AN EVALUATION OF SANITATION PRACTICES AND PREFERENCES IN SELECTED SMALL TOWNS WITHIN KISUMU COUNTY, KENYA

BY

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DECLARATION

I do hereby declare that this is my original work, independently produced by me in fulfillment of the requirement for a Master degree and that it has not been presented to any institution for any award. Where information has been derived from other sources, I confirm that this has been duly acknowledged.

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DEDICATION

To my father, Albert Oronje Ogumbo in memoriam. For his love and selflessness that has transformed an entire generation. You will always be remembered! *Amare et sapere vix deo conceditur*.

ABSTRACT

Progress towards achieving full sanitation coverage is still slow in small town settlements in most developing countries. Small towns are the new frontier in urbanization. However, investments have not kept pace with the growing demand for services. Small town's water supply and sanitation is a neglected area globally and Kisumu County is no exception. Water supply and sanitation systems in small towns are typically too complex to be well managed by community groups, but too small to be financially viable for professional Water Service Providers (WSP). In Kisumu County, these unique challenges have led to on-site sanitation particularly pit latrines as the most popular sanitation choice. The limited sanitation choices has partly contributed to poor sanitation practices in small towns. Most studies on water and sanitation have focused mainly on large cities and rural areas without appreciating the unique characteristics of small towns and secondly on water at the expense of sanitation. The purpose of this study therefore was to assess sanitation practices and preference in selected small towns in Kisumu County. Specifically it aimed at assessing sanitation practices, determine factors influencing sanitation preferences and examine existing barriers to improving sanitation. These objectives were linked up with other components of the study using a conceptual framework. The study employed a cross sectional survey design, with 356 households sampled from a population of 4903 households using systematic random sampling. Purposive sampling was used to select participants for in-depth interviews and FGD. Primary data was collected through questionnaires and interview schedules. Documentation review was used to collect secondary data. Data analysis was done using cross-tabulations, Chi square test, log linear and factor analysis. The findings showed that most residents do not conform to good sanitation practices. It was found that 21% of respondents did not have any form of sanitation facility, majority of the households (59%) were sharing. Open defecation was still practiced by 16% of respondents while 31% admitted poor practices on management of children wastes. Hand washing after visiting latrine was practiced by 70% of the respondents. Pit latrine was the most common form of sanitation technology (72%). The study revealed reduced risk of diarrhea and lack of flies as the main health factors that influenced sanitation preference, both factors were statistically significant at p-value 0.039 and 0.01 respectively. For technical factors, availability of water and ground condition were prevalent and were statistically significant p-value 0.031 and 0.044. Further, cost was the main economic factor influencing preference. Only 20% of residents use improved sanitation. However, all respondents desired improved facilities but faced barriers among them lack of reticulated sewer network and unreliable water supply for sanitation. This study recommends that interventions in small towns target health education and hygiene awareness, upgrading of on-site facilities and utilizing the existing demand for improved sanitation as springboard for intervention. Further research is however needed on willingness to pay for improved sanitation within small towns.

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LIST OF ABBREVIATIONS AND ACRONYMS

CIDP	County Integrated Development Plan
CLTS	Community-Led Total Sanitation
DHS	Demographic Household Survey
FGD	Focused Group Discussion
HH	Households
JMP	Joint Monitoring Program
KCIDP	Kisumu County Integrated Development Plan
KES	Kenya Shillings
KII	Key Informant Interviews
KIRA	Kenya Inter-agency Rapid Assessment
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
KNBS	Kenya National Bureau of Statistics
LVSWSB	Lake Victoria South Water Services Board
MDG	Millennium Development Goals
MTP	Medium Term Plan
M&E	Monitoring and Evaluation
MUSCO	Muhoroni Sugar Company
NGO	Non-Governmental Organization
OD	Open Defecation
ODF	Open Defecation Free
PDAE	Paris Declaration on Aid Effectiveness
PME	Participatory Monitoring and Evaluation
UN	United Nations
UNICEF	United Nations Children Education Fund
UNDESA	United Nations Department of Economic and Social Affairs
UN-Habitat	United Nations Human Settlements Program
SPSS	Statistical Package for the Social Sciences
VIP	Ventilated Improved Pit
WHO	World Health Organization.
WCED	World Commission on Environmental Development.
WSP	Water Service Providers

DEFINITION OF KEY TERMS

No	Term	Definition
1	Sanitation	Sanitation refers to the hygienic principles and practices relating to the safe collection, removal, or disposal of human excreta.
2	Sanitation Practice	These are specific behaviors related to sanitation which when properly observed leads to better hygiene, and good health by eliminating diseases related to poor sanitation. These practices are in relation to latrine ownership, latrine sharing, latrine use, hand washing, management of children wastes and cultural beliefs.
3	Sanitation Preference	This refers to certain characteristics any consumer wants to have in a sanitation choice/technology to make it preferable to him/her. In other words, these are the main factors that influence demand.
4	Small town	Are settlements that are sufficiently large and dense to benefit potentially from the economies of scale offered by piped systems but are too small and dispersed for conventional urban water and sanitation utilities to manage such systems efficiently. In Kenya, small towns have a population of between 5,000 and 80,000 and cover areas ranging from 5 km^2-50 km^2, population growth rate of 6-12% a year and usually have an administrative center, a commercial center, and housing areas for various income groups (UN-Habitat 2008).

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CHAPTER ONE:

INTRODUCTION

1.1 Background to the study

The world is becoming more urban. In 2007, the traditional rural-urban balance was for the first time in history tipped with the urban population exceeding the rural population (UN-Habitat, 2010). A new and significant cluster of human settlement is emerging, being the "small town" (IRC, 2006). According to Satterthwaite (2006), many nations have more than 20% of their population living in small urban centers. Further, Pilgrim (2007) revealed that over 50% of the world population live in urban areas and for every large town there are an estimated ten small towns, these towns are expected to double within 15 years. Providing sanitation services to these growing small town segment is somewhere between community-managed rural water and sanitation supplies and supply by large urban utilities (WSP). At the beginning of the millennium, this middle ground was not yet sufficiently documented or understood (WSP, 2002).

Although safe water has been receiving media attention and funding in the past decade, the global sanitation crisis has not shared the same spotlight or made the same progress. However, in recent years, the international community has begun to pay more attention to sanitation, but they have failed to provide direct guidance on the specific needs and challenges of improving sanitation in small towns (WHO/UNICEF, 2012). Most of their focus is on rural communities or on peri-urban areas of larger cities (Wright, 1997).

The Constitution of Kenya (GoK, 2010) initiated a major paradigm shift in sanitation sector governance and service delivery. The Fourth Schedule of the Constitution devolves most of sanitation functions and services to the 47 County governments, while the national government retains the responsibility for national policy formulation. It is on the strength of this shift that

the government of Kenya through MoH developed the new Kenya Environmental Sanitation and Hygiene Policy (KESHP) 2016-2030 and the Kenya Environmental Sanitation and Hygiene Strategic Framework (KESSF) 2016–2020. Unfortunately, these policy documents have failed to appreciate the unique characteristics of small towns. One of the strategic interventions focuses on scaling up sustainable access to improved rural and urban sanitation. In spite of the fact that "water and sanitation" are not separable in terms of policy approach, investments in sanitation are by and large dwarfed by investments in water initiatives. Between 1990 and 2000, investments in sanitation represented one-fifth of the total invested amount (US$15.7 billion) by developing countries for water and sanitation initiatives (UNICEF & WHO, 2000) despite the empirical evidence that investing in sanitation provide higher returns- Improving access to clean water can lead to a 25% reduction of diarrheal disease among children under five, compared to a 32% reduction for similar investments in improved sanitation systems (Fewtrell *et al.*, 2005).

UNICEF/JMP (2010) indicates that the number of people accessing improved water and sanitation in urban areas has increased since 1990. Those increases however, particularly in relation to sanitation are not keeping pace with urban population growth. If efforts to provide water and sanitation to the urban un-served continue at the current rate, by 2020 more than 2.7 billion people will still be living without basic sanitation (JMP, 2010). Given their pace of growth as indicated above, it can be assumed that a significant proportion of this un-served population will be in small towns.

Small town communities overwhelmingly lack adequate arrangements for waste disposal. Some of the most common sanitation practices in small town areas are either, *No system:* Defecation occurs in open areas within the settlement. *Latrines:* Use of latrines is the most common sanitation practice in small town regions (Murphy *et al*., 2009). According to WaterAid (2010), provision of sanitation facilities can be done through a careful study of the

culture and belief of the community. Individual users are the ultimate decision makers in accepting or rejecting a new practice and new technology. Women and men must be convinced of the benefits of improved sanitation and change in their own behavior. More critically, improved sanitation facilities are essential if transmission routes of water and sanitation-related diseases are to be cut and contagious diseases prevented. These improvements in facilities must go hand in hand with hygiene behavior change and practice, if the transmission of disease is to be prevented (WSP, 2004).

A wide range of latrines can be found in small town areas, including bucket latrines, pit latrines, and ventilated improved pit (VIP) latrines (WHO, 2008). Although a range of technologies are available along the sanitation supply chain, their selection is always based on preference, affordability and availability of materials (Katukiza *et al.,* 2012). Yet some technologies may not be appropriate to small town settlements due to technical standards, regulations, land tenure system and limited space (Tumwebaze *et al.,* 2013). Studies have shown that most interventions in small towns have focused only on hardware i.e. physical infrastructure (Van der Hoek *et al.* 2010). Attempts at improving access to sanitation for the urban poor without considering the local demand may result in the facilities either being abandoned, misused or never used at all (Mara *et al*. 2010).

The development of appropriate sanitation technologies for these settlements should assimilate the specific needs of the intended users to create demand (Muwuluke, 2007).

According to WaterAid (2010), achieving 100% access to improved sanitation involves gradual climbing along the sanitation ladder. Sanitation practices and preferences pose numerous challenges in climbing the ladder to improved sanitation. The challenges which are either related to environmental sustainability; how waste is physically being disposed of or financial sustainability; how the sanitation systems and facilities will be operated and maintained and

who is paying for them (Moe & Rheingans, 2006). Climbing the ladder therefore involves continuous elimination of barriers related to practices and preferences. Many small town dwellers that want improved sanitation desire flush toilets (WSP, 2004). These small towns often lack reliable running water leading to lack of infrastructure for piped water and sewage, furthermore, majority of the populations do not have the financial resources to build sanitation facilities *(ibid).* This complicates provision of sanitation services to these towns. Even if an NGO or government were to provide latrines, the question of sustainability would still linger (Strauss, 2001).

In Kisumu County, population growth has occurred faster than infrastructure development. This is manifested in the over half a million people relying on shared and public sanitation facilities as well as other unimproved sources (KCIDP, 2013). Much of this growth has taken place in small towns and slum areas on the edge of the city. These towns have no trunk sewers or septic tanks therefore depending on pit latrines, shared or public facilities (KCIDP, 2013). The growth rate of these small towns, the increased population density and the on-site sanitation which is prevalent in all the small towns' have led to contamination of groundwater, surface runoff and pollution leading to a myriad of health challenges. While studying sanitation among towns within Kano plains, Adoyo (2009) found out that most small town centers have the least access to improved sanitation at 36% compared to rural or major urban areas. He points out a number of factors contributing to this low coverage among them political, economic, policy framework and institutional capacity. This study, (Adoyo, 2009) and many others: (Simiyu, 2015; Gonzales *et al*., 1994; Wittington, 1993; Muwuluke, 2007), that focused on small towns sanitation dwelt on coverage and access to improved sanitation without looking into the specific preferences and practices in relation to sanitation among these small town residents.

1.2 Statement of the Problem

While much of the current sustainable cities debate focuses on the problems for the world's largest urban cities, a significant number of urban dwellers continue to reside in smaller urban settlements which have now become the next frontier in urbanization. Small town's water supply and sanitation is a neglected area globally and Kisumu County is no exception. The core problem is that water supply and sanitation systems in small towns are typically too complex to be well managed by community groups, but too small to be financially viable for professional Water Service Providers. Furthermore, most water supply and sanitation funding and assistance go to either rural or major urban areas, leaving small towns dependent on meager local government budgets. This has left most small towns with on-site sanitation mainly pit latrines as the available sanitation option, in the process limiting their sanitation choices. On the other hand, considering the growth rate of these small towns, the increased population density and the on-site sanitation which is prevalent in all these small towns; most inhabitants of small towns do not conform to good sanitation practices. This is manifested in contaminated groundwater, surface runoff and pollution leading to a myriad of health challenges. In Kisumu County, efforts at improving access to sanitation in small towns have paid little focus to resident's preferences and practices. This has engendered wastage of resources on installing facilities that are later misused or never used because they are not in tandem with the local demand. Understanding demand for improved sanitation in the local context based on the preferences is critical if improved sanitation is to be achieved in small towns.

This problem is further compounded by other multiple factors including inadequate policy framework, bias towards water at the expense of sanitation by Water and Sanitation sector and limited institutional capacity to effectively manage sanitation systems. Ironically, sanitation in small towns in Kisumu County has deteriorated even though developing sanitation in these

towns is relatively cheaper and the unique characteristics of rapidly growing small towns provide distinct opportunities to forestall the problems faced by larger cities.

1.3 Objectives of the Study

The objective of this study was to assess sanitation practices and preferences in small towns within Kisumu County.

The specific objectives were:

i. To assess the status of sanitation practices in small towns within Kisumu County.
ii. To determine factors that influence sanitation preference in small towns within Kisumu County.
iii. To examine the current barriers to improved sanitation in Small towns within Kisumu County.

This research sought to answer the following questions:

i. What are the sanitation practices in small towns within Kisumu County?
ii. What are the factors that influence sanitation preference in small towns within Kisumu County?
iii. What are the current barriers to improved sanitation in Small towns in Kisumu County?

1.4 Justification of the study

This research is important because, information on the unique and distinct characteristics of small towns alongside sanitation practices and preferences will be critical in order to begin to address sanitation issues in terms of expanding the limited sanitation choices in these towns and educate the community about good sanitation practices. Ultimately, this work can inform strategies and policies for improving basic sanitation infrastructure needs for small town

populations in Kisumu County. The academic community can use the study as a guideline in investigating similar problems at other study areas.

1.5 Scope and Limitations of the Study

The study was restricted to Kisumu County focusing on 356 households drawn from three small towns namely; Muhoroni, Sondu and Maseno towns. In the study area, sanitation only exists on a small-scale household level, i.e. sanitation in the context of this study is defined as the collection, storage and disposal of human excreta. Throughout this thesis, the concepts of improved and unimproved sanitation are used in accordance with the definitions by WHO and UNICEF-Improved sanitation is "*a sanitation facility that hygienically separates human excreta from human contact"*.

Sanitation inherently multi-dimensional encompassing several aspects among them solid waste and waste water disposal, hygiene, human excreta disposal among other components. This make it difficult to incorporate all the components in a single study. Therefore, the study prioritized human waste disposal with explicit attention to community practices, preferences and barriers of improving sanitation facilities.

During data collection, the only challenge was unwillingness of some participants talking issues human waste or by extension admitting open defecation. A handful of respondents were fearful as they assumed the researcher was a County Government Public Health officer masquerading as a researcher. This was however mitigated through proper and elaborate explanation of the purpose and identification, the University ethics and review committee approval letter came in handy.

CHAPTER TWO:

LITERATURE REVIEW

2.1 Introduction

This chapter provides a summary and synthesis of various works published on sanitation with specific attention to small towns. It aims at getting more insight on small towns' sanitation practices, preferences, barriers to improved sanitation and the linkage of sanitation to other aspects of community health and services. The conceptual framework is also discussed in this chapter. The discussion is divided into sub sections as per the three objectives.

2.2 Sanitation practices in small towns

The word sanitation has evolved over the years; this evolution gives a more thrilling approach in understanding sanitation practices. Sanitation as defined by the World Health Organization (1992) - Sanitation refers to all conditions that affect health, including drainage systems and handling of refuse from houses and infection-causing dirt. In recent times, there has been considerable awareness of community water supply needs and the potential threat of pollution from excreta and wastewater disposal. WHO (1992) revised the sanitation definition to refer solely to the means of collecting and disposing excreta and community liquid wastes in a hygienic way so as to protect health of individuals and the community as a whole. The scope of the definition has lately been focused only on handling of human excreta (UNICEF, 2008) - sanitation refers to the hygienic principles and practices relating to the safe collection, removal, or disposal of human excreta.

Effective and sustainable changes in sanitation practices involve much more than good engineering. Change in human behavior is required. Eade and Williams (1995) point out that defecation practices are surrounded by cultural taboos and beliefs, which must be well understood before any sanitation programme can hope to be effective. UNICEF (2001)

indicates that many cultures, norms and beliefs have negative impacts on sanitation efforts. The topic itself, or the methods of disposing of excreta, is associated with taboo. The taboos are also extended to the use of technologies, including the safe recovery of agricultural resources from human wastes. The existence of such taboos poses an increased challenge to hygiene and sanitation practices, which is needed to promote links between ecology and health protection as well as both the dangers and value of excreta. Social and cultural factors such as gender, religion and culture affect individuals' attitudes to waste generation and management (De Bruijne *et al.*, 2007). Gender differences have been reported for motivations for adopting latrines. One study found out that men desired latrines mostly for prestige purposes and displayed higher aversion to the perceived smell and dangers of latrines than women (WSP, 2004). Men were also attracted to the ambience of open defecation more than women. Women desired latrines for comfort, cleanliness and convenience, but had higher barriers to adoption of latrines and tended to install fewer than men (WSP, 2004).

Defecation is a private matter, which adults are unwilling to discuss. Contact with feces for transport to a treatment or disposal site, or in cleaning of latrines is often limited to the lowest class or caste in society (Eade & Williams, 1995). In most cultures and households, it is women rather than men who deal with their children's excreta. Gender differences and constraints such as the requirement in some societies for women to defecate under cover of darkness, must be sensitively addressed. There are also restrictions for women during menstruation, or in the postpartum period, when they may not share sanitary facilities with others.

The concept of hygiene, cleanliness, purity, and beliefs about sanitation and disease vary widely, but are often deeply ingrained through religious practice and culture (Hall, 2003). In some cultures, feces of children are often considered harmless yet they are a frequent cause of dangerous contamination of the household water supply and the food chain. In countries where

water is used for washing after defecation, the practice of using toilet paper is considered to be unclean and unhygienic.

According to WaterAid (2010), provision of sanitation facilities can be done through a careful study of the culture and beliefs of the community. Individual users are the ultimate decision makers in accepting or rejecting a new practice and new technology. Women and men must be convinced of the benefits of improved sanitation and change in their own behavior. Government programs must adopt people oriented strategies in which community members play an active role in planning and organizing so that local values are incorporated. This will ensure that the resulting program is relevant, appropriate, acceptable, accessible, affordable, equitable, empowering, and based on indigenous knowledge and local skills. Utilization involves proper human waste disposal, water handling from the source to the point of consumption and effective hand washing with soap after using the toilet (Waterkayn, 2000). National sanitation guidelines (2002) defines adequacy of sanitation facilities as the state of cleanliness of the facilities, it involves presence of clean latrines and urinals, functioning hand washing facilities with soap and water.

More critically, improved hygiene practices are essential if transmission routes of water and sanitation-related diseases are to be cut and contagious diseases prevented. Diseases such as diarrhea, parasitic worm infections, skin and eye diseases, need to be tackled by making improvements to sanitation facilities. These improvements in facilities must go hand in hand with hygiene behavior change and practice, if the transmission of disease is to be prevented (WSP, 2004).

According to WHO (2008), pit latrines are the most commonly used facilities for disposing human waste in developing countries. Studies indicate that the percentage of people using latrines as a means of sanitation in some part of East Africa is as follows: Kenya 30%, Uganda

60%, Tanzania 77%, and Ethiopia 7%. Sanitation service is much lower when compared with corresponding coverage on other African countries which ranges between 30-50%.

It has been observed that in situations where sanitation facilities are inadequate or absent, hand washing is very crucial in terms of interrupting fecal oral disease transmission routes (UNICEF/NETWAS, 2005). Diarrhea, worm infections and eye and skin infections are diseases related to water and sanitation. About three million children die from diarrhea each year (IRC, 2004). Each of the three common worms (roundworms, whipworms and hookworms) is estimated to infect more than 500 million people. Roughly 6 million people have become blind from trachoma, an eye disease. In view of the above, IRC (2004) counsels that good hygiene can help prevent much of this, saving lives and preventing illness. For example, it is estimated that washing hands with soap can reduce the risk of diarrhea by more than 40%. Hygiene promotion must therefore be recognized as an essential part of water and sanitation programs if the maximum health benefits are to be gained from provision of improved facilities.

Sanitation in Kenya has been traditionally accorded low priority in national development. It has often been marginalized and rarely talked about in national debates. Equally, individuals and the private sector have not accorded sanitation priority. Additionally, sanitation has previously suffered inadequate political and public support, lack of legislative and policy guidelines, poor technology choice, inadequate resources allocation (human, financial and material) as well as inadequate coordination among all concerned parties (MoH, 1997).

The incentive for an individual to demand improved sanitation comes from a number of social behavioral characteristics of community and not merely awareness of public health or environmental degradation (Bracken *et al.,* 2007). As an example, a study by Outlaw *et al.,* (2007) indicated that the high sanitation coverage in south-western Uganda was largely

attributed to the cultural beliefs of the region because it was culturally abhorrent for a household not to have a latrine facility. Understanding community behavior helps to integrate special factors in the sanitation management framework and change behavior to increase demand (Isunju *et al.,* 2011). Behavior change interventions are needed, not only to move people from open defecation to using a toilet, but also to encourage more hygienic use of facilities (Peal *et al.,* 2010). Social change requires an enabling environment in the form of political, economic, social, communication and cultural (Duhaime *et al.,* 1985); all to instill the discipline that change may require. This has been demonstrated by a positive relationship between improvements in education, health and hygiene awareness and the demand for sanitation facilities, whereby households with members who had a higher level of literacy were most likely to demand and adopt safer methods of excreta disposal than those with low levels of literacy (WSP, 2004).

