FACTORS ASSOCIATED WITH THE PRACTICE OF OPEN DEFECATION IN LODWAR, KENYA: A MIXED METHOD RESEARCH

BUSIENEI PHYLIS JEPKORIR

A thesis submitted to Graduate School in partial fulfillment for the requirements of the Master of Science Degree in Environmental and Occupational Health of Egerton University

EGERTON UNIVERSITY

MAY, 2019

DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been submitted or presented for examination in any other institution either in part or wholly.

Signature: …….. Date: ……

Busienei Phylis Jepkorir

NM15/14254/15

Recommendation

This thesis has been submitted for examination with our approval as university supervisors.

Signature: …….. Date: ……

Prof. George M. Ogendi

Department of Environmental Science

Egerton University

Signature: …….. Date: ……

Dr. Millicent Mokua

Department of Environmental Science

Egerton University

.

DEDICATION

This thesis is wholeheartedly dedicated to my beloved mother, Emily, who has been a source of inspiration and strength when I thought of giving up, whom continually provided her moral, spiritual, emotional and financial support. To my brothers, who taught me that even the largest task can be accomplished if it is done one step at a time, my sisters who taught me that the best kind of knowledge to have is that which is learned for its own sake and friends who shared their words of advice and encouragement to finish this study. Thank you all for your unending support and love throughout this journey.

ACKNOWLEDGEMENTS

I would like to thank Egerton University for offering me the chance to pursue my studies. My special gratitude also goes to the Egerton University Senate, Faculty of Environment and Resource Development and the Department of Environmental Science. I express my deep and sincere gratitude to my university supervisors Prof. George Ogendi and Dr. Millicent Mokua for their unending support towards my entire study including proposal development, data collection and publication and thesis writing. I also thank the African Population and Health Research Centre (APHRC), Nairobi for providing me with technical support through the African Doctoral Dissertation Research fellowship (ADDRF). I specifically thank Prof. Hesborn Wao, Prof. Blessing Mberu, Dr. Evelyn Gitau, Dr. Boniface Ushie and Dr. Gershim Asiki, all from APHRC for reviewing the proposal and parts of this thesis and giving me insightful comments. Lastly, I am grateful to Vincent Chisutia, Felix Lokwar, Paul Ekwar and Jackson Ekiru who helped me greatly during my data collection. May God bless each one of you.

ABSTRACT

Approximately 2.5 billion people lack access to improved sanitation globally. The situation is even worse in the Sub-Saharan African (SSA) countries. The practice of open defecation peaks beyond 72% of the population in Turkana. This has resulted into frequent outbreaks of water-related diseases such as cholera outbreak in the year 2013 and 2018. The main aim of this study was to assess socioeconomic factors associated with the persistent practice of open defecation in Lodwar. This is a report on both qualitative and quantitative aspects of a cross-sectional study. Stratified random sampling technique was chosen to select 403 participants for this study with the sample drawn from four administrative units (strata) of Lodwar. A structured questionnaire and observation checklist were used to collect quantitative data. A GPS gadget was also used to map major OD hotspots and latrine coverage. In addition, Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) were conducted to collect qualitative data.

Major OD hotspots included river banks, roads, the arboretum and the stadium. Only 19% of the study population had a latrine facility in their homesteads with 73% of the latrines constructed using poor materials. The quantitative findings revealed that culture was the leading factor why people practiced OD with the frequency of 44% followed by poverty levels that limited latrine ownership among the households (27%). Pearson's chi-square tests revealed that there was a significant association between socioeconomic factors and OD: At χ^2=107.317, there was a significant association between latrine presence and the education level of the household, latrine sharing χ^2 = 403, and the occupation of the household head χ^2 = 74.51 ($p<0.05$). The quantitative findings from the thematic analysis showed that culture was by far the most common factor that contributed to the practice of OD with a theme intensity of 31.1%. Further analyses identified five major cultural aspects that were associated with the practice of OD. Open defecation as a common habit among the respondents was the most cited factor that contributed to its rampant practice (Theme intensity 31.3%). Poverty and cultural aspects influence latrine adoption. Establishment of child clubs and community members that offer education on sanitation interventions may help foster a culture that can be transferred from generation to generation.

TABLE OF CONTENTS

DECLARATION AND RECOMMENDATION ..... **ii**
COPYRIGHT ..... **iii**
DEDICATION ..... **iv**
ACKNOWLEDGEMENTS ..... **v**
ABSTRACT ..... **vi**
TABLE OF CONTENTS ..... **vii**
LIST OF TABLES ..... **ix**
LIST OF FIGURES ..... **x**
LIST OF PLATES ..... **xi**
LIST OF ABBREVIATIONS AND ACRONYMS ..... **xii**
CHAPTER ONE **1**
INTRODUCTION **1**
1.1 Background to the Study 1
1.2 Statement of the Problem 2
1.3 Objectives 2
1.3.1 General Objective 2
1.3.2 Specific Objective 2
1.4 Research Questions 2
1.5 Justification of the Study 2
1.6. Assumptions of the Study 3
1.7. Scope and Limitations of the Study 3
1.8. Definition of Terms 4
CHAPTER TWO **5**
LITERATURE REVIEW **5**
2.1 Overview to Global Practice of Open Defecation 5
2.2 Latrine Conditions, Structure and Design 6
2.3 Factors Associated with the Practice of Open Defecation 8
2.4 Conceptual Framework 10
CHAPTER THREE **12**
MATERIALS AND METHODS **12**
3.1 Study Area 12
3.2 Research Design 12
3.3. Target Population 13

3.4 Sampling Procedures and Sample Size 14
3.5 Data collection 14
3.6 Data Analysis 15
3.7 Validity and Reliability 16
3.8 Ethical Consideration 17
CHAPTER FOUR 18
RESULTS AND DISCUSSION 18
4.1 Results 18
4.1.1 Characteristics of Study Participants 18
4.1.2 Quantitative Findings 18
4.1.2.1. Latrine Conditions, Structure and design 18
4.1.2.2 Latrine Distribution and Open Defecation Hotspots 21
4.1.2.3 Socio-economic factors associated with OD 24
4.1.2.4. Knowledge, Attitude, and Practices (KAP) relating to OD 26
4.1.2.5. Pearson's Chi-Square Tests of Associations 27
4.1.3. Qualitative Findings 28
4.2 Discussion 31
4.2.1. Latrine Conditions, Structure and design 31
4.2.2 Latrine Coverage and Open Defecation Hotspots 34
4.2.3 Socioeconomic Factors Associated with the Practice of Open Defecation 34
CHAPTER FIVE 40
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS 40
5.1 Summary of Findings 40
5.2 Conclusions 40
5.3 Recommendations 40
REFERENCES 42
APPENDICES 48
APPENDIX 1: QUESTIONNAIRE 48
APPENDIX 2: FAECAL WASTE MANAGEMENT OBSERVATION CHECKLIST 56
APPENDIX 4: KEY INFORMANT INTERVIEW GUIDE 66
APPENDIX 5: LIST OF PLATES 70
APPENDIX 6: RESEARCH AUTHORIZATION 72

LIST OF TABLES

Table 3.1: An FGD Distribution Guide in the Study Area 14
Table 3.2: Data Analysis Summary Table 16
Table 4. 1: Characteristics of the Study Participants……..……..18
Table 4.2: Latrine Conditions, Structure and design in Lodwar 20
Table 4.3: Socioeconomic Factors Associated with Open Defecation 25
Table 4. 4: A table on KAP Questions on OD 27
Table 4.5: Latrine presence as stratified by location, sharing, household head's level of education and occupation (n=403) 28
Table 4. 6: Frequency of themes describing factors associated with OD 30

LIST OF FIGURES

Figure 2.1: Conceptual Framework 11
Figure 3.1: Map of the Study Area 12
Figure 4.1: Map showing latrine distribution and open defecation hotspots in the study area 22

LIST OF PLATES

Plate 4.1: Latrine Conditions, Structure and design in Lodwar.....22
Plate 4.2: Plates A, B and C showing the nature of the latrines in Kanan IDP Camp.....23
Plate 4.3: Plate A & B showing common OD hotspots along R. Turkwel and Plate B showing R. Turkwel, a major source of water and also an OD hotspot 23
Plate 4.4: Plate A & B showing OD hotspots along Lodwar's major highway plate C 24

LIST OF ABBREVIATIONS AND ACRONYMS

ASALs	Arid And Semi-Arid Lands
CLTS	Community Led Total Sanitation
EMCA	Environmental Management and Coordination Act
FGD	Focus Group Discussion
KAP	Knowledge, Attitude, and Practice
KEFRI	Kenya Forestry Research Institute
KII	Key Informant Interviews
KNBS	Kenya National Bureau of Statistics
LOWASCO	Lodwar Water and Sanitation Company
NACOSTI	National Council of Science, Technology, and Innovation
NGO	Non-Governmental Organization
OD	Open Defecation
SDGs	Sustainable Development Goals
SID	Society of International Development
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
UNICEF	United Nations Children's Education Fund
USD	United States Dollar
VIP	Ventilated Improved-Pit Latrine
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

As at the year 2014, about 2.5 billion people in the world did not have access to improved sanitation with 1 billion practicing OD (WHO and UNICEF, 2014). This is a major cause of millions of deaths from water-related diseases such as diarrhoea among children under five years (WHO and UNICEF, 2010). Improved sanitation includes sanitation facilities that hygienically separate human excreta from human contact whereas Open defecation (OD) refers to the practice of defecating in fields, forests, bushes, bodies of water or other open spaces(WHO and UNICEF, 2014). OD is practiced in nearly all regions in the world. However, the practice is more common in India and some parts of the Sub Saharan Africa (SSA). In rural India alone, about 360 million don't have access to a toilet. However, over a third (37%) of the members of households still practice OD despite having a latrine facility(Barnard *et al*., 2013).

There is still inadequate access to improved sanitation facilities in SSA with approximately 215 million people practicing OD as at the year 2013 (Galan *et al*., 2013). Nonetheless, there was an improvement going by WHO 2015 report on "World Health Statistics", that shows increased use of improved sanitation in Africa from 25 percent in 1990 to 32 percent in 2013 (WHO, 2015). This increase, however, consisted more of access to a simple pit latrine, which has deficient levels of privacy, hygiene, and safety. The situation is no different in Kenya. Roughly 50% of the population in rural areas lack access to a basic sanitation facility with 5.6 million Kenyans (14% of the total population) still practicing OD (Njonjo, 2013).

There have been several interventions to end OD in Turkana such as Community Led Total Sanitation (CLTS) introduced in 2007 and the Open Defecation Free Rural Kenyan Campaign launched in the year 2011. These campaigns coupled with the expansion of sanitation facilities may not have been critical efforts to achieve meaningful health outcomes since OD cases are still rampant. Combining such efforts with cultural interventions may be an effective method for achieving ODF societies (Abubakar, 2018; Laura *et al*., 2015).

Various studies have been done to assess factors that limit latrine adoption in various countries. However, these factors majorly focused on income levels and education levels. A study in rural India between 2005 and 2012 showed that education, economic status, and households' demographic structures are weakly associated with latrine adoption(Coffey *et al*., 2017). How cultural factors can be reshaped in communities that practice OD still remains largely unexplored. In Turkana Kenya, there is limited research that has been done to exploit various

factors associated with OD practice, and especially cultural aspects. The OD practices peaks beyond 72% of the population despite efforts to eradicate it (Njonjo, 2013). It is against this background that this study was conceived to assess various underlying socio-economic factors that are associated with OD practices in Lodwar.

1.2 Statement of the Problem

Access to improved sanitation is an important component to human health. Open defecation can be linked with frequent outbreaks of water-related diseases such as cholera outbreak in Turkana in the year 2013 and 2018, rampant cases of typhoid and trachoma. Approximately 72% of the population in Turkana has been reported to practice open defecation. Efforts such as the construction of latrines by national and county government, Non-Governmental Organizations (NGOs) such as Save the Children, Community-Led Total Sanitation (CLTS) programs introduced in the year 2007, Open Defecation Free Rural Kenya Campaign introduced in the year 2011 as well as other sanitation campaigns have been in existence in Turkana. But despite these efforts, there has been little improvement since a larger percentage of the population still practice open defecation. This study was conducted to identify the underlying factors that contribute to the practice of open defecation despite such interventions.

1.3 Objectives

1.3.1 General Objective

Assessment of factors that still leads to persistent practice of open defecation despite various interventions to end it in Lodwar, Turkana County

1.3.2 Specific Objective

i. Assessment of latrine structure, design and condition
ii. Mapping out latrine distribution and open defecation hotspots
iii. Examining socioeconomic factors associated with the practice of open defecation

1.4 Research Questions

i. What is the latrine structure, design and conditions of the observed latrines?
ii. How is the distribution of the latrines and where are the common open defecation hotspots in the study area?
iii. What other underlying socioeconomic factors are associated with the practice of open defecation amid a number of efforts that have been put in place to end it?

1.5 Justification of the Study

Open defecation may be associated with various factors. These include income-levels, poverty, education levels, law enforcement and culture among others.

Since the research focuses on assessing the practices and various factors associated with open defecation in Lodwar, it is considered substantial for some reasons. First, the study is in line with achievement of the Sustainable Development Goal (SDG) 6, sub-goal 6.2 that aims to achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations as described in the country's development blueprint-Vision 2030. The study is also in line with Kenya's New Constitution, Article 42 that ensures a clean and healthy environment for all. The study is also considered helpful in coming up with recommendations to sanitation policymakers on the various interventions measures to end the practice of open defecation in Kenya. Lastly, the study also serves as baseline data for any further investigation and as a useful material for future studies.

1.6. Assumptions of the Study

The study had the following assumptions;

i) Cultural practices (that were unknown to the project team) did not go against practices that were studied
ii) No ethnic conflicts would occur during the project implementation period

1.7. Scope and Limitations of the Study

This study was carried out in Lodwar settlements at Kawalathe, Napetet, Kanamkemer and Nakwamekwi human settlements. The town is located in Turkana County which is an Arid and Semi-Arid Land (ASAL). It took place in October 2017 to February 2018. The study focused on latrine coverage in the region and the common open defecation hotspots as well as asking the respondents on various socioeconomic factors that might be contributing to the practice of open defecation.

This study is only focused to the peri-urban population of the four settlements in Lodwar and does not include the rural populations. The area has a high level of illiteracy and some of the respondents selected for the study did not understand the questions presented in the questionnaires and others were not able to fill them. However, four educated research assistants from the community were selected to help in filling the information provided by such respondents on the questionnaires. Lastly, the language barrier presented itself as a great challenge while carrying out the study. However, this was mitigated by the use of local educated research assistants who helped in translating the information given by the respondents.

1.8. Definition of Terms

Access to adequate sanitation: This refers to the provision of facilities to a distance of not more than 200 meters from a home for the safe and adequate disposal of human urine and faeces.

Culture: A way of life, the way a community do things. It includes ideas, customs and social behaviours of a community.

Household: Is a group of persons who in most cases eat and live together. They may, or may not be related by blood but usually make common provision for food and other essentials for their livelihoods. A household may comprise one or several members.

Open defecation: Defecating in the fields, water bodies, bushes and other open places.

Open defecation hotspot: A common open place where people go to defecate

Socio-economic factors: These are the combined measure of a household's employment status and household's economic and social position in relation to others, based on income and education levels among other factors.

Latrine: A sanitation facility that id dug and constructed at a user interface and allows for convenient and safe disposal of human faeces and urine.

Latrine conditions: Describes latrine filthiness or cleanliness

Latrine structure and design: Describes latrine physical characteristics such as wall, roof or flooring materials

Latrine coverage: The total number of latrines and their location at a particular time in a specific region

Water-related disease: Describes a variety of ailments resulting from contaminated water and include parasitic, viral, and bacterial infections.

CHAPTER TWO
LITERATURE REVIEW

2.1 Overview to Global Practice of Open Defecation

Open defecation is the practice of defecating in buses, rivers, roads and other open places. It is practiced in nearly all regions in the world. More than 564 million people in India practice open defecation and in rural areas and approximately 65% of the population lack access to a latrine facility (Njuguna & Muruka, 2017). The practice is worse in poor income areas. Nearly 188,000 children under the age of five years perish each year in India as a result of diarrhoea which results from the practice of open defecation(Coffey *et al*., 2013). Poor sanitation as a result of open defecation in the world has caused not only a threat to the human health but also the environment. There is contamination of water sources which both affect people's health as well as aquatic life.

