste”.

Male medical doctor: Kenyatta National Hospital.

The role of the media was highlighted as critical in disseminating information related to safe disposal practices. The key informants were also of the opinion that hospitals and pharmacies should play a key role in not only dispensing the right medicines to patients but also providing guidance on disposal of unused medicines. Additionally, labelling of medical packages with legible disposal instructions was also found inadequate. It was also deemed necessary that pharmaceutical companies uphold high standards of corporate and social responsibility in ensuring that they also engage the public in sensitizing the need for safe disposal of medicines. This was expressed in the following excerpt:

“Approaches to creating awareness should include introducing this subject as part of the curriculum as early as in primary schools to ensure that kids grow up knowing the dangers of unwanted medicines and advantages of safe disposal of unused medicines”. He further reiterated that *“the government should also ensure that legislations and regulatory frameworks for safe disposal practices are in place”.*

Male pharmaceutical officer: Dawa Limited.

4.4 Perceptions on Disposal Practices of Unused Medicines

Regarding household perceptions on unused medicines, the results as presented in Table 4-5 revealed that a majority (31.71%) of respondents “strongly agreed” regarding the extent to which they believe that unused medicines present potential risks and or negative consequences at home. Further 32.32% of the respondents also “strongly agreed” that children are more at danger with unused medicines while 89.02% of the respondents also “strongly agreed” that lack of adequate information on safe disposal practices are a precursor to the risks and negative consequences of unused medicines. None of the respondents “strongly agreed” that there is adequate advice by doctors and healthcare professional on safe disposal practices with only 29.88% strongly agreeing that mandatory take back programs as a disposal practice can help in addressing the potential risks and dangers associated with keeping unused medicines at home. This was also echoed in the following excerpt:

“The healthcare professionals are not doing enough justice to the general public when they ignore that medical life cycle not only begins with dispensing but also at the disposal stage”.

Male medical doctor: Kenyatta National Hospital.

Contrarily, 21.34% of the respondents “strongly disagreed” that unused medicines present potential risks at home with a further 19.51% and 31.10% “strongly disagreeing” that children are more vulnerable to the risks of unused medicines and that mandatory take back programs as a disposal practice should be initiated, respectively.

With regards to take back programs, the respondents gave varied opinions where 31.10% strongly disagreed that the programs should be mandatory while an almost similar proportion

(29.88%) strongly agreed that the programs should be mandatory. However, the respondents' inclination towards accepting mandatory take-back programs (56.94%) was higher than those were not in favour (41.47%) whereas only 3.05% remained neutral.

Table 4-5: Household Perceptions on Unused Medicines

Perception of Respondents	Percentage of Respondents				
	SD	D	N	A	SA
Unused medicines present potential risks at home	21.34	17.68	0.61	28.66	31.71
Children are more vulnerable	19.51	9.76	3.66	32.93	32.32
Lack of adequate information on safe disposal	0.00	0.00	0.61	10.37	89.02
Advise by doctors and healthcare professionals	93.90	4.88	1.22	0.00	0.00
Mandatory take back programs of unused medicines	31.10	10.37	3.05	25.61	29.88

SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree, SA-Strongly Agree

(Source: Compiled by Author)

Participants also gave mixed responses as shown in Table 4-6 regarding their perceptions on what they would consider as safe disposal practice of unused medicines. The most preferred disposal practice was throwing in garbage bins (28.66%) followed by flushing in the toilets at 25.00%. Some respondents (17.68%) would dispose of them in special garbage bins while 14.02% and 9.76% of the respondents respectively indicated that they would bury and burn them. Only 4.88% of the respondents perceived that returning unused medicines to the hospitals or pharmacies would be the best option.

The dangers of keeping unused and expired medicines were also highlighted by key informants. Keeping expired medicines at homes presents serious health risks. This was asserted in the following excerpt:

“Expired medications can even be dangerous, their chemical composition can change and, over time, expired drugs may become less effective or potentially harmful”. He further mentioned that “getting rid of old, unused medications can also help ensure children don't accidentally get their hands on them and that having fewer medications at home can also help prevent mix-up”.

Female pharmacist: KAM pharmaceuticals.

It was also observed that age is a key determinant factor with regards to the degree of risks that unused medicines pose when kept at home. This was echoed in the following excerpt:

“Older people who may be easily confused could take the wrong medication because the unwanted or expired medication wasn't disposed of and that having old prescriptions in the house also makes people a target for those looking to steal drugs”.

Male medical doctor: Mater Hospital.

Table 4-6: Perceptions on Safe Disposal Practices

Preferred Disposal Practices	Number	%
Flush in toilet	41	25.00
Throw in garbage bins	47	28.66
Take back programs	8	4.88
Burn	16	9.76
Bury	23	14.02
Special garbage bins	29	17.68

(Source: Compiled by Author)

While take back programs was the least favoured, the survey participants gave an almost evenly divided opinion with regards to its preference. Of those in favour, all supported the take back program citing safety and health risks associated with unused medicines while 69.79% cited risks associated with water pollution. On the contrary, the respondents who were not in favour of the take back program cited reasons associated with medicines being expensive and no need to dispose if they can help when in need (83.82%), while 35.29% of the respondents had a reservation of the potential of unused medicines being resold and 23.53% were of the opinion that special bins would expose street boys to the dangers associated with unused medicines. There were respondents (14.63%) who had reservations about people getting to know what ailments they had when they take back unused medicines. The survey further confirmed that the main obstacles to safe disposal practices of unused medicines are related to the absence of programs (34.15%) and lack of awareness of the dangers of unused medicines (29.27%). Economic factors (23.78%) such as lack of adequate funds to buy medicines, lack of medical insurance cover and inadequate interest from medical

practitioners to offer guidance (12.80%) also featured as hindrances to safe disposal practices of unused medicines. Indeed, this was confirmed in the following excerpt:

“Some patients go as far as taking back medicines in exchange of money”.

Female pharmacist: KAM pharmacy.

Table 4-7, presents respondents opinions towards their expectations with regards to safe disposal practices of unused medicines. Notably, most of their expectations were related to factors that they thought hinder and what they consider should be appropriate measures to ensure compliance with safe disposal programs. About 43.90% of the respondents believed that the subject has not been accorded much attention with 32.93% of the respondents considering it as a community health problem that should be taken seriously with only a few of the respondents (20.73%) considering it an issue to be left to the healthcare professionals only. A majority of respondents (76.83%) believed that outreach and awareness programs should be initiated to sensitize people on safe disposal practices and on the dangers of unused medicines in addition to the take back programs (54.27%). Further, 34.76% of the respondents consider economic status of individuals as a factor that may hinder willingness to dispose of unused medicines.

Table 4-7: Expectations on Safe Disposal of Unused Medicines

Expectations on safe disposal of unused medicines	Number	%
It's a community health problem and should be taken seriously	54	32.93
It has not been considered as a real issue	72	43.90
Take back programs should be initiated	89	54.27
Healthcare professional should be at the forefront	34	20.73
Outreach and awareness programs should be initiated	126	76.83
Economics can hinder any initiatives for safe disposal	57	34.76

(Source: Compiled by Author)

The key informants also supported that disposal of unused medicines is a community issue that should be taken seriously and efforts to initiate programs for safe disposal should be considered as stated in the following excerpts:

“It is not ethical to ignore the risks associated with household unused medicines”.