Small town communities overwhelmingly lack adequate arrangements for waste disposal. Wastewater from bathing and washing is typically spilled right outside shelters, where it may soak into the ground or form stagnant pools in poorly drained areas (Murphy *et al*., 2009). Where sewers exist, they are virtually always open drainage canals. The ground by the side of the shelters serves as a frequent substitute for urinals. In general, residents have improvised sanitation systems in small towns areas to satisfy their perceived needs (privacy and convenience, for example), and as materials and labor become available. Some of the most common sanitation practices in small town areas are either, *No system:* Defecation occurs in open areas within the settlement, on the perimeter of the settlement, or in drainage ditches. The lack of any planned waste disposal system is characteristic of most small town areas. *Latrines:* Use of latrines is the most common sanitation practice in small town regions (Murphy *et al*., 2009). A wide range of latrines can be found in small town areas, including bucket latrines, pit latrines and ventilated improved pit (VIP) latrines (Umande trust, 2012). In Asia, some systems

for excreta removal from latrine pits exist, either through buckets or vacuum truck. Latrines in small town areas are often poorly designed and maintained and may not be used by all family members. There are also documented cases of open defecation among people that own and/or have access to latrines in small towns. In these cases it is necessary to find out why people choose open defecation over hygienic latrine options. One study found multiple reasons, including no choice, privacy, convenience, and safety (Arnold *et al.,* 2010). Another study showed that in some small town areas people had to choose between inferior public facilities and expensive private facilities (Burra *et al.,* 2003). Access to a reliable water source could also affect sanitation; a study in Peru showed without adequate water, hygiene would not improve even with education. Sanitation and hygienic latrine uptake could suffer the same problem from unreliable water supplies, especially if a population is using any sort of flush toilet system (Gilman *et al.,* 1993).

While strategies are being devised to finance sanitation in small towns through micro financing institutions like loans, group saving schemes, revolving funds, grants, public private partnerships (Trémolet, 2012); demand must exist before people can even start to think of using the financing opportunities. The fundamental issue is the low priority residents in small towns give to sanitation, compared to other household needs (Isunju *et al.,* 2011).

Literature reviewed on sanitation practices has exposed the bias on focus of most studies on sanitation. Many studies cited are focused on sanitation practices in urban areas and in large and peri-urban areas of major towns. There also exists a pattern in study areas; most of the literatures are in Asia with few focusing on Sub Saharan Africa which alongside certain parts of Asia is well documented to be lagging behind sanitation targets. However, there seem to be a consensus that behavior change alongside hardware (sanitation infrastructure) is essential if sanitation is to be improved among communities and to ensure sustainability, an argument that the researcher strongly advocates.

2.3 Sanitation Preferences in small towns

The success of specific technology depends on its effectiveness in disrupting disease transmission cycles. The disruption point however, varies according to the types of pathogens and their transmission cycles (Alcock, 1999). The main purpose of any system is the containment and destruction of the disease causing pathogens found in human excreta.

The question why the adoption of sanitation technologies is slow especially in the developing world has remained complicated. Diwan *et al.* (1979) argued that the appropriate technology sometimes refers to an entire social movement that leads to the adoption of a collection of hardware and/or to the design alternatives ostensibly responsive to the ideology of that movement. According to Jequier and Gerard (1993), appropriate technologies are generally characterized by one or more of the following features: Low investment cost per work place, low capital investment per unit of output, organizational simplicity, high adaptability to a particular social cultural environment, sparing use of natural resources and low cost of final product or high potential for employment. Therefore, the improved sanitation technologies to be appropriate and successful in small towns will first have to meet the above broad characteristics.

When a new technology is introduced into an area, the adoption will be slow until that region reaches a level of development that can take advantage of the technology being introduced (Basu & Weil, 1998). Further, slow adoption of technology is brought about by the barriers that lead to increased cost of technology. Consequently, a technology will diffuse in an area only when barriers to adoption are reduced (Parente & Prescott, 1994). One way to facilitate technology transfer is through identifying barriers for its adoption. Understanding local constrains on introduction of a technology through devising a mechanism that facilitates a two way exchange of information between user and designer of the technology are essential. In such a system, users provide feedback on the performance of introduced technology. Such

feedback is used to redesign or in other ways to improve the technology in order to increase users' satisfaction (Murphy *et al.*, 2009).

Sanitation systems can be divided into two categories, 'onsite' and 'offsite' systems. Onsite sanitation systems deal with human excreta at the point of generation (e.g., the household level). Onsite sanitation can further be classified into two main categories: wet system which requires water for flushing and dry system which does not require water for flushing. Onsite sanitation systems include pit latrines, septic tanks and other household level technologies that do not involve sewerage (IRC, 2012). Offsite sanitation systems transport human excreta to another location for treatment, disposal or recycling. Offsite sanitation can also be further classified into two main categories of 'decentralized' and 'centralized' systems. Decentralized systems include systems in which groups of two or more houses are linked to a (small bore sewer) network leading to a communal treatment system whereas centralized systems consist of wastewater systems serving one or several communities. In most cases, decentralized systems represent an appropriate technological option for urban areas that face problems with high population density (IRC, 2012). However, in the developing world, sewerage systems are impractical because of high investment and operation costs (Mara *et al*., 2007). On-site sanitation options with low operation and maintenance costs remain the most appropriate particularly for rural and unplanned urban settlements (Nelson & Murray, 2008).

Countries and regions also differ considerably in terms of the type of sanitation widely available. Previous studies have shown there are many complex factors that influence personal preference about sanitation choices. A study of latrine adoption in Benin found a number of drivers for sanitation uptake that were broadly categorized as prestige-related, well-being and situational (Jenkins & Curtis, 2005). Another study in the Philippines showed that respondents valued many other latrine attributes over health. When asked to rank reasons they would like a latrine, the average rank for health was number five. Ranked more important was lack of smell,

lack of flies, clean and privacy (Cairncross, 1992). Another study in Ghana proposed that latrine adoption occurs in three behavioral stages: Preference, intention and choice (Jenkins & Scott, 2007). People's preference shifts when they become dissatisfied with current sanitation options and then they intend to build a latrine when the idea of a latrine becomes preferable and there are no structural barriers or constraints identified. Finally, they choose to install a latrine when they have access to good information, materials, finances and product choices (Jenkins & Scott, 2007). While not a predictive model for latrine adoption, this study outlines an example of the decision making process that goes into the choice to build or buy a latrine and change sanitation behavior.

Although a range of technologies are available along the sanitation supply chain, their selection is always based on preference, affordability and availability of materials (Katukiza *et al.,* 2012). Yet some technologies may not be appropriate to small town settlements due to technical standards, regulations, land tenure system and limited space (Tumwebaze *et al.,* 2013). Studies have shown that excreta disposal systems, packaged and delivered as low-cost "safe sanitation", but not matching the sanitation needs of the small town communities may neither be appropriate nor used and cannot therefore be sustained beyond the life of the project. Njogu (2000) notes that critical challenges hindering sanitation improvements in small towns and other typical informal settlements in Kenya include environmental issues; with low-lying terrain combined with a high water table and lack of sufficient water which limits technology options to mainly traditional pit latrines. The development of appropriate sanitation technologies for these settlements should assimilate the specific needs of the intended users to create demand (Muwuluke, 2007).

As stipulated above, there are many different types of sanitation used throughout the world, including both wet and dry systems. Flush toilets can empty into a sewer system, a septic tank,

or an open gutter (Tilley, 2008). Pit latrines can range from a simple hole in the ground to various superstructures, with ventilation pipes, slabs and dual chambers. Soak away pits absorb the wastewater from a flush toilet that empties into a hole in the ground (Tilley, 2008). There are also various models of ecological sanitation that recycle human waste back into the environment. An example is urine diverting toilets, which separate urine from feces. The urine can be used for fertilizer, and the feces can be used for composting, dried or burned for fuel (Tilley, 2008). Not all facilities are hygienic and there has been debates about what types are best suitable for different areas and regions.

In the literature on sanitation, the terms "adequate," and "improved" are used to describe sanitation coverage. Coverage is defined as the percentage of the population with access to adequate (improved) sanitation facilities. WHO and UNICEF differentiates between the term "improved" and "adequate" because of the lack of information on adequacy of sanitation facilities. As a result, they assumed that certain types of technologies are more adequate than others. The World Health Organization defines "improved sanitation" as access to personal sanitation facilities that are able to hygienically separate human waste from human contact (WHO, 2008). These include flush and pour-flush toilets that empty into a sewer, septic tank or soak away pit, as well as pit latrines with slabs, ventilated improved pit latrines (VIPs) and composting toilets. Unimproved sanitation includes no sanitation facilities at all, known as "open defecation", pit latrines without slabs, hanging toilets, buckets and shared or public facilities of any type.

The concept of "sanitation ladder" was introduced by WHO to show differing levels of sanitation access which gives more information than the dichotomous "improved"/"unimproved" labels (WHO, 2008). The table below lists sanitation technologies that are considered to be "improved" and "not improved"

Table 1: Types of Improved and unimproved Sanitation Facilities.

Improved Sanitation Facilities	Unimproved Sanitation facilities
Flush or pour –flush to: - piped sewer system - septic tank - pit latrine Ventilated improved pit Latrine Pit latrine with slab Composting toilet	service or bucket latrines Pit latrine without slab or open pit Hanging toilet or hanging latrine, flying toilets or open fields

Source: WHO/UNICEF (2000)

With the incentives to improve sanitation set by the SDGs' and other public health funding, the problem becomes how to improve population access to sanitation and change sanitation behavior. In order to do this, it is necessary to effectively measure sanitation behavior, access and demand. There is a growing body of literature examining the factors that influence choices about sanitation practices and preferences through multiple methods as well as accurately documenting sanitation behaviors. Failure to take into account a community's practices, preferences and attitudes towards sanitation can result in interventions that are not appropriate for a community. They may require behavior change that the community is not willing to make, they may be too technologically sophisticated for a community to relate to, operate and maintain, or they may not be culturally acceptable or conform to community norms and attitudes about sanitation (Yacoob, 1994).

Under the second objective on sanitation preferences, there exist a deviation in the trend established in objective one. Most literature here are focused on Sub-Sahara Africa. It could be argued that most studies in Sub-Sahara Africa therefore have focused more on sanitation technologies. However, there exists an empirical evidence to suggest that most small towns are faced with limited sanitation choices. The evidence further corroborates the gap that the

investigator strived to fill; Small towns have been neglected in the water and sanitation sector, the investment has not kept pace with population growth and does not heed local demand.

2.4 Barriers to improved sanitation in Small towns

As a fundamental part of daily life, sanitation systems are closely linked to societal issues of culture, technology and economic status. Some definitions adopt a more inclusive definition of "improved sanitation" as a system which protects and promotes human health, does not contribute to environmental degradation or depletion of the natural resource base and is technically and institutionally appropriate, economically viable and socially acceptable (Bracken *et al.*, 2005). This definition is used as a reference point for discussions of improved sanitation in this thesis.

Human excreta are associated with various diseases, especially gastrointestinal diseases and helminthes infections. The overall objective of improving sanitation is to hygienically separate humans from contact with feces. According to Appleton (2007), inadequate handling of human feces can lead to ground pollution, contamination of water sources and other surfaces that human come into contact with. Unhygienic disposal of human feces also provides habitat for disease transmitting vectors like flies and mosquitoes. Intolerable nuisances of both odor and sight may also be experienced when excreta are inadequately disposed (Van Wyk, 2009).

Fecal-oral related diseases often manifest in diarrhea (Thomas & Weber, 2001). As such, diarrhea is an indicator of poor sanitation and a measure used to ascertain the impact of using proper sanitation facilities. Access to improved sanitation can reduce diarrhea morbidity by 32% (WHO, 2004). As hygiene is part of proper sanitation, washing hands may lead to reduction of diarrhea disease by 45% (WHO, 2004). Many of the fecal related diseases affect children in particular, it is estimated that each year, diarrheal disease kills 1.5 million children globally (WHO, 2012).

Increasing access to improved sanitation has many challenges. The environmental sustainability; how waste is physically being disposed and its impact on the surrounding environment, can affect all people in a region regardless of socio-economic status. Water resources for sanitation systems are also an important aspect of environmental sustainability. Financial sustainability; how the sanitation systems and facilities will be operated and maintained and who is paying for them, depends in a large part on the consumer. The long-term sustainability of a system requires some sort of user fee and input from the people benefiting from the service. These fees are important to make sure people have ownership of their services and for accountability to make sure the system is functioning correctly. However, they can also be a barrier to sanitation for the poorest, which leads to unequal sanitation access and benefits (Moe & Rheingans, 2006).

Cultures where open defecation is condoned may not see a need to change their practices or see the public health benefits of sanitation. One reason for this is that sanitation coverage must be high in order for a community to see the effects of reduced disease and environmental impact. Even 90% latrine coverage can be negated by 10% open defecation and such high coverage numbers are rare in the developing world (Cairncross, 1992).

Existing sewerage infrastructures, high density of housing and full water reticulation systems may in some cases alter the economic ranking of various options. With better water supplies and the possible existence of trunk sewers, the call for higher levels of sanitation is often heard. While construction costs may be met, it must always be asked whether the community is able and willing to pay the on-going operation and maintenance costs of such systems. In some urban situations, people already have sanitation infrastructure that they cannot afford to run and maintain. In such cases, the local authorities will need to consider subsidies or other means of funding on-going costs. The costs of emptying pits and tanks and disposing of the contents

must be included in affordability calculations, alongside the costs of conventional sewage disposal.

The people who recognize need for or want sanitation facilities may also be limited by finances and logistics. Many small town dwellers that want improved sanitation desire flush toilets, because previous experiences with any kind of latrines have not been positive (WSP, 2004). These small towns often lack reliable running water leading to lack of infrastructure for piped water and sewage. It is unlikely these populations that have to purchase water by the bucket will turn around and flush that water down a toilet. Many populations do not have the financial resources to build sanitation facilities. Even if an NGO or government were able to provide latrines and/or toilets, the question of sustainability still remains. Water for flush toilets, either piped or pour-flush, must be paid for, and latrines and septic tanks must be cleaned, repaired, and emptied. Public facilities often charge fees for upkeep and maintenance, but for a personal facility, this responsibility falls on the owner. Often it is the poorest of the poor that lack adequate sanitation and practice open defecation, and they cannot afford to pay for public facilities or the construction and upkeep of personal ones (Strauss, 2001).

Several approaches have been used to increase sanitation coverage in small towns with mixed results. One of such approaches is to create new markets for sanitation. This involves incentivizing sanitation, either for health reasons or other motivations such as privacy, hygiene and social status (Curtis & Cairncross, 2003). Once demand exists for sanitation, there are many options for fulfilling that demand including through non state actors and outside donors. Social marketing has been successfully used for other public health products and services, such as household drinking water treatment and insecticide-treated bed nets (Waterkeyn & Cairncross, 2005).

Another approach of changing community perception on sanitation is Community-Led Total Sanitation (CLTS). This involves a trusted community member or outsider gathering the

community together and explaining how open defecation results in feces movement to places where food is grown, children play, public areas and water sources (Kar, 2008). The purpose is to shame the community into rejecting open defecation and empower the community to tackle the problem of open defecation. By addressing the community as a whole, the issue of partial sanitation coverage is avoided. Criticism of the program includes questioning the ethics of using shame as a tool for behavior change (WaterAid, 2010). There have been some documented negative impacts on members of a village who were caught defecating in the open after the program implementation, often with harsh penalties from within the communities (Sah & Negussie, 2009).

Studies that have made attempts to establish barriers to improving sanitation in small towns have dwelt on improving access to onsite sanitation, this is further evidence that most small towns globally are not connected with networked sanitation system and also an indication that investment has been low in these towns. There seem to be a consensus that a key method of increasing sanitation coverage is to create new markets for sanitation. This involves incentivizing sanitation, either for health reasons, or other motivations such as privacy, hygiene, social status and CLTS. This is an argument that the researcher is at odds with. Particularly its application in small towns within Kisumu County, where evidence exists of sanitation interventions which have failed to increase coverage due to lack of attention to local demand. In regards to CLTS in Kisumu County, the impact cannot be authoritatively stated as CLTS in Kisumu County is a weak component with very few villages declared ODF.

2.5 Gaps in the Literature

The review of the literature revealed a number of gaps in the integration of small towns in water and sanitation sector, which this study sought to fill. Most studies on water and sanitation dwelt on large cities and rural areas without appreciating the unique characteristics of small towns. Secondly the literature also showed a bias towards water at the expense of sanitation. Many

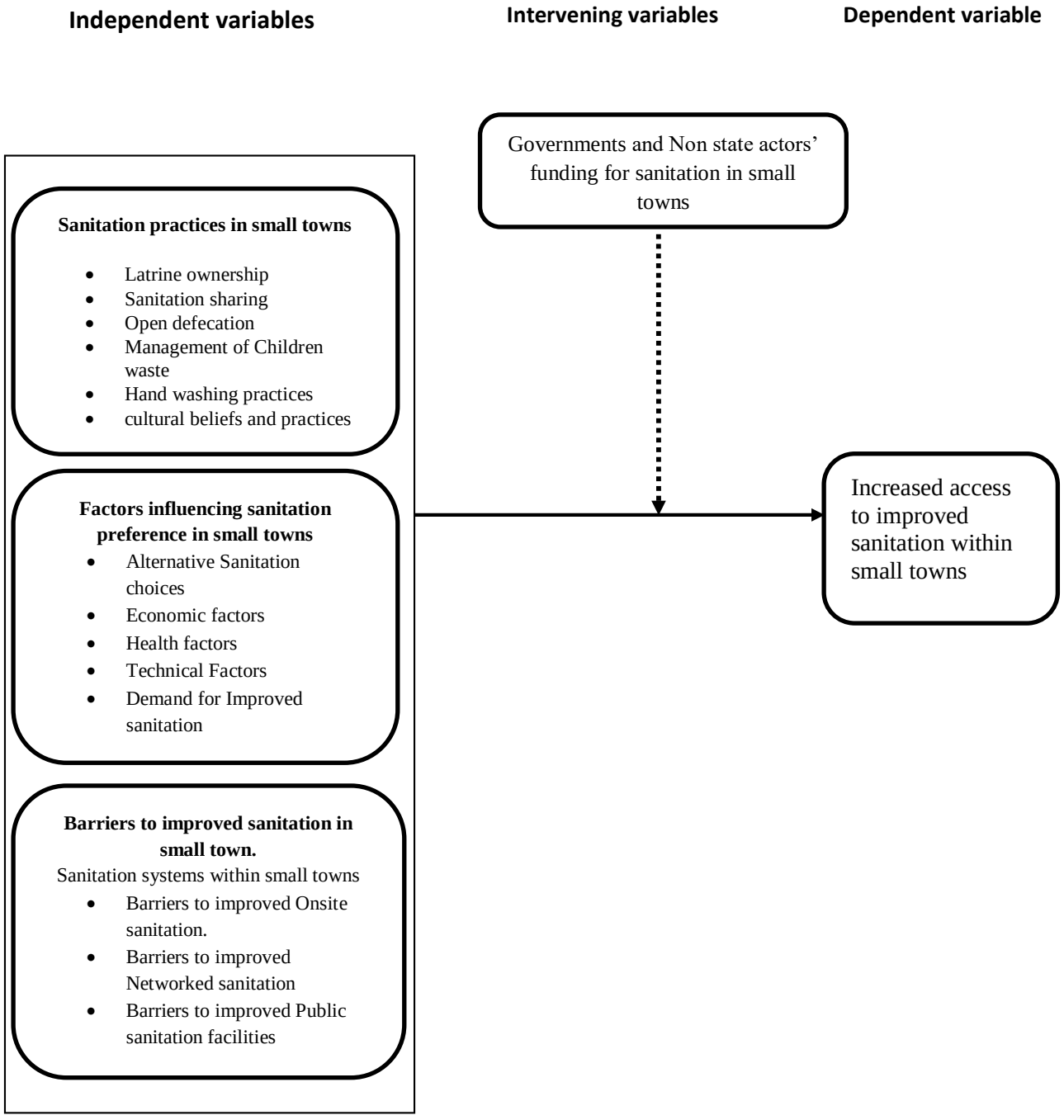
researchers studying water and sanitation as a combination dwells on water with sanitation ending up as a footnote.

2.6 Conceptual Framework

Increasing access to improved sanitation requires a clear understanding of the targeted population segment. The unique challenges within small towns makes it difficult to increase coverage and uptake of sanitation as this would require a more tailored approach compared to the standard approaches for rural and major urban areas. Understanding sanitation practices and preferences among communities in small towns are therefore a precursor in beginning to address sanitation challenges within these towns.

In this study, increasing access to improved sanitation is designed to depend on three factors namely: Sanitation practices with focus on residents defecating points, human wastes disposal, hygiene practices, cultural beliefs, practices and norms. Secondly on sanitation preferences, this is influenced by a number of variables broadly categorized as economic factors, technical factors and health related factors. Finally increasing accessibility to improved sanitation in small towns also involves eliminating the existing barriers of improving sanitation; in this study these barriers are assessed in relation to on site sanitation facilities, networked facilities and public sanitation facilities. The intervening variable in increasing access to improved sanitation among small town residents is government and other non-state actors' funding for sanitation services.

Figure 1 below shows the Conceptual Framework for sustaining access to improved Sanitation in small towns. It is within this framework that this research will be carried out



Source: Author, 2017

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The study was conducted in three small towns: Maseno, Muhoroni and Sondu within Kisumu County. This study employed a cross-sectional survey design with 356 households which represented 7.26% of the study population, sampled using systematic random sampling. For the qualitative sampling, purposive sampling was utilized. Primary data collection was done using household questionnaires, in-depth interviews and focus group discussions. Secondary data was obtained from the government records. Quantitative data analysis was done using both descriptive and inferential statistics while qualitative data was coded and analyzed by themes as per the objectives generated using content analysis. Findings of the research are reported using a combination of varied approaches and techniques. The chapter further discusses the quality control measures taken, risks and benefits to the participant and the ethical consideration.

3.2 Research Design

This study employed a cross-sectional survey research design. Mugenda and Mugenda (1999) perceive a survey as an attempt to collect data from members of a population in order to determine the current status of that population with respect to one or more variables. Surveys can be used for explaining or exploring the existing status of two or more variables at a given point in time. Saunders and Thornhil (2007) also explains that this research strategy allows collection of data through questionnaires administered to a sample and that the data collected by this design can be used to suggest possible reasons for particular relationships between variables and produce models for such relationships.

The researcher developed and employed an array of participatory tools for use in the study. The tools included both structured and semi-structured questions, key informant interviews guides, focus group discussions guides, questionnaires and in-depth analysis guides.