Open defecation is a major risk factor for several illnesses. It has been shown to cause a high prevalence of diarrhoea and intestinal worms such as hookworm, whipworm, and roundworms (Njuguna & Muruka, 2017). Surface runoff washes away faecal matter into water bodies thus contaminating them. This will further lead to water-borne diseases when humans consume such water. Children are the most vulnerable groups in the society since they ingest almost everything and their immune system is weak. Approximately 1.5 billion children worldwide die each year as a result of diarrhoeal diseases (WHO, 2015). In Kenya, about 17, 100 children under the age of five die each year as a result of diarrhoeal diseases. Open defecation is also linked with malnutrition especially in children living in developing countries. This often causes childhood stunting(Coffey *et al*., 2013).

Improved sanitation is an important aspect of human health as it offers people an opportunity to save 1.5 lives of children every year from diarrhoeal diseases and protect human dignity among other sectors (WHO and UNICEF, 2014). The Kenyan Constitution, Article 43 (b) ensures a right to reasonable standards of sanitation(Government of Kenya, 2010). However, this may not be feasible any time soon. Approximately 5.6 million Kenyans (14% of the total population) practice open defecation. About 50% of the population in Kenyan rural areas lack access to a basic sanitation facility, and this signifies that some percentage of the population still practice open defecation(Njonjo, 2013). Some of the communities, for instance Turkana still have a latrine but are not using it, and the factors underlying this may include cultural practices as well as poor latrine conditions, structure and design.

2.2 Latrine Conditions, Structure and Design

At a household level, improved sanitation entails having a toilet facility for safe disposal of human faeces (Godana & Mengistie, 2017). Lack of access to improved sanitation facilities results to use of unimproved sources which includes the practice of OD, bucket latrines, use of uncovered pit latrines amongst others. OD is majorly practiced by the least able communities due to inability to afford the cost of improved sanitation facilities (Novotný *et al*., 2018; O'Connell, 2014; Yimam *et al*., 2014). Few households who can afford to construct a sanitation facility face latrine-sharing challenges that encourage latrine dirtiness. Often, such latrines are constructed using poor materials with less safety and privacy thus deterring usage. Poor Latrine conditions, structure, and design provoke communities to practice OD which exposes the public to acute excreta-related diseases, a leading cause of diarrhoeal diseases in the world today (Abubakar, 2017).

In Sub-Saharan Africa, access to improved sanitation facilities is still very low with over 700 million people using unimproved sources (Abalo, 2016). These include the use of uncovered pit latrines often in poor structure and design such as tattered latrine walls, poor flooring material, stagnant water on the latrine floors or presence of human faeces on the latrine floors. Such latrines make them unpleasant to clean and may revoke reversion to OD (Rheinlander, Keraita, Kondradson, Samuelsen, & Dalsgaard, 2013). A study to assess factors affecting the utilization of Improved Ventilated Latrine (VIP) in Tanzania reported that 98% of the household members would rather use VIP latrines than unimproved latrines (Kema *et al.*, 2012).

Faecal waste management, however, remains a great challenge, especially in poor and growing urban areas. The percentage of the population who possess a faecal containment facility in the urban areas may access emptying services. However, after the emptying process, faecal matter is poorly disposed of and often left to accumulate in poorly designed ponds or is discharged into open waters and open drains dumped into a wasteland, waterways, and unsanitary dumping sites (Chowdhry & Kone, 2012). The situation poses a threat to the environment as well as human health.

In Kenya, faecal waste management is unsystematically and unplanned by the responsible bodies. Faecal waste management is often a role of the informal private service providers in Kenya rather than the formal service providers. Most urban centers depend on unregulated private sectors to solve the challenges of faecal waste management (Mutisya & Yarime, 2011). These bodies are often not in the capacity to handle this task alone. It eventually results in poor

faecal waste management, for instance, unhygienic manual emptying. These conditions often force the majority of the population to opt for the use of unimproved sanitation facilities such as bushes.

The responsible bodies poorly regulate faecal sludge collection, and there is the widespread illegal dumping of these wastes (Mutisya & Yarime, 2011). Households who can afford improved sanitation facilities in these urban areas do not often access emptying services since the construction of these establishments does not take into account emptying services. This means that the majority of the population here relies on unhygienic manual emptying and overflows of such wastes into the drainage flows. Even after emptying has been done, the residues are often left untreated, or it undergoes limited faecal sludge treatment, and this has negative consequences on the environment. Such bad sanitation practices often force the population to opt for unimproved sanitation facilities such as open defecation. This means that there is weak policy enforcement that deals with faecal waste management in most Kenyan urban centers. Faecal waste management can be described in Kenya as being an invisible aspect to policymakers.

Latrine conditions, structure, and design influence its usage in many ways. Odor, filled-up latrines, lack of a toilet roof, incomplete latrines are some of the reported deterrents (Abramovsky *et al*., 2015; Yimam *et al*., 2014). Lodwar town is located within Arid and Semi-Arid Land (ASAL) Turkana County. According to the international poverty line of USD $1.25 a day, Turkana County has a poverty index of 94.3%, a hygiene poverty index of 66.2% and sanitation poverty index of 59.1% (Njonjo, 2013). The area is characterized by households living in low socioeconomic status and cannot afford improved sanitation facilities such as VIP latrines, covered pit latrines, connection to a septic tank or a sewer (Busienei *et al*., 2019). This forces them to depend on unimproved sanitation facilities such as uncovered pit latrines, bushes among others (WSP, 2012). The nomadic pastoralist kind of life has resulted in little sanitation demand. Illegal dumping of faecal waste including babies' faeces is common in the region. There is also inadequate household containment, and this affects their abilities to empty these waste disposal facilities.

Lack of adequate latrines or poor-quality pits dominates in the study area with the few available ones often abandoned unsafely when they are full. This poses a significant challenge to the environment and public health (WSP, 2012). The OD practices peak beyond 72% of the population despite the provision of latrines by various organizations (Njonjo, 2013).

According to KNBS and SID report, 2013, approximately 39% of Kenya's population do not have an access to an improved sanitation facility with about 18% of the population practicing open defecation. Majority of this population (74%) with an access to a sanitation facility uses simple pit latrines with 48% using covered pit latrines, 5% using Ventilated Improved Pit latrine (VIP) and 21% using uncovered pit latrines (Njonjo, 2013). In a study in Ethiopia done by Awoke & Muche, 2013, all the available latrine facilities in the study area were only pit latrines. This is mainly because they are constructed using cheap materials which are more affordable to the majority of the population (Busienei *et al*., 2019). Often, these materials are of poor quality and they lose their quality faster, provoking reversion to OD.

Privacy is an important factor among the latrine owners. A good latrine facility should provide enough privacy for its users. Most individuals will tend to avoid facilities that tend to expose their body parts. This has been the major motivations for the construction of good latrines in many households (O'Connell, 2014). However, this may have also been the major motivator for the use of bushes for some of the individuals who do not have a good latrine or no latrine at all.

Even with the availability of a latrine facility in a household, the presence of stagnant water or faeces all over the latrine facility may encourage individuals to practice open defecation. In addition to this, bad odor and presence of flies in the latrine may also encourage the practice of open defecation (Godana & Mengistie, 2017). This situation affects mostly the females than their male counterparts. Females are more concerned about the cleanliness of a place as compared to male (O'Connell, 2014). Such conditions may force them to seek other options. An open defecation is often an option for such kind of a scenario.

2.3 Factors Associated with the Practice of Open Defecation

Low-income levels have been found to be the major contributing factor to the problem of OD with individuals lacking access to a latrine facility spending 2.5 days or 60 hours per year searching for a place to defecate (WHO and UNICEF, 2014). A similar report by WSP, 2012 indicates that the poorest populations are more likely to practice OD as compared to the wealthiest populations (WSP, 2012). Kenya is not an exception with its poorest communities (Including Turkana) practicing OD 270 times than the rich communities. This is due to limited funds to construct such facilities (Godana & Mengistie, 2017). Therefore, access to sanitation facilities is lower in the higher poverty gap index countries as compared to lower poverty gap index countries.

Due to poverty levels, latrine facilities may be constructed using poor construction materials such as mud or grass and are often in poor conditions (for instance stagnant water or faeces spread on the latrine floor). These practices may encourage OD practices. Construction of quality toilets may help reduce the OD practices. The recent emphasis on community participation in good sanitation programs like the Slum Sanitation Program in Mumbai has pointed out that construction of toilets that meet the people's needs is required to overcome the problem of OD(Desai *et al*., 2015) . Low latrine coverage encourages long queues, especially in the morning which in turn force these populations to practice OD (Desai *et al*., 2015). In order to achieve the sanitation target of the Sustainable Development Goals, the poor need to be helped to eradicate OD practice (Abubakar, 2018; Mara, 2017).

How countries promote latrine construction and use is important in achieving Open Defecation Free (ODF) societies. Provision of subsidies for construction of these facilities has proven to be an effective health promotion strategy in some communities. A cross-sectional study in India, Indonesia, Mali, and Tanzania shows that households who were provided with subsidies to construct latrines showed greater odd of latrine usage than households who were encouraged to construct latrines through health promotions (Laura *et al*., 2015).

Education level may also contribute to good sanitation and hygiene practices. The higher the level of education of an individual, the rational the mind of an individual and hence the wiser the person (Tan *et al*, 2013). Individuals who reached secondary and tertiary levels of education are aware of the negative impacts of OD and therefore tend to practice good sanitation practices. Most of the Non-governmental organizations today have constructed latrine facilities to the less fortunate societies but some do not even use these facilities. Participation of the family members in use of such facilities is still lacking (Abubakar, 2018; Makhfudli *et al.*, 2017) and this is majorly because most of these individuals are not even aware of the importance of these facilities.

Weak or lack of sanitation laws and policies may lead to poor sanitation practices such as OD (Cherukupalli, 2016). In a qualitative research report from eight countries, a larger percentage of the population agrees that the introduction of sanctions and strict rules to stop OD will reduce OD practice significantly (O'Connell, 2014). The introduction of sanctions to each household that does not possess a latrine facility may tend to end OD practices in areas such as Lodwar.

A number of states, districts or villages in various countries have fought against OD practice and have been declared open defecation free (ODF). In India, Kerala, Himachal Pradesh, and

Sikkim state, 85 districts across the country and 1,52,535 villages have already been declared open defecation free (ODF) under the Swachh Bharat Mission (SBM), the Centre's flagship programme (Gore, 2018). However, faecal waste management still remains a great challenge, especially in poor and growing urban areas in many developing countries.

A study in India showed that lack of water cannot explain rampant cases of OD as 90% of the population in rural India have access to improved drinking water sources (Coffey *et al*., 2014). A review study in rural Indonesia showed that sanitation interventions only has a small impact on latrine construction and utilization by communities (Odagiri *et al.*, 2017). The Indian Government has provided subsidies for construction of latrines as one of the interventions to curb the practice of OD. However, this has yielded no fruit as the OD practices still persist in rural India despite India's strong economic growth (Hathi *et al*., 2016).

2.4 Conceptual Framework

There is a direct relationship between poor latrine Conditions, Structure and design, education level, income level, culture and the practice of open defecation. Lack of access to good sanitation facilities, poor socio-economic status are some of the factors that may be responsible for rising cases of open defecation in some regions. The more the presence of human waste disposal facilities such as improved latrines, the minimum the cases of open defecation.

The presence of bushes along the rivers may also be indirectly associated with the practice of open defecation in some regions. This forms an intervening variable. In addition, Legal frameworks such as EMCA Act 1999 and Public Health Act ensures a clean and healthy environment thus failure to adhere to the provisions of these acts may result in high cases of open defecation. EMCA Act ensures that any act or omission deleterious to the environment, for instance, defecating in the open or along water sources is prevented, stopped or discontinued (Government of Kenya, 2015) and similarly, lack of adherence to this law may contribute to rampant cases of open defecation.

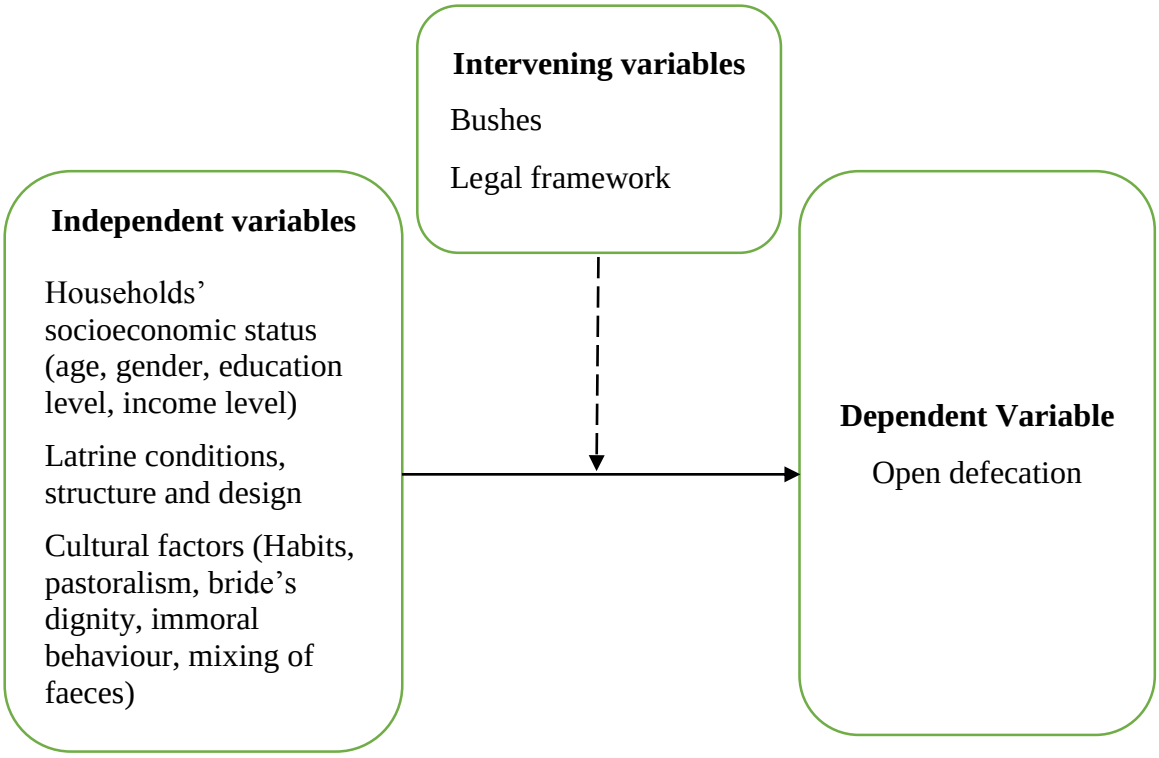


Figure 2.1: Conceptual Framework

Source: Adapted from National Environmental Research Institute, Denmark Department of Policy Analysis

CHAPTER THREE
MATERIALS AND METHODS

3.1 Study Area

The study was conducted in Lodwar settlements (Kanamkemer, Kawalathe, Napetet and Nakwamekwi) located within an Arid and Semi-Arid Land (ASAL) in Turkana County. Turkana County is situated in North Western Kenya and it borders Uganda, South Sudan, and Ethiopia. It is ranked the poorest County in Kenya with a poverty line of 94.3% (doubling the national rate of 45.9%) according to the international poverty line of USD $1.25 a day. Lodwar settlements which forms the study area is the main headquarters of the County and it lies within the GPS coordinates 3° 07′ 8.80″ North and 35° 35′ 17″ East. The population living in Turkana cannot afford improved sanitation facilities (WSP, 2012). They lead a nomadic pastoralist life and only 18% of the population can read and write (Njonjo, 2013). There were 41, 120 households in the study area and 403 were selected. This area was chosen due to rampant cases of OD reported in the region, (Figure 3.1).