Male doctor: Kenyatta National Hospital

“Irrespective of the economic status of individuals, there needs to be common and safe disposal practices of unused medicines. We have lagged behind as a nation to realize that unused medicines present both health and safety risks and there is dire need to come up with policy and regulatory frameworks to address the issue”.

Male officer: Kenya Medical Supplies Agency (KEMSA)

As presented in Table 4-8, the respondents were of the opinion that the government (39.02%) should be at the forefront in taking responsibility in ensuring that individuals are made aware of the dangers of unused medicines and safe disposal practices are in place. 28.05% of respondents believed that the buck lies with the hospitals while 20.73% of the respondents were of the opinion that being a community health issue, individuals should equally take responsibility. Only 12.20% of the respondents believed that pharmacies should take the responsibility.

Table 4-8: Stakeholders Responsibility

Stakeholders Responsibilities	Number	%
Households	34	20.73
Hospitals	46	28.05
Pharmacies	20	12.20
Government	64	39.02

(Source: Compiled by Author)

Some of the identified barriers to safe disposal practices of unused medicines were those related to lack of adequate information on safe disposal practices, inadequate government efforts and a lack of regulations and policies. The key stakeholders such as hospitals and pharmacies and even pharmaceutical companies have also not shown interest. Minimal media coverage on the issue was also cited as a barrier. Economic conditions were also highlighted as a barrier as well as the mushrooming over the counter outlets, lots of natural and vitamins available which allow people to hoard medicines at their homes. The perception that unused medicines are poisonous and could be accidentally used by children significantly influenced the respondents' decision to dispose of them safely. The study did not identify much on the cultural factors that influenced households' disposal decisions and disposal practices.

4.5 Disposal Practices

As shown in Table 4-9, 53.05% of the respondents indicated that they do not dispose of unused medicines and just keep them at home and 19.51% share with others while none of the households return unused medicines to the hospitals or pharmacies. For the households who dispose of their unused medicines (27.44%), the predominant disposal practice was throwing in garbage bins (12.80%) while 7.32% of the respondents flush unused medicines in toilets and 7.32% of the respondents dispose in kitchen and hand wash sinks.

Table 4-9: Disposal Practices

Disposal Practices	Number	%
Flush in toilet	12	7.32
Throw in garbage bin	21	12.80
Return to pharmacies or hospitals	0	0.00
Dispose in the sinks	12	7.32
Don't dispose	87	53.05
Others (donate/share)	32	19.51

(Source: Compiled by Author)

As to whether respondents dispose unused medicines, the survey revealed that (Table 4-10) a significant number of respondents do keep them at home while only 15.24% dispose their unused medicines. However, when questioned for how long unused medicines past expiry date are kept, 35.97% stated that they keep them for less than 3 months while 12.23% keep them for more than 1 year. Further, 17.27% and 15.11% of the respondents respectively keep expired unused medicines for between 3-6 months and 6-9 months with only 19.42% keeping them between 9-12 months.

The practice of flushing certain medicines because of concerns about trace levels of drug residues found in surface water, such as rivers and lakes, and in some community drinking water supplies was captured. This was suggested in the following excerpt:

“If no disposal instructions are given on the prescription drug labelling and no take-back program is available in your area, throw the drugs in the household trash but do not flush into sinks as that would potentially result into environmental impacts”.

Male Pharmacist: KAM

Medicines that are flushed or poured down the drain can end up polluting our waters, impacting aquatic species, and contaminating our food and water supplies. This was emphasized in the following excerpt:

“Throwing unused medicines in the trash is better than flushing, but it does not adequately protect people and our environment from exposure to potentially dangerous drugs”.

Male officer: Kenya Medical Supplies Agency

Table 4-10: Disposal of Unused Expired Medicines

Disposal of Unused Expired Medicines	Number	%
Yes	12	15.24
No	21	84.76

(Source: Compiled by Author)

As shown in Figure 4-2, the study revealed that respondents keep unused medicines at varied location with the dining wall unit dominating at 30% followed by bedroom cabinets at 20%, suitcases at 16% and bathroom closets at 11%. Other preferred locations (23%) included kitchen cabinets (11%), handbags (6%) and dressing closet (6%).

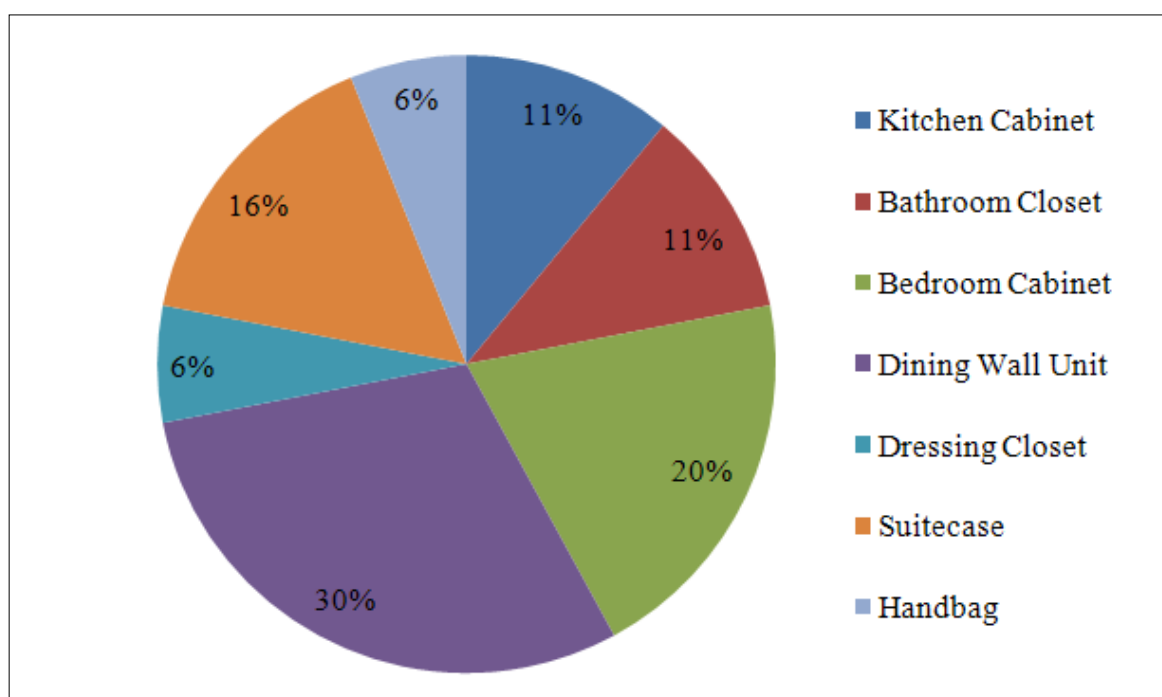


Figure 4-2: Household Unused Medicines Storage Locations

(Source: Compiled by Author)

When the households were asked if they would dispose of unused medicines if drop off locations were provided, a majority (73.78%) were in concurrence with only 26.22% declining citing economic reasons (90.57%), fear of being resold (69.81%) and fear of falling

into wrong hands such as those of street boys (41.51%). The study found a number of factors that influence the disposal decisions of unused medicines. As presented in Table 4-11, it is worth noting that these factors fell into two broad categories, i.e. the obligators (factors that can persuade individuals to dispose unused medicines) and inhibitors (factors that may prevent them from disposing unused medicines). In order to control hoarding of medicines in households, all the key informants concurred that the healthcare system should encourage ethical practices that prohibit citizens from accessing over the counter medicines without prescriptions from a medical practitioners. This was asserted in the following excerpt:

“Unused medicines returned to the sources to eliminate chances of being kept at homes”.