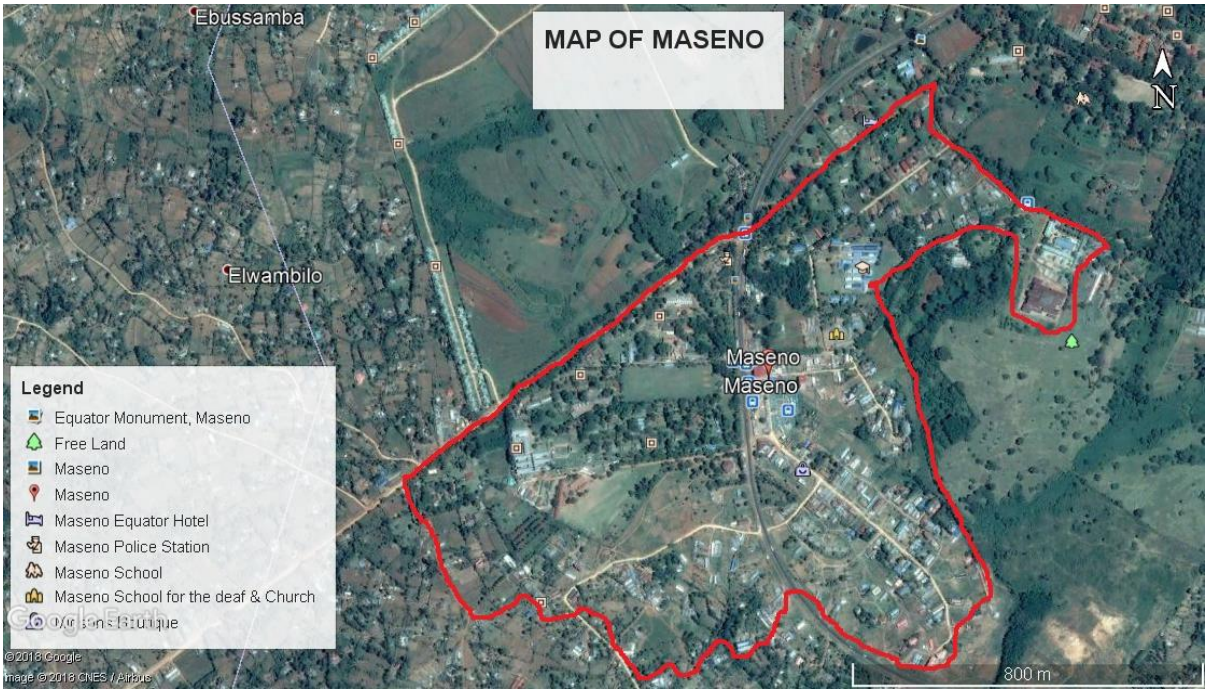
3.3 Study Area

Kisumu County is one of the 47 devolved county governments in Kenya. The County covers 0.36% of the total land mass in Kenya, over an area of 2,085.93 km^2 spanning from the Winam Gulf's northern to south-eastern shores on Lake Victoria. Geographically Kisumu County is sandwiched between Vihiga, Nandi, Kericho, Homa Bay, Siaya counties and the Winam Gulf. The county has a population of 968,909 people; 2.51% of the total population of Kenya and a population density of 460 people per sq. kilometer (KNBS, 2009).

3.3.1 Maseno Town

Maseno is a town in Kisumu County, Kenya. It is located along Kisumu - Busia highway 25 kilometers to the lake side city. Another road connects Maseno to Vihiga town, located 15 kilometers east of Maseno. The altitude of Maseno is 4,934 feet above sea level and lies within coordinates 0.0067^0 South and 34.5985^0 East. Maseno town had a population of about 6000 residents within the township (KNBS, 2009) and hosts a number of learning institutions among them Maseno University Main Campus. The figure below shows the spatial mapping of the study area within Maseno Town.

Fig 2: Mapping of Study Area in Maseno Town

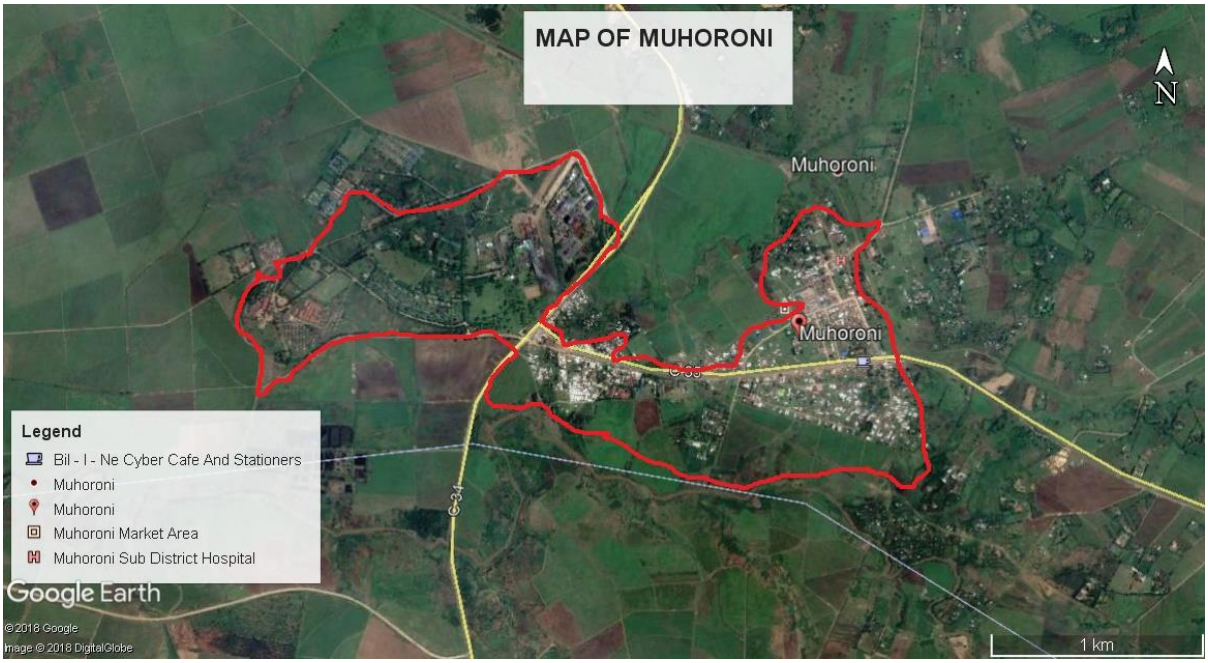


Source: Google Earth, 2018

3.3.2 Muhoroni Town

Muhoroni is a town in Kisumu County, Kenya. Muhoroni has a railway station along the Nairobi-Kisumu Railway. The town is located 50 kilometers east of Kisumu City, the County capital. Chemelil, a smaller town, is located 10 kilometers west of Muhoroni. The town lies within coordinates 0.1566^0 South and 35.1984^0 East. Muhoroni town had a population of about 14,800 residents within the township (KNBS, 2009). Muhoroni is a sugarcane growing town and home to Muhoroni Sugar Company and Agro-Chemical & food Company Limited among others.

Fig 3: Mapping of Study Area in Muhoroni Town

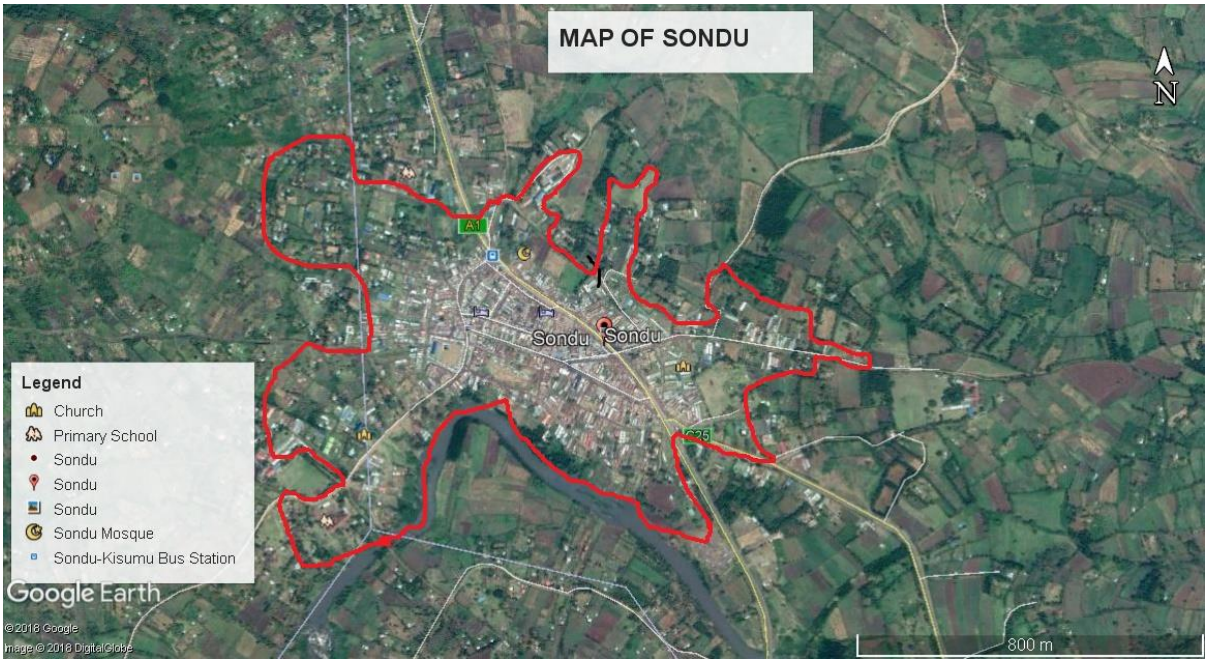


Source: Google Earth, 2018

3.3.2 Sondu Town

Sondu is a small border town along Kisumu County and Kericho County. It borders Homa bay County to the south with river Sondu-Miriu acting as a boundary to the south. It also acts as a transport hub between Kericho, Kisumu and Kisii towns. The town is located 52 kilometers from Kisumu city. The town lies within coordinates 0.3900^0 South and 35.0140^0 East. Sondu town had a population of about 7800 residents within the township (KNBS, 2009) and has a high population density.

Fig 4: Mapping of Study Area in Sondu Town



Source: Google Earth, 2018

3.4 Study Area population

Kisumu County has six small towns with a combined population of 12,637 households. This particular study was carried out within three small towns; Maseno, Muhoroni and Sondu with a population of 4903 households (KNBS, 2009). There is also a significant number of employees in the water and sanitation sector who together with small town residents and other community leaders were sampled for focus group discussions and in-depth interviews. Household was taken as the unit of analysis in this study.

3.5 Sampling

3.5.1 Criteria for inclusion of small towns

Kisumu County has 11 urban centers; Ahero, Maseno, Kombewa, Awasi, Holo, Chemelil, Muhoroni, Katito, Pap Onditi, Sondu and Kisumu city (KCIDP, 2013). The population distribution of these urban centers is as in the table below.

Table 2: Population distribution of urban centers within Kisumu

Urban centre	Kisumu City	Ahero	Maseno	Kombewa	Awasi	Holo	Chemelil	Muhoroni	Katito	Pap Onditi	Sondu
Population	259,258	8875	6301	3821	2488	6453	7888	14806	2967	2131	7892

Source: *KNBS, 2009 Kenya Population and Housing Census Vol. 1A, 2010*

The criteria for defining small town varies significantly from country to country usually based on the population size of the primary cities. Population size threshold is the most commonly used defining characteristic for small towns. However, some countries do include other elements such as relative percentage of the local economy that is not agriculture based e.g. Nepal and population density (Doe, 2003).

In Kenya, small towns have a population of between 5,000 and 80,000 and cover areas ranging from 5 km^2-50 km^2, population growth rate of 6-12% a year and usually have an administrative center, a commercial center and housing areas for various income groups (UN-Habitat, 2008). This definition by UN-Habitat is adopted: Unlike the definition by Kenya urban areas and cities Act, UN-Habitat defined small towns with respect to sanitation; The population of 5000 is used as a minimum threshold when small towns fully transitions from rural to urban with manifestations of urban sanitation challenges. At that level, the main challenge is that sanitation systems becomes typically too complex to be well managed by community groups, but too small to be financially viable for professional water utilities (WSPs).

According to the above definition, population size threshold was used as basis for selection of small towns due to availability of reliable data. Therefore, Kisumu County had the following small towns: Ahero, Maseno, Holo, Chemelil, Muhoroni and Sondu.

The six small towns were further categorized for purposive sampling; Chemelil, Sondu and Muhoroni as border towns, Holo, Maseno and Ahero as dynamic market centers developing along major highways. Purposive sampling was thereafter used to include Muhoroni for being

a sugarcane growing town with higher population, Maseno because of the presence of major learning institutions and Sondu because of the high population density.

3.5.2 Sample size

The three small towns in the study had a total of 4903 households (KNBS, 2009). When the population is more than 10,000 individuals, 384 of them are recommended as the desired sample size (Mugenda & Mugenda, 1999). With the study population less than 10,000, the following formula was used to compute the sample size:

$$nf = \frac{n}{1 + n/N}$$

Where: nf = the desired sample size when the population is less than 10,000.
n = the desired sample size (when the population is more than 10,000).
N = the estimate of the population size.
Using the above formula sample size is:

$$nf = \frac{384}{1+384/4903} = 356 \text{ Households}$$

3.5.3 Sampling technique and procedure

For the quantitative study, 356 households which represented 7.26% of all the households were sampled using systematic random sampling based on sampling by probability proportional to size. The sampling interval was 10; this is done when the cluster sampling units do not have the same number of elements. Kothari (1992) referred to this type of approach to sampling as the multi-stage sampling. Combining different sampling methods gives a rich variety of probabilistic sampling (*ibid*). An enumeration map was then used to identify the households from the sampled small towns and a structured questionnaire administered by the researcher to

the household heads, or any competent member of the household in cases where household's heads were away at the time of data collection.

Table 3: Sampling frame and sample sizes.

NO	Small town	No. of Households	sample (HH)	percentage %
1	Maseno	1090	78	22
2	Muhoroni	2603	189	53
3	Sondu	1210	89	25
	TOTAL	**4903**	**356**	**100**

Source: *KNBS, 2009 Kenya Population and Housing Census Vol. 1A, 2010*

For the qualitative study, purposive sampling was utilized. According to De Vos *et al.* (1986), purposive sampling is used where the sample is composed of elements that contain the most characteristics and representative attributes of the population. This technique was used to identify participants for in-depth interviews (KII) and between 6-12 members for focus group discussion in all the three small towns.

3.6 Data collection

3.6.1 Primary data

a) Household Interviews

Niewenhuis (2007) refers to interviews as a two-way conversation in which the researcher seeks answers from the participants by asking questions about the phenomenon under investigation. The sample survey questionnaires constituted the main research tool because it is easy to use on a large number of subjects, 356 households. It has an advantage of facilitating collection of a lot of information in relatively short time and can be answered by respondents without explanation. Household questionnaire was used to collect demographic and socioeconomic characteristics of the respondents, sanitation practices: Latrine ownership, latrine sharing, open defecation, hand washing, management of children wastes and cultural practices. Factors influencing sanitation preferences: Sanitation choices, health, technical and

economic factors and finally household questionnaire was used to gather data on barriers to improved sanitation in relation to onsite, networked and public sanitation facilities. This tool was used to collect data from household heads, or any competent member from a sampled household in cases where the head was not available. The respondents were of both gender and at least 18 years of age. The household questionnaire was administered by the researcher.

b) In-depth interviews

The researcher conducted in-depth interviews with key informants including; sub county public health officers and sub county administrators, community leaders and other stakeholders who were sampled purposively. All the three small towns in the study are in different Sub Counties, the researcher therefore conducted four in-depth interviews in each small town. This method was adopted because it enables one to come across new ideas. This interview method is appropriate as it brings the interviewer and the interviewee close to each other allowing for probing to help clear ambiguities. It also generates first-hand information, has a high response rate and enables acquisition of data there and then. This tool assisted in understanding the sanitation situation within the specific small towns, levels of people's knowledge about different sanitation choices and their linkages to health and the specific barriers on improving sanitation.

c) Focus Group Discussion

According to Niewenhuis (2007), focus groups are also interviews. Their strategy is based on the assumption that group interaction will be productive to widen the range of responses, activate forgotten details of experiences and release inhibitions that may otherwise discourage participants from disclosing information. Discussions in the focus groups were centered on particular topics, whereby debate and conflict were encouraged to assist with data collection. Purposive sampling was again used to identify participants for FGD from community members whom the researcher in his wisdom deemed to be capable of providing reliable and insightful

information. Sanitation being a gender issue, the investigator was mindful of gender differential on sanitation issues. Therefore, two focus group discussions were conducted in each of the three small towns comprising male only and female only participants. All the participants in the focus group discussion were of 18 years and above. According to Gibbs (1997) and Stewart *et al*. (2007), each focus group should have six to twelve participants. Groups with fewer than six participants tend to reveal less information and can be dull. On the other hand, it is difficult to have an informative discussion with groups larger than twelve. Though there are no firm guidelines regarding the number of focus groups, most studies use at least two groups and few studies use more than four groups (MacDougall & Fudge, 2001). Fewer groups are also needed when the population is homogenous or the question is simple (Stewart *et al*.,2007), by having male and female-only discussions helped to create some sense of homogeneity considering the different gender roles on issues of water and sanitation.

Different tools were used under this technique among them: Barrier assessment to highlight challenges to improved sanitation, force field analysis to better understand different sanitation practices and option assessment to evaluate the feasibility of various sanitation choices within the small towns.

d) Direct Observation

An observation checklist was used for direct observation. Direct observation was used to validate some of the information collected on sanitation practices from the household questionnaire. The researcher mostly observed sanitation facilities and certain behaviors like hand washing and open defecation. These information was recorded by taking notes and photographs. This allowed the researcher to gain first hand experiences without informants (Dooley, 2001).

3.6.2 Secondary Data

Secondary data was obtained from the government records both county and national governments. More information was gathered from other scholarly publications, relevant online portals and from organizational records and reports of non-governmental players in sanitation sector within Kisumu County. Secondary data was preferred because of the pre-established degree of validity and reliability which needed not be re-examined by the researcher. The secondary data was helpful in research design and providing baseline upon which research findings were compared and discussed.

3.7 Data analysis

All the questionnaires were numbered and disaggregated by specific study area. Data analysis and interpretation was guided by the key issues under investigation. Quantitative data analysis was done using descriptive statistics; by running frequencies and cross-tabulations. Inferential statistics; such as Chi square test of association and log linear analysis to show the strength of relationships in crosstabs and factor analysis to highlight barriers to improved sanitation. Qualitative data was analyzed through content analysis by coding, summarizing, categorizing and direct quoting.

Findings of the research are reported using a combination of varied approaches and techniques. Results on major aspects of sanitation service delivery have been discussed in line with the objectives of the study. Qualitative analyses was done for each of the main themes and supported with presentation of actual results of responses in frequency tables. The major findings are summarized in line with the objectives of the study and recommendations made for enhancing sanitation services delivery and enriching further discussions around sanitation within small towns.

Confidentiality was ensured by using good data collection and storage practices. Data was stored digitally and secured using security codes and was not discussed outside the research context. In general, access to information has been restricted to the researchers and the affiliate institution. Care has been taken to avoid breaches of confidentiality in which this information is divulged to anyone unauthorized user. The findings of the study will be disseminated to participants and stakeholders through seminars, conferences and public *barazas*. The published version will also be available for reference online. Further to that, hard copy will be made available at the Maseno University library for reference.

3.8 Quality control

The study strived to ensure data quality control throughout the study spectrum. The tools that were used for the study were pre-tested for validity and reliability. After data collection, the researcher checked all the questionnaires for completeness and consistency before data entry. The questionnaires were then numbered and disaggregated by specific study areas. Data entry screen was designed in epi data since this software allows setup of quality checks like skip patterns as well as assigning specific ranges of variables. The researcher also used triangulation to ensure validity. Creswell and Miller (2000) defined triangulation as "A validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories of a study". They advocate the use of triangulation by stating that it 'strengthens a study by combining methods'.

3.9 Risk and Benefits to the participants

Unlike in a clinical/therapeutic study, this study had minimal, if any risks to the participants except only for inconveniences, this was however mitigated through voluntary participation and reducing the time needed for response. Although the participants did not directly benefit from the study, their participation ensured that they become part of a wider process that may

provide valuable information for addressing sanitation issues bedeviling them and many other residents of small towns.

3.10 Ethical Consideration

Ethics are standards of behavior that guide moral choice about our behavior and relationship with others. The goals of ethics in research are to ensure that no one suffers adverse consequences from the research activities (Kothari, 2004). Similarly, Mugenda (2011) encourages protection of the rights and welfare of participants. These include the right to life, protection from pain and injury and to voluntary participation.

The proposal was submitted to the Ethics Review Committee at Maseno University for approval and eligibility to use human subject in the study (Approval REF: MSU/DRPI/MUERC/00401/17). During data collection, participants consent to participate was sort beforehand. Information was presented to enable residents to voluntarily decide whether or not to participate as research subjects. Informed consent process was a dialogue that saw the study purpose, duration of participation, all foreseeable risks and discomforts to the subject and the benefits of the research to the individual and by extension to the society demystified. Consenting is a continuous process and participants were made to understand their right to withdraw their participation at any level. The informed consent process ultimately ensured that the subject fully understood what they participated in, signed and kept a copy of the consent form.

CHAPTER FOUR;

FINDINGS AND DISCUSSION

4.1 Introduction

The main purpose of the study was to assess sanitation practices and preferences in small towns within Kisumu County. To this end, data collection was categorized into key thematic areas. The findings of the study are presented in this chapter in relation to the specific study objectives. It is worth noting that even though household was used as the unit of analysis, head of the household was the main unit for data collection. Under objective one; Sanitation practices in small towns, data on the following variables are presented; Latrine Ownership, latrine sharing, open defecation, management of children feces, hand washing, cultural beliefs and practices related to sanitation. Under the second objective on factors that influence sanitation choices, data is presented on the following variables: sanitation types and on specific factors which are here categorized into health, economic and technical factors. Finally on the last objective, barriers on improving sanitation are categorized into on-site, networked and public sanitation facilities.

All these variables are further discussed in relation to other influencing demographic and socio-economic factors among them: Sex of respondent, level of education, household population, age of respondent, household Income and occupation of head of household.

Methods that involve graphical illustrations, frequency tables and cross tabulations have been utilized in the presentation to reflect statistics that accompany explanations for better understanding.

4.2 Demographic and socio-economic profile of the respondents

Demographic and socio-economic characteristics of respondents have a significant role on influencing personal responses about any problem in social research. Keeping this in mind, a

set of personal characteristics namely, sex, age, level of education, occupation, size of household and income of the 356 respondents were examined. Demographic and socio-economic data was collected using the household questionnaire and by observation for gender of respondents.