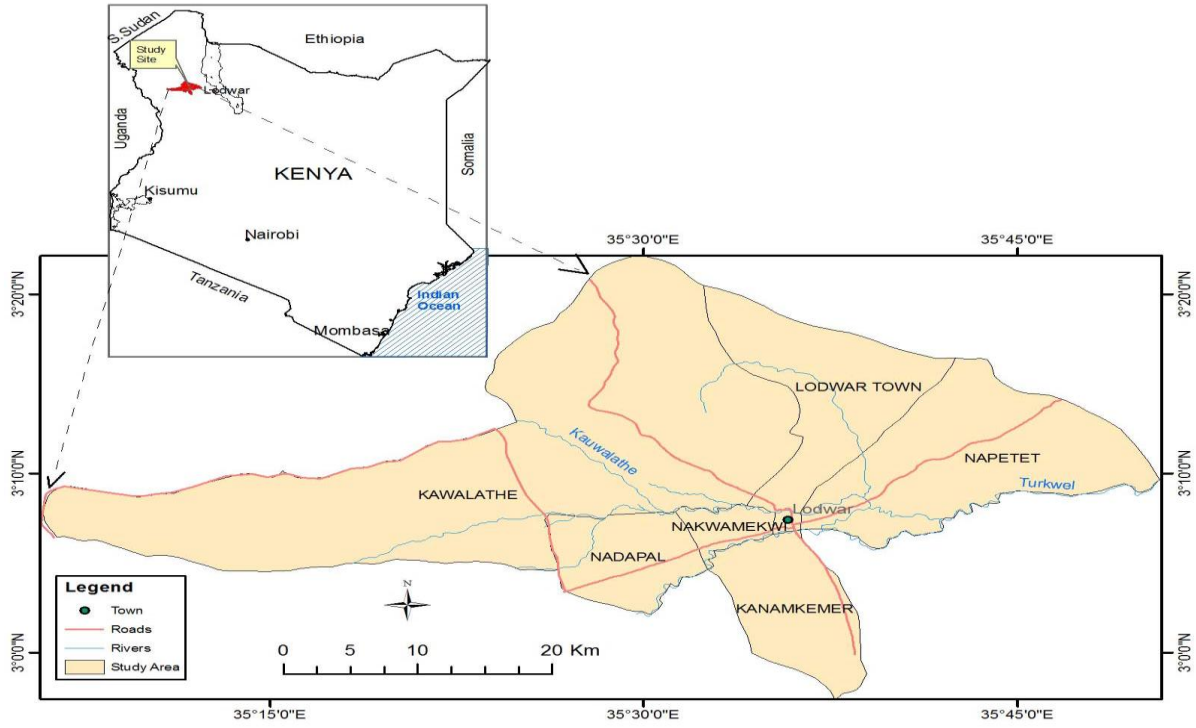


Figure 3.1: Map of the Study Area Showing the Study Sites (Kanamkemer, Kawalathe, Napetet and Nakwamekwi) from Topographic map of Kenya; Scale 1:100,000

3.2 Research Design

This study was a cross-sectional study which employed a partially mixed sequential equal status design including quantitative and qualitative (thematic content analysis) that explored various factors associated with the practice of open defecation(Leech & Onwuegbuzie, 2011).

Using semi-structured questionnaires and observation checklists, the quantitative component assessed various factors associated with open defecation, that is, households' socio-economic status, latrine Conditions, Structure and design at the time of visit, latrine distribution and open defecation hotspots. A GPS gadget was used to collect data on latrine distribution and OD hotspots.

The latrine Structure and designs included the latrine roofing, wall and flooring material. The latrine conditions at the time of visit included the presence or absence of flies, presence or absence of human faeces on the latrine floor, presence or absence of odor, leaking or non-leaking latrine roof and presence or absence of stagnant water on the floor of the latrines. Through KIIs and FGDs, the qualitative component further explored the various socioeconomic and cultural aspects that are associated with the practice of open defecation in the region.

The quantitative component was accorded equal weight with the qualitative component in addressing the overarching research question. The qualitative component elaborated more on these factors thus giving a deeper meaning to the situation. Mixed method research provides a more balanced perspective by combining the benefits of both methods as well as offsetting the weaknesses that result from using one method alone (Mckim, 2017).

3.3. Target Population

The target population for the quantitative study was adult household heads aged at least 18 years or their designated representatives, who could give accurate data.

The target population for the qualitative component was the key informants and the focus groups. A total number of 20 key informants were selected based on their willingness and the fact that they have first-hand knowledge about the community (Kumar, 1989). Majority of these participants were from organizations that deal with water and sanitation issues, for instance, Lodwar Water and Sanitation Company, Save the Children and National Environmental and Management Authority.

In addition, 10 Focus Group Discussions (FGDs) comprising 5-8 participants per group were selected purposely based on their willingness to participate in the study(Krueger & Cassey, 2015). For all the four administrative units, there were three female FGD groups and seven male FGD groups. Since the study targeted household heads, few female FGD groups were selected. This is because, in some countries including Kenya, the number of female-headed households is about one-third of the total households (Bongaarts, 2001).

Table 3.1: An FGD Distribution Guide in the Study Area

LOCATION	MALE (18-39 years)	FEMALE (18-39 years)	MALE (40+ years)	FEMALE(40+ years)
Nakwamekwi	Yes	No	Yes	Yes
Napetet	Yes	No	Yes	No
Kanamkemer	Yes	Yes	Yes	No
Kawalathe	Yes	No	No	Yes

3.4 Sampling Procedures and Sample Size

The sample size to assess the socioeconomic factors associated with the practice of open defecation was estimated using Kish 1965 formula for determining sample size for estimating population proportions,

$$n = \frac{Z^2 \times P\,(1-P)}{d^2}$$

Where;

n is the required sample size,

Z is statistic for a level of interval (at 95%, Z= 1.96),

P is the population proportion, that is, 0.72 (The percentage of the population known to practice open defecation in the study area), and

d is precision which is 0.05.

Using this formula, a minimum sample size of 310 households was estimated. Anticipating a 30% non-response rate, a final sample of 403 households was estimated (Kish, 1965).

The total number of households in the study area were 41,120. Proportionate simple random sampling technique was employed to select 101 households from each stratum. Kanamkemer and Kawalathe settlements were the low-middle income areas whereas Napetet and Nakwamekwi were the low-income settlements.

3.5 Data collection

There were four research assistants in the study. The research assistants had obtained a bachelor's degree in environmental science and had a prior experience in data collection. They were trained by the student researcher and the supervisor for five days before data collection. Quantitative data collection took place from October to mid-December, 2017 using a standardized questionnaire (Appendix A) and an observation checklist (Appendix B). Based on prior studies that focused on factors that contribute to OD, the independent variables

included household head's education level, income levels, religion, and cultural factors (Habits, pastoralism, bride's dignity, immoral behaviour, mixing of faeces).

The dependent variable was OD practice(Abubakar, 2018; Cherukupalli, 2016; Godana & Mengistie, 2017; Makhfudli *et al*., 2017; O'Connell & Devine, 2015; O'Reilly *et al*, 2017; Rahul & Srivastava, 2017; Routray *et al*, 2015; Sara & Graham, 2014). Qualitative data collection took place in February 2018. Using an FGD protocol (Appendix C) three FGDs were done in Nakwamekwi, 2 in Napetet, 3 in Kanamkemer and 2 in Kawalathe. Prior to the study, the respondents were notified and were all able to meet at the agreed place and time. All the four enumerators handled one FGD at a time. Refreshments were offered to the participants.

Using a KII protocol (Appendix D), 20 KIIs were conducted majorly at offices of the selected participants as well as homes. Both the FGDs and the KIIs questions were based on factors contributing to OD, nature of latrines and major OD hotspots with the average time for both the KIIs and the FGDs being 1 hour. There were additional questions for female FGDs on challenges of latrine access. In both the KII and the FGDs, note taking and audio recording was employed to store data.

3.6 Data Analysis

The collected data on the questionnaires were coded then entered into Statistical Packages for Social Science (SPSS) database. Quantitative data were then checked for completeness. Frequencies and valid percentages were employed to analyze descriptive data. Pearson Chi-Square tests were used to analyze data on the various socioeconomic factors that are associated with OD practice. After all the analysis had been done, quantitative data obtained were represented in the form of tables. All level of significance was tested at alpha = 0.05. Data obtained from the GPS gadget were presented in form of geospatial maps showing latrine distribution and OD hotspots in the study area.

For the qualitative data, once the FGDs and the KIIs were done, the audio-tape of the discussions was carefully transcribed and others translated. After the data had been transcribed, it was coded following keywords, key concepts or reflections by the use of *in vivo* and analyzed for common themes to achieve improved organization when pulling out the results and the key findings. The codes were then read by more than one researcher to check the consistency of the codes. The name of each theme was finalized, its description was written and illustrated with some quotations from the original text to better communicate its meaning.

Major themes were recorded and computed as follows:

Theme Frequency = Number of responses referring to a particular theme

Theme Intensity = $\frac{\text{Number of responses referring to a particular theme}}{\text{Total number of responses in the study}} \times 100$ (Wao *et al*., 2011)

Table 3.2: Data Analysis Summary Table

Objective	Variables	Analytical approach
Assessment of latrine structure, designs and the conditions at the time of the visit	Latrines' Structure and design (the latrine roofing, wall and flooring materials) Latrine conditions (presence or absence of flies, human faeces on the latrine floor, odor, leaking or non-leaking roof and stagnant water on the floor of the latrines)	Descriptive statistics (frequencies and valid percentages)
Mapping out latrine distribution and open defecation hotspots	Number of latrines and Open defecation hotspots	Geospatial maps on latrine distribution and open defecation hotspots
Examining socioeconomic factors that are associated with open defecation	Household's socioeconomic status (age, gender, education level, income level) Cultural factors (Habits, pastoralism, bride's dignity, immoral behaviour, mixing of faeces)	Descriptive statistics (Frequencies and valid percentages) Inferential statistics that is, Pearson Chi-Square tests and thematic analysis

3.7 Validity and Reliability

Before the actual study, a pilot study was done during the last two days of the training in Nadapal human settlements, and one of Lodwar settlements with similar ecological conditions was conducted to pre-test the tools. A standardized questionnaire, whereby all the respondents were exposed to the same nature of questions and the same system of coding their responses was used to collect quantitative data. The questionnaire contained 45 closed-ended questions ranging from the respondent's personal details, faecal disposal practices and the Knowledge, Attitude, and Practices (KAP) questions on household's faecal management practices.

Due to high illiteracy levels in the study area, in-person interview procedure was employed to administer and retrieve the questionnaires as this was considered less burdensome to those respondents who could not write out their responses. It also provides a high response rate and an opportunity to observe the household sanitation conditions thus providing a room to fill the observation checklists. A total of 10 households here were sampled to collect quantitative data.

Two FGDs with women and men (18-80 years) from both low and high-income areas were conducted to elaborate more on quantitative data. Two KIIs were also conducted with one village elder and a community member was done.

Cronbach's alpha calculation was used in scoring out an average response and a value of 0.7 was achieved

3.8 Ethical Consideration

A research permit from Egerton University Research and Ethics Committee and the National Council of Science, Technology, and Innovation (NACOSTI/P/18/77199/25718) was obtained before the study for ethical reasons. Further approval was sought from the community leaders in the study area and the local authorities before the study began. Just before administering the questionnaires and the FGDs, consent was sought from the respondents to be included in the research process and to start audio-recording the FGDs and the interviews. Written informed consent was also obtained from each participant in the questionnaires.

The informed consent touched on the purpose of the study process and this involved a simple explanation of the study before the study began. The respondents were also notified on the method of selection, that is, how he or she was selected. Lastly, the respondent was informed on how the data will be used, who will have access to the data and that the data would be destroyed after its pre-determined uses have been exhausted.

Respect for Respondents privacy and confidentiality was highly maintained. Participation in the study was voluntary, and no names or pictures were recorded in the transcripts. The FGDs participants were each given numbered tags for identification. Since this study focused on a faecal matter which is a taboo to some communities, the questions, both in the questionnaires, key informant interviews, and the FGDs were phrased accordingly to avoid any kind of embarrassment and to enable tackling of sensitive issues and taboos within the local community.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results

4.1.1 Characteristics of Study Participants

Kanamkemer had the largest number of respondents (Table 4.1). Forty-eight percent of household heads were unemployed and 13% were employed. Additionally, 34% of the household heads were illiterate with only 4% of household heads who had obtained a university-level education.

Table 4. 1: Characteristics of the Study Participants

Characteristic	N	%	Characteristic	n	%
Administrative Unit			**Family Size**		
Kanamkemer	170	42	0-4 members	137	34
Napetet	33	8	5-9 members	203	50
Nakwamekwi	140	35	10-14 members	57	14
Kawalathe	60	15	15 members and above	6	2
Gender			**Occupation of H/Head**		
Male	151	38	Employed	53	13
Female	252	62	Unemployed	192	48
Age			Casual labor	75	19
18-28 years	124	31	Business	83	21
29-39 years	152	38	**H/Head's Education Level**		
40-50 years	76	19	Primary level	129	32
51-61 years	37	9	Secondary level	86	21
62-72 years	13	3	Tertiary colleges	36	9
73 years and above	1	0	University	17	4
			Illiterate	135	34

4.1.2 Quantitative Findings

4.1.2.1. Latrine Conditions, Structure and design

A total of 77 (19%) households had a latrine facility and this consisted mainly of simple pit latrines (86%) with only 4(5%) being a flush toilet (Table 4.2). Forty-five percent of the latrines had their floors made of sand or mud and 38% were without any form of roofing material. Sixty-seven percent of the latrines present had their walls fully covered and 27% were almost filled up with faeces visible inside the latrine. Twelve percent of the latrines had stagnant water on their floors. Sixty-five percent of the latrines were being shared by more than one household, and 51% had human faeces scattered all over the floor. Only 17% of the latrines had a water supply present in or near the latrine.

On the basis of cleanliness, 10% of the latrines identified (Mostly the shared ones) were never cleaned at all. Thirty-eight percent of the latrines had a cleaning material present inside or

around the latrine, and these were mostly brooms. The county government and the community facilitated the construction of 4% and 5% of the latrines respectively (Table 4.2).

Fifty-four percent of the households had their latrine located between 20-39 meters from their houses. On the basis of latrine distribution, each household was sampled to provide an estimate distance to the nearest latrine facility, and 72% of the households had their nearest latrine located more than 100 meters away (Table 4.2).

Table 4.2: Latrine Conditions, Structure and design in Lodwar

Characteristic	n	%	Characteristic	n	%
Latrine presence			**Latrine type**		
Yes	77	19	Pit latrine (Three from government and Four from the community)	66	86
No	326	81	VIP latrine (2 from NGOs)	7	9
			Flush toilet	4	5
Latrines Wall construction material			**Latrine Roofing Material**		
Cement	21	27	Iron sheets	40	52
Iron sheets	10	13	Wood	1	1
Wood	12	16	Mats	1	1
Mud	11	14	Grass material	6	8
Mats and polythene materials	7	9	None	29	38
Stones	2	3			
Grass material	14	18	**Stagnant Water present in the latrine**		
			Yes	9	12
Latrine Flooring material			No	68	88
Cement	35	45			
Wood	6	8	**Human Faeces on Latrine floor**		
Mud or sand	35	45	Yes	39	51
Stones and wood	1	1	No	38	49
Latrine walls covered			**Water supply present around the Latrine**		
Yes	52	67	Yes	13	17
No	25	33	No	64	83
Faeces Visible Inside the Latrine			**Latrine sharing**		
Yes	21	27	Yes	50	65
No	56	73	No	27	35

Table 4.2: Continuation

Characteristic	n	%	Characteristic	n	%
Households sharing Latrines			**Latrine cleaning time**		
1-4 Households	8	10	Daily	15	19
5-9 Households	10	13	2-5 days	24	31
10-15 Households	12	16	Weekly	23	30
16 Households and more	47	61	Monthly	7	9
			No cleaning	8	10
			Latrine construction contributors		
Cleaning material present in the latrine			Government	3	4
Yes	29	38	Joint Community	4	5
No	48	62	Individual Households	68	88
			NGOs	2	3
The distance of the latrine from the household			**Distance from Each household to the nearest latrine**		
0-19 meters	15	19	0-19 meters	21	5
20-39 meters	42	54	20-39 meters	10	3
40-59meters	10	13	40-59 meters	10	3
60-79 meters	6	8	60-79 meters	19	5
80 meters and beyond	4	5	80-99meters	53	13
			100 meters and beyond	290	72

4.1.2.2 Latrine Distribution and Open Defecation Hotspots

Eighty-one percent of the respondents in the study area lacked access to a latrine facility (own or nearest) and practiced open defecation. The findings indicated that 72% had their nearest latrine facility located beyond 100 meters from the respective households (Fig 4.1)

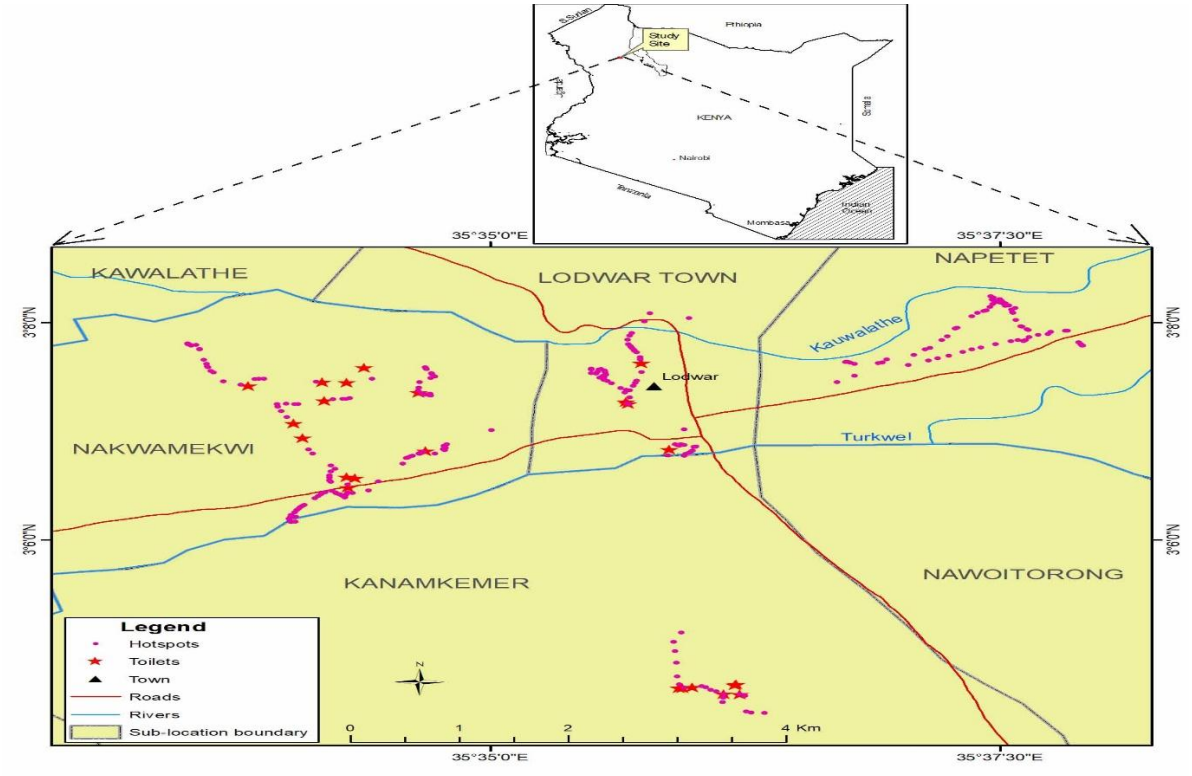


Figure 4.1: Map showing latrine distribution and open defecation hotspots in the study area
Source: Topographic map of Kenya; Scale 1:100,000, Field Survey

Major OD hotspots include the bushes, along the river, under trees and along the roads in the sampled sites (Fig 4.1). In Lodwar town alone, there are only two public latrines with less than 30 individuals using it per day (Plate 4.1 A&B).