Male medical doctor: Mater Hospital.

Table 4-11: Factors Influencing Disposal of Unused Medicines

Factors that influence disposal decisions	Score	%	Category
Poisonous	66	40.24	Obligators
Wrongful used by children	52	31.71	Obligators
Side effects	36	21.95	Obligators
Cultural	10	6.10	Obligators
Economic (no money to buy when need arises)	128	78.05	Inhibitors
Lack of programs	36	21.95	Inhibitors

(Source: Compiled by Author)

Of the inhibitors, 78.05% of the respondents argued that economic factors (such as lack of money to buy medicines) when need arises influences their decision while 21.99% indicated lack of disposal programs and awareness as the main influencing factors. On the contrary, of the obligating factors, 40.24% of the respondents indicated that the fear of unused medicines being poisonous can influence their decisions to dispose of them, followed by wrongful use by children (31.71%) and potential side effects (21.95%). On the other hand, 6.10% of the respondents also indicated cultural factors (such as using unused medicines that were meant for treatment of particular ailments) as a taboo and could lead to one contracting the same disease and thus the need to dispose them.

Table 4-12 summarizes the factors that influence respondent's decisions towards keeping unused medicines at home. The most prominent factor was related to knowingly keeping unused medicines with an intention to share with other family members in case of need. The respondents did indicate that once they get better, they stop the dosage and keep the rest. A sizeable percentage of respondents (54.27% and 47.56%) respectively keep the unused medicines once they finish the dosage or are actually not sure on how to dispose of the unused medicines. There is a group of respondents (51.83%) who just buy medicines and keep at home just in case they fall sick while side effects (42.07%) also featured as a prominent factor. Other factors with varied degree of influences included the following: difficulty to follow instructions or unclear disposal instructions, some did not want to use them, change of prescription, traveling, while some of the respondents stated that they keep unused medicines donated to them by NGO's and CBO's. This was emphasized in the following excerpts:

“It should be mandatory that medicines should be well labelled with proper storage and disposal instructions to deter households from unsafe disposal practices”.

Male pharmacist: KAM pharmacy.

“While the role of NGO’s was applauded for providing medicines to the economically disadvantaged, they were challenged to go beyond this duty and sensitize their beneficiaries on safe disposal practices of unused medicines and even collection of unused medicines”.

Male medical doctor: Kenyatta Hospital.

Some respondents were also against disposing unused medicines in garbage as was highlighted in the following excerpt:

“Throwing medicines in the garbage is not safe – especially for controlled substances like narcotics and other highly addictive and dangerous drugs – because the drugs can be found and used by others”.

Pharmacist: DAWA limited.

Sharing of unused medicines was also observed as a dangerous practice amongst households.

This is confirmed by the following excerpt:

“Individuals should not give your medicine to friends as doctors prescribe medicines based on a person’s specific symptoms and medical history. A medicine that works for you could be dangerous for someone else”.

Medical doctor: Mater Hospital

Table 4-12: Factors Influencing Keeping Unused Medicines at Home

Factors for keeping unused medicines	Score	%
Give to family members and neighbours when sick	126	76.83
Finished the dose and remained	89	54.27
Side effects made me stop	69	42.07
Change of prescription	62	37.80
Bought and kept just in case	85	51.83
I became better and stopped	103	62.80
Donated by NGO	28	17.07
I travelled and forgot	21	12.80
Passed expiry date	67	40.85
Did not want to use them	54	32.93
Not sure how to dispose them	78	47.56
Difficulty to follow instructions	52	31.71
Labels had unclear instructions	48	29.27

(Source: Compiled by Author)

The key informants concurred that creating awareness on safe disposal practices is important in ensuring that the public has an easy method of safely disposing of unwanted medicines.

This was emphasized in the following excerpt:

“To reduce the volume of stored unwanted medicines in people’s homes, appropriate disposal methods should be provided to reduce the risk of accidental poisonings in the home and diversion of medicines to other people not authorized to possess them”.

Female medical doctor from Mater Hospital.

A number of safe disposal practices that were proposed by key informants included; distributing special disposal kits, community collection events, pharmacies/hospitals take back programs and collection points. Key informants were of the view that there should be a corporate policy compelling pharmaceutical companies to be directly involved in unused medicines disposal programs. This was confirmed in the following excerpts:

“Not only do we advocate for safe disposal practices in Kenya, it is our responsibility as it our policy elsewhere”.

Medical representative: DAWA pharmaceutical company.

“There should be policies on unused medicines collection, handling, disposal and destruction”.

Female pharmacist: KAM

The need for a collaborative approach and involvement of many different agencies and a shared responsibility was highlighted by key informants as highlighted in the following excerpts:

“Coordination and communication between local efforts is crucial to ensure that lessons learned are shared, and to foster a sense of community outreach among programs scattered across the country”.

Male doctor: Kenyatta National Hospital

“Doctors who recommend changes of prescription should demand that the initial prescription be returned and discarded in hospital bins to avoid chances of being donated to other, and that the government should introduce and take advantage of community drug take-back programs that allow the public to bring unused drugs to a central location for proper disposal”.

Male medical doctor: Mater Hospital.

Proper education and awareness to the community on safe disposal practices was suggested in order to orient households on proper and standard disposal practices. This was confirmed in the following excerpt:

“It is important to increase awareness and undertake training interventions among the public by the county and national governments, pharmacists, and pharmaceutical industries, and should be on the forefront in guiding and providing proper education and awareness to the community on safe disposal practices”.

Male medical doctor: Kenyatta National Hospital.

Despite the suggested alternatives disposal practices, diverse opinions on safe disposal practices by the key informants emerged as pointed in the following excerpts:

“The proper and best option for the safe disposal of pharmaceutical waste is incineration which requires third party intervention for the collection of unwanted medicines. In addition, the establishment of a national policy and a legal framework, training of personnel, is essential in successful pharmaceutical waste management”.

Pharmacist: KAM

“Pharmacists are in an excellent position to educate patients on medicine disposal, therefore leveraging their knowledge through training programs and continuous education is of importance”.

Pharmacist: DAWA

“Bias in medicine disposal practices has been observed due to lack of proper awareness; therefore, there is a pressing need for raising public awareness on proper disposal of unused and expired pharmaceuticals at home and hospitals”.

Medical doctor: Mater Hospital

CHAPTER 5: DISCUSSION AND CONCLUSIONS

5.1 Introduction

This Chapter discusses the study findings against other similar studies elsewhere and provides conclusions derived from the study. Relevant recommendations regarding disposal practices of unused medicines and the need for further research are also provided.

5.2 Knowledge on Disposal Practices of Unused Medicines

Studies on household disposal practices of unused medicines supplemented by investigations that try to explore the reasons for keeping unused medicines at homes in many countries around the world are available (Tong *et al.*, 2011). Whereas this study compares well with other studies elsewhere, it provides evidence regarding household knowledge on disposal practices of unused medicines to an under-researched area in Kenya.