4.2.1 Sex of Respondents

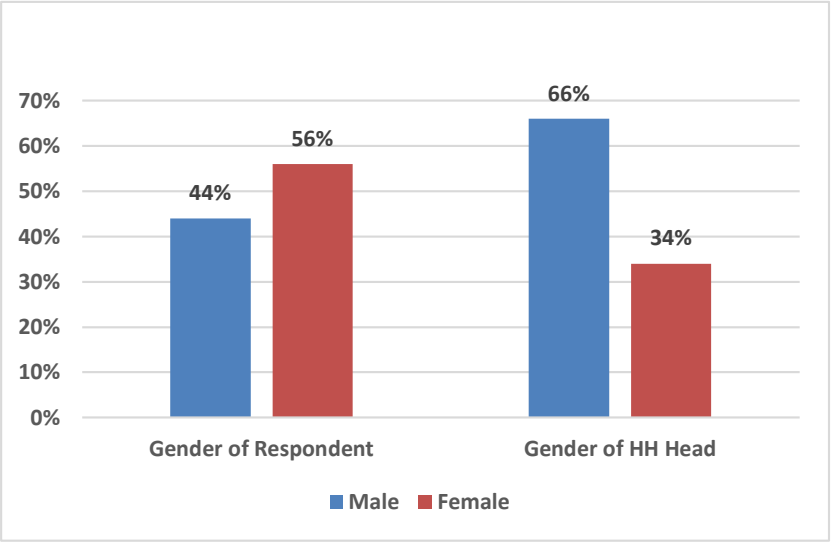
Gender is a salient variable in any social situation which is variably affected by social or economic phenomenon, sanitation is no exception. Gender influences the sanitation needs of different family members in a household. According to the World Health Organisation (2000), sanitation needs for female family members are not necessarily the same as those of male family members. Consequently, sex of respondents and sex of head of households were determined.

Table 4: Sex of respondents

VARIABLE		MASENO (%)	MUHORONI (%)	SONDU (%)	AVERAGE (%)
Sex of respondent	Male	50	43	40	44
	Female	50	57	60	56

The gender ratio in all the three small towns was almost one to one apart from Sondu town where the ratio was two males to three female participants. In societies across Africa, most households are headed by males. Head of household was the main unit for data collection. More than half of the sampled households (66%) were male headed with only 34 % being female headed. This was due to the makeup of the households rather than convenience sampling as all households within the study area had equal chance of being sampled.

Fig 5: Percentage distribution of gender of respondents and Gender of household head



Traditionally, females play key roles in terms of water, hygiene and sanitation. They execute most of the household chores such as the preparation of food, collection of water, changing of children's nappies among others. It is evident from the research findings that this study had more female respondents than the male respondents. Females made up 56% of the sampled respondents while their male counterparts constituted 44%.

Most studies on WASH often overlook the central role of women in sanitation management. The importance of involving women in the management of water and sanitation has been recognized at the global level. For instance, the International Conference on Water and Environment in Dublin (1992) explicitly recognized the central role of women. Consequently, the idea of International Decade for Action, 'Water for Life' (2005-2015) was founded on the understanding of the integral role of women in sanitation-related development interventions.

4.2.2 Age of respondents

Age is an overriding characteristic in understanding a respondent's view about a particular problem. The study required respondent from all participating households to be over the age of 18 years, the selection was based on the fact that they were mature and would provide responsible responses.

Table 5: Age of Respondents

VARIABLE	COHORT	MASENO (%)	MUHORONI (%)	SONDU (%)	AVERAGE (%)
Age of respondent (In years)	18-28	57	20	24	**33**
	29-38	28	31	37	**32**
	39-48	8	26	19	**18**
	49-58	3	20	15	**13**
	59-68	3	2	4	**3**
	68 and above	1	1	1	**1**

The population of the three small towns was youthful. The average age of respondents was in the mid-thirties. More than half the population was under the age of 35 years, 34% between the ages 39 years and 68 years. In all the three small towns there was only 1% of elderly respondents of 68 years and above. Majority of respondents from Maseno town were students and that could explain why 57% are between ages 18 and 28years.

4.2.3 Level of Education

According to Weeks (2005), the level of education that a person attains determines the level of understanding of developmental and societal issues, especially the need and uptake of sanitation and other hygiene related issues in the households or within the communities. Birley (1995) noted that education level is a paramount factor in as far as sanitation is concerned. Education which he defines as an instrument in human capital as it involves passing on preserved values, knowledge and skills from one generation to another whether formal or informal; is important to community members and stimulates change among the beneficiaries.

Table 6: Level of Education

VARIABLE		MASENO (%)	MUHORONI (%)	SONDU (%)	AVERAGE (%)
Education Level	None	1	1	1	1
	Some Primary	3	20	10	11
	Finished Primary	12	26	28	22
	Some Secondary	19	23	26	23
	Finished Secondary	28	14	21	21
	College/university	37	16	14	**22**

Education levels varied greatly among the three small towns. *None* was defined as not having stepped into a class room. *Some primary* is attending any class between standard one to eight without sitting the national examination (KCPE), on the same note, *some secondary* is attending between form one to form four without ultimately sitting the final exams (KCSE). *Finished primary* and *secondary* is sitting the two national examinations respectively. *College/university* is post-secondary school studies. Study participants in Maseno town had the highest average education attained, perhaps because of the learning institutions and the fact that a significant percentage of the respondents were students, while Muhoroni town had the lowest education levels on average.

It can be concluded from table 6 above that by and large, the respondents were relatively educated. Looking at the median, more than 50% had some Secondary education and above. This conclusion therefore gives more confidence on the credibility of the information provided by the respondents and by extension, the findings.

4.2.4 Occupation of the respondents

An individual's occupation has a bearing on his or her quality of life as determined by the incomes he derives from it. Occupation of an individual also characterizes behaviours which in turn influences level of understanding of particular phenomenon. Majority of the study participants were self-employed (22%). Self-employment mainly consisted of small scale business owners. Civil servants were 19%; mainly teachers and County Government employees. An equal percentage were casual workers. Majority of student respondents were from Maseno (28%) with farmers mainly from Muhoroni town.

Table 7: Occupation of HH head

Variable		MASENO (%)	MUHORONI (%)	SONDU (%)	AVERAGE (%)
Occupation	Private Sector	4	17	9	10
	Civil Servant	21	15	20	19
	Casual Worker	12	27	17	19
	Self employed	24	10	31	22
	Farmer	5	21	11	12
	Student	28	2	6	12
	Unemployed	6	8	6	6

According to Sunanda (1977), a person's response to a problem is possibly determined by the type of occupation he is engaged in.

4.2.5. Household Income

Income of a person plays an important role in shaping the economic conditions of an individual which in turn is likely to have a bearing on the responses about a problem posed to him. The researcher, therefore investigated the average monthly income of the respondents' household.

Table 8: Monthly Household Income

Variable	Cohort	Maseno (%)	Muhoroni (%)	Sondu (%)	Average (%)
HH Monthly Income	Less than 5000	30	27	21	31
	5001-10,000	21	12	21	25
	10,001-20,000	13	23	27	11
	20,001-30,000	12	14	20	19
	30,001-40,000	14	9	7	6
	40,000 & above	10	15	4	8

More than half of the households (56%) were earning less than Kshs. 10,000 monthly and only 8% of households were earning more than Kshs.40, 000.

4.3.1 Household Size

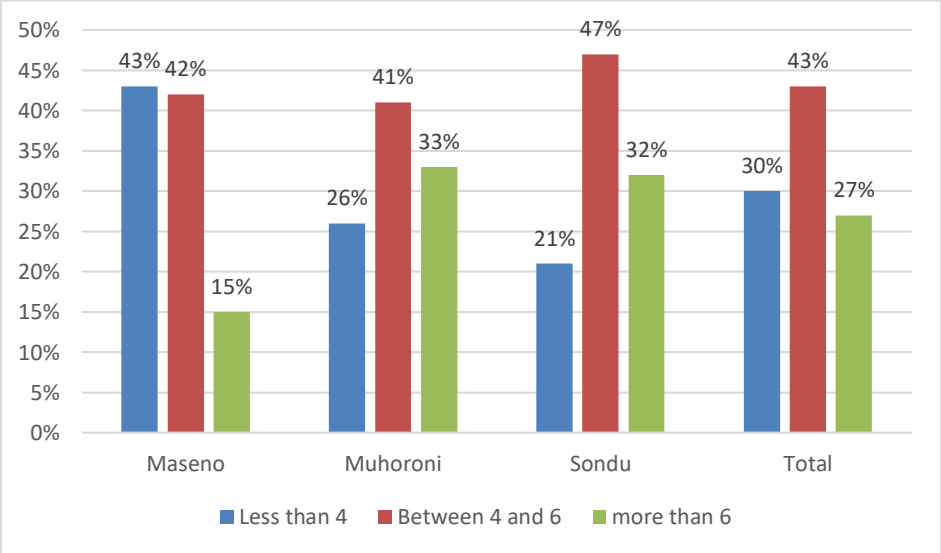
Household size is closely linked to socioeconomic status of households and their prospects in life (Weeks, 2005). The size of the household has an impact on the use of sanitation facility. Crowding is associated with transmission of tuberculosis and respiratory infections (Parker *et al.*, 2006).

Table 9: Household Size

Variable		Maseno (%)	Muhoroni (%)	Sondu (%)	Average (%)
Household	Less than 4	43	26	21	30
Population	Between 4 & 6	42	41	47	43
	More than 6	15	33	32	27

Majority of the households sampled within the three small towns comprised of between 4 and 6 members (43%), 30% of the households had less than 4 family members with a further 27% having more than 6 members. The average of between 4 and 6 individuals per household, according to MoH (2006) is not considered crowding in relation to access to a single door pit latrine. Furthermore, the average household population in Kenya is 4.4 people per household (KNBS, 2015) and according to KIRA County fact sheet for Kisumu, Kisumu County's average is at 4.3 persons per household.

Fig 6: Graph showing distribution of Household Sizes



4.3 Sanitation practices in Small towns

The section on sanitation practices had six variables aimed at finding out whether small town dwellers conformed to good sanitation practices. The following practices were examined as the key variables: latrine ownership, sharing of sanitation facilities, open defecation, handling of

children stools, hand washing and cultural beliefs. Data on sanitation practices was collected mainly using the household questionnaire. Direct observation, in-depth interviews and FGD were also used for triangulation.

4.3.2 Latrine Ownership

Data on latrine ownership was collected through the questionnaire, the key indicator under ownership was the proportion of household with any form of sanitation facility (improved, shared or non-improved). This indicator has been adopted by UNICEF/JMP to show estimates of sanitation coverage across countries through Demographic Household Surveys (DHS). Data was then collected by asking the respondents if they owned any form of sanitation facility. Reasons for not owning a latrine were also collected through the same tool but later triangulated during in-depth interviews. Sondu town had the highest number of households with latrines (58%) with Muhoroni town having the lowest at 47% and Maseno town (52%). The number of respondents without any form of latrine or toilet were 21%. According to WSP (2015), Kisumu County has 57.2% latrine ownership. Looking at the latrine ownership across the three small towns' vis-à-vis that of the County, it can be concluded that latrine ownership is low in Muhoroni and Maseno, with only Sondu town marching the county coverage.

The researcher sought to find out how latrine ownership was influenced by other socio economic factors. The table below summarizes latrine ownership by level of education, gender of household head, household population and Income:

Table 10: Latrine ownership by Education level, gender, household size and income

VARIABLES		Do you have a latrine (%)	
		YES	NO
Education level	None	33	67
	some primary	47	53
	Finished Primary	33	67
	Some secondary	52	48
	Finished secondary	75	25
	College/ university	72	28
Gender of HH Head	Male	45	55
	Female	59	41
HH Population	Less than 4	61	39
	Between 4 & 6	46	54
	More than 6	49	51
HH Income	Low	31	69
	Middle	57	43
	High	68	32

Importance of proper sanitation and hygiene in Kenya is taught as from primary school level. Household heads who missed the opportunity to attend at least primary school were the majority whose households had no toilets. The analysis of data shows that 67% of households that were found to lack toilets, the head of household did not have any formal education; this was followed by those who had some primary education, 58%. Only a quarter of those who had either finished secondary education or college/university did not have a latrine. Improved toilets were also found in some households where heads had not gone to school, the proportion was however small (8%), whereas for those with secondary education and above, 32% had improved sanitation.

A Chi-square test to examine the strength of these relationships yielded:

Table 11: Chi-Square Test sanitation ownership by level of education, gender, household size and income

Pearson Chi Square	Value	DF	Assymp.Sig (2-Sided)	Significance
Education level	6.32	11	0.03	**Significant**
Gender of HH Head	2.23	8	0.59	Not Significant
HH Population	5.03	6	0.19	Not Significant
HH Income	8.90	3	0.00	**Significant**

The results of the Chi-square analysis revealed that there was a statistically significant association between latrine ownership and level of education of respondents within the small towns ($\chi^2 = 6.32$, *P<0.05)*. Similarly latrine ownership and household income showed a significant statistical association ($\chi 2 = 8.90$, *P<0.05).* On the other hand, gender of the household heads and household population had no significant association with latrine ownership.

Similar findings have been reported by Anne Thitu (2016) while studying factors influencing latrine coverage among the Maasai of Ildamat town, Kajiado County. The study by Thitu indicated that majority of the respondents who had no form of education had no latrines (87.9%) while comparatively those who had tertiary education had more latrines (81.8%). Through Chi-square test, she established the relationship to be significant (χ^2 =34.37, p<0.001). Birley (1995) noted that, education level is a paramount factor in as far as sanitation is concerned. Education which he defines as an instrument in human capital as it involves passing on preserved values, knowledge and skills from one generation to another whether formal or informal; is important to community members and stimulates change among the beneficiaries. Other studies across the developing world have also reported the same finding: (Bonu & Kim 2009; Veerashekarapa & Bhide 2009; and Dickinson *et al*., 2012). All these studies argue that besides living in urban areas, those with formal education and high income are the most likely to have latrines. In most cases, they have the resources to build a latrine as well as the understanding of reasons why having a latrine would be beneficial.

The investigator further examined if there existed any relationship between the two significant variables in sanitation ownership (level of education and household income) through correlation analysis:

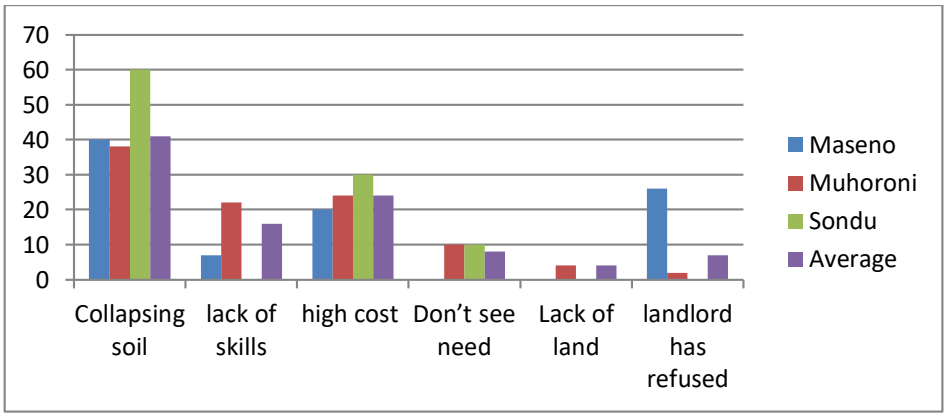
Table 12: Correlation Matrix between level of education and HH Income

		Level of Education	HH Monthly Income
Level of Education	Pearson Correlation	1	.781
	Sig. (2-tailed)		.000
	N	356	356
HH Monthly Income	Pearson Correlation	.781	1
	Sig. (2-tailed)	.000	
	N	356	356

From the correlation table, it can be observed that the correlation coefficient (r) equals 0.781, indicating a strong relationship. *P<0.001* indicates that the coefficient is significantly different from zero. This can be interpreted; the more a respondent is educated, the greater their household income is which in turn increases their chances of owning a sanitation facility.

Respondents were further asked the reasons for not owning a latrine. Majority of the respondents blamed it on collapsing soil of the pits (41%). In Sondu town, more than half (60%) mentioned collapsing soil as the main reason for not constructing a latrine. High cost of construction was also mentioned prominently by 24% of respondents. This could be attributed to low income settlement within the Small towns. Lack of technical knowhow on constructing latrines was mentioned by 16% of respondents. A further 8% ironically do not see the need of having a latrine, 4 % lack land for constructing a latrine and 7% blames it on landlords' refusal to construct sanitation facilities. Of the 12 participants of in-depth interviews, 10 stated that high cost of construction was the reason most residents did not own a latrine. A significant number (8) mentioned poor ground condition.

Fig 7: Graph showing reasons of not having a latrine



The three small towns under study were purposively sampled from a possible six Small towns within Kisumu County. Each town picked had some characteristics that the researcher thought could have an impact on sanitation challenges within the Small towns. Maseno was chosen because of the learning institutions, Sondu was chosen because of the high population density and Muhoroni for being a sugar growing town.

By cross tabulating level of education, household income level and the three small towns in a three way contingency table, the researcher investigated the relationship between the three categorical data (variables). Log linear analysis was employed to determine the model components which were necessary to retain in order to best account for the data.

Table 13: 3-way contingency table (Income, education and small town)

Level of education	Income Level	Small towns		
		Maseno	**Muhoroni**	**Sondu**
None	Low	03	01	00
	Middle	00	00	01
	High	00	00	00
Some Primary	Low	01	11	08
	Middle	01	09	03
	High	00	01	01
Finished Primary	Low	05	18	12
	Middle	06	06	08
	High	00	02	01
Some secondary	Low	12	12	16
	Middle	06	09	04
	High	01	02	02
Finished Secondary	Low	17	04	08
	Middle	09	04	09
	High	03	05	04
College/University	Low	05	02	02
	Middle	08	05	08
	High	23	09	12

For model selection, the researcher adopted the stepwise backward elimination rather than the more complicated two-stage analysis. The following table summarizes the stepwise backward elimination statistics from the HILOGLINEAR. In the table, the factors are abbreviated as follows: population density as *popdensty*, sugarcane growing as *sugargrowing*, learning institution as *learninstn*, finally education and income as *eduincome*. It is worth noting that education and income are combined as a single factor following the determination of their relationship through correlation analysis *(Table 12).*

Table 14: Summary of the stepwise backward elimination statistics

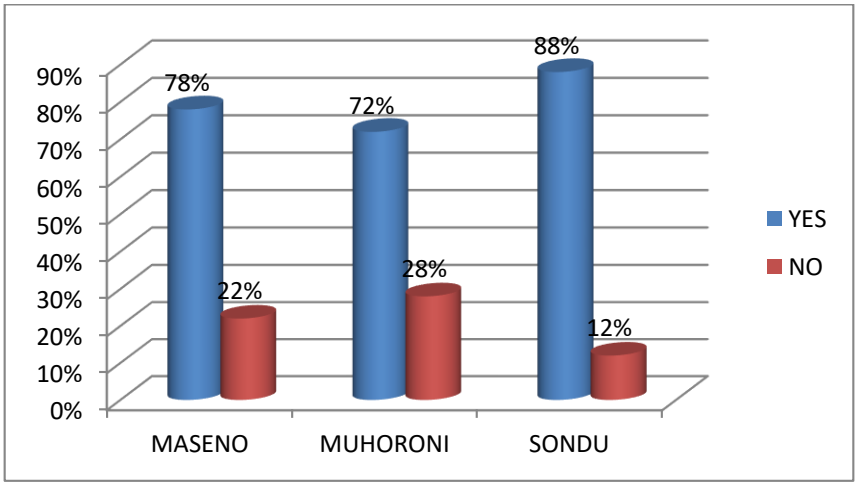
Steps			Effects	Chi-square	DF	Sig.	No. of Iterations
0	Generating Class		Educincome*Popdensity*Sugargrowing *larninstitn	.000	0		
	Deleting Effect 1		Educincome*Popdensity*Sugargrowing *larninstitn.	.000	1	.991	2
1	Generating Class		Educincome* Popdensity*Sugargrowing Educincome*Sugargrowing*larninstitn Educincome*Popdensity*larninstitn Popdensity*Sugargrowing*larninstitn	.000	1	.991	
	Deleting Effect	1	Educincome* Popdensity*Sugargrowing	0.343	1	0.407	2
		2	Educincome*Sugargrowing*larninstitn	3.975	1	0.021	2
		3	Educincome*Popdensity*larninstitn	0.459	1	0.098	2
		4	Popdensity*Sugargrowing*larninstitn	0.091	1	0.831	2
2	Generating Class		Educincome* Popdensity*Sugargrowing Educincome*Sugargrowing*larninstitn Educincome*Popdensity*larninstitn	0.069	2	0.981	
	Deleting Effect	1	Educincome* Popdensity*Sugargrowing	0.297	1	0.396	2
		2	Educincome*Sugargrowing*larninstitn	3.733	1	0.029	2
		3	Educincome*Popdensity*larninstitn	0.489	1	0.098	2
3	Generating Class		Educincome*Sugargrowing*larninstitn Educincome*Popdensity*larninstitn Educincome*Sugargrowing	0.470	3	0.919	
	Deleting Effect	1	Educincome*Sugargrowing*larninstitn	3.377	1	0.392	2
		2	Educincome*Popdensity*larninstitn	0.496	1	0.090	2
		3	Educincome*Sugargrowing	0.008	1	0.933	2
4	Generating Class		Educincome*Popdensity*larninstitn Educincome*Sugargrowing*larninstitn	0.493	4	0.934	2
	Deleting Effect	1	Educincome*Sugargrowing*larninstitn	3.346	1	0.397	2
		2	Educincome*Popdensity*larninstitn	0.458	1	0.090	2
5	Generating Class		Educincome*Popdensity*larninstitn Educincome*sugargrowing Educincome*learninginstn	1.186	5	0.911	
	Deleting Effect	1	Educincome*Popdensity*larninstitn	0.497	1	0.002	2
		2	Educincome*sugargrowing	17.514	1	0.000	2
		3	Educincome*learninginstn	17.779	1	0.000	2
6	Generating Class		Educincome*Popdensity*larninstitn Educincome*sugargrowing Educincome*learninginstn	1.186	5	0.911	

At each step, the effect with the largest significance level for the Likelihood Ratio is deleted, provided the significance level is larger than 0.05. After step zero, statistics are displayed for the best model. For 'Delete effect', this is the change in the chi-square after the effect is deleted from the model. The last step shows that if either interaction is deleted, there would be a significant decrement, so the final model (best) has generating class: Educincome*Popdensity*larninstitn. Meaning population density, learning institution and education & income have each a significant association with latrine ownership.