In upper Nakwamekwi settlements, there is limited latrine coverage as compared to other parts of the study area with the majority of the population here using the nearby bushes and along R. Kawalathe for defecation. Latrine coverage is even worse in one of the IDP Camp (Nataparkakono) where there is only one latrine that is completely filled up (Plate 4.1C). The IDP Camp comprises of 146 households using one latrine with many of the households practicing OD in the nearby bushes and thickets that are adjacent to R. Kawalathe.

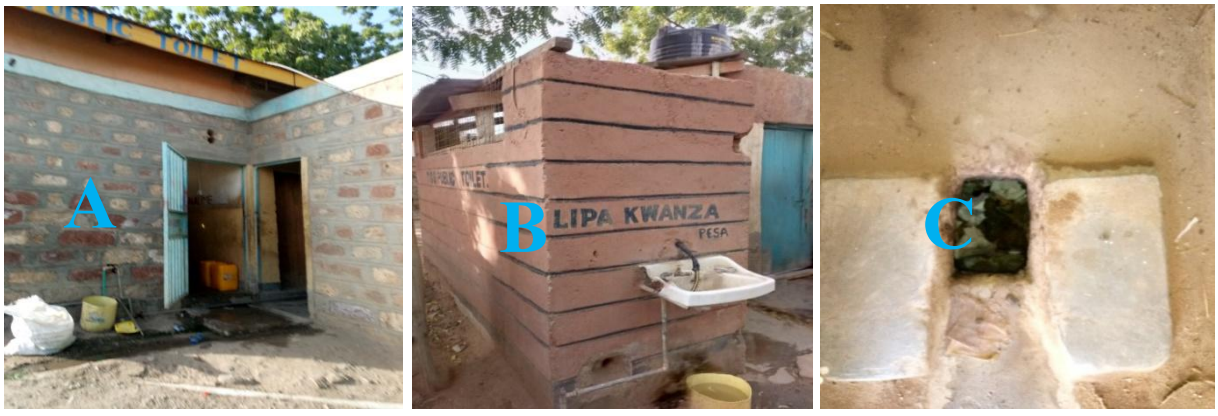


Plate 4.1: Latrine Conditions, Structure and design in Lodwar

In Kanan IDP camp located in Kanamkemer settlements, there were 610 households with only 6 latrines. These mostly consisted of simple pit latrines constructed using mud, grass material, polythene bags, mats, and wood. Most of these latrines are in very poor conditions (Plate 4.2 A, B&C). The rest of the households that lack access to a latrine facility uses the nearest bushes and excavations to defecate.

Plate 4.2: Plates A, B and C showing the nature of the latrines in Kanan IDP Camp

The study area is bordered by two rivers (River Turkwel and River Kawalathe). The rivers are a source of water for most households in the region. However, a larger percentage of the population uses the bushes for defecation which forms the major OD hotspots along these rivers to defecate (Plate 4.3 A&B).

Over 500 households in lower Nakwamekwi rely on River Turkwel as their main source of water for domestic use. Thus the riparian vegetation along River Turkwel forms their major OD hotspot (Plate 4.3C)

Plate 4.3: Plate A & B showing common OD hotspots along R. Turkwel and Plate B showing R. Turkwel, a major source of water and also an OD hotspot

Apart from the bushes and along the river, the roads including some of the major highways in Lodwar are some of the open defecation hotspots (Plate 4.4 A & B).

Plate 4.4 (C) shows Lodwar's arboretum in even a worse condition than the stadium. The arboretum was only fenced but has never been operational. Since the area is free and open to everyone, the residents have turned it into a kind of an open latrine. The presence of an open-air market in the adjacent area has accelerated the practice of OD.

Plate 4.4: Plate A & B showing OD hotspots along Lodwar's major highway plate C

4.1.2.3 Socio-economic factors associated with OD

A total of 27% of the respondents attributed the lack of latrine to high poverty levels in the region and culture. Forty-four percent of the respondents attributed the practice of open defecation to the culture of the people in the area.

A total of 20% of the respondents feared using a latrine with the 74% of the reasons being loose soils that do not support quality pits. A total of 321(80%) respondents stated that the

Latrine construction materials influenced latrine use. Only 17% of the respondents stated that they had not received any advice and guidelines on the need for latrines before (Table 4.3).

Table 4.3: Socioeconomic Factors Associated with Open Defecation

Characteristic	n	%
Factors associated with Latrine ownership		
Poverty levels	110	27
Poverty levels and culture*	64	16
Loose soils	53	13
Poverty levels, culture and law enforcement*	51	13
Culture	38	9
Poverty and education level*	31	8
Law enforcement	29	7
Education level	27	7
Why do people practice open defecation		
Culture	179	44
Sharing latrines, faeces on the latrine floor, tattered latrine walls and culture*	73	18
Sharing latrines, faeces on the floor, almost filled up latrines and tattered latrine walls*	42	10
Tattered latrine walls	37	9
Almost filled-up latrines	18	5
Sharing of latrine with many households	16	4
Faeces present in the latrine floor	14	4
Leaking latrine roof and stagnant water on the floor*	9	2
Bad odor in the latrines	8	2
Presence of flies, sharing of latrine, culture, and faeces on the latrine floor*	5	1
Presence of flies in the latrine	2	1

(*)To represent those respondents who stated more than one response

Table 4.3: Continuation

Characteristic	n	%
Fear of using a latrine		
No	321	80
Yes	82	20
Why fear using a latrine		
One can fall inside	61	74
For some, one has to pay to use them	10	12
One has to clean the latrine when it is dirty	6	7
Its maintenance is costly	5	6
Do construction material influence latrine use		
Yes	321	80
No	82	20
How do construction material influence latrine use		
Some are expensive	101	31
Some are expensive and some do not offer enough privacy*	65	20
Some are expensive. Some do not offer enough privacy and some have to be cleaned with water(limited) *	42	13
Some do not offer enough privacy	35	11
Some are poor and can collapse	28	9
For some, one has to clean it with water which is limited	27	8
Some are poor and some are expensive*	23	7
Hygiene advice received		
Use latrine for defecation, safe disposal of babies faeces and wash off hands with soap after defecation*	248	62
None	67	17
Use latrine for defecation	24	6
Use latrine for defecation and safe disposal of babies faeces*	30	7
Safe disposal of babies faeces	20	5
Wash hands with soap after defecation	13	3

(*)To represent those respondents who stated more than one response

4.1.2.4. Knowledge, Attitude, and Practices (KAP) relating to OD

About three-quarters (76%) agreed that OD was unsafe whereas 72% of the respondents agreed that latrine sharing was an unsafe practice (Table 4.4). A total of 70% of the respondents were aware that some illnesses were related to the practice of OD whereas 49% of the respondents agreed that the practice of OD had become part of their tradition.

Privacy was a major concern for most respondents and 86% of these respondents agreed that tattered latrine walls and poor roofing materials encouraged the practice of OD. Safety was also a major concern for most respondents and 84% of the agreed that poor flooring material for instance loose soils encouraged the practice of OD. Lastly, most respondents were concerned about the cleanliness of the latrine with 87% of the respondents agreeing that the presence of faeces on the latrine floor encouraged the practice of OD with only 3% of the respondents strongly disagreed with the statement (Table 4.4).

Table 4.4: A table on KAP Questions on OD

Characteristic	Agree	Undecided	Disagree
	%	%	%
Open defecation is unsafe	76	11	13
Latrine sharing is unsafe	72	15	13
Some of the illnesses are related to open defecation	70	15	15
Religion is against latrine	0	16	84
OD is a tradition	49	13	38
Flies encourage OD	11	7	82
Odor encourages OD	10	10	80
Tattered latrine walls encourage OD	86	12	5
Poor flooring materials encourage OD	84	11	5
Almost/filled up latrines encourages OD	92	5	3
Faeces on latrine floor encourages OD	87	10	3

4.1.2.5. Pearson's Chi-Square Tests of Associations

Pearson's chi-square tests were run to evaluate whether there was a significant association between the presence of latrines and the education level of the household head. Table 4.5 shows that at χ^2=107.317, there was a significant association between the education level of the household head and latrine presence in the study area ($p<0.05$) (Table 4.5).

There was no significant association between latrine presence and the administrative units present in the study area (χ^2=7.058, $p> 0.05$). However, Nakwamekwi settlements had a higher number of the population without an access to a latrine facility (82%). There were two IDP camps in Kanamkemer settlements, one (Kanan IDP camp) of which has a total number of 610 households with only 6 latrines. Nakwamekwi settlements also had two refugee camps, one (Nataparkakono IDP Camp) of which had 146 households only one latrine that was completely filled up. The other IDP camp in Nakwamekwi (Nakwamekwi IDP Camp) had no latrine facility and the bushes and thickets near the river were used for defecation.

There was a significant association between the total number of latrines (77 latrines) and latrine sharing ($\chi^2 = 403$; $p<0.05$). A total number of 50 latrines were being shared. The shared latrines were mostly the pit latrines and some of them were constructed by the government as well as the joint community.

There was a strong association between the occupation of the household head and the presence of a latrine in the sampled households ($\chi^2 = 74.51$; $p<0.05$) (Table 4.5). The larger number of

household heads (55%)who were employed were likely to possess a latrine facility as compared to household heads who were unemployed (5% with latrine) (Table 4.5)

Table 4.5: Latrine presence as stratified by location, sharing, household head's level of education and occupation (n=403)

Characteristic		Latrine Presence		
		Yes (%)	No (%)	p-value
Settlement	Kanamkemer	19	81	χ^2=7.058,
	Napetet	18	82	p>0.05
	Nakwamekwi	18	82	
	Kawalathe	22	78	
Head's Occupation	Employed	55	45	χ^2=74.51,
	Unemployed	5	89	p≤0.05
	Casual labor	20	80	
	Business	29	71	
Head's Education Level	Primary	8	92	χ^2=107.317,
	Secondary	37	63	p<0.05
	Tertiary college	53	47	
	University	71	29	
	Illiterate	3	97	
Latrine Sharing	Yes	65	0	χ^2=403.000,
	No	35	0	p<0.05

4.1.3. Qualitative Findings

The practice of open defecation in the study area was very rampant with the residents defecating almost everywhere including the government properties such as the arboretum, the stadium and along all the roads. In one of the Key Informant Interviews with one member of KEFRI, he noted,

"The residents here are used to defecating within the stadium premises even before it was declared a stadium and it has become a habit to most of them. So even with the construction of the latrine by the County government, people will always practice what they are used to and since the stadium is just along the highway and is open to everyone, people will always come here to defecate"(Personal Communication, 2018).

Due to low-income levels, Latrine sharing was a common practice in the study area with more than 16 households using a single latrine. In one of the interviews with the village elder in Kanan FFIDP Camp, he stated;

"*…..the residents in this IDP camp especially adults face major challenges when it comes to latrine access, and they have to wake up very early in the morning to go and relieve themselves in the open or wait until late in the evening. The nearest bushes are commonly used as well as the three excavations that were left open during the construction of this IDP camp*" (Personal

Communication, 2018). The few available latrines were constructed using poor materials as 48% of the population were not employed. The village elder added;

"I know of four latrines that have collapsed in this area. One of them collapsed and injured one user but was rescued by the family members. This has so far scared many users, and residents here prefer going to the bush to defecate. For those who have a latrine facility, most of them are constructed using poor quality timber that rots even in one year and may collapse killing some of the users"(Personal Communications, 2018).

Daily habits coupled with low-income levels was also a significant factor that encouraged the OD practice. In one of the male FGDs in Kawalathe settlements, a respondent stated;

'….*We are used to using these bushes along the river to relieve ourselves from when we were born. The sand is very loose too, and the latrine can collapse, and so I am more comfortable using the bush than the latrine....the bush is near and convenient, it also provides enough privacy compared to a latrine that I would have constructed using grass material."* (Personal Communication, 2018). In another female FGD in Kanan IDP, one respondent stated

"…*Even if we are provided with a latrine facility today, I am sure that the OD practice will still be present since we are brought up in a society where the practice is very common. For instance, I cannot use the same latrine with my father-in-law. OD has become a habit for most of us. If we are used to going to the bush, we will still go to the bush even if we are provided with a toilet"* (Personal Communication, 2018).

Lack of strict laws that govern OD practices was also stated as one factor contributing to rampant OD cases. In two KIIs with the officials of LOWASCO and Save the Children respectively, the interviewees stated that the major reason why the residents used bushes and thickets in the stadium as well as the arboretum to defecate was major because there are no strict laws that prohibit residents from doing so. One interviewee added up that some of the residents were in a position to construct a latrine but cannot do so because there is no law to enforce such a practice. In another KII with a staff of Water, Sanitation and Hygiene (WASH) at Save the Children, he stated

"…*even if the residents are provided with enough latrine facilities in the town today, people will still use the arboretum as well as the stadium, not even because it has become a habit but because there are no rules that prohibit OD practice. People like being monitored and with an introduction of a sanction, I am sure the OD practice in these two sites will be eliminated*" (Personal Communication, 2018).

The *in vivo* (the use of respondent's exact words) and descriptive (coding of major themes) coding analyses identified 5 major themes emerging from respondents on various socioeconomic factors associated with the practice of OD: *Culture, poverty, limited laws, education levels* and *loose sand* (Table 4.6). The five themes referred to various socioeconomic factors associated with OD. The results of the quantitative data owed that culture of the communities was significantly contributing to the practice of open defecation in the study area (Theme Intensity 31.1%) as compared to poor sand that limits latrine construction thus encouraging the practice of OD (n=206).

Further analyses were conducted on how culture influences the practice of OD and 5 major themes were identified: *Habit* to mean the community members were used to defecating in the open, *pastoralism* to mean that nomadic pastoralism kind of life did not allow latrine construction, *bride's dignity* to mean that latrines were only constructed during the welcoming of the bride to preserve the dignity of the family, *immoral behaviour* to mean that men and women using the same latrine was considered as a form of sexual immorality and *mixing of faeces* to mean that using the same latrine meant mixing of faeces which is considered as impure. The results of the meta-analysis revealed that OD was practiced because it had become a habit (Theme Intensity 31.3%) and the communities were used to it as compared to the mixing of faeces which was considered as impure (Table 4.6).