5.2.1 Inadequate Awareness Creation

The study respondents reported that they were not satisfied with the level of information received regarding disposal of unused medicines. Further, the study found that irrespective of the respondents' education level and profession, a massive percentage of respondents did not read and follow disposal instructions of unused medicines. A factor that may contribute to the lack of information reaching the general public is a lack of consensus on the optimal approach to the disposal of unused medications (Cook *et al.*, 2012), which may be driven by environmental considerations, human health risks, costs or practical considerations. In a study by (Tong *et al.* 2011), there was a diversity of answers; some people considered that the type of medication may influence the disposal practices, and that some medications should have special disposal methods. Some individuals stated that they dissolve or mix medications into the trash, so it is not picked up for non-medical uses. In another study by (Glassmeyer, *et al.*,

2009), the researchers asked the respondents to show their opinion for each of these four disposal practices (flushing in toilet, throwing in garbage bins, burying and burning) with respect to their health risks. The researchers found that throwing in garbage bins was perceived as the safest disposal method while burying as the most unsafe.

The legal framework and information policies are likely to impact medicines disposal behaviour (Seehusen & Edwards, 2006). The study's key informants stated that there is no adequate legislative and regulatory framework to address this issue. In Austria for example, unused medicines are required to be returned to pharmacies, or to public collection points, which are, for instance, offered by the municipalities (Vollmer, 2010). However, there are no sanctions for wrongful disposal; as there is no information available for people to believe that some forms of disposal are preferred. From a study carried out in New Zealand, it became evident that more than 35% of the respondents considered it acceptable to flush down unused medicines in the toilet, and more than 21% believed it acceptable to rinse them down the kitchen sink (Braund, Peake, & Sheiffelbien, 2009). Similar results were found in surveys conducted by Bound, Kitsou, & Voulvoulis, 2006 in England where 77% of respondents never sought to know about the correct way of disposal. In a study by Wilson *et. al*, (2015), two-thirds of the respondents had no knowledge of any documented guidelines pertaining to proper unused medicines disposal.

5.2.2 Hoarding

A sizeable percentage of respondents (98.27%) kept the unused medicines once they finished the dosage for they were not sure on how to dispose of them. The findings of this study are similar to recent studies done elsewhere. Evidence of unused medicines hoarding mainly amongst respondents resulting from retention of discontinued medication, change in

prescription, patient's health improving before finishing medicine, were also contributory factors that influenced households' need to keep unused medicines for future use or sharing. This was also evident in a study conducted in Kuwait by (Abahussain & Ball, 2015) where 52% of the respondents indicated that they do not dispose of unused medicines and keep them for future use. Similar reasons were reported in the surveys with patients returning medicines to pharmacies in other high-income countries (Morgan, 2001; Braund *et al.*, 2009). While the outcome of these studies have some similarities in pattern with the findings of the this study, a greater proportion of respondents (76.83%) indicated that they knowingly keep unused medicines with an intention to share with other family members in case of need, while 62.80% of the respondents also indicated that once they got better, they stopped the dosage and kept the rest.

On the other hand it has been observed that in Turkey, people with the health insurance can demand prescriptions from health care professionals more easily and put pressure on the doctors to write prescriptions for them only to hoard them at homes (Pinar, 2010). Özçelikay *et.al* (1995) researched drug usage of university students in Ankara and results showed that 90.2% of participating students keep unused medicines. Also, 13.1% of the participants said that they stopped taking medication when feeling better, and never disposed of the surplus medicines; 6.7% of students discontinue the therapy and give medications to others. The results of the study also showed that 34.9% of them did not read medication package inserts; and 28.3% of them did not check the expiry date of the drugs. A study performed at two military bases in December 2006 concluded that 61.6% of the respondents do keep unused medicines; 49.1% do not dispose of the expired medication; 42.9% keep the medications in a medicine cabinet or special drawer; and 42,2% keep them in refrigerator (Gocgeldi *et. al*, 2009).

Studies conducted in Spain, the UK, and the US have reported that elderly patients tend to have more medications in their homes, and a larger household size was found to be predictive of storage of more medications (Vollmer, 2010). A study conducted in Saudi Arabia found a mean of eight drugs per household, and up to 30% had at least 10 medications (Abou-Auda, 2003). The same study reported high use of non-prescription medications and dietary supplements among households. This number is comparable with the average number of medications stored at home in other countries, like Sudan, where the mean number of medications reported per household unit is 4.4 and that household income does not appear to have an association with quantity of medicine stored in the household. (Abou-Auda, 2003; Yousif, 2002).

The prevalence of home storage of medicines found in this study is higher than that reported in studies done elsewhere in the world; 95.7% in a Sudanese study (Yousif, 2002); 94.2% in a study done in Iraq (Jassim, 2010). All these studies used similar methods of data collection although the current study had more than twice as large the sample size. Therefore this difference in the rates of home drug storage could have been due to the unique socio-economic factors in Nairobi. However this finding was closely similar to that of a study done in Northern United Arab Emirates which reported that 98.2% of all the households visited had drugs (Sharif *et. al*, 2009).

5.2.3 Place of Storage

Previous studies have identified a link between where people store their medicine and how frequently the drug is used (Thompson and Stewart, 2001). They found that medicines for everyday use are often kept in places where they can be seen, such as the kitchen bench, while the “when required” medicines are usually kept out of the way in a bathroom cabinet. Storage of medicines in homes under damp and humid conditions, as well as exposure to light or high temperatures, can cause medicines to degrade more quickly than expected.

In this study, majority of the drugs were stored in a drawer (36%) and cupboard (35%). This finding is in agreement with the findings reported in Palestine (Sweileh *et. al*, 2010). From this, it can be easily understood that the place and condition of storage of drugs were not appropriate and in fact the storage places were accessible to children which can lead to accidental ingestion of oral drugs by children. The expiry date of a medicine is valid if the medicine stored at the proper conditions. Around 5% of the drugs were expired in this study. Similar findings on storage of unused drugs were reported in different studies (Yousif, 2002, Tourinho *et. al*, 2008). Lack of knowledge on expired drugs and their method of disposal could be put as possible reasons for the households to keep expired drugs (Atinafu *et. al*, 2014). Public education regarding the nature and risk of expired drugs and disposal of unused medication are needed to reduce the impact of expired drugs on the health of the community (Atinafu *et. al*, 2014).

A similar study in Qatar by Kheir *et. al* (2010) also found that the majority of drugs were kept in the bedroom, which makes them accessible, especially to children living in or visiting the house. Some medications were kept in the kitchen, and in around 25% of the cases in the fridge. The majority of medicines present at homes were mostly for ongoing treatments

(62%) in this study. This is in agreement with other studies done in Uganda (Ocan *et. al*, 2014) and Iraq (Jassim, 2010). In agreement with other studies (Jassim, 2010, Sweileh *et. al*, 2010), significant proportion of drugs (28%) found in the households were left over from the previous illness in this study. People may keep leftover drugs because of initial excessive prescribing for treatment, inadequate adherence to treatment and anticipated future use (Jassim, 2010]. For instance, in the present study, 64.3% of the medicines were stocked in the home anticipating future need. The same reason was also reported in different studies (Kiyangi and Lauwo, 1993, Yousif, 2002, Jassim, 2010). Frequent drug stock outs and inaccessibility of adequate health care in developing countries might be the possible explanation (Ocan *et. al*, 2014).

Storage of large quantities of medications at home could lead to medication administration error, accidental poisoning, adverse drug reactions, and waste of resources (Kheir *et. al*, 2011). Less coverage of modern health care facilities in developing countries and dependency on traditional medicine could explain the lower home drug storage in rural area (Gedif and Hahn, 2002). On the other hand, high proportion of home drug storage in families with health professional as a household member might be due to improvement of health seeking behaviour which in turn leads the households to take drugs and control their health.