4.3.4 Sanitation Sharing

Data on sanitation sharing was collected from participants who indicated ownership of any form of sanitation facility. Through the questionnaire, they were asked if and why they thought their neighbors shared their facilities. More than half of the respondents (59%) were sharing. According to JMP/UNCEF, those sharing sanitation facilities are considered to be lacking access to improved sanitation. This finding is nonetheless higher than that by JMP (2008) that indicates 51% of urban population share latrines. The difference could be in part explained by the disparity that has been highlighted in the study with reference to the focus of sanitation interventions. The JMP finding of 51% is however similar to the data for Kisumu County at 52% for urban population sharing sanitation facilities (KCIDP, 2013). It can therefore be argued that the majority of those sharing sanitation in urban areas of Kisumu County are residing in peri-urban areas and within the Small towns.

Fig 8: Graph showing proportions of those sharing sanitation facilities



The study finding is consistent with other studies, Zakiya (2013) found out that 75% of respondents are sharing facilities in a study of sanitation at Kabale in Uganda. Globally, shared sanitation accounts for an estimated one-third of the global population who use unimproved sanitation (UNICEF/WHO, 2010).

Figure 9: Shared pit latrine in Maseno Town

When asked the reasons for sharing sanitation facilities, 48% of the respondents reported that their neighbors lacked latrines. Those sharing because of lack of latrines were dominant in Maseno at 62% followed by Muhoroni 46% and Sondu at 40%. A significant number of respondents from Sondu believed that they shared their latrines with neighbors because their latrines looked better than what their neighbors got. There were cases of sharing due to collapsed latrines 7%. More than half of the key informants also agreed with high percentages of sanitation sharing. An important observation was that majority of the people sharing latrines lacked ownership, but there was a significant proportion of those who own non-improved and poorly managed facilities who shared neighbors improved facilities-This was observed to be common in Sondu and Muhoroni towns.

Table 15: Reasons for sharing latrine. (%)

Small Town	Do you know why they use your latrine?					
	better than theirs	they lack one	Theirs is full	Collapsed	We changed residence	others
Maseno	8	62	22	8	0	0
Muhoroni	11	46	31	7	4	1
Sondu	30	40	24	5	1	0
Average	16	48	26	7	2	1

However, it is necessary to distinguish households who share improved sanitation against those who share public or communal facilities. Households sharing privately owned facilities place a higher appreciation on hygiene issues than communal or public sanitation. Indicators used to evaluate MDG targets on sanitation did not distinguish shared sanitation into improved and unimproved; all were labeled "shared sanitation" and considered unimproved (Zakiya, 2013). The decision to exclude these facilities that have technologies deemed as improved has recently been re-examined (UNICEF /WHO, 2010). Shared sanitation has been found to be the only solution in high density and low-income urban areas (Taylor, *et a*l., 2003; Schaub-Jones, 2006). If individual sanitation cannot be in the short term granted to all in low-income and high density urban areas, alternative solutions need to be implemented. Shared sanitation is criticized by many practitioners, but in reality, a third of Sub-Sahara Africa urban dwellers and by extension the developing countries globally use them (Kariuki, 2007). The researcher therefore argues that definition of sanitation should take into account the diversity of shared sanitation and should not automatically be assumed unimproved. Experience from Sub-Sahara Africa e.g. Ghana has illustrated how household shared sanitation may well fit within culturally acceptable choices and not necessarily be unhygienic.

Two studies from southern peri- urban Ghana indicates that one third of the population would prefer shared sanitation due to issues of land and financial means that inhibits their ability to construct single household toilets (Spenser, 2012). In poor Small towns within the outskirts of Dar-es Salaam-Tanzania, shared toilets among household were the most common type of sanitation and they were more likely to be functional and safe in terms of waste management system and general condition as compared to non-shared (Jenkins *et al.*, 2014). Similar findings have been reported in studies in India and other parts of developing World (Hawkins, 2013; Nelson *et al*., 2014). Accepting household shared sanitation as a suitable toilet type for the urban poor could have overarching implications among them upgrading the shared facilities to

improved standards. The researcher therefore postulates that, the focus of future sanitation programs targeting the urban poor should be on improving the hygienic levels of shared facilities to improved standards. If well managed these facilities could be feasible and socially acceptable choice for millions of underserved populations globally.

4.3.3 Open Defecation

Open defecation was measured using behavioral indicator; the proportion of respondents who used a latrine the last time they wanted to defecate. To help situate the behavior, the respondents were first asked about their location the last time they needed to defecate.

The findings indicated that a significant percentage of respondents across the three sampled small towns still practices open defecation. In Sondu town, 20% of those without latrine admitted open defecation, 9% in Maseno town and 18% from Muhoroni town also admitted to open defecation.

Table 16: HH Members defecation points

Defecation Point	**Location last time one needed to defecate**	**Small Towns**		
		Maseno (%)	Muhoroni (%)	Sondu (%)
Latrine (Owned/Shared)	Home	50	54	43
	Away from home	23	08	11
Public Toilet	Home	08	06	09
	Away from home	06	05	05
Open Defecation	Home	02	11	13
	Away from home	07	07	07
Burying in the ground	Home	04	09	12
	Away from home	00	00	00

From the table above it can be observed that open defecation is mostly reported when defecators are away from home. According to WSP (2014), open defecation is influenced by contextual factors. Open defecation may be more frequent during certain times, for instance when travelling and access to sanitation is limited and at night in cases where latrines are far and security is a concern (*ibid*).

It's further observed from the same table that open defecation is rampant in Muhoroni and Sondu towns. These towns were sampled purposively because of sugarcane growing and high population density respectively. The researcher hypothesized that these two factors could have a bearing on certain practices. There is empirical evidence linking population density to numerous sanitation practices among them open defecation; USAID in an attempt to explore the links between population densities, open defecation and child health outcomes conducted an analysis of demographic and Health Survey (DHS) in 68 countries. In the analysis of DHS data, the researchers found an association between population density and open defecation (USAID, 2010).

During focus group discussion, the researcher explored the reasons behind the practice of open defecation. A number of participants were uncomfortable to discuss the practice or even get associated with it. However, lack of access to a latrine and being further away from one were the most common responses given by participants. In Muhoroni, FGD participants mentioned sugar plantations as being very ambient for defecation.

Unsafe disposal of excreta causes smell, flies and contamination of ground water (WHO, 2000). According to Ministry of Health (2016), national open defecation rate in Kenya stands at 14%. The problem of open defecation was established to be a major public health issue across the three small towns, this was revealed during interviews with the three sub county public health officers. One of the PHO stated

"Open defecation is still a major threat to public health as it is still rampant within this town despite our numerous interventions to discourage the practice"

Similar findings have been reported, Spenser (2006) while studying sanitation practices in peri-urban Accra-Ghana found out that the most common reasons for open defecation (defined as the bush, beach or a plastic bag) was that it was the "only option they had" (40.05%). The other

common reasons for open defecation were: the bush/beach was convenient (8.5%), the latrines were too far away (7.7%).

The Kenyan Constitution Article 43 (b) declares sanitation as a basic human right and guarantees the right of every person to "reasonable standards of sanitation." Despite the law, open defecation is still a challenge in many regions within the country. Typically, open defecation is bound up with poverty: more than 60% of the poorest wealth quintile practices it as against less than 1% in the wealthiest quintiles (Daniele, 2016). While studying OD in the newly created Kenyan counties, Njuguna and Muruka (2013) found that an estimated 5.6 million Kenyans practice OD across the 47 counties. The World Health Organization/ United Nation Children's Fund joint monitoring programme for water and sanitation estimated that in 2015, 12% of Kenya's population practiced open defecation. This however, compares favorably with some neighboring countries such as Burundi (29%). On the other hand, other neighboring countries like Uganda (7%) and Rwanda (2%) are doing much better. (UNICEF/WHO 2015).

Table 17: Table showing OD Rates in Kenya and her neighbors

Country	Improved (%)	Shared (%)	Unimproved (%)	OD (%)
Kenya	31	25	29	15
Uganda	48	26	16	10
Tanzania	24	23	40	13
Egypt	94	5	1	0
Algeria	95	-	1	4

WHO/JMP 2012

Out of a population of more than 40 million in Kenya, 12 million are estimated to live in urban areas (UN-Habitat, 2008). According to KNBS (2009), Kisumu County had a population of 968,909. Of this, 322,880 live in urban areas. A significant proportion of the population live below the poverty line, 45%. With a population density of 460 people per square kilometer, OD rate is still high at 14.3%. Busia County, being the only other county apart from Kisumu

with an ODF (open defecation free) sub County- Nambale and Nyando for Busia and Kisumu respectively- had an OD rate at 6.9%. The disparities in terms of poverty and OD rate can be seen in the table below.

Table 18: Table showing OD Rates in Kisumu and other selected Counties

County	% OD Rate	% population living in Poverty	Population density
Busia	6.9	65	439
Kisumu	14.3	45	465
Siaya	19	36	333
Homa Bay	40.1	44	371
Tukana	88.4	93	7
Kajiado	45.5	12	31
Nyandarua	0.1	49	184

(UNICEF 2014, KNBS 2012)

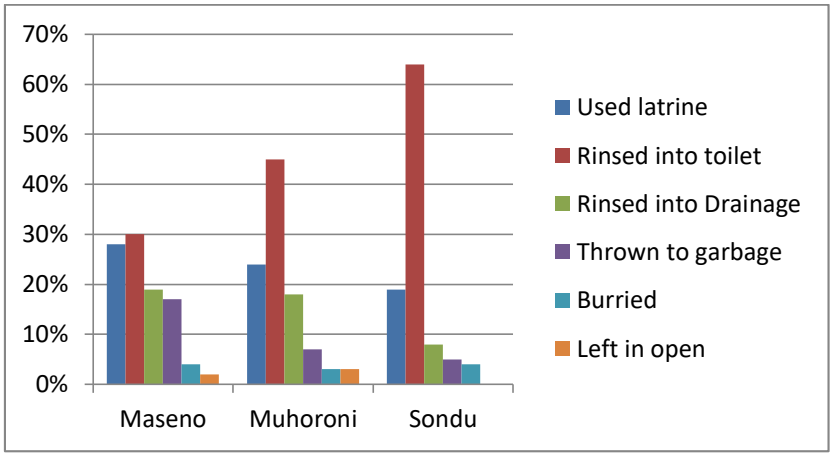
Poverty is the most significant predictor of open defecation. Poor sanitation is a key link in the cycle of disease and poverty, 'People living in poverty are less likely to spend on sanitation (Scott, 2013). This predisposes them to sanitation related diseases. People living in poverty are also more likely to live in poor environmental conditions characterized by overcrowding, bad drainage, polluted air, and insufficient water supply (Scott, 2013). Against this backdrop, the Kenyan Government implemented the *"National Open Defecation Free Kenya 2020 Campaign Framework 2016-2020"* as an attempt to make the Country open defecation free by 2020 and achieve the Sustainable Development Goal (SDG). So compounded, the Campaign aligns with the *"Kenya Environmental Sanitation and Hygiene Policy (KESHP) 2016-2030"*. With the overall goal being to eradicate open defecation and declare all counties and Kenya Open Defecation Free by the end of 2020 (MoH, 2014).

4.3.4 Handling of Children Stools

Safe stool disposal was measured using the indicator; percentage of young children under age five by the manner of disposal of the child's last fecal matter. Children's stool was considered to be safely disposed of if the child uses a toilet, the child stool is put in or rinsed into a toilet/latrine or is buried. The indicator was assessed using two questions: Identifying the

youngest child in the household and determining the manner in which feces were disposed of the last time he/she defected. A significant portion of the respondents admitted to poor practices oblivious of the dangers. Those who rinsed/put into drainage or ditch were 15%, 10% threw children stool into garbage, *shamba* or bush with a further 6% either burying or leaving in the open.

Fig 10: Graph showing handling of children stool



The relationship between the management of children waste practices and a number of influencing factors was investigated. These factors included; level of education, respondent's gender, age of respondents and latrine ownership:

Table 19: Cross tabulation on management of children waste

VARIABLS		**How the stool of your child was handled last time defecated (%)**					
		Used latrine	Rinsed to toilet	Rinsed into Drainage	Thrown to garbage	Buried	Left in Open
Education Level.	None	0	25	50	25	0	0
	Some primary	22	13	13	16	6	30
	Finished Primary	23	29	3	10	26	9
	Some secondary	21	34	6	18	12	9
	Finished secondary	17	36	8	6	11	22
	College/ University	24	47	3	18	0	8
Respondent Gender	Male	16	34	11	15	6	18
	Female	24	34	4	14	11	13
	Less than 28 years	27	30	6	15	9	13

Age of respondent	Between 29 and 48	5	44	9	13	9	20
	More than 48 Years	0	0	0	0	0	0
Latrine Ownership	Yes	33	45	5	8	6	3
	No	8	21	10	21	13	27

Chi square test of association was utilized to examine the strength of the above factors. The analysis yielded the following results:

Table 20: Chi-square test result for management of children waste practices

Pearson Chi Square	**Value**	**df**	**Assymp.Sig (2-Sided)**	**Significance**
Education level	12.4	6	0.00	**Significant**
Gender of Respondent	23.8	13	0.99	Not Significant
Age of Respondent	6.43	5	0.13	Not Significant
Latrine ownership	11.30	9	0.02	**Significant**

The results of the Chi square analysis revealed a statistically significant relationship between handling of children stool and respondents level of education ($\chi^2 = 12.4$, *P<0.05)*, similarly the relationship is significant with latrine ownership ($\chi^2 = 11.3$, *P<0.05).* Those with formal education tend to practice better handling of children wastes among them using toilet and rinsing to the toilet compared to those with lower levels or no education. The same can be said of those who own sanitation facilities. However, the relationship between management of children stool practices, gender of respondent and age of respondent were statistically not significant meaning the association exhibited could be attributed to chance.

Numerous studies have been done on children's feces disposal practices in developing world; (Ana Gil *et al*., 2004; WSP, 2015; Cousens *et al*., 1996; Staiton, 1987 and Almedom, 1995). A study in Bandundu, Zaire, showed mothers poor practices on management of children feces. Only 40% reported disposing of their child's stools in latrines, 28.6% left on the ground and 31.6% threw outside in the yard (Almedom, 1995). Similar results were reported by Ana Gil (2004) in a more comprehensive study done in Bobo-Dioulasso, Burkina Faso, 36% reported

disposing of their child's stools in latrines with an even bigger proportion leaving on the ground (41%).

There is a common belief that the feces of children are not as harmful. However, there is empirical evidence that children's feces could be more risky than adults' feces due to a higher prevalence of diarrhea and pathogens in children than in adults (Garelick *et al*., 1983). A 2009 study among children under age five in Mauche, Kenya, found that 37 percent of children ingest earth occasionally (less than a handful per day), and 12 percent ingest a lot (Shivoga & Moturi, 2009). In areas where children's feces are not being safely disposed of, feces and the accompanying pathogens may also be ingested *(ibid).* Children's feces should therefore be treated with the same concern as adult feces, using safe disposal methods that ensure separation from human contact and household contamination.

Poor child feces management can result in substantial health impacts in children, including a higher prevalence of diarrheal disease, intestinal worms and malnutrition. A 1989 study in Cebu, Philippines, found unsanitary disposal of young children's feces to be associated with a 34 percent increase in clinically diagnosed diarrheas and a 63 percent increase in pathogen positive diarrheas, compared to those who had better sanitation practices, (Baltazar & Solon, 1989). Further, a study in Burkina Faso found "evidence of an association between where the mother reported disposing of the child's stools and hospital admission with diarrhea or dysentery." (Curtis *et al*., 2011).

To add on the empirical evidence, the World Bank Group's WSP and UNICEF partnered in 2014, to develop profiles outlining the child feces disposal practices of caregivers and existing interventions to improve those practices for 26 locations. To develop the country profiles. More than half of households with children under age of 36 months in 15 of the 26 locations reported that the feces of their children were not disposed into any kind of sanitation facility. Not surprisingly, the highest levels of unsafe child feces disposal were found among households

practicing open defecation. However, all countries reported some unsafe child feces disposal behavior, even among those households with improved sanitation. In the countries examined, between 11 and 64 percent of households with improved sanitation still unsafely disposed of their children's feces. For example, in India, over 54 percent of households with improved sanitation still unsafely disposed of their children's feces with 23 percent of those with improved sanitation simply leaving children's feces in the open.

Table 21: Percentage HH with available comparable Multiple Indicator Cluster Survey (MICS) or Demographic and Health Survey (DHS) data reporting safe feces disposal for their youngest child under age three for select countries

Country	Unsafe children disposal into Improved facility	Unsafe children disposal into unimproved facility	Unsafe Children feces disposal
Kenya	29	48	23
Uganda	52	23	25
Tanzania	8	54	46

MICS/DHS, 2014

4.3.5 Hand Washing

Hand washing practice was measured using behavioral indicator: Proportions of respondents who washed their hands with soap the last time they went to a toilet. A significant number of the respondents across the three small towns admitted to not washing hands after visiting the toilet (30 %.), the practice of hand washing was least practiced among respondents from Maseno at 64% with 79% of respondents from Sondu town being the majority practicing hand washing.

Table 22: Hand washing practice after visiting latrines

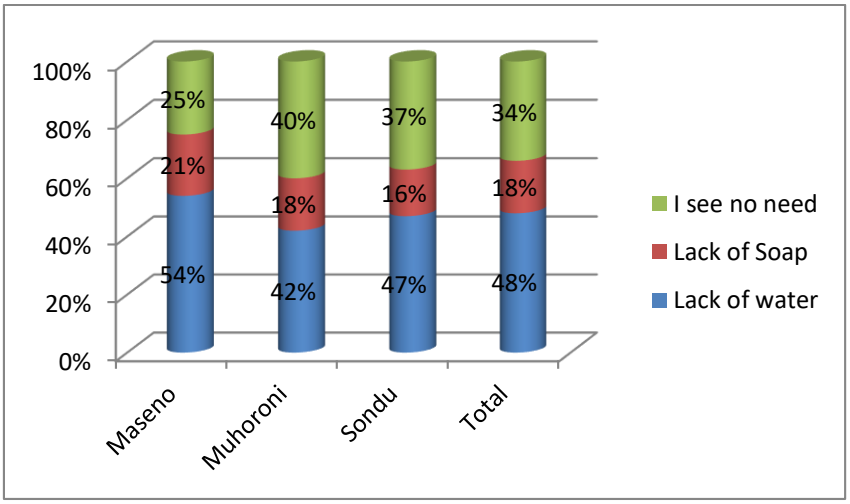
Hand washing after visiting the toilet (%)			
		YES	NO
Small Town	Maseno	64	36
	Muhoroni	66	34
	Sondu	79	21
Average		70	30

This result is consistent with findings from other studies done across the developing world. One study in Bangladesh directly observed hand washing behavior and found that frequency of hand washing after defecation in 1,000 households was around 32% (Nizama *et al*, 2015). Further, the World Bank initiated a Small town's WASH programme in Nampula Province-Mozambique in 2012 targeting 5 Small towns. The baseline figures for key sanitation practices across the five small towns were relatively low; Hand washing after defecation was only practiced by 29% of respondents from Ribaue and Rapale towns, (WSP, 2012).

It has been observed that in situations where sanitation facilities are inadequate or absent, hand washing is very crucial in terms of interrupting fecal oral disease transmission routes (UNICEF/NETWAS, 2005). A number of infectious diseases can be spread from one person to another by contaminated hands. These diseases include gastrointestinal infections, such as salmonella and respiratory infections such as influenza. IRC (2004) estimates that washing hands with soap can reduce the risk of diarrhea by more than 40%. As a key component of hygiene and sanitation washing of hands before handling food is one of the first steps of personal hygiene practices and is by far the best way to prevent germs from spreading and to keep kids from getting sick.

Those who did not practice hand washing after visiting a toilet were further asked the reasons behind the practice. Majority of which picked lack of water as the reason for not washing hands after visiting toilets (48%) and a worrying lot who did not see the need of washing hands after toilet visits (34%).

Fig 11: Graph showing reasons for NOT washing hands



Several studies have attempted to assess the factors that influence the practice of hand washing: (Nizama *et al*., 2015; CDC, 2006; Katz, 2004; Van de Mortel, 2001; Devine, 2010 and Parker, 2006). The most cross cutting factors that most of these studies have highlighted are gender, knowledge and ethnic differences.

The table below shows that female respondents within the study area practiced hand washing more than their male counterparts, 74% and 66% respectively. When hand washing practice is analyzed with reference to respondents' levels of education, the highest proportion of those practicing hand washing can be seen to be among those with at least secondary education.

Table 23: Hand washing practice by gender and level of education

Do You Wash Hands After Visiting A Toilet (%)			
Variable		YES	NO
Gender of Respondent	Male	66	34
	Female	74	26
Level of Education of Respondent	None	67	33
	Some Primary	67	33
	Finished Primary	64	36
	Some Secondary	69	31
	Finished Secondary	79	21
	College/University	74	26

An attempt to determine the relationship between hand washing practice and gender revealed a statistically insignificant relationship between the two variables.

Table 24: Chi Square test (hand washing practice and gender)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.705[a]	4	.832
Continuity Correction	.524	1	.469
Likelihood Ratio	.707	1	.400
Linear-by-Linear Association	.703	1	.402
N of Valid Cases	356		

($\chi^2 = 1.705$, *P>0.05)*. However, this finding contradict an earlier finding by Carl (2013) while studying hand washing practices in a college town environment. He found that a significant gender bias exists, women washed their hands significantly more often, used soap more often and washed their hands somewhat longer than men. Female respondents practiced hand washing more than male respondents, 92.9% compared to 85.4% respectively. On using soap while washing hands, only half of male respondents used soap while 77.9% for female. Alison *et al*. (2008) reported the same findings in a study in Michigan. More females than males washed their hands 6 or more times per day (36% vs. 19%; P<.0001)

The relationship between hand washing and level of education was however significant: ($\chi^2 = 2.724$, *P<0.05)* suggesting that the more one increases level of education the more he gathers knowledge and appreciates better hygiene practices like hand washing.

Table 25: Chi Square test (hand washing practice and level of education)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.724[a]	5	.342
Likelihood Ratio	3.609	5	.407
Linear-by-Linear Association	.100	1	.652
N of Valid Cases	356		

Three studies explicitly related knowledge to hand washing behavior in Cambodia; they found out that, if farmers understood the risk of animal transmitted infections, they were more likely

to wash their hands, (UNICEF, 2008; WaterSHED, 2009 and Summer, 2009). In Nigeria, knowledge of Ebola transmission routes made people more likely to wash their hands (Merenu, 2015 and Ogunsola, 2013). However, in Ethiopia and Haiti, knowledge about why to wash hands was associated with less frequent hand washing (UNICEF, 2008).

4.3.5 Cultural beliefs and practices

Data on cultural beliefs and practices relating to sanitation were collected during FGD and in-depth interviews. Participants were asked to discuss some of the cultures and practices that impact their sanitation decisions.