Table 4.6: Frequency of themes describing factors associated with OD

Themes / Response	**FGDs**	**KIIs**	**n**	**Theme Intensity**	**Culture Themes/ Response**	**FGDs**	**KIIs**	**n**	**Theme Intensity**
Culture	47	17	64	31.1%	Habit	15	5	20	**31.3%**
Poverty	30	18	48	23.3%	Pastoralism	15	3	18	**28.1%**
Limited laws	25	12	37	18.0%	Preserve dignity	7	4	11	**17.2%**
Education level	17	13	30	14.5%	immoral behaviours	5	3	8	**12.5%**
Loose soils	22	5	27	13.1%	Mixing of faeces	6	1	7	**10.9%**
TOTAL			206	100%	**TOTAL**			64	**100%**

(Wao *et al*., 2011)

4.2 Discussion

4.2.1. Latrine Conditions, Structure and design

Access to an improved latrine facility is an important component of human health (WHO and UNICEF, 2014). There is low latrine coverage with majority of these facilities being a simple pit latrine. This may be majorly attributed to low income and low education levels experienced in the region. A study by KNBS and SID (2013), approximately 39% of Kenya's population does not have access to an improved sanitation facility with about 18% of the population practicing open defecation(Njonjo, 2013).

The use of simple pit latrines, with deficient levels of hygiene, safety and privacy is common in the study area. Residents cannot afford to construct high quality pits due to high poverty levels. Addressing the issues of poverty may increase latrine ownership. Large-Scale randomized trial research on promoting hand-washing and sanitation in 2015 in Rural Tanzania observed that sanitation promotion increased latrine ownership rates from 38.6% to 51% thus reducing OD practice (Briceño *et al*., 2015). However, a similar study to examine patterns and determinants of communal latrine usage in Bhopal, India, indicates that provision of communal latrines reduce but does not reduce OD in low-income areas (Biran *et al*, 2011).

The small number of latrines present in the study area were constructed using poor materials which do not provide enough privacy to the users. This is majorly due to poverty levels experienced in Lodwar. Failing latrines, inability to repair and maintain them are reported causes of OD practices(Tyndale-Biscoe *et al*., 2013). In Lodwar town center, there were only two public latrines with the very low turnout of users. In one key informant interview (KII) with a village elder in Kanamkemer, some of the few available latrines were not being used because they are of poor construction materials. He stated that most residents were not in a position to purchase strong building materials and therefore used weak and cheap materials that could collapse. This scared away some users. Some of the construction materials such as wood materials may rot thus the latrine may sink after some few years.

A similar systematic review and meta-analysis to quantitatively characterize how sanitation interventions impact on latrine coverage and use suggests that good latrine structure and design are associated with higher latrine use thus accelerating the progress towards OD elimination(Garn *et al*., 2017). A study to determine latrine use and determining factors in 2016 in Southwest Ethiopia also reported that those latrines that were not in use were in poor states and needed repair (Oljira & Berkessa, 2016).

A good latrine facility should provide enough privacy for its users. This study also assessed latrine privacy and whether it had an influence on OD practices. Respondents in FGDs stated that they would rather go far to the bush, far from households to defecate other than using a latrine that has its walls tattered. Similar studies by O'Connell, 2014 and Garn *et al*., 2017 points out that it is very important to have a latrine with all its walls enclosed(Garn *et al*., 2017; O'Connell, 2014). O'Connell, 2014 found out that latrine privacy was a crucial factor especially for women as most of them do not like exposing their body parts and was the main reason why people were constructing latrines rather than defecating in the open.

Increased access and usage of improved sanitation facilities that can hygienically separate human excreta brings improved public health outcomes whereas latrine filthiness may be a notorious disincentive from using such facilities (Novotný *et al*., 2017). This was observed in the study area with three-quarters of the few available latrines not cleaned regularly. Additionally, KAP survey concluded that most respondents agreed that human faeces on latrine floors, latrine odor and filled/almost filled up latrines encouraged the practice of open defecation. A systematic review to assess what determines open defecation and latrine ownership reported that few latrine users would use a latrine with human faeces on its floor(O'Connell, 2014).

On the other hand, the bad odor has been found to be an overlooked barrier to latrine ownership(Rheinlander *et al*., 2013). A similar study to assess factors influencing OD and latrine ownership in Meghalaya, India reported that 56% of the population stated that bad smell in latrines was the reason for its non-use. Thus, poor latrine conditions may have deterred latrine usage in Lodwar. A similar systematic review and meta-analysis to quantitatively characterize how sanitation interventions impact on latrine coverage also concluded that latrine cleanliness was frequently associated with its increased use while poorer latrine conditions were associated with its lower use(Garn *et al*., 2017). Another limiting factor to latrine-use that was observed in Lodwar was rampant cases of water scarcity. This was reported to limit latrine cleaning. A study to assess the long-term sustainability of improved sanitation in Bangladesh found out that the distance to the water-source was significantly related to latrine cleanliness (Hanchett *et al*., 2011).

Latrine sharing goes hand in hand with latrine filthiness (Okullo *et al*., 2017). Queuing and congested is expected with shared latrines. This was a common practice in the study area with more than half of the latrines being shared by more than one household. Latrine sharing result

from the inability of most respondents to construct their latrines and only depend on those who can afford to construct a simple latrine. Most of these shared latrines were not cleaned regularly. O'Connell & Devine, 2015 found out in their study that the perception of the latrine users towards the use of dirty latrines, which in this case a shared facility, is negative and thus may opt for open defecation. Social interventions to make sanitation facilities more hygienic may increase its use (Obeng *et al*., 2015).

Provision of communal latrines has been found to play a critical role in catering for daily defecation needs in low-income areas (Biran *et al*., 2011). This is similarly the case with the residents of Lodwar. However, a study conducted in Ghanaian peri-urban to understand the factors influencing the use of household and communal latrines in 2015 reported that provision of public latrines does not guarantee its regular use (Obeng *et al*., 2015). The few available communal latrines were never cleaned at all. Such conditions accelerated OD practice.

Owing to low-income levels in the region, an introduction of a small fee for daily maintenance and cleanliness of such facilities may prove to be an effective strategy towards its increased usage. A study to examine patterns and determinants of communal latrine usage in Bhopal India reported that the introduction of household subscription fee from cleaning was a proxy indicator of good latrine conditions and it had a 24hour access (Biran *et al*., 2011).

Pit latrines eventually fill up and need to be emptied or replaced. Owing to rampant cases of latrine sharing reported in the region, the filled-up rates of such latrines is similarly faster. With high poverty levels reported in the region, replacement or emptying such facilities is slow/lacking. Loose soils in Lodwar makes it even worse to dig new pits when the existing ones are filled up. Emptying or replacing filled-up latrines in the study area is a major challenge due to its cost. A study to examine adaptation strategies to address limitations of pit latrines in 2016 in Malawi reported that communities adopted improved sanitation facilities when there are no barriers (such as cost) preventing them (Chunga *et al*., 2016). The perception of people towards filled-up latrines may further dissuade them from using it (Hanchett *et al*., 2011). These conditions accelerate OD practices as the situation become more marked with time.

Distance to a latrine may have an important role in influencing OD cases. Majority of the households had a latrine located 100 meters and beyond from their homestead. This was because a large number of these facilities were shared as most households did not have one. Access to a latrine facility located far from the household, especially during the night may have been one of the contributing factors that contributed to rampant cases in the study area. A similar study to examine patterns and determinants of communal latrine usage in Bhopal India

reported that households who did not have a latrine facility had greater odds of practicing OD compared to households who were closer to a latrine facility (Biran *et al*., 2011).

Additionally, the study area is characterized by sandy soil that does not support the construction of pit latrines. This was attributed to latrine non-use as a result of fear of such facilities collapsing. According to a similar study by O'Connell, 2014, people would always use a latrine facility that is comfortable for them.

Distance to an accepted OD site may also be an important determinant of latrine use (Biran *et al.,* 2011). Even with the availability of two public toilets in Lodwar town and one latrine in the stadium, residents still defecated in the proposed arboretum and the stadium respectively. These places are characterized by the presence of human faeces scattered all over. This presents a serious health concern especially during the rainy season as the runoff water carry along this faecal matter and deposit them into the rivers which are the main sources of domestic water in Lodwar. The outcome is the outbreak of various water-related diseases such as typhoid and cholera, most frequent in Lodwar(Njonjo, 2013)

4.2.2 Latrine Coverage and Open Defecation Hotspots

There is inadequate access to latrine facilities in Lodwar. A larger percentage of the population cannot afford to construct their own latrines and only depend on those who can afford to construct a simple latrine. The few available latrines are poorly constructed putting users at risk of injury or loss of lives. In Lodwar town alone, two public latrines serves the whole town and due to scarcity of water, this limits latrine cleanliness leading to poor latrine conditions. The latrines are also being paid for and this limits the number of people using it due to low income levels.

The practice of open defecation in the study area is very rampant with the residents defecating almost everywhere including the government properties such as the arboretum, the stadium and along all the roads. According to similar studies by Junias, 2016 and Kurgat, 2017, some of the common open defecation hotspots included the fields, gardens, and rivers.

4.2.3 Socioeconomic Factors Associated with the Practice of Open Defecation

Employment goes hand in hand with increased earnings, good health as well as other socioeconomic outcomes. There was little latrine coverage in households with low-income sources as compared to households with high-income sources in the study area with the majority of the respondents stating that construction materials (perceived as being expensive) influenced latrine ownership. In a similar study to assess factors related to OD behaviour among school-age children in West Lombok, Indonesia, the majority of the respondents with

low-income levels did not have a latrine facility at their homes as they cannot afford the cost of construction(Makhfudli *et al*., 2017). According to KNBS and SID report, 2013, only 6% of the population in Turkana County works for pay and is ranked the last and is the poorest County in Kenya (Njonjo, 2013). Households with low-income levels will often place a lower priority on sanitation(Jenkins & Scott, 2007).

People living in low socio-economic status cannot afford improved sanitation thus are less likely to spend on sanitation(Njuguna & Muruka, 2017; Peprah *et al*., 2015). A cross-sectional study from 2008-2012 from households in rural areas of Tanzania, Indonesia (East Java), and multiple states of India reported that more than 60% of the households living in low-socioeconomic status practice OD compared to less than 1% of the households living under high socioeconomic status(O'Connell & Devine, 2015). This is majorly due to the cost of latrine construction as reported by 83% of the respondents in this study. A similar study in Ethiopia shows that in households with an annual income of USD $300 or more per year, latrine ownership increased by two- folds as compared with households with less than USD $300 per year (Awoke & Muche, 2013). Another study to assess patterns and determinants of latrine use in Odisha, India however suggests that the construction of latrines by the government alone was insufficient to address the practice of OD(Sinha *et al*., 2017) adequately.

Low-income levels lead to the use of poor latrine construction materials which do not offer enough privacy. This may encourage OD practices. The study area is also characterized by loose soils that requires good constructed latrines. This was a major problem as majority of the household heads were unemployed. In this study, respondents preferred going to the bush than using a latrine that had its walls tattered. A similar study to assess factors influencing OD and latrine ownership in Cambodia, India (Rajasthan, Meghalaya, and Bihar), Indonesia (East Java), Kenya, Malawi, Peru, Tanzania, and Uganda, the report points out that it is very important to have a latrine with all its walls enclosed as latrine privacy is a crucial factor(O'Connell, 2014). This is especially for women as most of them do not like exposing their body parts and is a motivation why people construct latrines rather than defecating in the open.

Low-income levels may also encourage latrine sharing which was a common practice in the study area with half of the latrines being shared by more than one household. Latrine sharing goes hand in hand with latrine filthiness (Okullo *et al*., 2017). Latrine filthiness may have been one of the factors why some households possessed a latrine but was not using it with more than three-quarters of the respondents agreeing that human faeces on the latrine floors and

filled/almost filled up latrines encouraged the practice of open defecation. A formative study to examine who is likely to own a latrine in 2008 and 2012 from households in rural areas of Tanzania, Indonesia (East Java), and multiple states of India also reported that the perception of the latrine users towards the use of dirty latrines is negative and thus they may not want to use an unhygienic facility and may opt for open defecation(O'Connell & Devine, 2015).

Secondly, study findings show that latrine ownership in the study area was largely associated with the respondents' levels of education. Household respondents who did not own a latrine were mostly illiterate, and those who had primary levels of education. The education level of a household head is an important aspect towards human development as it exposes him/her to various opportunities as well as increased earnings. A similar study to assess factors that facilitate latrine adoption in Tanzania reported that education was significantly associated with OD. Respondents who had reported to have attended school had 5.26 greater odds of using a latrine facility as compared to those who had never attended school(Sara & Graham, 2014). Educational status of mother and the presence of secondary school student are the leading factor to latrine use and consequently the practice of OD (Yimam *et al*., 2014).

This study also identified limited, or absence of strict laws govern the sanitation practices as the third factor that contributes to OD practices in Lodwar. Individuals who have a perception that the presence of village rules and regulations in place that inhibit the OD practice have greater odds of owning a latrine(O'Connell & Devine, 2015). However, the development, implementation, and monitoring of sanitation laws and policies require adequate budget allocations (Galan *et al*., 2013) which is a major problem in most developing countries. A similar study to assess the elimination of OD and improved sanitation in Nepal reported that presence of sanitation regulations were some of the social pressures that drove households to adoption and sustained use of latrines (Mcmichael, 2017).

There were households, however, that possessed latrine facilities in the study area but were not using them simply because according to them, latrine ownership was a necessary requirement. A similar report from Kajiado Kenya shows that some of the households in the region possessed a latrine facility but were not using it because they are not used to defecating in the latrines. The owners reported that those latrines were only constructed for the health officials and the government who forced them to do so (Kurgat, 2017). These communities tend to have deep-rooted values on such practices. Findings from a similar study among school-age children in West Lombok, Indonesia reported that such communities are often comfortable defecating in

the open even if such situations are uncertain(Makhfudli *et al*., 2017). As a result, such communities are not too oriented to any form of regulations. A combination of fines, shaming, and withholding of community benefits may be considered as successful sanitation elements that may promote latrine construction as well as its usage among such communities(O'Connell, 2014; O'Reilly & Louis, 2014).

Various sanitation campaigns have been conducted in Turkana County with a majority of the respondents fully aware of such advice as the use of latrine for defecation, safe disposal of children faeces and washing of hands after defecation. However, OD is still a challenge in the region with respondent citing OD as a cultural habit that has been in existence over a long period of time. A report by World Bank to assess if sanitation campaigns get people to use toilets in Tanzania showed that sanitation campaigns reduced regular OD but occasional OD continued(Berman, 2016). Even with the provision of infrastructure to construct latrines, the presence of nearby water, habits, sanitation rituals, and daily routines are some of the factors that contribute into little latrine adoption (Routray *et al*., 2015).

Findings from this study strongly associate OD practice to cultural habits as the fourth socio-economic factor. Daily habits determine the health conditions of a population. Often, several factors play a role in influencing the formation of these habits (Routray *et al*., 2015). The process to change these habits is often hard if the habits have been internalized and embedded in the every-day life of such populations. A similar study to assess the effects of India's Total Sanitation Campaign on defecation behaviours in Rural Madhya Pradesh reported that changing social norms and behaviours achieved modest reductions in OD cases(Patil *et al*., 2014). This is a field which has not been looked at in-depth in Lodwar Kenya. Even with the presence of a latrine facility, some of the households do not use these facilities. Such compounds were characterized by the presence of faeces scattered over the compound.

Various cultural aspects played a role in influencing OD practices in the study area with OD as a daily habit/routine being the most cited aspect that contributed to OD practice. A cultural value which has been learned from childhood is often a difficult thing to change as mothers train their children to defecate in the open and later on in life it becomes a habit (Routray *et al*., 2015). So even with changes in sanitation practices, such communities may not change what they are used to. These findings are similar to those of a study that assessed socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha with the men respondents known to practice OD reporting that latrines were suitable for females only who were home most of the time, and especially a newlywed daughter-in-law (Routray *et al*., 2015).

Owing to the occupation of such populations, men, especially farmers who cannot come back home to access a latrine and can defecate anywhere. Findings from a similar study in Uttarakhand, India, wealthier villagers could afford to construct latrines, but OD practice was considered more convenience to them especially when practicing agriculture or transhumance(O'Reilly *et al*., 2017). Complementarily, 60.4% of the respondents who were known not to use latrines in Denbia district, Northwest Ethiopia attributed latrine use to long live habit with 18.9% considering OD a comfortable practice (Yimam *et al*., 2014).

Pastoralism kind of life was also cited as the second leading cultural factor that hindered most households from constructing a latrine. Majority of the Counties in Kenya with high OD rates have a large proportion of pastoralists who practice livestock keeping (Njuguna & Muruka, 2017). These nomadic communities tend to move with their animals in search of water and pasture and rarely carry mobile toilets along. They perceived latrine construction as wastage of funds as they were not going to stay in one location anyway and would rather defecate in the open. Findings from a similar study In rural Tanzania shows that livestock-keeping was significantly associated with OD practice with 15(16%) of the households practicing OD earning their income through livestock-keeping(Sara & Graham, 2014).