5.3 Perceptions on Disposal Practices of Unused Medicines

For a minority of households who disposed of unused medicines in garbage trash and flushing in toilets, their motivations were mainly related to the vulnerability of children to accidental poisoning. The study also found that sharing of unused medications amongst the households precludes them from thinking of disposal of unused medicines. The study found out that the perceived obstacles to safe disposal of unused medicines were related to

unavailability of safe collection practices at local levels, and an underestimation of the consequences of improper behaviour. It was evident, that most of the households were not informed about proper disposal of unused medicines and felt certain that they were not doing something wrong in keeping unused medicines. Further, it was also evident that a majority of respondents were willing to safely dispose unused medicines if programs like community outreach programs and take back programs were put in place and easily accessible. These findings are similar to other studies elsewhere. In the USA, fewer than 20% are ever given advice from a healthcare provider about medication disposal, with only 1.4% returning their medications to a pharmacy, while 54% disposing them in the garbage, 35.4% flushing unused medications down the toilet or sink, and 9.2% do not dispose of their unused medications (Sharon et al., 2010).

Respondents considered physicians to be the primary source for information on safe disposal practices of unused medicines. It was found out that lack of instructions on the disposal of unused medicines inhibit adaptation to safe disposal practices. This confirms the findings of studies by (Abahussain *et al.*, 2006; Persson *et al.*, 2009) which reported that the motivation factors that would encourage households to dispose unused medicine safely include among others making relative information available, education, especially about negative impact of unused medicines in the environment, giving knowledge about the risks of unsafe disposal and information dissemination about safe methods. The results of this study suggest that there is a role for patient education on proper disposal of unused medications. A majority of the participants (64.64%) mentioned that the best way to educate the public about disposal of unused medication was through hospitals and pharmacies. This resonates with a similar study that reported that extensive public awareness creation and mass-media campaigns are more

effective in educating and empowering populations on safe disposal practices of unused medicines (Sharon *et. al*, 2010).

The medicines present in households were mostly for on-going treatments which could indicate high prevalence of ill health in the community and were mostly used to treat symptoms of malaria and upper respiratory tract infections. With the need for quick recovery from ill health and the challenges of healthcare delivery in Kenya, keeping drugs at home provides improved access for treatment especially in cases of emergencies. However with limited knowledge of proper drug storage, appropriate use and disposal in the communities, presence of medicines in households is likely to fuel irrational drug use due mainly to unintentional use among household members. This finding is comparable with reports from a previous study (Haak and Hardon, 2012). Inappropriate use of drugs may expose patients to adverse drug reactions, resistance development, financial loss and potentially prolonged illness (Wasserfallen, 2003). Female respondents were more likely to store drugs in their households and are comparable to the findings of a study done in Sudan (Yousif, 2002). This could be due to the central role women play in maintaining the health of family members especially children, a practice which is common in most parts of the world.

The high prevalence of drugs in households could also indicate wide spread use of drugs in the households. However this is of public health concern as most of the respondents (76%) in households that had drugs reported using stored medicines without medical consultation in addition to sharing drugs among household members. This is consistent with the results from studies done elsewhere in the world, (Sharif *et. al*, 2009) (United Arab Emirates); (Jassim, 2010) (Iraq) and (Kheir *et. al*, 2011) (Qatar). Sharing of medicines among individuals for whom the drugs were not intended could increase the risk of inappropriate drug use which

potentially may exacerbate unwanted drug effects, treatment failure, morbidity and mortality (Caeser and Wurtz, 2000). Sharing of medicines among household members reflects the influence of social factors on the use of medicines in communities.

Presence of medicines in households is a risk factor for encouraging inappropriate drug use such as using the antimicrobial drugs in illnesses when they are not indicated mainly due to the ease of access (Kiyingi and Lauwo, 1993). Respondents who had prior successful treatment were more likely to keep similar medications used in their households. This is mainly due to the confidence that patients acquire with time upon continued use of similar medications in addition to the ease of access of these drugs from the private sector. The major sources of medicines kept in homes were the private sector (drug shops, pharmacies and clinics) and 'leftover' drugs from previous prescriptions. Inadequate patient adherence to treatment in addition to poor prescription practices among health professionals could have contributed to the 'left over; drugs found in most of the households (McNulty *et. al*, 2006). The presence of 'left over' drugs in households is a risk factor for self-medication (Okumura *et. al*, 2010) and the associated effects. This became more apparent with the presence of self-initiated use of drugs kept at home which exposes patients to risks such as adverse drug reactions, accidental poisoning and resistance development (Wasserfallen *et. al*, 2003). In the present study it was difficult to assess the expiry dates of the drugs kept in homes as most of the medicines were in secondary packages.

Employed respondents were about twice more likely to keep medicines in their households. This is contrary to a study done in Qatar (Kheir *et. al*, 2011) and could be due to the difference in the data collection methods as this study used face-to-face interview opposed telephone calls in the Qatar study. The differences in healthcare infrastructural development

between Kenya and Qatar could have also contributed to the difference in the findings of these studies. The challenges of healthcare delivery such as frequent drug stock outs, and lack of medical personnel common in Kenya, potentially influence communities to seek alternative ways to access treatment including storage of medicines in homes as standby drugs (Kiyangi and Lauwo, 1993). The ease of access of medicines from the private sector in the community due mainly to inadequate regulation in addition to availability of money among respondents potentially influences home storage of medicines.

5.4 Unused Medicines Disposal Practices

In this study, disposing in garbage bins was the predominant mode of disposal for unused medications followed by disposal in sink/toilet while storing in house (53%) is a popular practice. None of the respondents practiced take back program. This study showed lack of knowledge on correct and safe disposal methods of unused medicines amongst households. Availability of formalized guidelines for medicine disposal is a major influence on drug disposal. A majority (73.78%) of households preferred drug drop off location to be a suitable solution to this problem.

In a study by Abrons *et al.*, (2010) 12.8% patients disposed medication appropriately; 27.2% respondents flushed medication down the toilet whereas 34.6% dumped medication in trash. In a study conducted in Malaysia, solid medications (tablets and capsules) were predominantly disposed in household waste (65%) and returned to pharmacy (8%); liquid medications were disposed in sink/ toilet (62%) and trash (27%); semisolid medications were predominantly disposed in household waste (83%) and returned to pharmacy (12%) (Azad *et al.*, 2012). In Egypt, a similar study reported that 12% respondents returned unused medicines to pharmacy, 26.27% disposed in garbage and 11.39% flushed them down the toilet (El-

Hamamsy, 2011). (Da Silva et al., 2004) reported similar results of indiscriminate and haphazard disposal of unwanted medicines into the municipal collection systems in Southern Brazil and also echoed in similar study in Nigeria (Auta et al., 2011).

A study conducted by Statistics Canada (2005) reported that about a quarter of Canadian households generated leftover medications. Of the households with unused medications, the portion that continued to practice disposal via the sewer, trash, or burial was significant, ranging from 20-70 %. A similar study from Kuwait showed that three quarters of respondents reported that they discarded unwanted medicines in the trash (Abahussain & Ball, 2007). A study in 2005 showed that 63% of the respondents in UK discarded unused medications in the household waste, 11% emptied them into the sink or toilet and 22% returned them to a pharmacy (Seehusen & Edwards, 2006).