Culture is the particular knowledge, beliefs and understanding of art, law, morals, customs and other skills and habits that a person acquires as a member of a given society (De Bruijne *et al*., 2007). Beyond their individual differences, the members of a group or a society have particular ways of thinking and behaving, and will react to situations in similar ways. Culture is also an instrument; a tool by which we assign meaning to the reality around us and to the events that happen to us (*ibid*).

This study brought together participants from four different cultures: Kisii, Luo, Luhyia and Kalenjin. However, all focused group discussion were dominated by Luo speaking participants, this made it difficult for members from other communities to talk openly about some of their cultural practices.

Some of the Luo cultures that came out conspicuously were on use of toilet where a woman is not allowed to share a latrine with her father- in law, this would force either of them to share a neighbors latrine or defecate in the open, as it was also determined that most families could not afford to put two separate facilities. It also emerged that open defecation is a culture that is widely acceptable and embraced during funerals. In terms of gender roles, building of a latrine among the Luos is a preserve for men. However, the cleaning and maintenance is a female role.

A study by WSP (2016) among communities in Kenya, found that different communities have different excreta disposal practices some of which are influenced by traditional beliefs. For instance the Digo in Kwale are mainly Muslims and their excreta disposal practice is influenced by the belief that people are not supposed to excrete in houses (including pit latrine structures). The GEMA communities on the other hand believe that an improved excreta disposal facility enhances one's image in the society. It is also culturally accepted that if one wants to build a house, one starts by building a latrine for use by the builders. The Maasai are a pastoral people hence they do not build toilets in most cases but are frequently using the vicinities where they often congregate.

However, respondents did not rank cultural belief as a major sanitation practice issue. This was the same case with sharing. During FGD, using Force field analysis tool, participants were asked to rank their top five challenges related to sanitation practice. The exercise explored why these were problem issues, the positive aspects of each issue and existing or potential solutions. The purpose of this activity was to better understand the community's most pressing sanitation issues and their understanding of their causes and solutions. The findings are summarized in the table below.

Table 26: Respondents top five challenges related to sanitation practices

Rank	Problem	Hindering Factor	Enabling Factor	Copying Mechanism	Possible Solution
1	Open Defecation	Low access to sanitation	Sensitization through barazas	Use of public facilities	Incentivizing construction of latrines
2	Poor hand washing	Lack of reliable water for sanitation Lack of public sensitization	Involvement of PHO and CHW	Avoiding eating before washing hands after visiting a latrine.	Hygiene promotion
3	Lack of reliable water for sanitation	Lack of piped water system	Availability of rivers and streams	Water from vendors	Government to invest in provision of water

4	Low sanitation ownership	Low income	Sensitization through barazas Availability of low cost technologies	Sharing of facilities	Government to make policies on sanitation facility ownership
5	Lack of sewerage system	Lack of investment by government	Devolving of Sanitation to County Governments	Use of septic tanks	Government to prioritize construction of reticulated system

4.4 Factors that influence sanitation Preferences in small towns

According to rational choice theory, individuals always make logical decisions that provide them with the greatest benefits given the choices available and are also in their highest self-interest (Anand, 1993). The same theory goes further to postulate that individuals have preferences and choose according to those preferences. The premise of the rational choice theory in modeling of social behaviors is on its assumption that an individual has preferences among the available alternatives that allow them to state which choice they prefer. The rational agent is therefore assumed to take into consideration the available information, potential costs and benefits in identifying preferences and to act consistently in choosing their best self-determined choice.

Choice therefore being a matter of alternatives, it was necessary for the researcher to start by assessing all the available sanitation technologies within the three Small towns under the study. The data under this section was collected using questionnaires and FGD; specific tools and techniques used to gather the factors were option assessment, psychometric measures (the likert scale) and in-depth interviews.

4.4.1 Alternative sanitation choices

The study revealed that there were six different sanitation technologies within the study area, namely: Flush/pour flush, Ventilated improved pit latrine, Pit latrine with slab, pit latrine without slab, Ecosan and bucket. The coverage of these facilities varied within the Small towns.

Pit latrine with slab was the most used sanitation type across the three Small towns (40%). However, direct observation revealed most pit latrines were in poor conditions

Figure 12: A dilapidated pit latrine in Muhoroni town

Respondents using pit latrine without slab/ open pit were also significant (32%), this was particularly common among residents of Muhoroni town and Maseno town where more than 30% of the respondents used it. Twenty percent of the respondents were found to be having access to improved sanitation facilities i.e. VIP, Flush/pour flush and EcoSan. All the 12 KII participants agreed that pit latrines were the most commonly used technology across the three small towns.

"Almost everybody within Sondu town is using a pit latrine, very few are using flush toilet which is believed to be a preserve of the rich" Ward administrator, Sondu.

Figure 13: Ecosan Latrine in Sondu town

Maseno town had the highest population with improved sanitation (34%) and Muhoroni at 19%.

This finding is consistent with that of WHO (2008) in terms of popularity of pit latrines. However, there is a contradiction in terms of coverage. According to WHO, pit latrines are the most commonly used facilities for disposing human waste in developing countries. Studies indicate that the percentage of people using pit latrines as a means of sanitation in some part of East Africa is as follows: Kenya 30%, Uganda 60%, Tanzania 77%, and Ethiopia 61%. In Africa, the most common type of "unimproved" latrine has a slab made of wood that is covered with mud to make a floor (Pickford, 1995). Conventional sanitation; a flush toilet connected to a centralized sewer system is possible for only a small fraction of people in developing nations, thus the poor are left with on-site systems of feces disposal such as pit or bucket latrines (Bill & Melinda Gates Foundation, 2011). The table below summarizes types of sanitation facilities that households have access to:

Table 27: Types of sanitation facilities that HH have access to (%)

	Flush/pour flush	VIP	Pit with slab	Pit without slab	Ecosan	Bucket	Others
Maseno	29	5	29	33	3	1	0
Muhoroni	16	3	34	34	9	0	4
Sondu	6	5	61	28	0	0	0
Average	16	4	40	32	5	1	2

Among the respondents who used flush/pour flush, majority flushed to septic tanks (42%). Those flushing to pit latrine were 38% with only 20% flushing to sewer system. The use of septic tank was only common in Maseno and Muhoroni. It was established that only Maseno and Muhoroni towns are connected to reticulated sewer network. However, in both towns, the sewer networks are privately owned. Maseno University owns the one at Maseno while Agro-chemicals and Muhoroni Sugar Company (MUSCO) owns two separate networks in Muhoroni town. In-depth discussions with the Kisumu County public health officials revealed that the county government has plans to connect the towns with sewer network through Kisumu Water & Sewerage Company (KIWASCo). However, this still remains a pipe dream as no budgetary allocation exists to actualize this plan.

Figure 14: Pour flush to a septic tank at Sondu and Septic tank at Maseno

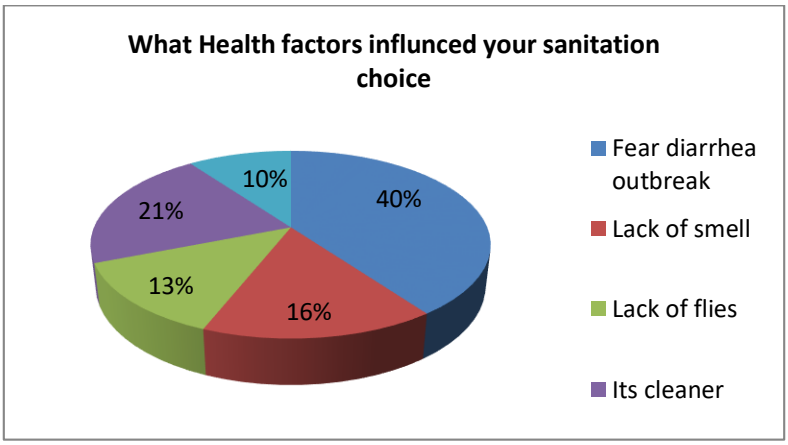
4.4.2 Factors influencing sanitation preference

Respondents were asked to name some of the major factors that influenced their preference for the sanitation facilities: Fear of diarrhea, availability of materials, cleanliness, affordability, water availability/scarcity, and ground condition, lack of smell & flies, access to good information on hygiene, lack of sewer network, ease of use & ease of construction were identified by the participants. To allow for in-depth and more structured analysis, the researcher categorized these factors into health, economic and technical.

4.4.2.1 Health Factors

Among the health factors influencing sanitation preferences in small towns within the Study area, fear of diarrhea outbreak was mentioned as the leading factor (40%). This was the trend across all the three small towns. It was also determined through FGD and in-depth interviews that the three Small towns have all experienced outbreak of diseases associated with poor sanitation. Fear of diarrhea is a factor that is closely linked to cleanliness, at 21% across all respondents. The two leading health factors were further found out to be the popular reason among those respondents who had access to improved sanitation as 95% of them mentioned the two factors as the major reasons they upgraded their sanitation facilities.

Fig 15: Pie chart showing health factors that influenced sanitation choices



The health factors discussed under the study were analyzed further to determine how each of them influenced the choice of each sanitation type within the three Small towns. From table 28, it can be seen that reducing risks of diarrhea outbreak was the major health factor that influenced respondents sanitation preferences (40%), this was common mostly among those with flush/pour flush (29%), VIP (36%) and EcoSan toilet at 39%. It is noteworthy to mention that the three sanitation types whose uptake was mostly influenced by reducing risk of diarrhea were improved facilities. Ten percent of the respondents mentioned other health factors not included in the likert scale. Commonly mentioned was fear of other forms of physical harms mostly on children.

Table 28: HH toilet facility by health factors influencing preference

	Health factors influences Sanitation choice (%)				
What kind of toilet facility do your HH use	Reduced risk of diarrhea	Lack of smell	Lack of flies	Its cleaner	others
Flush/pour flush	29	25	16	14	16
VIP	36	29	14	21	0
Pit latrine with slab	21	19	5	52	3
Pit latrine without slab/open pit	15	6	21	18	40
EcoSan toilet	39	6	0	44	11
Bucket	0	0	100	0	0
Others	0	1	15	57	28
Total	40	16	13	21	10

The significance of health factors influencing uptake of improved sanitation was determined. Chi square results revealed a strong association between reduced risk of diarrhea and uptake of improved sanitation facilities (flush/pour flush, VIP and EcoSan); (χ^2 = 4.929, *P<0.05)*. Similarly a significant relationship existed between reduced diarrhea and uptake of unimproved sanitation facilities (χ^2 = 11.459, *P<0.05)*. However, the strength of association was weak as compared to influence on improved facilities; *P*=0.014 and *P* =0.043 respectively.

Table 29: Chi square test for health factors and sanitation preferences

Unimproved facilities (Pit latrines and bucket)				
Pearson Chi Square	**Value**	**DF**	**Assymp.Sig (2-Sided)**	**Significance**
Reduced risk of diarrhea	11.495	10	0.043	**Significant**
Lack of smell	23.340	9	0.921	Not Significant
Lack of flies	13.322	14	0.098	Not Significant
Its cleaner	7.907	8	0.176	Not Significant
Improved Sanitation Facilities (Flush/Pour Flush, VIP and EcoSan)				
Reduced risk of diarrhea	4.929	6	0.014	**Significant**
Lack of smell	34.98	16	0.087	Not Significant
Lack of flies	3.987	11	0.039	**Significant**
Its cleaner	10.07	8	0.064	Not Significant

Hernandez *et al* (2009) compared drivers for sanitation adoption and investigated household motivations to build a pit latrine in rural Ethiopia. Focusing on females with children, 745 respondents in 22 villages were interviewed to determine their perspective on sanitation ownership. Majority of respondents indicated that the ease of maintenance, privacy and health benefits were their motivating factors. Furthermore, the sanitation adopters also designated prestige, modernity and popularity as significant drivers.

The ability for improved sanitation to provide health benefits has inconclusive results for being a driver. Jenkins (1999) reported spontaneous mentions of health benefits as being the third most frequently mentioned driver ranked most important by heads of households; 7.3% mentioned it as their most important factor, ranking it third most important factor with $P < 0.005$, indicating that health, even though one of the most frequently mentioned drivers, was not an actual driver to persuade adoption of technology (Jenkins, 1999).

4.4.2.2 Economic Factors

Among Economic factors that influenced sanitation choices, affordability and availability of materials were mentioned as the major factors across the three Small towns (41% and 37%)

respectively. The two major factors were popular among respondents with unimproved sanitation facilities with 43% of those with Pit latrines without slab picking availability of materials and 29% saying affordability as the driving force behind their preference. The two variables (affordability and availability of materials) had the lowest pick among those with improved sanitation facilities. 10% of the respondents mentioned access to good information as the driving factor that informed their sanitation preference, majority (62%) of which were discovered to be those with access to improved sanitation. Proximity was mentioned by a further 4% and most of them were retailers who depended on public ablution blocks in market areas.

Figure 16: A pit latrine in Maseno constructed using iron sheets

Table 30: Economic Factors influencing Sanitation Preference

Variable		Maseno Counts (%)	Muhoroni Counts (%)	Sondu Counts (%)	TOTAL Counts (%)
Economic Factors	Availability of materials	27	42	36	37
	Affordability	53	33	49	41
	Access to good info	15	7	9	10
	Proximity	5	5	3	4
	Others	0	13	3	7

Provision of household sanitation and the type of sanitation facility is determined by the affordability and ability of the households to pay for such services. People may have demand for sanitation but get disadvantaged by constraints, on the same note, they may want excreta management facilities but not at the prevailing cost (UNICEF, 2000). It can be seen from this study findings that most respondents were low income Households *(see table 8)*.

Table 8: Monthly HH Income

Variable	Cohort	Maseno	Muhoroni	Sondu	Average
HH Monthly Income	Less than 5000	30	27	21	31
	5001-10,000	21	12	21	25
	10,001-20,000	13	23	27	11
	20,001-30,000	12	14	20	19
	30,001-40,000	14	9	7	6
	40,000 & above	10	15	4	8

More than half of the household respondents (56%) were earning less than Kshs. 10,000 monthly, only 8% of the households were earning more than Kshs.40, 000. Based on this research findings, it can be concluded that majority of people in the study area were poor. Poverty in this study was measured using income and not from the more conventional estimated consumption expenditure. In Kenya, the poverty line which is a threshold below which a person is considered poor is estimated at Kshs. 3,180 per adult equivalent per month for urban household. Nationally 45.2% of the population lives below the poverty line (KNBS, 2009) with Kisumu County at 40%.

Costs of each sanitation technology was estimated using local prices of materials in each small town. The estimated costs of each sanitation technology in each of the towns are explained in the table below. In the same table, it can be observed that the cost of constructing a simple pit latrine without slab is way above the total monthly earnings of majority households.

Table 31: Cost of various sanitation technologies in KES

Small town	Cost of Technologies in Kenya (KES)				
	Pit latrine with slab	Pit latrine without slab	VIP	Flush/Pour Flush	EcoSan
Maseno	54,900	34,000	56,800	60,300	185,000
Muhoroni	49,800	28,100	51,800	59,200	185,000
Sondu	52,600	19,500	54,300	63,000	185,000
Average	52,435	27,200	54,300	41,935	185,000

Department of Public Health, Kisumu County

Rural urban migration has increased in the last few decades, especially in Sub-Saharan Africa. The rural poor usually come to large cities to take advantage of job opportunities and improved living standards not available in their villages (Glaeser, 2011; Banerjee & Duflo, 2006). Indeed, it can be a very productive move, even for temporary migrants (Bryan *et al*., 2011). However, Small town areas which has now become the new frontier in urbanization have often been unprepared to absorb expanding populations and provide adequate urban services; housing, sanitation, health among others to meet the needs of these rapidly growing new populations. Consequently, migration has shifted the locus of global poverty to the cities and small towns, a process now recognized as the "urbanization of poverty" (UN-Habitat 2003).

While there have been numerous advances in sanitation over the past few years, in many countries the cost of a typical option for improved sanitation still remains beyond reach and in most cases represents a month or more of income for the typical household. Furthermore, the fragmented, highly customized nature of most solutions means that households must spend significant amounts of time sourcing skilled labor and constructing facilities, acquiring the raw materials resulting in greater inconvenience and oftentimes lower quality (Britta *et al*., 2015). Achieving the Sustainable Development Goals (SDGs) for universal access to sanitation by 2030 will require bold, innovative approaches that reduce the overall cost of ownership, simplify the purchasing process and increase quality and durability.

Low public spending on sanitation has led many sanitation programs to persuade households to invest in the construction of private facilities. These interventions assume that the expected private returns from investing in a private household toilet are at least as high as the costs the household is expected to incur. According to WSP (2007), private quality household sanitation is a worthwhile investment for households to make.

4.4.2.3 Technical factors

The last category of factors influencing sanitation preferences among Small town residents were technical factors. Ease of construction was mentioned as the main factor that influenced respondents sanitation preference (22%); this factor was predominantly mentioned by those with either pit latrine with slab or pit latrine without slab, which are both unimproved on-site dry sanitation facilities (34% and 66% respectively). These were also the most commonly used sanitation type among respondents across the three small towns (72%). Ease of use was the second mostly mentioned factor at 19%; this was also synonymous with the two sanitation facilities (Pit latrines). Availability of water was picked by 8% of respondents, this is a reason that resonated with households that used improved wet sanitation facilities (93% for flush /pour flush). Eighteen percent of the respondents across the 3 small towns said ground condition was the main influencing factor of their sanitation preference. More than 80% of those with pour flush (Flushing to septic tank) pegged it on unstable ground while 90% of those with pit latrines said stability of their grounds led them to constructing pit latrines, 15% of the respondents also said that lack of networked sewer system is the reason they prefer their current sanitation facilities. Majority of them are those with pour flush and EcoSan toilets (48%).

Table 32: HH toilet facility by technical factors influencing preference

What technical factors influences your choice of san type (%)						
Sanitation Technologies	Availability of water	Water scarcity	Ground condition	Lack of sewer network	Ease of Use	Ease of construction
Flush/pour flush	93	13	14	10	12	0
VIP	0	7	5	4	7	0
Pit latrine with slab	2	57	31	62	32	34
Pit latrine without slab/open pit	0	18	30	12	42	66
EcoSan toilet	0	5	11	12	3	0
Bucket	0	0	3	0	0	0
Others	0	0	6	0	4	0
Average	**8**	**18**	**18**	**15**	**19**	**22**

A Chi-square test to examine the significance of the relationship between technical factors and sanitation preferences within the small towns yielded the following results.

Table 33: Chi square test for technical factors and sanitation preferences

Unimproved facilities (Pit latrines and bucket)				
Pearson Chi Square	**Value**	**DF**	**Assymp.Sig (2-Sided)**	**Significance**
Availability of water	8.945	12	0.89	Not Significant
Water scarcity	3.093	6	0.57	Not Significant
Ground condition	2.026	6	0.00	**Significant**
Lack of sewer network	12.877	8	0.46	Not Significant
Ease of Use	24.342	4	0.01	**Significant**
Ease of construction	9.033	9	0.03	**Significant**
Improved Sanitation Facilities (Flush/Pour Flush, VIP and EcoSan)				
Availability of water	42.234	10	0.03	**Significant**
Water scarcity	21.345	8	0.32	Not Significant
Ground condition	8.566	7	0.04	**Significant**
Lack of sewer network	13.127	8	0.87	Not Significant
Ease of Use	4.450	3	0.18	Not Significant
Ease of construction	2.345	6	0.09	Not Significant

The findings on health, economic and technical factors influencing sanitation choices were not overly unique. Previous studies have shown many complex factors that influence personal choices about sanitation practices. A study of latrine adoption in Benin found eleven drivers for sanitation uptake that were broadly categorized as prestige-related, well-being and situational. (Jenkins & Curtis, 2005). Another study in the Philippines showed that respondents valued many other latrine attributes over health. When asked to rank reasons they would like a latrine, the average rank for health was five. Ranked more important was lack of smell, lack of flies, cleaner and privacy (Cairncross, 1992). Another study in Ghana proposed that latrine adoption occurs in three behavioral stages: preference, intention and choice (Jenkins & Scott, 2007). A person's preference shifts when they become dissatisfied with current sanitation options and then they intend to build a latrine when the idea of a latrine becomes preferable, and there are no structural barriers or constraints identified. Finally, they chose to install a latrine when they have access to good information, materials, finances and product choices. (Jenkins & Scott, 2007).

During focus group discussions, respondents in each small town made comments on each technology and explained their perception. Table 34 summarizes responses of participants about each technology in all the three small towns.

Pit latrine with slab toilet was the most desired technology in all the three small towns, because it was viewed as simple to construct and easy to improve. It offers opportunity for improvement like installing squatting pan or vent pipe.

Figure 17: Improved pit latrine with Vent and squatting pan at Sondu town

Participants also thought that pit latrine with slab toilet do not induce dependence on external knowledge on construction of toilets because local artisans who build main houses could also be used to build the pit latrines without need for any further expertise.

Table 34: General perception about Sanitation technologies

No.	Technology	General Perception
1	Pit latrine with slab	Simple and affordable Local artisans can construct one; skilled personnel can be expensive especially after Receiving special training. It's the most reliable form of sanitation considering lack of reticulated sewer line and water scarcity
2	Pit latrine without slab	Simple and affordable Seen to be more backward and that which should be restricted to rural areas.
3	VIP Latrine	It's an improvement of pit latrine with slab There is not much difference with pit latrine with slab. Its considered to be a bit expensive Most participants would be a bit uncomfortable with the darkness in VIP
4	Flush/Pour flush	Looks very advanced technology It's the desired option but for unreliable water supply Expensive, hence a preserve for the rich in the society

5	EcoSan	Considered an advanced and new technology There exist very little knowledge among small town residents Many residents would not be comfortable handling human wastes as fertilizer or consuming farm products grown from search fertilizer

Maseno town had limited access to water supply yet residents preferred flush/ pour flush toilet. The main reasons were that residents viewed other technologies as inferior, choosing a technology that requires water was seen as a way of capturing the attention of those in authority to supply water. Pit latrine without slab was the cheapest technology among all technologies in all the small towns. The technology however wasn't much preferred for it was seen to be more rural and retrogressive.

Participants did not prefer ecological sanitation or EcoSan. The technology was seen as complex and expensive. Another limitation of adopting EcoSan was the use of human wastes as fertilizer, an idea that did not sound socially acceptable to residents of these small towns.