Dignity and immoral behaviour were also some of the cultural aspects to OD practice. Households were only likely to construct a latrine during the welcoming of the bride to her new house and defecating outside was perceived to lower the prestige of the family. Some of the respondents also stated that having one latrine in a compound that is shared among all the members of the households was considered as a form of immoral behaviour. Relatives, for instance, a father and his daughter-in-law are not allowed to use the same toilet as this is considered immoral behaviour. Findings from a similar formative cross-sectional study from households in rural areas of Tanzania, Indonesia (East Java), and multiple states of India points out that cultural norms such as the belief that male in-laws and females should not share the same latrine facilities are associated with OD practice (O'Connell & Devine, 2015).

Lastly, the findings from this study indicated that using the same toilet among all the family members meant mixing of faeces which is considered impure according to their beliefs. Similar evidence from a household survey in rural north India indicates that some percentage of the population continue to defecate in the open despite having a latrine facility. Such population believes that defecating in the open is healthier than using a latrine(Coffey *et al*., 2014).

The novelty of this study

Existing interventions to end OD practices in Turkana County have been largely unsuccessful. This study highlights poverty, low levels of educations, limited sanitation laws and policies, loose soils and culture as some of the leading factors that have contributed to rampant cases of OD in Lodwar, Kenya. Provision of infrastructure to construct latrines and awareness campaigns on the importance of good sanitation practices have majorly been some of the interventions to end OD in the study area. However, these efforts have not yielded fruits as there are significant and culturally engrained cultural barriers to latrine use as well as OD practice. Various cultural aspects have been pointed out in this study, and this presents a significant gap that other studies in Kenya have not looked at it much deeper. An assessment of these cultural aspects in such communities proves to be an appropriate method in understanding the reasons for rampant cases of OD, which may otherwise be difficult to solve through the provision of subsidies to construct latrines and sanitation campaigns that have been in existence.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

Some of the major findings from this study included:

i) Inadequate access to latrine facilities
ii) Few available latrines were constructed using poor materials
iii) Latrines were in poor latrine conditions
iv) Government facilities, bushes, along the roads and rivers are the common OD hotspots
v) Culture and high poverty levels were attributed to rampant OD cases

5.2 Conclusions

There was inadequate latrine coverage in the study area with majority of them constructed using poor materials. Most of the latrines were untidy and poorly maintained with quite a number of these facilities being in very poor conditions, the later resulting to reversion to OD. Major OD hotpots identified were bushes, along the rivers, along major roads, Lodwar town's arboretum and the stadium.

Culture and Poverty levels were the common factors that accelerated the practice of OD in Lodwar. The qualitative findings concluded that the practice of OD had become a common habit that was inherited through generations who are known to practice it.

Therefore, this study finally concludes that even though poverty levels are high in the study area, provision of a latrine facility alone may not be able to solve the current issue of OD without addressing the issue of culture holistically.

5.3 Recommendations

Owing to the nomadic-pastoralism way of life and the inability of such communities to afford improved sanitation facilities, the government should take charge of the provision of temporary, but quality latrines to each household.

Establishing children and community clubs that tackles sanitation as well as other issues may help to mitigate the issue of culture in such societies. Changing hygiene and sanitation behaviour is a complex challenge, and ensuring sustainability can take years. But the knowledge and skills child clubs and community members learn through sanitation interventions may help foster a culture that can be transferred from generation to generation.

Regular programmes and campaign activities are required, however, to en-courage internalization of good habits and maintain this progress

Future sanitation interventions addressing OD should also factor in each cultural aspects in such communities in order to come up with appropriate OD eradication measures which have otherwise be difficult to solve through poverty eradication and sanitation campaigns that have been in existence.

REFERENCES

Abalo, J. (2016). Sanitation and Health practices: A Positive Deviance study of three Community Led Total Sanitation (CLTS) host villages in Uganda, (May).

Abramovsky, L., Augsburg, B., & Oteiza, F. (2015). *Sustainable Total Sanitation*. Retrieved from http://www.ifs.org.uk/uploads/publications/mimeos/Abramovsky_et_al_Baseline report Nigeria STS.pdf

Abubakar, I. R. (2017). Access to sanitation facilities among nigerian households: Determinants and sustainability implications. *Sustainability (Switzerland)*, *9*(4), 1–17. https://doi.org/10.3390/su9040547

Abubakar, I. R. (2018). Exploring the Determinants of Open Defecation in Nigeria Using Demographic and Health Survey Data. *Science of Total Environment*, *637*(638C), 1455–1465.

Awoke, W., & Muche, S. (2013). A cross sectional study: latrine coverage and associated factors among rural communities in the District of Bahir Dar Zuria, Ethiopia. *BMC Public Health*, *13*(1), 99. https://doi.org/10.1186/1471-2458-13-99

Barnard, S., Routray, P., Majorin, F., Peletz, R., Boisson, S., Sinha, A., & Clasen, T. (2013). Impact of Indian Total Sanitation Campaign on Latrine Coverage and Use : A Cross-Sectional Study in Orissa Three Years following Programme Implementation. *PLoS Med*, *8*(8), e71438. https://doi.org/10.1371/journal.pone.0071438

Berman, D. (2016). Tanzania: Do Campaigns to Get People to Wash Hands & Use (Improved) Toilets Work?, (February).

Biran, A., Jenkins, M. W., Dabrase, P., & Bhagwat, I. (2011). Patterns and determinants of communal latrine usage in urban poverty pockets in Bhopal , India. *Tropical Medicine and International Health*, *16*(7), 854–862. https://doi.org/10.1111/j.1365-3156.2011.02764.x

Bongaarts, J. (2001). Household size and composition in the developing world in the 1990s. *Population Studies*, *55*(3), 263–279. https://doi.org/10.1080/00324720127697

Briceño, B., Coville, A., & Martinez, S. (2015). *Promoting Handwashing and Sanitation Evidence from a Large-Scale Randomized Trial in Rural Tanzania*.

Busienei, P. J., Ogendi, G. M., & Mokua, M. A. (2019). Open Defecation Practices in Lodwar, Kenya: A Mixed Methods Research Busienei P.J. 1,. *Environmental Health Perspectives*, *13*, 1–13. https://doi.org/10.1177/1178630219828370

Cherukupalli, A. (2016). Open defecation in India: forcing people to stop is not the solution | Global Development Professionals Network | The Guardian. Retrieved February 22,

2018, from https://www.theguardian.com/global-development-professionals-network/2016/nov/18/open-defecation-india-solution-world-toilet-day

Chowdhry, S., & Kone, D. (2012). *Business Analysis of Fecal Sludge Management : Emptying and Transportation Services in Africa and Asia*.

Chunga, R. M., Ensink, J. H. J., Jenkins, M. W., & Brown, J. (2016). Adopt or Adapt : Sanitation Technology Choices in Urbanizing Malawi. *PLoS ONE*, *11*(8), 1–16. https://doi.org/10.1371/journal.pone.0161262

Coffey, D., Deaton, A., Dreze, J., Dean, S., & Tarozzi, A. (2013). Stunting among Children Facts and Implications. *Economic and Political Weekly*, *xlviii*(34), 68–70.

Coffey, D., Gupta, A., Hathi, P., Khurana, N., Spears, D., Srivastav, N., & Vyas, S. (2014). Revealed Preference for Open Defecation. *Economic and Political Weekly. Review of Urban Affairs*, *xlix*(38), 55.

Coffey, D., Spears, D., & Vyas, S. (2017). Switching to sanitation : Understanding latrine adoption in a representative panel of rural Indian households. *Social Science & Medicine*, *188*, 41–50. https://doi.org/10.1016/j.socscimed.2017.07.001

Desai, R., McFarlane, C., & Graham, S. (2015). The politics of open defecation : informality, body, and infrastructure in Mumbai. *Antipode*, *47*(1), 98–120. Retrieved from http://dx.doi.org/10.1111/anti.12117

Galan, D., Kim, S., & Graham, J. (2013). Exploring changes in open defecation prevalence in sub-Saharan Africa based on national level indices. *BMC Public Health*, *13*(1), 13. https://doi.org/10.1186/1471-2458-13-527

Garn, J. V., Sclar, G. D., Freeman, M. C., Penakalapati, G., Alexander, K. T., Brooks, P., … Clasen, T. F. (2017). The impact of sanitation interventions on latrine coverage and latrine use: A systematic review and meta-analysis. *International Journal of Hygiene and Environmental Health*, *220*, 329–340. https://doi.org/10.1016/j.ijheh.2016.10.001

Godana, W., & Mengistie, B. (2017). Exploring Barriers Related to the Use of Latrine and Health Impacts in Rural Kebeles of Dirashe District Southern Ethiopia: Implications for Community Lead Total Sanitations. *Health Science Journal*, *11*(2), 492. https://doi.org/10.21767/1791-809X.1000492

Gore, M. (2018). ‘ Swachha Bharat Abhiyan ’ (Clean India Campaign) : A Step Towards Social Accountability. *European Journal of Multidisciplinary Studies January-April*, *3*(2), 60–69.

Government of Kenya. (2010). *The Constitution of Kenya, 2010*.

Government of Kenya. Environmental Management and Co-ordination (Amendment) Act

(2015). Retrieved from http://extwprlegs1.fao.org/docs/pdf/ken41653.pdf

Hanchett, S., Krieger, L., Kahn, M. ., Kullmann, C., & Ahmed, R. (2011). *Long-Term Sustainability of Improved Sanitation in Rural Babgladesh, Washington, DC: World Bank*. Retrieved from http:/openknowledge.worldbank.org/handle/10986/17347

Hathi, P., Spears, D., & Coffey, D. (2016). Can collective action strategies motivate behaviour change to reduce open defecation in rural India ? *Waterlines*, *35*(2), 118–135.

Jenkins, M. W., & Scott, B. (2007). Behavioral indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana. *Social Science and Medicine*, *64*(12), 2427–2442. https://doi.org/10.1016/j.socscimed.2007.03.010

Junias, M. S. (2016). Factors of Knowledge and Toilet Availability in Affecting Behavior of Open Defecation. *International Journal of Scientific and Research Publications*, *6*(5), 440–443.

Kema, K., Semali, I., Kagonji, I., Temu, F., Ilako, F., & Mkuye, M. (2012). Factors Affecting the Utilization of Improved Ventilated Latrines Among Communities in Mtwara Rural District, Tanzania. *Pan African Medical Journal*, *13*(4), 1–5.

Kish, L. (1965). *Survey Sampling*. NY: John Wiley and Sons.

Krueger, R., & Cassey, M. (2015). Participants in a Focus Group. In *5th Edition* (p. 280).

Kumar, K. (1989). *Conducting Key Informant Interviews in Developing Countries A.I.D.*

Kurgat, M. (2017). Rural Kajiado locals shun toilets, opt for the bush | The Star, Kenya. *The Star*. Retrieved from https://www.the-star.co.ke/news/2017/04/25/rural-kajiado-locals-shun-toilets-opt-for-the-bush_c1548224

Laura, M., Gertler, P., Shah, M., Alzua, M., Martinez, S., & Patil, S. (2015). *How Does Health Promotion Work ? Evidence from the Dirty Business of Eliminating Open Defecation*.

Leech, N. L., & Onwuegbuzie, A. J. (2011). A typology of mixed-methods research designs. Quality & Quantity, *43*(2), 265–275.

Makhfudli, Rachmawati, P., & Andini, S. (2017). Factors Related to Open Defecation Behavior Among School-Age Children in West Lombok. *Jurnal Ners*, *12*(Leininger 2002), 119–125.

Mara, D. (2017). The elimination of open defecation and its adverse health effects: a moral imperative for governments and development professionals. *Journal of Water Sanitation and Hygiene for Development*, *7*(1), 1–12. https://doi.org/10.2166/washdev.2017.027

Mckim, C. A. (2017). The Value of Mixed Methods Research : A Mixed Methods Study.

Journal of Mixed Methods Research, *11*(2), 202–222. https://doi.org/10.1177/1558689815607096

Mcmichael, C. (2017). Toilet Talk : Eliminating Open Defecation and Improved Sanitation in Nepal ce pt us t. *Medical Anthropology*, 42. https://doi.org/10.1080/01459740.2017.1371150

Mutisya, E., & Yarime, M. (2011). Understanding the grassroots dynamics in Nairobi: The dilemma of Kibera informal settlements. *International Transaction Journal of Engineering, Management, and Applied Sciences and Technologies*, *2*(2), 197–213.

Njonjo, K. S. (2013). *"Exploring Kenya ' s Inequality: Pulling Apart of Pooling Together"*.

Njuguna, J., & Muruka, C. (2017). Open Defecation in Newly Created Kenyan Counties: A Situational Analysis. *Journal of Health Care for the Poor and Underserved*, *28*(1), 71–78. https://doi.org/10.1353/hpu.2017.0009

Novotný, J., Hasman, J., & Lepič, M. (2018). Contextual factors and motivations affecting rural community sanitation in low- and middle-income countries: A systematic review. *International Journal of Hygiene and Environmental Health*, *221*(2), 121–133. https://doi.org/10.1016/J.IJHEH.2017.10.018

Novotný, J., Kolomaznikova, J., & Humnalova, H. (2017). The Role of Perceived Social Norms in Rural Sanitation : An Explorative Study from Infrastructure-Restricted Settings of South Ethiopia. *International Journal of Environmental Research and Public Health*, *14*(794), 1–17. https://doi.org/10.3390/ijerph14070794

O'Connell, K. (2014). *What Influences Open Defecation and Latrine Ownership in Rural Households?: Findings from a Global Review Scaling Up Rural Sanitation*.

O'Connell, K., & Devine, J. (2015). Who is likely to own a latrine in rural areas? Findings from formative research studies. *Waterlines*, *34*(4), 314–329. https://doi.org/10.3362/1756-3488.2015.029

O'Reilly, K., Dhanju, R., & Goel, A. (2017). Exploring "The Remote" and "The Rural": Open Defecation and Latrine Use in Uttarakhand, India. *World Development*, *93*, 193–205. https://doi.org/10.1016/j.worlddev.2016.12.022

O'Reilly, K., & Louis, E. (2014). The toilet tripod: Understanding successful sanitation in rural India. *Health & Place*, *29*, 43–51. https://doi.org/10.1016/J.HEALTHPLACE.2014.05.007

Obeng, P. A., Keraita, B., Oduro-kwarteng, S., Bregnhoj, H., Abaidoo, R. C., Awuah, E., & Konradsen, F. (2015). Usage and Barriers to Use of Latrines in a Ghanaian Peri-Urban Community. *Environ. Process*, *2*, 261–274. https://doi.org/10.1007/s40710-015-0060-z

Odagiri, M., Muhammad, Z., Cronin, A. A., Gnilo, M. E., Mardikanto, A. K., Umam, K., & Asamou, Y. T. (2017). Enabling factors for sustaining open defecation-free communities in rural Indonesia: A cross-sectional study. *International Journal of Environmental Research and Public Health*, *14*(1572), 1–20. https://doi.org/10.3390/ijerph14121572

Okullo, J. O., Moturi, W. N., & Ogendi, G. M. (2017). Open Defaecation and Its Effects on the Bacteriological Quality of Drinking Water Sources in Isiolo County , Kenya. *Environmental Health Insights*, *11*, 1–8. https://doi.org/10.1177/1178630217735539

Oljira, D., & Berkessa, T. (2016). Latrine use and Determinant Factors in Southwest Ethiopia. *Journal of Epidemiology and Public Health Reviews*, *1*(6), 1–5.

Patil, S. R., Arnold, B. F., Salvatore, A. L., Briceno, B., Ganguly, S., Jr, J. M. C., & Gertler, P. J. (2014). The Effect of India ' s Total Sanitation Campaign on Defecation Behaviors and Child Health in Rural Madhya Pradesh : A Cluster Randomized Controlled Trial. *PLoS Medicine*, *11*(8). https://doi.org/10.1371/journal.pmed.1001709

Peprah, D., Baker, K. K., Moe, C., Robb, K., Wellington, N. I. I., Yakubu, H., & Null, C. (2015). Public toilets and their customers in low-income Accra, Ghana. *Environment & Urbanization*, *27*(4), 589–604. https://doi.org/10.1177/0956247815595918

Rahul, A., & Srivastava, A. (2017). Understanding toilet usage, cleanliness, and hygiene in rural India. *International Research Journal of Human Resources and Social Sciences*, *4*(8), 196–208.

Rheinlander, T., Keraita, B., Kondradson, F., Samuelsen, H., & Dalsgaard, A. (2013). "Smell: An Overlooked Factor in Sanitation Promotion." *Waterlines*, *32*(2), 106–112.