A similar study from New Zealand showed that between 13% and 24% of medications were returned to a pharmacy (Braund *et al.*, 2009). On the contrary, a Swedish study reported that none of the study participants flushed the drugs down the drain (Wieczorkiewicz *et al.*, 2013). This might be due to that the pharmacists in Sweden supply special transparent plastic bags with informational text where unused drugs preferably should be placed. In Germany, 43% of households questioned admitted to having thrown unused medicines into the sink or toilet at least occasionally, compared to 16% of the surveyed people disposing them as part of normal household garbage (Gotz & Keil, 2007). A survey from the United States showed that more than half of the people interviewed reported storing unused and expired medications in their homes, and more than half had flushed them down a toilet (Glassmeyer, et al., 2009). These and further findings (Tong et al., 2011) suggest that unused medicines are more likely to be discarded in normal household garbage and disposed of via toilets and sinks which is

consistent with this study findings. The differences in the above studies may reflect the disparity between regulations and advice in the different regions.

The key informants believed that there is need to establish mechanisms through which information on unused medicines should be channelled to household in addition to improved labelling of drugs packages to create more awareness on safe disposal practices. Other countries have developed consistent programs on safe disposal practices as well as institutional and regulatory framework that govern handling and disposal of unused medicines. Further, pharmaceutical companies as well as other stakeholders are equally involved in programs aimed at ensuring that unused medicines are safely disposed. Take-back or mail-back program has been recommended as one of the disposal practices in many parts of the world (Bound et al., 2006).

In this study, there was a very low rate (0.2%) of reported return of 'leftover' or unwanted medicines in households to healthcare facilities for proper disposal and is similar to what was observed in other studies (Kheir *et. al*, 2011). This is could be attributed to by a lack of drug disposal policy which clearly spells out methods of proper drug disposal and this should be of concern to the policy makers. However this could be due to the reluctance among health professionals in providing patients with information on how to properly handle or use medicines in households (Kiyingi and Lauwo, 1993). The improper drug disposal methods such as giving out the 'unwanted' or 'left over' drugs to other sick members or throwing a way to the common rubbish pits as found in the current study could endanger the environment in addition to promoting irrational drug use in the community (Sharif et. al, 2009).

In similar studies, three quarters of patients reported that they discarded unwanted medicines in the trash, with disposal down the drain, to friends (by sharing) and returning them to pharmacies each reported by around 10% of respondents (Daughton, 2003). Where no organized collection system exists, disposal of medication in domestic garbage destined for landfill is accepted as more environmentally friendly than flushing them down the drains (Daughton, 2003; Boehringer, 2004). The disposal habits of Kuwaiti households are therefore 'better' than those reported for 500 United States households where 54% threw unwanted medication in the trash, 35% flushed them down the toilet or sink and 1% returned them to a pharmacy (Kuspis and Krenzelok, 1996). In this survey, 9% of patients said they disposed of unused medicines by sharing them with friends and 16% believed sharing of unexpired medication to be acceptable. Sharing of medicines without medical advice may be dangerous, even if the medicine has not expired. An inappropriate medication may be used and it is not possible to guarantee the quality of the pharmaceutical product if it has been improperly stored.

5.5 Conclusions

The study found out that household's knowledge on safe disposal practices of unused medicines is relatively weak and is attributed to by a lack of public outreach and awareness campaigns by both national and county government, laxity on the side of medical and healthcare professionals to provide disposal guidance at hospitals and pharmacies, unclear disposal instructions on medicines packages and negligence to read the disposal instructions. While there was a general acceptance amongst the respondents towards organized safe disposal practices, however, there were negative perceptions as some respondents were concerned of unused medicines finding their way into the market, can expose street children to risks and a stigma of others knowing individual ailments.

Even though many households do acknowledge that unused medicines present a public health risk, a majority of households still opt to keep unused medicines at homes. However, it emerged that the predominant existing household disposal practices include; flushing in the toilets, throwing in garbage bins and disposal in kitchen sinks. In terms of preference with regards to safe disposal practices, special garbage bins was favored to the take-back program, however, there was a consensus that take-back programs should be initiated and that healthcare professional should be at the forefront in sensitizing communities towards safe disposal practices of unused medicines. Demographic variables related to gender, marital status/number of children, education level and profession do not determine the households' disposal practices of unused medicines. Finally, the study found that there is also lack of coordinated approaches and public programs on safe disposal of unused medicines; and a lack of strong regulatory framework to guide safe disposal practices in Kenya.

5.6 Recommendations

Unused medicines disposal is not only a community health issue but has also become a global health concern. The main paradox is that while households do appreciate the risks of unused medicines, their disposal practices leave a lot to be desired. The proposed recommendations are not a one-stop shop for good practice; however, while some of them have been employed either singly or collectively by many nations with good degrees of success, the influence of context should always prevail as a unified approach to dealing with disposal of unused medicines may not be sufficient. While it is necessary to have a consistent approach to the challenge, the fundamental premise to having successful solution rests with the formulation of a sound public policy agenda, stakeholder engagement, strong institutional and regulatory framework, judicious instruments of accountability and distinguished monitoring and

evaluation for results. A number of recommendations are put forward under the auspices of policy, programs and areas that required further research.

5.6.1 Policy Recommendations

The following policy recommendations should be considered as a key step towards streamlining safe disposal practices of unused medicines. It should however be noted that the order carries no absolute importance but should be collectively and inclusively form the fundamental building blocks to addressing the existing problem.

5.6.1.1 Public Awareness Campaigns

A lack of information about how one should dispose of unused medicines makes it clear that there is an immediate need for an action, and a corresponding public awareness campaigns could be in place to sensitize consumers that unused medicines should never be disposed unsafely. If unused medicines are merely considered as “normal household waste”, many households will have little understanding of why unused medicines should not be discharged through sink or toilet. As a response, it is recommended that a coordinated and systematic public awareness campaigns on the negative and health risks/impact of unused medicines, safe disposal practices, education campaigns, especially starting from an early age.

5.6.1.2 Stakeholders Engagement

Managing disposal of unused medicines is highly associated with daunting challenges that cannot be sorted out by just one player but rather all players involved in the medicines supply chain and practitioners such as public and private health facilities, medical practitioners, pharmaceutical companies, schools/institutions, NGO’s, media houses, national and county governments among others.

The principle of “product stewardship’ that directs all participants involved in the life cycle of a product to take shared responsibility for the impacts to human health and the natural environment that result from the production, use, and end-of-life management of the product should be exercised. Pharmaceutical companies for instance should have a corporate policy and mandate to work with government entities where unused medicine management programs are implemented. The national and county governments should also seek the assistance of pharmaceutical companies as it implements approaches for managing unused medicines. In order to do so, a specific working group composed of representatives of the relevant departments should be brought together to develop the policies that govern disposal of unused medicines to ensure a holistic approach and to align the actions of all individuals involved in the management of the issue. The policies should not be restricted to the disposal aspect of unused drugs but should also address the key issues related to every reason why households keep unused medicines at home. Further, the print and electronic media should also give much attention to the matter.

5.6.1.3 Institutional and Regulatory Framework

Addressing unused medicines challenge depends wholly on how they are approached within the boundaries of institutional and regulatory frameworks. Regulatory and institutional frameworks broadly encompass all relevant laws, and regulations, all regulatory agency activities, imposed controls, processes, and relationships between regulatory institutions and all other organs of the state on policy and administrative matters relating to the sector that is being regulated. The complexity of unused medicines disposal requires robust institutional and regulatory frameworks and thus requires an extension of the mandate of the existing institutions.