4.4.3 Demand for improved sanitation facilities

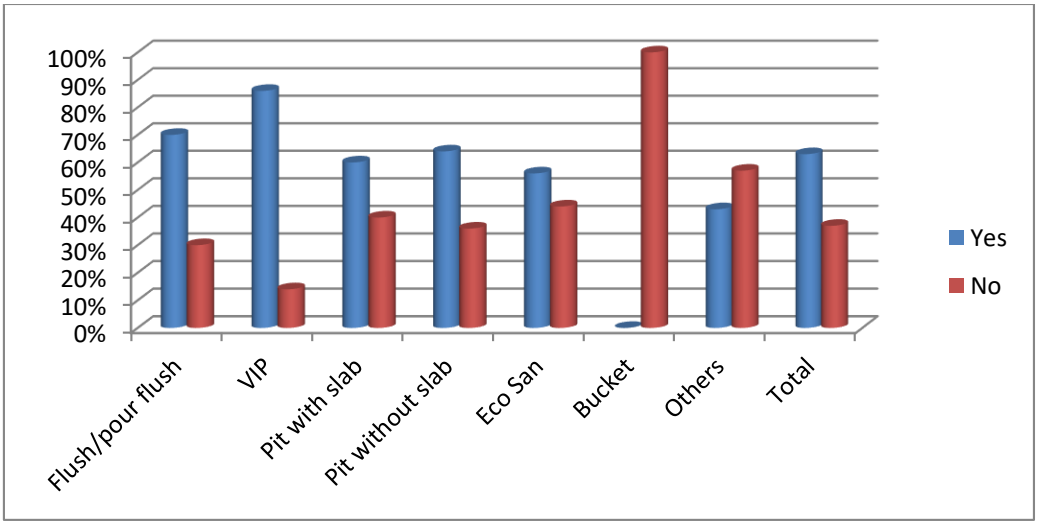
Case studies exploring the acceptability of sanitation systems in developing world have examined general satisfaction levels with existing technology. Measuring satisfaction levels is a subjective method of determining user contentment. This study employed psychometric measures, particularly the likert scale. Measurements of user satisfaction were examined to understand how users perceived various sanitation options; for sanitation users to be considered "satisfied," they must indicate their satisfaction with their existing sanitation as "good," "somewhat satisfied," or "very satisfied."

More than half of the respondents across all the three small towns were satisfied with their sanitation facilities (62%). There was no gender differential, both male and female respondents expressed satisfaction with their sanitation options in equal proportions. However, Satisfaction levels by each sanitation option revealed some intriguing results. More than half of the

respondents accessing unimproved sanitation facilities expressed satisfaction with their available sanitation. More than half (64%) of those with pit latrines without slab were satisfied, 60% of those with pit latrines with slab were equally satisfied. Ironically, a significant number of those with improved sanitation facilities also indicated lack of satisfaction, 30% of those using flush/ pour flush are not satisfied with a further 14% of those with VIP not satisfied as well.

However, when asked if they would desire upgrading their current sanitation facilities, all respondents expressed willingness to upgrade but mentioned cost as a major barrier.

Fig 18: Graph showing Satisfaction by various types of sanitation facilities



Similar trend could be seen during in depth discussions, 11 of the 12 interviewees agreed that there exist demand for improved facilities. This can be taken as major indicator for demand of improved sanitation facilities.

Respondents were further interrogated on technology preference they would wish to upgrade to. Majority of the respondents (92%) wished to upgrade to flush toilet with 7% wishing for a VIP latrine. This finding is consistent with findings of a similar study in Nyarugenge town in Rwanda. According to this study, 50.26% of households were satisfied with their individual sanitation facilities while 49.73% were not satisfied with them. On willingness to upgrade,

85.71% wished to have flushing toilets while 14.29% wished to have VIP (Kayitesis, 2008). Another study by Oswald and Hoffman (2007) stated user satisfaction levels is dependent on sanitation technology and user adoption classification. In general, improved sanitation technologies had higher percentages of satisfied users than unimproved sanitation technologies. Specifically, technologies that utilized water as a conveyance operation mode, such as cistern flush toilets and ablution blocks, consistently had higher numbers of satisfied users than dry pit-based technologies. Ecological sanitation latrines, communal ablution blocks using cistern flush toilets indicated satisfaction levels of 88%, 69%, and 53%, respectively. Regardless of geographical region, designation approach or respondent sample size, pit latrines consistently have lower percentages of satisfied sanitation users (Walker, 2011). Whittington *et al*. (1993) reported 90% of communal pit latrine users and 56% of household pit latrine users rated their overall satisfaction of cleanliness as "poor" or "fair". Furthermore, privacy and convenience were additional factors for communal sanitation users with each reporting a poor ranking of 54% and 70%, respectively (Whittington *et al.* 1993).

During focus group discussion, participants were taken through an option assessment activity discussion on the feasibility of different sanitation preferences within their towns. The feasibility of each sanitation preference was based on locally accepted criteria as well as externally identified categories such as: Technical feasibility, social feasibility, affordability and sustainability. Assessing different options creates community awareness of any information based on their real needs. Focus group participants were led through a discussion and scoring of the feasibility of different technologies.

Score Board
1 = excellent
2 = good
3 = fair/ satisfactory
4 = poor
* *Lowest **score** got highest **rank***

Participants reached a consensus of scoring each sanitation technology for each of the indicators listed below.

Table 35: Exploring Potential Options

Option		Technical Feasibility	Social Feasibility	Afford ability	Sustain ability	Total Score	Rank
Pit latrines		2	3	1	1	7	1
Flush/pour Flush to:	Piped sewer system	4	2	4	4	16	7
	Septic tank	4	2	4	3	13	5
	Pit latrine	3	2	3	2	10	3
Ventilated improved pit latrine (VIP)		2	2	2	3	9	2
Ecosan Toilet		4	4	4	3	15	6
Public sanitation		3	1	3	4	11	4

Even though most residents in these small towns would prefer having flush /pour flush (92%) as shown earlier, option assessment proves pit latrines to be the most feasible option for the respondents. This is closely followed by VIP.

4.5 Barriers to improving sanitation in small towns within Kisumu County

The third category of data was on the existing barriers to improving sanitation, these were categorized into barriers in relation to improved on-site sanitation, networked sewer system and barriers of accessing improved public sanitation facilities. Nonetheless, it was necessary to first identify the coverage of each sanitation system across the study area. Data was once more gathered using questionnaires and FGD. To identify the specific barriers, factor analysis was employed under this objective.

4.5.1 Sanitation system

Majority of the residents in the three small towns used on-site sanitation as the main sanitation technology (82%). A small proportion relied on public sanitation (10%) while the remaining (8%) were connected to sewer network; these were respondents from either Maseno or Muhoroni towns.

In Maseno town, there exist a sewer system, but it is privately owned by Maseno University. It was revealed that only a handful of residents were allowed to connect to the sewer line which is mainly used by the institution.

Figure 19: Reticulated Sewer Line in Maseno town

In Muhoroni town, there exists two separate sewer lines privately owned by Agro-chemicals and Muhoroni Sugar Company (MUSCO). An in-depth discussion with the estates department from companies revealed that the sewer lines were strictly for use by the companies' staff quarters.

Figure 20; Sewer treatment Pond by MUSCO. Popularly known as Lagoon

Figure 21; A Sewer treatment plant, owned by Agro-Chemicals

Many small town dwellers who demand improved sanitation desire flush toilets. These small towns often lack reliable running water leading to lack of infrastructure for piped water and sewage (Strauss, 2001). Decentralized systems represent an appropriate technological option for urban areas that face problems of high population density, but financing capability limits acquisition of larger centralized treatment systems (IRC, 2012). In the developing world for instance, sewerage sanitation systems are impractical because of high investment and operation costs (Mara *et al*., 2007). On-site sanitation options with low operation and maintenance costs remain the most appropriate particularly for small towns and unplanned settlements (Nelson & Murray, 2008).

4.5.2 Barriers on accessing improved on-site sanitation

This data was collected from respondents who used non improved on-site facilities. Through the questionnaire, they were asked to name the major challenge that inhibits them from upgrading their facilities to improved standards. Participants in in-depth interviews were probed on barriers impeding access to improved sanitation. Barrier matrix was used in focus group discussion. The following barriers were mentioned; Financial constraint, lack of

information on improved sanitation, poor ground condition, lack of reliable water, tenancy uncertainty, lack of priority, lack of demand, illegal land ownership and lack of responsibility.

Table 36. Frequency table of barriers on improving access to on-site sanitation

	Variables	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Financial Constraint	71	19.9	19.9	19.9
	Lack of information	47	13.2	13.1	33.0
	Ground condition	43	12.1	12.1	45.1
	Water scarcity	54	15.2	15.4	60.5
	Tenancy	29	8.1	8.3	68.8
	Lack of priority	31	8.7	8.6	77.4
	Lack of demand	41	11.5	11.5	88.9
	Illegal land ownership	19	5.3	5.6	94.5
	Lack of responsibility	18	5.1	5.5	100.0
	Total	353	99.2	100.0	
Missing	System	3	0.8		
Total	356	100.0			

These factors were subjected to data reduction using factor analysis. Factor analysis is based on the 'common factor model' which is a theoretical model. This model postulates that observed measures are affected by underlying common and unique factors (Tabachnick & Fidell, 2007). Principal Component's analysis was used to extract maximum variance from the data set with each component thus reducing a large number of variables into smaller number of components.

The preliminary analysis to assess if the data on barriers to improved sanitation qualified for factor analysis yielded an affirmative response. This was achieved through computation of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of Sphericity. Usually the KMO statistics ranges between 0 and 1. In most cases a value of zero means that factor analysis is inappropriate because the sum of partial correlations is large relative to the

sum of correlations, indicating diffusions in the pattern. On the other hand, a value approaching one indicates compactness and ability of factor analysis to yield distinct and reliable factors.

Bartlett's measure of Sphericity tests the Null hypothesis that the correlation matrix is an identity matrix. Some relationship is needed to exist between variables for factor analysis to work. Therefore a test would be significant if the significance value is less than 0.05 and such a significance level would show that there exist relationships between variables to be included in the analysis and therefore factor analysis is appropriate.

Table 37: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.897
Bartlett's Test of Sphericity	Approx. Chi-Square	41.945
	df	36
	Sig.	.029

The principle component analysis procedure was used to extract the factors from the variable data. Kaiser's rule was used to determine which factors were most eligible for interpretation because this rule requires that a given factor is capable of explaining at least the equivalent of one variable's variance. This is not unreasonable given that factor analysis has as its objective reducing several variables into fewer factors. Using this rule, four factors were extracted (**see Table 38**). Together they are capable of explaining approximately 65% of all the variable variances. The Eigen value associated with each factor represents the variance explained by that particular linear component. SPSS displays the Eigen value in terms of the percentage of variance explained, for instance factor one explains 14.122 of the total variance.

Table 38: Total Variance Explained

Component	Initial Eigen values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Financial Constraint	1.271	14.122	14.122	1.203	23.363	23.363
Lack of information	1.171	13.006	27.128	1.170	17.005	40.368
Ground condition	1.112	12.355	39.482	1.128	12.534	52.901
Water scarcity	1.074	11.932	51.414	1.126	12.513	65.414
Tenancy	.967	10.745	62.159			
Lack of priority	.933	10.365	72.524			
Lack of demand	.910	10.111	82.635			
Illegal land ownership	.801	8.903	91.538			
Lack of responsibility	.762	8.462	100.000			

Extraction Method: Principal Component Analysis

A plot of the Eigen values is provided below and it can be seen the curve beginning to tail after the fourth factor. Hence this confirms the retention of the four factors.

Fig 22: Scree Plot

The rotated sums of squared loadings displays the Eigen values after rotation. Rotation has the effect of optimizing the factor structure and one consequence is that the relative importance of the four factors is equalized. Factor one before rotation accounted for a larger share of variation than the other three factors but this is reduced after rotation and all the four factors seem to be contributing almost equally.

Output four shows the table of communalities before and after extraction. Principle component analysis unlike maximum likelihood works on the original assumption that all variance is common, therefore before extraction the communalities are all one. After extraction, the communalities change and they represent the amount of variance in each variable that can be explained by the retained factors after extraction and some factors have been discarded leading to loss of some information.

Table 39: Communalities

	Initial	Extraction
Financial constraint	1.000	.549
Lack of information on improved sanitation	1.000	.437
Poor ground condition	1.000	.622
Lack of reliable water	1.000	.573
Tenancy uncertainty	1.000	.546
it's not my priority	1.000	.444
Lack of demand	1.000	.454
Illegal land ownership	1.000	.461
Not my responsibility	1.000	.569

Extraction Method: Principal Component Analysis

The fifth output shows factor rotation. The rotated component matrix indicates how each variable loads on each of the four factors.

Table 40: Rotated Component Matrix

	Component			
	1	2	3	4
Not my responsibility	0.715		0.105	
Am Satisfied	0.648			0.168
Tenancy uncertainty	-0.125	-0.682	0.237	0.568
Financial constraint		0.978	0.202	-0.102
Poor ground condition	0.128	0.268	0.730	-0.412
Lack of reliable water	0.242	-0.325	0.737	
Illegal land ownership	-0.307			0.599
Lack of information on improved sanitation	-0.243	0.121	-0.752	0.084
it's not my priority	0.565	0.673	0.273	-0.582

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 8 iterations

The variables loaded on the factors as follows: Not my responsibility, not my priority and am satisfied loaded heavily on factor one, all the three variables seems to be leading to lack of

responsibility in improving sanitation. Financial constraint and lack of priority loaded heavily on factor two and the common underlying theme among the two variables is low income. Lack of reliable running water, lack of skills and poor ground condition loaded heavily on factor three, these are technical factors. Finally, illegal land ownership, tenancy uncertainty loaded heavily on factor four all of which have a component of tenure security.

This analysis led to a conclusion that the four major barriers to improving sanitation in small towns within Kisumu County were lack of responsibility for improving sanitation, low income of small town residents, technical challenges and tenure security. These factors were also the main ones mentioned by participants of in depth interviews. One of the KII participant stated that;

"Most people here use un improved sanitation facilities mostly on-site. There is desire to upgrade to improved facilities as we have sensitized them on the importance of improved facilities. However, most residents here are poor and cannot afford improved facilities which are more expensive"

4.5.1.1: Lack of Responsibility

A government's role in providing sanitation is to set policy and regulate the sector to ensure a clean and healthy living environment for her people. At the same time individuals and households bear the greatest responsibility for their own well-being by adopting improved sanitation and hygiene practices. The shift from public construction of latrines to more complete approach to sanitation and hygiene promotion places the household at the center of both decision making and action. But it also implies a strong role for the community in planning and management of interventions.

4.5.1.2 Low income

Income level of household is important as it determines affordability and sustainability of a toilet facility owned by a household. The rapid urbanization process in Sub-Sahara Africa and

the declining economic performance of most African countries have created a new face of poverty, characterized by a significant proportion of the population living below the poverty line in over-crowded slums and sprawling shanty towns around major cities. Estimates by UN-Habitat show that about 70% of all urban residents in Sub-Sahara Africa live in slums and smaller towns in the suburbs (UN-Habitat, 2003). The experiences of the urban poor are unique and often characterized by reliance on cash economy, overcrowding, poor environmental sanitation, lack of security, lack of social and health services, greater indulgence in risky sexual practices, social fragmentation, and high levels of migration (Zulu *et al*., 2002).

4.5.1.3 Technical challenges

The decision of technology or combination of technologies to use for small town sanitation intervention will perhaps be one of the most challenging for any intervention. Tried and tested sanitation technologies for either rural areas or formal urban areas have for the most part been found to be inappropriate for small town and peri-urban settlements. When choosing and designing a sanitation technology, consumers traditionally focus primarily on physical site characteristics such as slope, water table, soils and so on. In small towns however, physical site characteristics are indeed very critical considerations, but the unique characteristics of small towns poses new challenges that must also be considered for successful and sustainable implementation among them weak institutional capacity, poor ground conditions, lack of reliable water for sanitation and high population density.

4.5.1.4 Tenure Security

Small towns present unique challenges to sanitation improvement activities. Most challenging are the characteristics that set these areas apart from the urban and rural sectors. One of these key challenges is the lack of legal land tenure. Security of tenure as a precursor for household investment is the cornerstone of the property rights debate (Payne *et al*., 2007). Household investment decisions in sanitation are inherently linked to tenure security. Based on evidence

gathered in Dakar Senegal, tenure provide sufficient security for household investment in sanitation. Rental housing (both formal and informal) represents 61% of housing in Africa (UN-Habitat, 2003). It has been shown that tenants and those with lower tenure security do not invest in capital infrastructure, they are willing to pay for the operational aspects of sanitation services. As the provision of sanitation facilities requires land, the right to access and use land has a bearing on sanitation. The lack of tenure in small towns is a major problem for sanitation provision. Local residents are reluctant to install systems themselves because of the risk of evictions and demolitions (Water Information Network, 2011).

4.5.3 Barriers on accessing improved networked and public sanitation facilities

Financial constraint was identified along with lack of reticulated sewer system, 31% and 64% respectively as the major barriers in improving access to networked sanitation system in the sampled small towns. Respondents from Muhoroni and Sondu identified other factors other than financial constraint and lack of networked sewer system as barriers. Majority of them expressed ignorance on networked sanitation system or satisfaction with their current facilities, a significant number also mentioned lack of adequate water for sanitation.

Figure 23: Public Sanitation in Muhoroni town (flushing to a septic tank)

High charges and poor smell/lack of cleanliness were the main barriers in improving access to improved public sanitation (35% and 44% respectively). In-depth discussion with relevant authorities revealed that most public toilets were charging between Ksh.10 and Kshs. 20. A figure most residents considered to be too high. All the public ablutions were ran by special groups (youth groups and women groups). These groups attributed lack of cleanliness to low daily collection.

Table 41: Barriers on improved Networked and Public sanitation system

Variable		Maseno Counts (%)	Muhoroni Counts (%)	Sondu Counts (%)	Total Counts (%)
Networked sanitation	No Networked system	32 (41)	46 (24)	33 (37)	111 (31)
	Financial Constraint	46 (59)	129 (69)	53 (60)	228 (64)
	Others	0 (0)	14 (7)	3 (3)	17 (5)
Public sanitation	Proximity	12 (15)	37 (20)	5 (6)	54 (15)
	High charges	34 (44)	63 (33)	27 (30)	124 (35)
	Poor smell/not clean	32 (41)	72 (38)	51 (57)	155 (44)
	Others	0 (0)	17 (9)	6 (7)	23 (6)

Figure 24: Unfinished, Open defecation active public sanitation in Maseno

Communal sanitation facilities have been introduced in slums and other peri-urban towns of Kisumu. According to Simiyu (2016), usage among residents has been low. In Accra small

towns, unlike Kisumu, it has been noted that there is high use of communal or public sanitation facilities (Arku *et al.,* 2013). Findings from Kisumu informal settlements suggest low usage of communal facilities, with the main barriers being accessibility and cost/economic factors. Accessibility to these communal facilities at night is a major challenge, especially for women and in such places where communal facilities are not open at night, women's and girls' security is questionable. They (Arku *et al*) further note that, despite the high use of public facilities in Accra, users preferred it if the toilets were close to their homes. This suggests that communal sanitation facilities ought to be as close as possible to users' dwellings. Economically, the urban poor find it irrational to pay for sanitation services, especially at communal sanitation facilities. It makes economic sense for a poor person to find an alternative at his neighbor/friend/relative's dwelling, use open defecation, or use flying toilets, rather than pay for use of communal facilities. Therefore, as long as the urban poor have other alternatives where they do not have to walk for a distance to access and use a sanitation facility and/or pay for use of sanitation facilities, it may take a while before there is behavioral change from the use of unimproved sanitation facilities to the use of communal facilities (Simiyu, 2016).

In a similar study by Greg and Noah (2014), "innovative communal sanitation models for the urban poor"- lessons from Uganda. They reported that the informal settlements in many Ugandan towns and cities have complex and contested land tenure systems making acquiring land for communal investment in sanitation facilities very difficult. The small percentages of facilities that residents can access are normally dilapidated and poorly maintained.

During focus group discussion, barrier assessment was used to better understand the barriers to improving sanitation in small towns. The exercise involved the following steps:

Step 1: Participants were asked to list all barriers to improving sanitation within their town

Step 2: After listing, they were asked to rank the top five barriers.

Step 3: Participants were then asked to determine whether solving these problems are difficult, easier or easiest to solve. The goal was to foster a sense of ownership of the community-devised 'best' solutions—as well as their feasibility.'

The table below summarizes the barriers and their perceived Level of difficulty for implementing Solution.

Table 42: Barrier assessment matrix

NO	**Challenge**	**Solution**	**Level of difficulty for implementing solution**		
			Difficult	Easy	Easiest
1	Financial constraint	Economic Empowerment			
2	Lack of reliable water	Increasing availability of water			
3	Lack of information on improved sanitation	Sensitizing the community			
4	Poor ground condition	Construction of facilities on stable grounds Adopting technologies that doesn't require digging of pits			
5	Lack of tenure security				

CHAPTER FIVE;

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter presents overall summary, conclusions and recommendations which are based on the findings of this study. These are targeted at addressing issues raised in the research questions and consequently objectives of this study.

5.2 Summary of findings

5.2.1 Sanitation practices in Small towns

Latrine ownership is relatively low. Sondu town had the highest population with latrines (58%) with Muhoroni town having the lowest at 47%. Those who did not have any form of latrine or toilet were 21%. Majority of the respondents without latrine blamed it on collapsing soil of the pits (41%). Through chi-square analysis, education level and household income were discovered to be the key factors influencing latrine ownership, both factors had statistically significant association; ($\chi^2 = 6.32$, *P<0.05)* and ($\chi 2 = 8.90$, *P<0.05)* respectively. Further, by use of log linear analysis, it was determined that population density, learning institutions and education & income have each a significant association with latrine ownership. On the other hand, more than half of those with latrines were sharing. According to JMP/UNCEF (2014), those sharing sanitation facilities are considered to be lacking access to improved sanitation. When asked the reasons for sharing sanitation facilities, majority of the respondents said that their neighbors lacked latrines (48%). A good proportion of respondents from Sondu believed that they shared their latrines with neighbors because their latrine looked better than what their neighbors got (30%). There were cases of sharing due to collapsed pit latrines 7%.

The findings indicated that a significant percentage of respondents across the three sampled small towns still practiced open defecation. In Sondu town, 20% of those without latrine

admitted open defecation, 9% in Maseno town and 18% from Muhoroni town also admitted to open defecation. Using empirical evidence and own findings, the researcher linked open defecation practice to population density and sugarcane plantations in Sondu and Muhoroni towns respectively. In the same breadth, it was also determined that most respondents do not have good practices on management of children stool. Fifteen percent of respondents rinsed/put into drainage or ditch, 10% threw children stool into garbage, *shamba* or bush with a further 6% either burying or leaving in the open. Some of the socio-economic factors that influenced handling of children feces were level of education and Sanitation ownership, both of these were statistically significant ($\chi^2 = 12.4$, *P<0.05)* and ($\chi^2 = 11.3$, *P<0.05)* respectively.