Routray, P., Schmidt, W.-P., Boisson, S., Clasen, T., & Jenkins, M. W. (2015). Socio-cultural and behavioural factors constraining latrine adoption in rural coastal Odisha: an exploratory qualitative study. *BMC Public Health*, *15*(880). https://doi.org/10.1186/s12889-015-2206-3

Sara, S., & Graham, J. (2014). Ending Open Defecation in Rural Tanzania: Which Factors Facilitate Latrine Adoption? *International Journal of Environmental Research and Public Health*, *11*(9), 9854–9870. https://doi.org/10.3390/ijerph110909854

Sinha, A., Nagel, C. L., Schmidt, W. P., Torondel, B., Boisson, S., Routray, P., & Clasen, T. F. (2017). Assessing patterns and determinants of latrine use in rural settings : A longitudinal study in Odisha , India. *International Journal of Hygiene and Environmental Health*, (220), 906–915. https://doi.org/10.1016/j.ijheh.2017.05.004

Tan, S., Cheng, P., Soon, H., Ghazali, H., & Mahyudin, N. (2013). A qualitative study on personal hygiene knowledge and practices among food handlers at selected primary

schools in Klang valley area, Selangor, Malaysia. *International Food Research Journal*, *20*(1), 71–76.

Tyndale-Biscoe, P., Bond, M., & Kidd, R. (2013). *ODF Sustainability Study, FH Designs and Plan International*. Retrieved from www.communityledtotalsanitation.org/resource/odf-sustainability-study-plan

Wao, H. O., Dedrick, R. ., & Ferron, J. . (2011). Quantitizing text: using theme frequency and theme intensity to describe factors influencing time-to-doctorate. Quality & Quantity, *45*(4), 923–934.

WHO. (2015). *World Health Stastics*. Geneva, Switzerland. Retrieved from (www.who.int

WHO and UNICEF. (2010). *Progress on Sanitation and Drinking Water-2010 Update*. *Joint Monitoring Programme for Water Supply and Sanitation*. Geneva, Switzerland. https://doi.org/http://apps.who.int/iris/bitstream/10665/81245/1/9789241505390_eng.pdf?ua=1

WHO and UNICEF. (2014). *Progress on Drinking Water and Sanitation;2014 Update*. *Joint Monitoring Programme for Water Supply and Sanitation*. Geneva, Switzerland. Retrieved from http://www.who.int/about/licensing/copyright_form/en/index.html

WSP. (2012). *The key messages Sanitation Data from 18 Countries in Africa*. Retrieved from http://www.wsp.org/wsp/content/africa-economic-impacts-sanitation

Yimam, Y., Kassahun, G., & Daniel, C. (2014). Latrine utilization and associated factors among people living in rural areas of Denbia district, Northwest Ethiopia, 2013, a cross-sectional study. *Pan African Medical Journal*, 1–10. https://doi.org/10.11604/pamj.2014.18.334.4206

APPENDICES

APPENDIX 1: QUESTIONNAIRE

Introduction

The research team intents to solicit views from the respondents using this questionnaire tool on the factors that might be associated with open defecation in Lodwar Settlements. The information provided will be used for research purposes only and all the responses will be treated with utmost confidentiality. The findings will inform the sanitation policy as well as interventions to curb or reduce the problem of open defecation

INFORMED CONSENT

Hello. We are researchers from Egerton University. We are conducting a study on the factors that may be associated with open defecation in Lodwar. We will appreciate your willingness to participate in this study. The information you provide will help to know if the practice still exists in the community and suggest various efforts to combat it in the country.

Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions for whatever reasons, without any reprisal to you or members of your household. The information you give will be kept secret and will not be shared with any other person who is not part of the research team. Your name or any information that might identify you will not be used in reports arising from this study.

If you have questions about your rights as a research participant, you may contact:

Egerton University Research and Ethics Committee at www.egerton.ac.ke or alternatively call/write; Egerton University Research and Ethics Committee, P.O Box 536, 20115, Egerton, Kenya. Tel: +254512217620. Fax: +254512217847

HOUSEHOLD SURVEY QUESTIONNAIRE ON FACTORS ASSOCIATED WITH OPEN DEFECATION IN LODWAR SETTLEMENTS

Instructions; Do not write your name in the questionnaire, tick (√) for YES and cross (X) for NO for answers in the boxes. Explain your opinion in the spaces provided. To be filled by the household head or the caregiver in the family.

1.0. PERSONAL DETAILS (Please tick one)

1. **Gender**

i. Male ☐

ii. Female ☐

2. **Age.** Please tick one

i. 18-28 Years ☐
ii. 29-39 Years ☐
iii. 40-50 Years ☐
iv. 51-61 Years ☐
v. 62-72 Years ☐
vi. 73Years and above ☐

3. What is the number of your family members?

i. 0-4 ☐
ii. 5-9 ☐
iii. 10-14 ☐
iv. 15-19 ☐
v. 20 and beyond ☐

4. What is the occupation of the household head?

i. Employed ☐
ii. Unemployed ☐
iii. Casual laborer ☐
iv. Business ☐
v. Other specify…….

5. What is the level of education of the household head?

i. Primary level ☐
ii. Secondary level ☐
iii. Tertiary colleges ☐
iv. University ☐
v. None ☐

Faecal waste disposal practices

6. Is there a latrine in this household?

i. Yes ☐
ii. No ☐

7. What type of latrine is present in the household?

i. Pit latrine ☐
ii. VIP latrine ☐
iii. Flush toilet ☐
iv. None ☐

v. Other specify……

8. Do you have to pay to use the type of latrine you mentioned above?

i. Yes ☐

ii. No ☐

9. Is the type of latrine mentioned above convenient for you?

i. Yes ☐

ii. No ☐

10. If yes, why?

i. Protection from weather ☐

ii. Convenient at night when one is experiencing diarrhoea ☐

iii. It saves time ☐

iv. Source of manure ☐

v. Other specify……..

11. Which of these contributed towards the construction of this latrine?

i. Government ☐

ii. Community ☐

iii. Individual household ☐

iv. Non-governmental organizations ☐

v. Others, specify…….

12. Is the latrine shared?

i. Yes ☐

ii. No ☐

13. If yes, how many households do you share the latrine with?

i. 1 to 4 ☐

ii. 5 to 9 ☐

iii. 10 to 15 ☐

iv. 15 and more ☐

14. How far is the latrine from the household?

i. 0 to 4 meters ☐

ii. 5 to 9 meters ☐

iii. 10 to 14 meters ☐

iv. 15 to 19 meters ☐

v. 20 meters and beyond ☐

15. How often do you clean your latrine?

i. Daily ☐
ii. After two-five days ☐
iii. Weekly ☐
iv. Monthly ☐
v. None ☐
vi. Other specify…….

16. If yes, what materials do you use to clean your toilet?

i. Water only ☐
ii. Water, soap, and brush ☐
iii. Brush only ☐
iv. None ☐
v. Other specify…….

17. What factors do you think are related to latrine ownership

i. Poverty ☐
ii. Education level ☐
iii. Cultural issues ☐
iv. Law enforcement by the responsible bodies ☐
v. Others, specify……..

18. What factors do you think can limit latrine use?

i. Presence of flies ☐
ii. Sharing a latrine among households ☐
iii. Presence of odor ☐
iv. Presence of faeces on the floor ☐
v. Leaking roof and floor ☐
vi. Almost filled up latrines (faeces visible) ☐
vii. Poor material used to construct the walls of the latrine ☐
viii. Poor roofing or flooring material ☐
ix. Others specify…….

19. If no latrine, how much time do you spend looking for a place to poop?

i. 0 to 9 minutes ☐
ii. 10 to 19 minutes ☐
iii. 20 to 29 minutes ☐
iv. 30 minutes and beyond ☐

20. Do you usually go to one place or different places?

i. One place ☐

ii. Different places ☐

21. Is there a separate place for women and men to poop?

i. Yes ☐

ii. No ☐

22. Do adults accompany children to poop?

i. Yes ☐

ii. No ☐

23. Do you fear using a latrine?

i. Yes ☐

ii. No ☐

24. If yes, why?

i. One can fall inside ☐

ii. Maintenance cost is very high ☐

iii. One has to clean the latrine before using ☐

iv. Latrines may be dirty ☐

v. Others, specify……

25. Do you latrine construction material influences its use?

i) Yes

ii) No

26. If yes, why?

i) Some are of poor quality and one can fall inside ☐

ii) Some are very expensive and I cannot afford ☐

iii) Some do not offer enough privacy ☐

iv) For some, one has to clean the latrine before using it ☐

v) Others, specify…….

27. Where do you usually dispose of your children's faeces?

i. In the latrine ☐

ii. In the open ☐

iii. Burn ☐

iv. Disposal Bins ☐

v. Others specify……

28. Have you received any of the following hygiene advice before?

i. Use a latrine for defecation ☐
ii. Wash hands with soap ☐
iii. Solid waste management in the house ☐
iv. Safe disposal of babies faeces ☐
v. Others Specify……

Please tick well whether you agree or disagree with the following statements

29. Open defecation is an unsafe practice and should be discouraged

i. Agree ☐
ii. Undecided ☐
iii. Disagree ☐

30. Sharing a latrine between households may lead to poor latrine conditions which eventually discourage people from using it

i. Agree ☐
ii. Undecided ☐
iii. Disagree ☐

31. Most of the illnesses at home occur as a result of poor faecal waste management such as open defecation

i. Agree ☐
ii. Undecided ☐
iii. Disagree ☐

32. Typhoid, Cholera, and diarrhoea occur as a result of poor faecal waste management

i. Agree ☐
ii. Undecided ☐
iii. Disagree ☐

33. Using a latrine is considered not religious

i. Agree ☐
ii. Undecided ☐
iii. Disagree ☐

34. Sharing a latrine between men and women is a non-religious practice

i. Agree ☐
ii. Undecided ☐
iii. Disagree ☐

35. Which religion do you belong to?

i. Christian ☐
ii. Muslim ☐
iii. Hindu ☐
iv. Pagan ☐
v. Other, specify

36. Religion is against the construction of latrines

i. Strongly agree ☐
ii. Agree ☐
iii. Undecided ☐
iv. Disagree ☐
v. Strongly disagree ☐

37. The practice of open defecation is a tradition

i. Strongly agree ☐
ii. Agree ☐
iii. Undecided ☐
iv. Disagree ☐
v. Strongly disagree ☐

38. The presence of flies in a latrine forces the users to opt for the use of bushes

i) Strongly agree ☐
ii) Agree ☐
iii) Undecided ☐
iv) Disagree ☐
v) Strongly disagree ☐

39. Bad odor in the latrines forces the users to opt for the practice of open defecation

vi) Strongly agree ☐
vii) Agree ☐
viii) Undecided ☐
ix) Disagree ☐
x) Strongly disagree ☐

40. Open or tattered latrine walls and roofs forces the users to opt for open defecation

i) Strongly agree ☐
ii) Agree ☐
iii) Undecided ☐

iv) Disagree ☐

v) Strongly disagree ☐

41. Almost filled up latrines (faeces visible) forces the users to opt for the use of bushes

xi) Strongly agree ☐

xii) Agree ☐

xiii) Undecided ☐

xiv) Disagree ☐

xv) Strongly disagree ☐

42. Poor flooring and wall materials in the latrines forces the users to opt for the practice of open defecation

xvi) Strongly agree ☐

xvii) Agree ☐

xviii) Undecided ☐

xix) Disagree ☐

xx) Strongly disagree ☐

43. Presence of faeces all over the floor of the latrine forces the users to opt for the practice of open defecation

i) Strongly agree ☐

ii) Agree ☐

iii) Undecided ☐

iv) Disagree ☐

v) Strongly disagree ☐

44. Other important issues identified

……

……

……

……

APPENDIX 2: FAECAL WASTE MANAGEMENT OBSERVATION CHECKLIST

1. Is there a latrine in this household?

i. Yes ☐
ii. No ☐

2. What types of latrines are present in the households?

i. Pit latrine ☐
ii. VIP latrine ☐
iii. None ☐
iv. Other specify…….. ☐

3. How far are the latrines located from the households

i. Less than one 5 meters ☐
ii. Between 5 and 15 meters ☐
iii. Between 15 and 30 meters ☐
iv. Beyond 30 meters ☐

4. What type of material has been used to construct the roof?

i. Iron sheet ☐
ii. Grass ☐
iii. Plastic paper ☐
iv. Wood ☐
v. None ☐
vi. Other specify……..

5. Are there holes in the roof?

i. Yes ☐
ii. No ☐

6. What type of material has been used to construct the wall?

i. Plastic paper ☐
ii. Iron sheet ☐
iii. Stones ☐
iv. Wood ☐
v. Other specify……

7. Are the walls fully covered?

i. Yes ☐
ii. No ☐

8. Are the walls clean?

i. Yes ☐

ii. No ☐

9. What type of material has been used to construct the floor?

i. Wood ☐

ii. Mud ☐

iii. Cement ☐

iv. Other specify……..

10. Is there stagnant water on the floor of the latrine?

i. Yes ☐

ii. No ☐

11. Are there faeces on the floor of the toilet?

i. Yes ☐

ii. No ☐

12. Can you see faeces inside the latrine?

i. Yes ☐

ii. No ☐

13. Can you see a container inside the latrine?

i. Yes ☐

ii. No ☐

14. Are there any cleaning supplies such detergents?

i. Yes ☐

ii. No ☐

15. Is there any water source within fifteen meters from the latrine?

i. Yes ☐

ii. No ☐

16. What is the estimated distance between one latrine facility and another in the area?

i) 0-9meters ☐

ii) 10-19 meters ☐

iii) 20-29 meters ☐

iv) 30-39 meters ☐

v) 40-49 meters ☐

vi) 50 meters and beyond ☐

17. If no latrine, where are the common places used to poop

i) Backyard ☐
ii) Under a tree ☐
iii) In the nearest bush ☐
iv) In the bush along the river ☐
v) Any place around ☐
vi) Others, specify ☐

18. Are there faeces in the compound?

i) Yes ☐
ii) No ☐

Other important observations identified

……
……

APPENDIX 3: FOCUS GROUP DISCUSSION GUIDE

INFORMED CONSENT

Hello. We are a research team from Egerton University. We are conducting a study on the factors that may be associated with open defecation in Lodwar. We will appreciate your willingness to participate in this study. The information you provide will help to know if the practice still exists in the community and suggest various efforts to combat it in the country.

Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions for whatever reasons, without any reprisal to you or members of your household. The information you give will be kept secret and will not be shared with any other person who is not part of the research team. Your name or any information that might identify you will not be used in reports arising from this study.

If you have questions about your rights as a research participant, you may contact:

Egerton University Research and Ethics Committee at www.egerton.ac.ke or alternatively call/write; Egerton University Research and Ethics Committee, P.O Box 536, 20115, Egerton, Kenya. Tel: +254512217620. Fax: +254512217847

I. Administrative unit……
II. FGD code……
III. Date……...
IV. Time start…….
V. FGD completed…….
VI. Incomplete, reason……

A FOCUS GROUP DISCUSSION GUIDE ON THE FACTORS THAT ARE ASSOCIATED WITH OPEN DEFECATION IN LODWAR SETTLEMENTS

Instructions; Do not write your name in this guide, tick. Explain your opinion in the spaces provided. To be filled by one member of the FGD group.

Socioeconomic status

1. What is the major occupation of the household's head in this area?.....
   .....
   .....
2. What is the estimated monthly income for most of the households in this area?.....
   .....
   .....

3. Do you think income-level affects latrine ownership in the study area? why is it so?.....
   .....
   .....
4. Who are the most affected group in the society by the absence of a latrine? Why?.....
   .....
   .....
5. Are Men likely to practice open defecation than women? why is it so?.....
   .....
   .....
6. Do you think the absence of latrines affects children performance at school? If yes, why so?.....
   .....
   .....
7. What age of children is more affected by this practice? Why?.....
   .....
   .....
8. Are girls more likely to be impacted by the practice of open defecation than boys? Why?.....
   .....
   .....
9. Is family size likely to have an impact on latrine use in the household? Why?.....
   .....
   .....
10. Is the education level of the members of the households likely to influence latrine ownership and use? Why?
    .....
    .....
    ……

Cultural practices

1. Is the practice of open defecation a taboo in your place or is it a tradition?
   .....
   .....
   .....
2. Do you think culture has an impact on latrine ownership and use in your community? How is this so?
   .....
   .....
   .....
3. Do you think the practice of open defecation has some cultural;
   i. Advantages? Which are these?
      .....
      .....
      .....
   ii. Disadvantages? Which are these?
      .....
      .....
      .....
4. Is human faeces considered as being impure in your community? Why?.....
   .....
   .....
5. Do you think sharing a latrine between men and women is okay? Why?.....
   .....
   .....
6. Does religion play a part in latrine use or practice of open defecation in your community? How and why?
   .....
   .....
   ……

Latrine Conditions, Structure and design

1. Does cleaning of a latrine on a daily basis likely to influence its use? Why?.....
   .....
   .....
2. Think of these scenarios;
   i. A latrine with a lot of flies
   ii. A latrine with stagnant water on the floor
   iii. A latrine with a leaking roof
   iv. A latrine with a leaking floor
   v. An almost filled up latrine (faeces visible)
   vi. A latrine with faeces on the floor
   vii. A latrine with its wall made of plastic bags and has no door

   Do you think each of the above scenarios has an influence on the latrine use? Explain for each

   ……
   ……
   ……
   ……

Latrine distribution and OD hotspots

1. Are more households likely to possess a latrine in the study area? Why is this so?.....
   .....
   .....
2. How is the latrine facilities distributed in the study area? Do you think they are okay? Why?.....
   .....
   .....
3. Do you think the distance of latrine location from the household has an influence on the practice of open defecation? How?
   .....
   .....
   .....