The National Board of Pharmacy regulates pharmacies and pharmacists and prescribes specific practices for accounting for prescription medicines. However, the board does not stipulate the disposal mechanisms of unused medicines. The board should establish regulations that ensure unused medicines from households safely disposed. The National Drugs and Poisons Board's mandate should also be extended to legally be involved in the collection of unused medicines and it should be an absolute necessity that law enforcement officials be on-site, participate in the collection, and take physical control and custody of all controlled substances. Similarly, the National Hazardous Waste Law should not only regulate the transportation, treatment, and disposal of hazardous waste, but also include waste generated by households and their disposal.

5.6.2 Safe Disposal Programs

A number of safe disposal programs could be introduced in Kenya. These can be initiated by Kenyan Pharmaceutical Association, county governments; however special measures to prevent diversion of expired medicines or those of abuse potential (Kuspis and Krenzelok, 1996) should be put in place. The following programs should be taken into consideration.

5.6.2.1 Develop a "Do Not Keep and Do Not Flush" Outreach Program

A collaborative outreach program could be initiated to stress the importance of keeping unused medicines from homes, and provide information about proper disposal practices.

5.6.2.2 Take Back Programs

Different models of take-back programs of unused medicines are presently being used in many parts of the world and could be emulated. At times a single method may be used alone, or often, several types of programs are used in conjunction in order to best serve

community's needs, reach the largest audience, or to accommodate challenges such as local ordinances or resource restrictions. Some of the take-back programs are discussed below:

a. Establish Periodic Community Collection Programs

Community unused medicine collection program would provide a viable alternative for the safe collection and disposal of unused medicines. Periodic collection days for unused medicines could be implemented. These events could occur on their own, at pharmacies, or community centres. The events could be organized by government agencies or other organizations. Guidance on legal and logistical issues that need to be addressed when developing unused medicines collection day event should be developed.

b. Law Enforcement Office Collection Programs

Unused medicine collection boxes could be established within in estates, county offices that are continuously staffed by law enforcement officers. An advantage to this collection method is that permanent collection facilities with excellent security would be established. However, efforts should be made to ensure that these types of collection boxes may collect items other than unused residential medicines such as needles and syringes.

c. Pharmacy or Hospital Take Back Programs

Requirements could be established that mandate pharmacies to take back unused medicines for proper disposal. A pharmacy take-back requirement would be convenient for households and has proven to be successful in other countries. The second option, which mirrors or is run in a similar fashion to pharmacy programs, is coordinating doctor offices or hospital-based take back locations, the doctor's reception counter, or with a locked drop box.

5.6.3 Further Research

The study has provided an insight into household's knowledge, perceptions and patterns of disposal practices of unused medicines in South C area of Langata constituency in Nairobi. Nonetheless, while the study sample was homogenous, further research should be initiated to cover household knowledge and disposal patterns of unused medicines in rural areas and academic institutions such as boarding schools and universities. Research into how referral hospitals, county hospitals, health centres and dispensaries regard their capacities of operations with regards to their disposal practices of unused medicines should be done. Another area that is worth being studied is the common types of household unused medicines, abuse of unused medicines and cases of accidental poisoning by unused medicines.

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Appendix A - Semi-Structured Questionnaire – Household Survey

Part 1: Biographical Information

1. What is your age? Less than 20..... 20-30.....30-40.....over 40 years.....
2. Are you married? Yes.....No.....
3. Do you have children? Yes.....No.....If yes how many?.....
4. How many children less than 18 years old are living in your household?.....
5. What is your sex? Male.....Female.....
6. What is your profession/occupation?.....
7. What is your education level? Primary.....Secondary.....Tertiary.....
8. Which estate do you live in Nairobi?.....

Part 2: Knowledge on Household Storage and Disposal of Unused medicines

9. Do you currently have any unused medication stored at home that was prescribed by a doctor? Yes.....No..... If yes, for how long have you had the medicines stored at home?.....
10. Do you currently have any unused medication stored at home that was purchased over the counter? Yes.....No..... If yes, for how long have you had the medicines stored at home?.....
11. Do you have unused medicine that has past its expiry date? Yes.....No.....If yes, how long past their expiry dates?.....

12. Where do you store your unused medicine? Kitchen cabinet.....

Bathroom.....Bedroom.....Others

(Specify).....

13. What are the factors that lead you keep unused medicines at

home?.....

.....

14. Do you ever read medicines disposal instructions? Yes.....No.....

15. Do you separate unused medicines before disposal? Yes.....No.....

16. What are the factors that influence your decisions with regards to disposing of unused

medicines?.....

.....

17. If you are interested to learn more about disposing of unused medicines, where would

you prefer to get the information from?

Hospital.....NGO's.....Pharmacies.....Community

groups.....Others.....(specify).

Part 3: Perceptions on household disposal of unused medicines

18. What is your opinion on the following statements:

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Unused medicines present potential risks at home.					

Children are more vulnerable to the risks of associated with unused household medicines.					
There is lack of adequate information on safe disposal of unused household medicines.					
Doctors and healthcare professionals do provide advice on safe disposal of unused household medicines.					
Take-back programs of unused medicines should be mandatory.					

19. Why do you think that unsafe disposal of unused medicines has persisted?.....

.....

20. What do you think can be done to minimize risks associated with unsafe disposal of unused medicines?.....

.....

.....

21. In your opinion what is the best way of disposing unused medicines?.....

.....

.....

22. If you were given an option of taking-back your unused medicines/ disposing them in special bins, would you accept? Yes.....No... If yes why?.....
If no, what are the reasons?.....
23. What do you think are the obstacles to safe disposal of unused medicines?.....

24. What are your expectations/imaginings on safe disposal of unused medicines?.....

25. Who should take more responsibility towards safe disposal of unused medicines? Households.....Hospitals.....Pharmacies.....Government.....
26. Have you ever received any information about how to dispose of unused medicine? Yes.....No.....If yes, where or who provided you with the information?.....
27. If there were a convenient location where you would drop off unused medicines, would you be willing to use this method? Yes.....No.....If no, give reasons why?.....
28. Are there any reasons why you might not want to take unused medicines back to the hospitals or pharmacies?.....

Part 4: Household Disposal Practices of Unused Medicines

29. How do you dispose unused medicines?

Flush in toilet.....

Throw in garbage bin.....

Return to pharmacy or hospital.....

Dispose in the sink.....

Don't dispose of unused medicines.....

Others (specify).....

30. For what duration do you keep unused medicines in the house and why.....

31. Do you have any concerns about this study? Yes.....No.....If yes, specify.....

Thanks for your time and cooperation.

Appendix B - Key Informant Interview Guide

1. Describe the specific roles of key stakeholders who should play important roles in sensitizing household on safe disposal practices of unused medicines.
2. List some of the required regulations and policies that govern disposal of unused medicines.
3. Describe the best approaches to creating awareness with regards to disposal practices of unused medicines
4. Please describe some of the barriers to safe disposal practices of unused medicines.
5. List some of the disposal practices of unused household medications. Describe their strengths and weaknesses which are specific to Kenya.
6. List some of the recommendations that you would put in place to address the barriers to safe disposal practices of unused medicines.

Thanks for your time and cooperation.