Thirty percent of respondents admitted not washing hands after visiting the toilet, the practice of hand washing was least practiced among respondents from Maseno at 64% with 79% of respondents from Sondu town being the majority practicing hand washing. The investigator determined the relationship between hand washing practice and gender. Revealing a statistically insignificant relationship between the two variables, ($\chi^2 = 1.705$, *P>0.05)*. The relationship between hand washing and level of education was however significant; ($\chi^2 = 2.724$, *P<0.05)*.

Some of the Luo cultural practices that came out conspicuously relating to sanitation, were on use of toilet where a woman was not allowed to share a latrine with her father- in law. This would force either of them to share a neighbor's latrine or defecate in the open. It also emerged that open defecation is a culture that is widely practiced during funerals. In terms of gender roles, building of a latrine among the Luos was a preserve of men however, the cleaning and maintenance was a female role.

5.2.2 Factors that influence sanitation choices in small towns

Pit latrine with slab was the most widely used sanitation type across the three small towns (40%). 20% of the respondents were found to be having access to improved sanitation facilities i.e. VIP, Flush/pour flush or EcoSan. Maseno town had the highest population with improved sanitation (34%). Among the respondents who used flush/pour flush, majority of flushed to septic tanks (42%). Those flushing to pit latrine were 38% with only 20% flushing to sewer system. The use of septic tank was common in Maseno and Muhoroni. It was further established that only Maseno and Muhoroni towns were connected to reticulated sewer network. However, in both towns, the sewer networks were privately owned with restricted or no access to the public.

While assessing factors that influenced sanitation preference, fear of diarrhea outbreak was mentioned as the leading health factor that influenced sanitation preference (40%). This was the trend across all the three small towns. The investigator determined the significance of health factors influencing uptake of improved sanitation. Chi square results revealed a strong association between reduced risk of diarrhea and uptake of improved sanitation facilities (flush/pour flush, VIP and EcoSan) ($\chi^2 = 4.929$, $P<0.05$). Similarly a significant relationship existed between reduced diarrhea and uptake of unimproved sanitation facilities ($\chi^2 = 11.459$, $P<0.05$). However, the strength of association was weak as compared to influence on improved facilities; P=0.014 and P =0.043 respectively.

Among Economic factors that influenced sanitation choices, affordability and availability of materials were mentioned as the major factors across the three Small towns (41% and 37%) respectively. The two major factors were popular among respondents with unimproved sanitation facilities with 43% of those with Pit latrines without slab picking availability of materials and 29% saying affordability as the driving force behind their preference. The two variables (affordability and availability of materials) had the lowest pick among those with

improved sanitation facilities. 10% of the respondents mentioned access to good information as the driving factor that informed their sanitation preference, majority (62%) of which were discovered to be those with access to improved sanitation. Proximity was mentioned by a further 4% and most of them were retailers who depended on public ablution blocks in market areas.

The last category of factors influencing sanitation preferences among small town residents was technical factors. A number of respondents (22%) mentioned ease of construction as the main factor that influenced their sanitation preference; this factor was predominantly mentioned by those with either pit latrine with slab or pit latrine without slab, which are both unimproved on-site dry sanitation facilities (34% and 66%) respectively. These were also the most commonly used sanitation type among respondents across the three small towns (72%). Ease of use was the second mostly mentioned factor at 19%; this was also synonymous with the two sanitation facilities (Pit latrines). Availability of water was picked by 8% of respondents, this is a reason that resonated well with households that used improved wet sanitation facilities (93% for flush /pour flush).

More than half of the respondents across all the three small towns were satisfied with their sanitation facilities (62%). By gender it was a similar trend as both male and female respondents expressed satisfaction with their sanitation options in equal proportions (62%). However, satisfaction levels by each sanitation option revealed some intriguing results. More than half of the respondents accessing unimproved sanitation facilities expressed satisfaction with their available sanitation option, a significant number of those with improved sanitation facilities also indicated lack of satisfaction. However, when asked if they would desire upgrading their current sanitation facilities, all respondents expressed willingness to upgrade

but mentioned cost as a major barrier. Majority of the respondents (92%) wished to upgrade to flush toilet with 7% wishing for a VIP latrine.

Even though most residents in these small towns would prefer having flush /pour flush, from the focus group discussion option assessment, pit latrines still proved to be the most feasible option for the respondents.

5.2.3 Barriers to improving sanitation in small towns within Kisumu County

Majority of the residents in the three small towns used on-site sanitation as the main sanitation technology (82%), a small proportion relied on public sanitation (10%) while the remaining (8%) were connected to sewer network.

Through factor analysis, it was shown that the four major barriers to improving sanitation in small towns within Kisumu County were lack of responsibility for sanitation services, low income of small town residents, technical challenges and tenure security. Financial constraint was identified along with lack of reticulated sewer system, 31% and 64% respectively as the major barriers in improving access to networked sanitation system in the sampled small towns. A handful of respondents, 7% and 3% from Muhoroni and Sondu respectively, identified other factors other than financial constraint and lack of networked sewer system as barriers. Majority of respondents expressed ignorance on networked sanitation system or were satisfied with their facilities. A significant number also mentioned lack of adequate water for sanitation. High charges and poor smell/lack of cleanliness were the main barriers in improving access to improved public sanitation (35% and 44%) respectively.

5.3 Conclusions

The study findings paints a worrying picture on sanitation situation in small towns. From the findings, the following conclusions could be drawn:

a) **On Sanitation Practices within small towns**

- The findings revealed that most residents did not conform to good sanitation practices; a significant proportion still lacked sanitation facilities, open defecation was being practiced, children wastes were not properly handled and hand washing was not so common among residents. The study also revealed that most sanitation practices in small towns were influenced by level of education and household income. Therefore it is concluded that increasing level of education could in turn increase household income which would translate to better sanitation practices.
- More than half of the respondents (59%) were sharing latrines. According to JMP/UNCEF, those sharing sanitation facilities are considered to be lacking access to improved sanitation. However, there is need to distinguish shared sanitation into improved and unimproved and expand definition of sanitation to take to account the diversity of shared sanitation and should therefore not automatically be assumed unimproved

b) On factors influencing Sanitation preferences

- The study found out that pit latrine was the most common form of sanitation technology used in the small towns (72%), this was necessitated by among other factors poor ground condition and lack of reliable water for sanitation. It can be concluded that small town residents are faced with limited sanitation choices/ technologies. Unlike cities which are connected with reticulated sewer networks and reliable water sources, small town residents are forced to choose from dry on-site sanitation technologies that are in most cases non improved.
- More than half of the respondents across all the three small towns indicated satisfaction with their sanitation facilities (62%). However, when asked if they would desire upgrading their current sanitation facilities, all respondents expressed willingness to upgrade but mentioned cost, lack of sewer network and reliable water

as the major barriers. It can be concluded that there exists demand for better/ improved sanitation facilities among small town residents.

c) **On Barriers to improving sanitation facilities**

- Improving sanitation in small towns is faced by numerous challenges among them lack of reticulated sewer system and unreliable water for sanitation among others. Most of these are government functions leading to conclusion that government has underinvested in sanitation within the small towns.

5.4 Recommendations

Based on the findings and the above conclusions of the study, the following recommendations are put forward:

a) Most sanitation practices are influenced by either level of education or household income. There is need to focus on education and hygiene awareness and on economic development of small town residents, this would go a long way in improving their lifestyle which will in turn ensure adoption of better sanitation practices.

b) Accepting household shared sanitation as a suitable toilet type for the urban poor could have overarching implications among them upgrading the shared facilities to improved standards. The researcher therefore recommends that the focus of future sanitation programs targeting the urban poor should be on improving the hygienic levels of shared facilities to improved standards. If well managed these facilities could be feasible and socially acceptable choice for millions of underserved populations globally.

c) On-site sanitation is never the best form of sanitation in recent times, particularly after the paradigm shift to decentralized sanitation system. However, for small town residents, it remains the most sustainable option. Therefore, effort should be put on

improving on site sanitation facilities. For instance, Ventilated Improved Pit latrines are recommended for these upcoming towns as household or communal sanitation systems. A VIP latrine minimizes harmful side effects related to traditional pit latrines. It is cheap compared to other facilities and can be accessed by the community. Skilled labor is easily accessible as it is simple, easy to maintain and different types of cleansing materials both solid and water can be used.

d) The existing demand for improved sanitation facilities should be taken as the first step by Governments and other sectorial partners in beginning to address sanitation issues in small towns. However, such interventions must be sensitive to different aspects of the demand in terms of cultural practices, preferences and the currently existing barriers.

5.4. Key area for further research (Willingness to pay for improved sanitation)

Improving sanitation coverage will require identification of major sources of challenges to the adoption of new technologies and solutions. Understanding the underlying factors that affect demand for urban sanitation is a precursor in beginning to address sanitation coverage in urban areas. One such key factor would be to understand what household characteristics affect the willingness to pay for improved sanitation. There is more research on willingness to pay for other products including water but nothing to write home about on sanitation. Many factors could explain a low willingness to pay for improved sanitation. In some cases, people may not be willing to pay for a new technology because they do not fully understand its use or value. They may not be aware of the benefits to those services or because they underestimate the health costs.

Policymakers have long considered lack of information to be a central barrier. For example, the Community-Led Total Sanitation (CLTS) program takes as given the fact that people do

not understand the pathways of disease transmission between fecal matter, food and water sources. Making these disease pathways salient through demonstration events is therefore a key component of the CLTS intervention (Kar & Chambers, 2008). But more research is needed to understand the conditions in which information really makes a difference. Even when households understand the health benefits of a technology, that may not be their primary consideration; they may care more about other attributes of the technology.

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ANNEXES

Annex 1: CONSENTING FORM

Consent for participation in the Research Interview

Form code	

Study Title	An evaluation of sanitation practices and preference in selected small towns within Kisumu county, Kenya0	
The principle Investigator	Benard Ouma ORONJE	MA/PA/0054/2013 +25411497480 benoronje@yahoo.com
Participating Investigators	Prof. George Mark Onyango	School of Planning and Architecture Maseno University
	Dr. G.G Wagah	School of Planning and Architecture Maseno University
For any question pertaining to your rights as a research participant contact		The Secretary Maseno University Ethics Review Committee Private Bag, MASENO Tel: 057-51622/ 0722203411 Email: muerc-secretariate@maseno.ac.ke

Dear Participant.

Before agreeing to participate in this research study it is important that you read and understand the following explanations of the proposed study. It describes the purpose, procedures, potential risks and benefits, confidentiality and your right to participate, decline or withdraw.

I am a student at Maseno University school of planning and Architecture. Am a conducting a study evaluating sanitation practices and preferences focusing on three small towns within Kisumu County namely; Sondu, Maseno and Muhoroni towns. These small towns have become the new frontier in urbanization which far outstripping investment in basic amenities like sanitation. The study will collect data focusing on practice and preferences as it's assumed that this would provide the foundation for beginning to address sanitation issues within small towns.

The information you will provide will be treated with a lot confidentiality and will not be shared outside the study framework. The questionnaire is expected to take a maximum of 15min, your participation is voluntary and it is your right to withdraw mid-way without giving explanations and will not be penalized for the same.

The study is not expected to pose any physical, social or economic risk/discomfort. Otherwise by participating you will get an opportunity to provide information that would play a key role in

highlighting the unique challenges that small town dwellers face in regards to sanitation services. This would go a long way in providing critical information in improving service delivery by different players.

I have read the information above, and any questions I asked have been answered to my satisfaction. I understand a copy of this form will be made available to me for the relevant information and that I may withdraw at any point without prejudice

Participant:

_____ _____

Signature **Date**

Researcher:

_____ _____

Signature **Date**

Annex 2: DATA COLLECTION TOOLS

HOUSEHOLD QUESTIONNAIRE

This Questionnaire has been developed to collect data in a study regarding sanitation in small towns within Kisumu County. Please complete the questionnaire form to aid in the study. The findings are to help in evaluating sanitation practices and preferences and the barriers in improving sanitation in small towns. The data is required for academic purposes only and will be treated with maximum confidentiality. Your cooperation will be highly appreciated

Name of town: _____ Date: _____

SECTION A: RESPONDENTS PERSONAL DETAILS

No	Questions	Responses	Mark	Skips
01	What is your relationship to the head of the household?	Self		
		Spouse		
		Son/daughter		
		Other (specify)		
02	Respondent's sex? ***[by observation]***	Male		
		Female		
03	How old are you?	Between 18-28 years old		
		Between 29-38 years old		
		Between 39-48 years old		
		Between 49-58 years old		
		Between 59-68 years old		
		Older than 68 years		
04	What is the sex of the household head? ***[if the respondent is NOT the head of HH]***	Male		
		Female		
05	What is the occupation of the head of the household?	Professional/Technical		
		Factory worker		
		Day labourer		
		Civil service/Teacher		
		Service/Sales/Commercial		
		Agricultural		
		Student		
		Other (specify)_____		

06	How many people usually live in this household?	Male:		
		Female:		
07	What level of schooling did the head of household achieve?	None		
		Some Primary		
		Finished Primary		
		Some Secondary		
		Finished Secondary		
		Higher		
08	What is the religion of the HH	Muslim		
		Christian		
		Other (Specify)		
09	What is your tribe	Luo		
		Luhyia		
		Kalenjin		
		Kisii		
		Other (Specify)		
10	What is your average Household Monthly income	Less than 5000		
		5001-10,000		
		10,001-20,000		
		20,001-30,000		
		30,001-40,000		
		40,000 & above		

SECTION B: SANITATION PRACTICES

011	Do you have a latrine?	Yes		
		No		>>**13**
011	Do you share this facility with other households?	**Yes**		
		No		
012	Do you know why they use your toilet	Look good than theirs		>>**16**
		they do not have one		
		Theirs is full		
		Other specify……		
		Collapsed		
		We changed residence		
		Other (Specify)		
013	What reasons stops you from having a latrine now?	Collapsing soil in the pit		
		Lack of knowledge/skills on how to build		
		High cost of construction		
		Don't see the need		
		Lack of land to construct		

		landlord/lady has refused to construct		
		Others specify		
014	The last time you needed to defecate, where were you?	At home		
		Away from home (Specify)		
015	Did you use a toilet	YES		
		NO		
015	Who own the toilet	self		
		Land lord		
		County government		
		Neighbour		
		Other (Specify)		
		No		
016	Do you have a child below five years in the Household (What is the name-*optional)*	**Yes**		
		No		>>018
017	The last time your child *(name*) passed stools, what was done to dispose of the stools?	Child used toilet/latrine		
		Put/rinsed into toilet or latrine		
		Put/rinsed into drain or ditch		
		Thrown into garbage/ shamba/bush		
		Buried		
		Left in the open		
		Other (specify)_____ __		
		Vendors		
		Others (specify)		
017	Do you wash your hands after visiting the toilet?	Yes		
		No		>>**19**
018	Was it possible to wash your hands with soap after the last time you went to the toilet at/near home?	Yes		
		No		
019	If NO why Not	No water available		
		No soap available		
		Don't see the need		
		Others (specify)		
020	How satisfied are you with your current defecation place?	Very satisfied		
		Satisfied		
		Unsatisfied		
		Very unsatisfied		
		Don't know		
021	How common is it for people in your community to defecate in the open	Never		
		Rarely		

		Sometimes		
		Most of the time		
		Alwyas		

SECTION C: FACTORS INFLUENCING SANITATION CHOICES

022	What kind of toilet facility do members of your household usually use? ***If "flush" or "pour flush" probe:*** Where does it flush to?	Flush/pour flush to:		
		piped sewer system		
		septic tank		
		pit latrine		
		elsewhere		
		don't know		
		Ventilated improved pit latrine (VIP)		
		Pit latrine with slab		
		Pit latrine without slab/open pit		
		EcoSan toilet		
		Bucket		
		Other (specify)_____ __		
023	What health factors influences your choice of the sanitation type	Reduced risks of diarrhoea		
		Lack of smell		
		Lack of flies		
		Its cleaner		
		Others (specify)		
024	What technical factors influences your choice of the sanitation type	Availability of water		
		Water scarcity		
		Ground condition		
		Lack of sewerage network		
		Ease of construction		
		Others (specify)		
025	What economic factors influences your choice the sanitation type	Availability of materials		
		Affordability		
		Access to good information		
		Proximity		
		Others (specify)		
026	Are you satisfied with the toilet facility you have access to?	Yes		
		No		

SECTION D: BARRIERS TO IMPROVED SANITATION

027	Among the following , which one best describes your sanitation system	On-site		
		Networked system		
		Public sanitation		
028	What are some of the challenges in improving access to improved on site sanitation	Financial constraint		
		Lack of knowledge on improved on site sanitation		
		Ground condition		
		Lack of reliable running water		
		Others (specify)		
029	What are some of the challenges in improving access to improved networked sanitation system	Lack of networked system		
		Financial constraint		
		Others (specify)		
030	Are there challenges in accessing public sanitation facilities	Proximity		
		High service fee		
		Poor smell/ not clean		
		Others (specify)		

KEY INFORMANT INTERVIEW GUIDE-Public health Officers

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1. Can you describe the current situation of sanitation within this town
2. How many people in the town have access to a latrine?
3. What types of latrines is commonly used in this town and why?
4. Please compare accessibility to on-site, public and networked sanitation facilities.
5. What are some of the barriers in accessing each of the above sanitation facilities
6. What would you say the level of people's knowledge about the different types of latrines and its linkages to health and disease prevention is? Why?

KEY INFORMANT INTERVIEW GUIDE-Administrators (Chiefs, Ward Admin, MCA)

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1. Can you describe the current situation of sanitation within this town
2. Are there any specific social and cultural norms that encourage open defecation?
3. What would you like to say about their capacity/skills to build or upgrade latrines?
4. Can you tell who holds the strongest influence for persuading people to build/upgrade latrines and/or stop open defecation?
5. If we were to implement a behavior change program in this town, what do you think would be your role

KEY INFORMANT INTERVIEW GUIDE-women leader (CHW)

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1. Can you describe the current situation of sanitation within this town?
2. Which types of sanitation are commonly used here, and why?
3. For households that do not have latrines, what are the reasons why they do not have latrines and where do they defecate?
4. What are the constraint/problem of people who do not own latrine in your village?
5. How do people dispose of feaces from young babies? Do young children use potties for defecation?
6. What are some of the challenges for those willing to upgrade / improve their latrine?
7. Can the community obtain technical support and know-how for upgrading/improving your latrine? Where?

Focus Group Discussion Guide

A) Force field analysis Estimated Time: _30mins___

- Sanitation practices
- Sanitation preferences and factors influencing sanitation choices
- Barriers to improving sanitation

A process of analysis will be undertaken for the top 5 'issues' the group has selected related to Sanitation within the small town. The analysis exercise will explore **why** these are problem issues, the **positive aspects** of each issue and existing or potential solutions (*see table below).* The purpose of this activity is to better understand the community's most pressing sanitation Issues and their understanding of the cause and solutions.

The following steps should be followed in this activity:

1. Ask the group to brainstorm and list all problems related to access to sanitation.
2. Ask the group to rank the problems.
3. Allow the group to go through the analysis process listed below with each of the first 5 priority issues (see example below)

	Issue/problem	Hindering Factors	Enabling (Positive) Factors	Current Coping Mechanisms	Possible solutions
1					
2					
3					
4					
5					

B) Barrier Assessment *Estimated Time: _30mins___*

This exercise aims to better understand the barriers to improving sanitation within small towns the exercise should also gauge their level of satisfaction**.**

Step 1: Ask the group to list all barriers/deterrents to improving sanitation within their town

Step 2: Once the group has finished listing all barriers, then ask the group to rank the top five barriers.

Step 3: Take the top 5 barriers listed by each group and ask the group to determine whether solving this problem is difficult, easier, easiest to solve. The goal is to foster a sense of ownership of the community-devised 'best' solutions—as well as their feasibility

BARRIERS MATRIX

			Level of Difficulty for Implementing Solution		
	CHALLENGE	**SOLUTION**	**Difficult**	**Easier**	**Easiest**
#1					
#2					
#3					
#4					
#5					

C) Option Assessment *Estimated Time: _30min___*

The purpose of this activity is to lead focus group participants through a discussion on the feasibility of different sanitation choices within the town. The feasibility of each sanitation choice is based on locally accepted criteria as well as externally identified categories such as: Technical feasibility, Social feasibility, Affordability, Sustainability:

Assessing different options creates community awareness of any information based on their real needs.

STEPS:

Focus Group participants should be led through a discussion and scoring of the feasibility of different activities.

Score Board

1 = excellent
2 = good
3 = fair/ satisfactory
4 = poor

* *Lowest **score** gets highest **rank***

Participants should reach a consensus of scoring each level of service for each of the indicators listed below.

'Exploring Potential Options

Option		**Technical Feasibility**	**Social Feasibility**	**Affordability**	**Sustainability**	**Total Score**	Rank
Pit latrines							
Flush/pour Flush to:	Piped sewer system						

	Septic tank						
	Pit latrine						
Ventilated improved pit latrine (VIP)							
Ecosan Toilet							
Public sanitation							

PLENARY SESSION

From the different focus Groups we need to appreciate the following

- Is there demand for improved sanitation facilities?
- What is the role of the participants and other stake holders in up scaling access to improved sanitation?

Observation Checklist.

Name of Small Town……

1. Is there a toilet
2. The type of the toilet available
3. The condition of the latrine
4. Availability of hand washing
5. Evidence of open defecation
6. Availability of sewer line
7. Presence of public toilet

Annex 3: List of Participants (KII)

MASENO

1	Hildah Ayieko	PHO Kisumu West
2	Maureen Apiyo	Kisumu County DPHO
3	Onono Richard	Former estates manager MU
4	Vincent Jagongo	Political Leader
5	Sam Ombogo	MCA Kisumu North West Ward
6	Mike Wafula	Community leader

MUHORONI

1	Osborne Odero	PHO Muhoroni
2	Paul Omondi	MUSCO Estates Department
3	Solomon Awino	Agro Chemicals Secretary
4	Willis Ogonyo	MCA Muhoroni/Koru Ward
5	Peter Wauna	Assistant Chief
6	Winnie Acheing	Woman Leader

SONDU

1	Anne Osero	PHO Nyakach
2	Luke Agango	Ward Admin Central Nyakach
3	Martha Awino	CHW
4	Adhiambo Nyambok	Community Elder
5	Eldah odhiambo	Public relations KIWASCO