4. For those households who do not possess a latrine, which are the most common places for defecation?
   Why?.....
   .....
   .....
5. Do men and women poop at the same place? Why?

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

Other faecal waste disposal practices

1. What types of latrines are most common in the study area? Why?.....
   .....
   .....
2. Do people pay for these latrines? If yes, do you think this might be of the contributing factors to the practice of open defecation in the study area?.....
   .....
   .....
3. Which bodies have contributed towards the construction of latrines in your area? Have they been successful in curbing the problem of open defecation in your area? If yes, how did they achieved this?.....
   .....
   .....
4. Are latrines shared among households? And if so, do you think sharing a latrine may contribute to the practice of open defecation? Why?.....
   .....
   .....
5. What factors do you think are related to latrine ownership in the area? Why?.....
   .....

6. Do you think the practice of open defecation has some;

iii. Advantages? Which are these?

.....

.....

iv. Disadvantages? Which are these?

.....

.....

7. What could be some of the reason some household's members opt for open defecation whereas they possess a latrine? Why is this so?

.....

.....

8. How do you dispose of your children's faeces? Why?

.....

.....

9. Have you ever received any hygiene advices before? Do you practice them? Why yes or no?.....

.....

.....

10. Do you think poor faecal disposal may pose any threat to human health? Why?.....

.....

.....

11. What are some of the measures we can do to prevent children from getting sanitation-related diseases in the area?

(Probe on diseases such as diarrhoea, typhoid or cholera)

.....

.....

ADDITIONAL QUESTIONS FOR WOMEN FGDS

Challenges for women

1. 1. What challenges do women face in accessing latrine facilities in this community?
   (Probe on the access at night/very early morning, options that women use if access is impossible; other challenges women face)

   ……

   ……

   ……

   2. What are your thoughts about girls defecating in the open?

   (Probe regarding the adolescent girls at school and their male counterparts)……

   ……

   ……

   Do you think the absence of latrines impacts on girls and women even more than their male counterparts?

   (Probe on the woman's menstrual period)

   ……

   ……

   ……

   TIME FINISH……

APPENDIX 4: KEY INFORMANT INTERVIEW GUIDE

INFORMED CONSENT

Hello. We are a research team from Egerton University and would like to spend 30 minutes or so with you to ask you a few questions. We are talking to several people in this and other villages. If you talk to us, the information you provide will help us to know if the practice still exists in the community and suggest appropriate efforts to combat it in the country. We will appreciate your willingness to participate in this study.

The information you give will be kept secret and will not be shared with any other person who is not part of the research team. Your name or any information that may identify you will not be used in reports arising from this study. You may find some questions to be psychologically upsetting or you may feel that you will be placed at social risk by answering them. You may choose not to answer them. However, we hope that you will fully participate in this study since your views are important.

If you have questions about your rights as a research participant, you may contact:

Egerton University Research and Ethics Committee at www.egerton.ac.ke or alternatively call/write; Egerton University Research and Ethics Committee, P.O. Box 536-20115, Egerton, Kenya. Tel: +254512217620. Fax: +254512217847

i. Administrative unit……..
ii. Interviewer code…….
iii. Date…….
iv. Time start……
v. Interview completed……
vi. Incomplete, reason……

A KEY INFORMANT INTERVIEW GUIDE ON THE FACTORS THAT ARE ASSOCIATED WITH OPEN DEFECATION IN LODWAR SETTLEMENTS

Instructions; Do not write your name in this guide. Explain your opinion in the spaces provided. To be filled by the interviewee.

1. Gender

i. Male ☐

ii. Female ☐

2. Demographic information

i. What is your occupation? .....

ii. What are the main income sources in your household? .....

iii. Do you think the household's head income level can have an influence on latrine ownership and use? Why?

.....

.....

.....

iv. What is your education level? .

.....

Faecal waste disposal management

3. Do you possess a latrine facility in your home? If yes, do all the members of your household use this facility?

i. If yes, why do members of your household use a latrine to poop?.....

.....

.....

ii. If no, why do members of your household avoid using a latrine to poop?.....

.....

.....

iii. If no, where do you usually defecate?

.....

.....

.....

4. Do you think the education level of the household head can have an influence on latrine ownership and use?

i. Why?

.....

.....

.....

.....

5. Imagine that there are two villages; in one village, everyone uses a latrine to defecate, while on the other, everyone goes out in the open. In which village would children be healthier, or would they be similar in both villages? why?

.....

.....

.....

.....

6. Do people pay for community latrines? If yes, do you think this has an influence on the practice of open defecation?

.....

.....

.....

.....

7. How are the latrine facilities in your village?

.....

.....

.....

.....

i. If bad, what would you wish to change?

.....

.....

.....

.....

8. Do the government play a part in the construction of latrines in your area?

.....

.....

.....

.....

i. If no, does this have a large influence on latrine ownership in the area?.....

.....

.....

.....

9. A lot of people poop in the open. What is the reason for this? Have you ever thought about why people go in the open? Does open defecation have any benefits? I am trying to learn

……

……

……

……

10. Do people in your village mostly use the latrine or mostly defecate in the open? Why is this so?

.....

.....

.....

.....

i. If in the open, where are some of the most common open defecation hotspots in your area?

.....

.....

.....

.....

11. Do you think latrine use have issues to do with tradition? How is this so?.....

.....

.....

12. How do you think someone feels when he or she realizes that someone else has seen him or her pooping? Does this matter to you?

.....

.....

.....

Other important notes

……

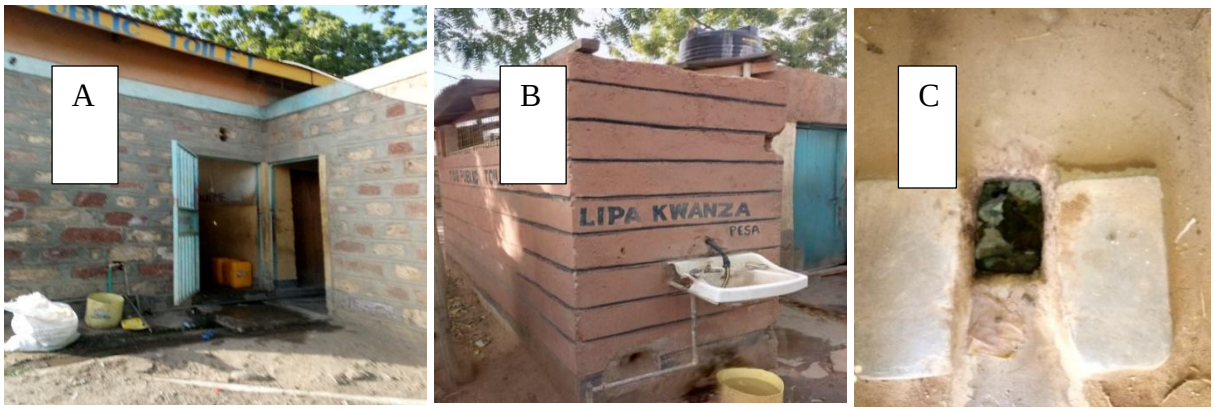
……

……

TIME FINISH…….....

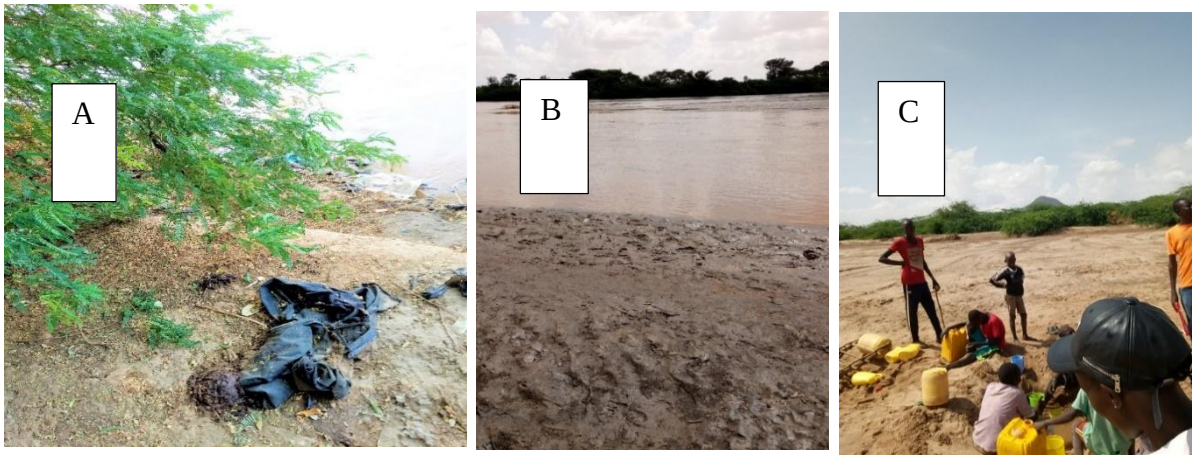
APPENDIX 5: LIST OF PLATES

1. Plate 4.1: Plate A and B showing Lodwar town's two public latrines; Plate C showing one filled up latrine present in Nataparkakono IDP Camp

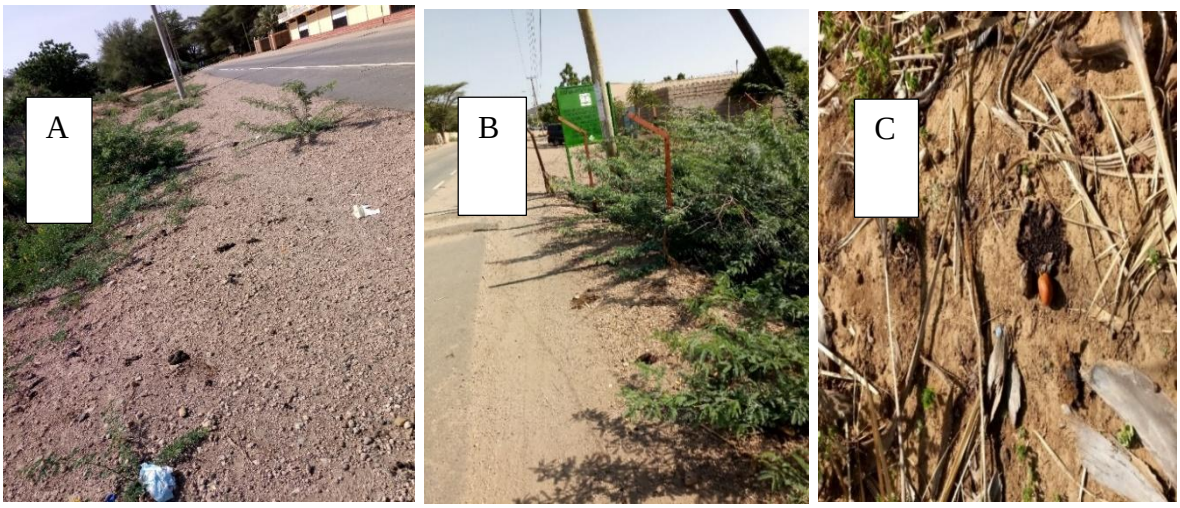


2. Plate 4.2: Plate A, B and C showing the nature of the latrines in Kanan IDP Camp

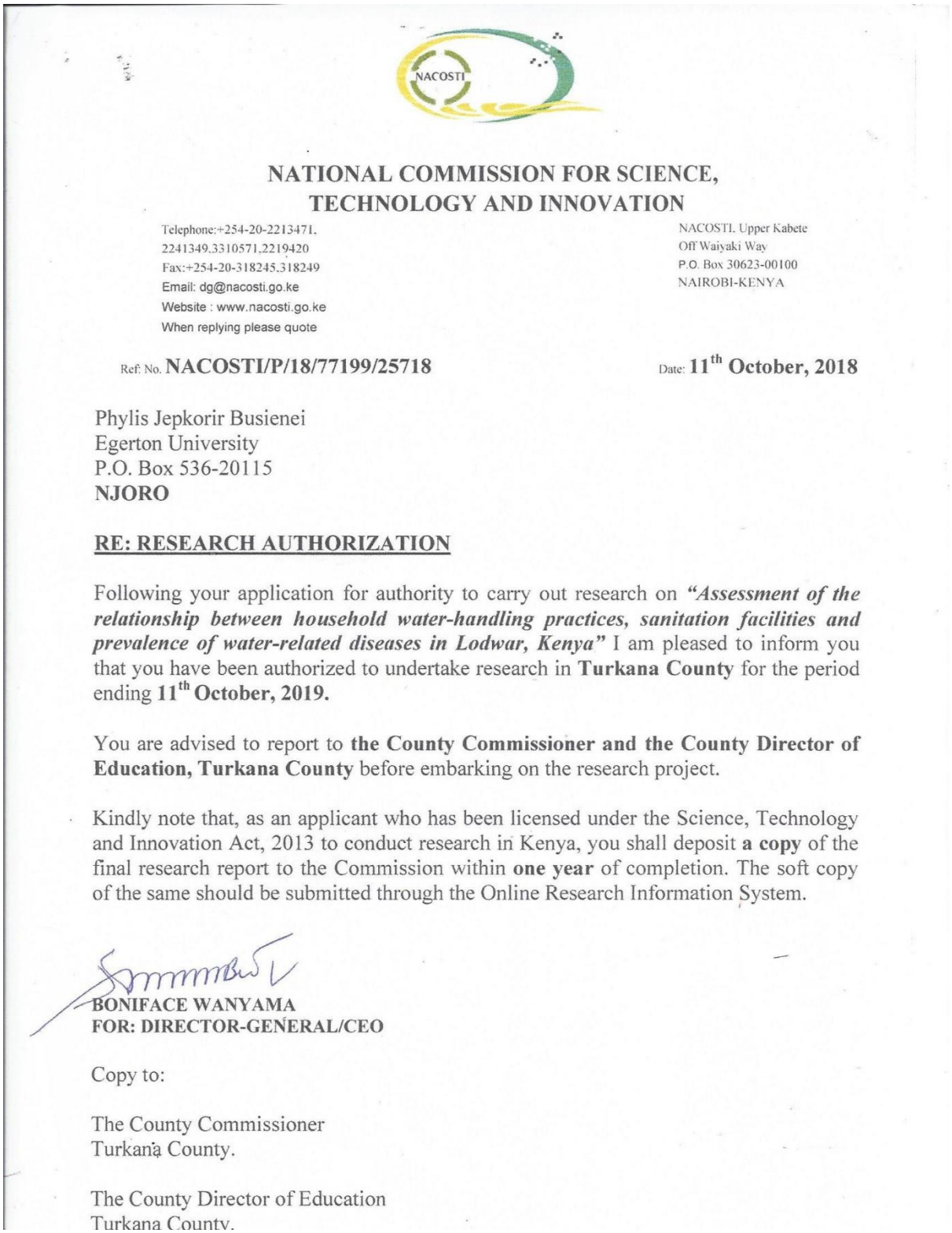
3. Plate 4.3: Plate A & B showing common OD hotspots along R. Turkwel and Plate B showing children fetching water from R. Turkwel just along the bushes (Plate A) which is a major OD hotspot



4. Plate 4.4: Plate A & B showing OD hotspots along Lodwar's major highway plate C showing Lodwar's arboretum (Town's major OD hotspot)



APPENDIX 6: RESEARCH AUTHORIZATION



NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/77199/25718**

Date: **11th October, 2018**

Phylis Jepkorir Busienei
Egerton University
P.O. Box 536-20115
NJORO

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Assessment of the relationship between household water-handling practices, sanitation facilities and prevalence of water-related diseases in Lodwar, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Turkana County** for the period ending **11th October, 2019.**

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

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

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Turkana County.

The County Director of Education
Turkana County.