Appendix C - Informed Consent Form – Household Survey

I amassisting with a research seeking to understand people's behaviour and perceptions on household disposal patterns of unused medicines in Nairobi City County. As a requirement, the research is for the award of a Master of Arts degree course at the University of Nairobi, Institute of Anthropology, Gender and African Studies. This study will determine the households' knowledge and perceptions on the various disposal practices of unused medicines. It will also examine the different household disposal practices. The questions asked in this interview will be in line with these three objectives. The names of all respondents will be with-held and replaced with numerical codes for the purpose of protecting their identity. The data collected will be used purely for research purposed by the study's team only and will be kept confidential at all times. The findings of this study will be presented in the form of a cumulative report and not individual interview reports. Upon completion of the study, the raw data will be destroyed to ensure confidentiality and anonymity of respondents. Participating in this study will also be beneficial to the community. The study will help create awareness and sensitize households on the unsafe disposal practices. As a prospective interviewee, your participation in this study will be voluntary. You have the right to say no and you may change your mind anytime and withdraw. You may also choose not to answer specific questions or stop participating at any time. There are no immediate benefits of participating in the study however, your participation will help in improving interventions and developing programs promoting safer household disposal practices. The study will also cause no harm or risk to your household. A summary of the outcomes of the study will also be presented back to the household interviewees through the estate management committees.

I agree to participate in the study voluntarily **Yes** [] **No** []

I understand that participation is voluntary, and that I am free to choose not to answer specific questions **Yes** [] **No** []

I understand that participation is voluntary, and that I am free to withdraw from this study at any time without negative consequences **Yes** [] **No** []

I have been assured that confidentiality will be maintained and information will not be used for any material gain **Yes** [] **No** []

I am aware that if I have any issues on my role and rights as a research participant I should contact ERC Chair- Prof. A. N. Guantai Tel. 2726300 Ext 44102 and for any questions and concerns about the study I should contact the principal researcher Sarah Ang'ienda on 0725 644 668 and her supervisor Dr. S. Bukachi on 0726 771 808.

I have read and understood this consent form and my signature below means that I voluntarily agree to participate in this research study.

Name of Respondent _____ **Signature** _____ **Date** _____

Name of Interviewer _____ **Signature** _____ **Date** _____

Appendix D - Informed Consent Form – Key Informant Interview

My name is Sarah AdhiamboAng’ienda. I am pursuing a Master of Arts degree course at the University of Nairobi, Institute of Anthropology, Gender and African Studies. As required for the award of the Master of Arts degree, I am pursuing a research seeking to understand people’s behaviour and perceptions on household disposal patterns of unused medicines in Nairobi City County. The aim of this study is to determine the households’ knowledge and perceptions on the various disposal practices of unused medicines and also examine the different household disposal practices. You have been identified as a key informant based on your expertise and wide experience in pharmaceutical and related issues. The information that you will provide will be regarded as confidential and will only be meant solely for the study. The findings of this study will be presented in the form of a cumulative report and not individual interview reports. Upon completion of the study, the raw data will be destroyed to ensure confidentiality and anonymity of the interviewee. Participating in this study will also be beneficial to the community and other stakeholders such as public and private health facilities, medical practitioners and pharmaceutical companies amongst others. The outcomes of the study will be disseminated to the research community, research participants and the general public through relevant national/regional conferences, workshops and through scientific journals that are dedicated to all aspects of pharmaceutical and community medicine. A copy of the research thesis will also be presented to you after the study.

If you have any issues on role and rights as a research participant contact ERC Chair-Prof. A. N. Guantai Tel. 2726300 Ext 44102 and for any concerns about the study contact my supervisor Dr. S. Bukachi on 0726 771 808.

Name of Key Informant _____

Signature _____ **Date** _____

Name of Interviewer _____

Signature _____ **Date** _____

Appendix E - Data Management Plan

1.0: Research Topic
Perceptions and practices on household disposal patterns of unused medicines in Nairobi City County
2.0: Research Objectives
<p>The general objective of the study is to explore households' perceptions and practices of disposal patterns of unused medicines in South C area, Nairobi City County.</p> <p>The specific objectives are;</p> <ol style="list-style-type: none">1. To determine households' knowledge on disposal practices of unused medicines.2. To determine households' perceptions on disposal practices of unused medicines.3. To examine the different household disposal practices of unused medicines.
3.0: Roles and Responsibilities
<p>The researcher will direct the overall data management process and will take responsibility for the collection, management, and sharing of the research data. The research assistants/enumerators will be responsible for survey administration amongst the sample respondents while the researcher will lead the key informant's interview. However, day-to-day quality assessment will be the responsibility of the researcher during the data collection process.</p> <p>Data extraction, processing and inputting for the dataset will be undertaken by the researcher assisted by the research assistants. The researcher will be finally responsible for dealing with quality, sharing and archiving of data.</p>
4.0: Cost Schedule
There is a proposed budget to cover the costs of data collection, data preparation, dissertation production and dissemination of findings. These costs will be met by the researcher.

5.0: Description of Data

The research objectives require qualitative data that are not available from other sources. They also require quantitative analysis of the data collected. The research will involve primary data collection through semi-structured interviews of the sample respondents and key informant interviews amongst individuals with adequate knowledge on the subject under study.

The semi-structured interviews of the randomly sampled survey respondents will be done using questionnaires and will cover the three main issues of demography, existence and perceptions of unused medicines in homes, and disposal practices. Other information that will be gathered will include usage of the medicines in relation to the instructions for use on their label, and degree of satisfaction with the drug information received. The interviews will be conducted in both English and Swahili where necessary.

The key informant's interviews will be undertaken in pairs to enable detailed note-taking and typed in word format and saved. Interview notes will be typed up systematically according to the sequence of questions.

Data will thereafter be inputted and stored in a widely available spread-sheet format (e.g. Excel or SSPS), to ensure accessibility and analysis by the researcher.

6.0: Standards for Data

The research data will be transferred from the questionnaires and entered into computer and will be stored using Excel and SPSS save data file formats.

Variables will use a standardized naming convention consisting of a prefix, root and suffix system. Separate files will be managed for the two kinds of records produced: one file for the household respondents and another file for the key informants.

Qualitative descriptions will be validated through comparative descriptions of collected materials.

7.0: Access, Sharing and Privacy

All research data collected as part of this project is for the sole purpose of the dissertation and

wholly owned by the researcher. The main output from this project is field data whose analysis will be published as part of the dissertation and will be available and cited in other publications.

During the data processing and analysis, data will be maintained in an open Excel format to enable open re-use of the data by the researcher and will only be accessible only by the researcher.

An informed consent will be signed by the survey respondents to protect their privacy and confidentiality of the information provided. The information in this study or any publication from this study will only be used in ways that will not reveal the identities of the survey respondents. Additionally, a clear verbal explanation will also be provided to each interviewee and key informants.

8.0: Policies and Provisions for Re-use & Re-distribution

The data gathered and dissertation documentation will be wholly owned by the researcher. Any citation of the dissertation will be under "fair use" to permit data sharing, and clearly acknowledged but it may not be re-disseminated by users.

The field data will not be used or offered for co-authorship to the research assistants who collected the data.

The results of the data analysis will be of interest to research community, practitioners and policymakers in the subject under study and the researcher may be interested to present the findings in seminars and publish in refereed journals.

9.0: Data Storage and Preservation

The research data will be analysed, form part of dissertation and will be archived within the University of Nairobi library. The data files from this study will be managed, processed, and stored in a secure environment (e.g., lockable computer systems with passwords, firewall system in place, power surge protection, virus/malicious intruder protection) and by controlling access to digital files with encryption and/or password protection. The paper based questionnaire will be destroyed and discarded after entering the data in the computers for analysis.