DETERMINANTS OF LATRINE QUALITY IN PRIMARY SCHOOLS IN TRANSNZOIA COUNTY KENYA: THE CASE OF HEALTHY ENVIRONMENTAL CHILDREN ALLIANCE PROGRAM

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APRIL, 2017
DECLARATION

This thesis is my original work and has not been presented for a degree or other award in any other University.

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DEDICATION

This dissertation is dedicated to my family and specifically to my daughter Wangui, my wife Lydia, my parents and siblings Alice, Sophie and Jeff.
ACKNOWLEDGEMENT

I would like to acknowledge the following people and institutions for their contribution towards the completion of this dissertation and without whose help this work would not have been possible. First I would like to acknowledge the almighty God, without His grace and providence none of this would have been possible.

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# TABLE OF CONTENTS

DECLARATION ................................................................................................................... ii
DEDICATION .................................................................................................................... iii
ACKNOWLEDGEMENT ...................................................................................................... iv
TABLE OF CONTENTS ...................................................................................................... v
LIST OF TABLES ............................................................................................................... ix
LIST OF FIGURES ............................................................................................................ x
ABBREVIATIONS AND ACRONYMS ............................................................................. xi
DEFINITION OF TERMS ................................................................................................. xii
ABSTRACT ......................................................................................................................... xiv

## CHAPTER ONE: INTRODUCTION ................................................................................. 1

1.1 Background to the Study ......................................................................................... 1
1.2 Problem Statement .................................................................................................... 4
1.3 Justification of the Study ......................................................................................... 5
1.4 Research Questions .................................................................................................. 6
1.5 Hypothesis ................................................................................................................ 7
1.6 Objectives ................................................................................................................. 7
1.7 Significance of the Study ......................................................................................... 7
1.8 Study Assumptions and Limitations ....................................................................... 8
1.9 Conceptual Framework ............................................................................................ 10

## CHAPTER TWO: LITERATURE REVIEW .................................................................. 11

2.0 Introduction ............................................................................................................. 11
2.1.1 Sanitation coverage ............................................................................................ 11
2.1.2 Latrine quality .................................................................................................... 12
2.1.3 Importance of quality latrines .......................................................................... 13
2.2 HECA program strategy and other Strategies adopted do deal with sanitation problem globally........................................................................................................... 15
2.3 Teachers role in sanitation improvement .................................................................. 17
2.4 Environmental issues affecting latrine construction ................................................. 18
2.5 Diseases related to poor sanitation ......................................................................... 19
2.5.1 Health Problems as a result faecal oral contamination ........................................19
2.5.2 Health Problems Due To Soil Contamination .....................................................20
2.6 Types of latrines in developing world .................................................................21
2.6.1 Earthworm Toilets ...........................................................................................19
2.6.2 The Sulabh Toilet ............................................................................................19
2.6.3 Bucket Latrine .................................................................................................19
2.6.4 Ventilated improved pit ....................................................................................22

CHAPTER THREE: MATERIALS AND METHODS .........................................................24
3.1 Introduction ............................................................................................................24
3.2 Study Design .........................................................................................................24
3.3 Study Area ............................................................................................................24
3.4 Study Population ...................................................................................................25
3.4.1 Inclusion criteria ...............................................................................................26
3.4.2 Exclusion criteria ...............................................................................................26
3.5 Study Variables .....................................................................................................26
3.5.1 Scoring of quality parameters .........................................................................28
3.5.2 Latrine adequacy ..............................................................................................28
3.5.3 Structure of the latrine ......................................................................................28
3.5.4 Accessibility and Privacy ..................................................................................30
3.5.5 Cleanliness ........................................................................................................31
3.5.6 Hand washing facilities ....................................................................................31
3.5.7 Independent Variables ......................................................................................31
3.6 pre-testing of tools ...............................................................................................33
3.7 Sample Size Determination ..................................................................................33
3.8 Sampling ................................................................................................................34
3.9 Validity and Reliability of the study .....................................................................36
3.9.1 Validity ...............................................................................................................36
3.9.2 Reliability ..........................................................................................................37
3.10 Data collection .....................................................................................................37
3.10.1 Questionnaire ..................................................................................................37
3.10.2 Checklist. .........................................................................................................37
3.10.3 Additional data measurement instrument ........................................... 38
3.11 Data collection method ........................................................................... 38
3.12 Data processing and analysis ................................................................. 38
3.13 Ethical considerations ............................................................................. 39

CHAPTER FOUR: RESULTS............................................................................. 40
4.1 Introduction ............................................................................................... 40
4.2 Social demographic characteristics of the study population ....................... 40
4.3 Quality of latrines..................................................................................... 42
4.4 Comparison between HECA participating and Non HECA participating schools . 42
  4.4.1 Latrine adequacy ................................................................................. 43
  4.4.2 Latrine structure ................................................................................. 44
  4.4.3 Latrine privacy and accessibility ............................................................. 46
  4.4.4 Hand washing facilities ....................................................................... 49
  4.4.5 Sanitary cleanliness ............................................................................. 52
4.5 Teachers’ related determinants affecting the quality of latrines................... 54
4.6 Environmental related determinants affecting the quality of latrines .......... 57

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS. 60
5.1 Discussion .................................................................................................. 60
  5.1.1 Latrine quality ..................................................................................... 60
  5.1.2 Difference between HECA participating schools and HECA non-participating schools ................................................................. 61
  5.1.3 Association between teachers’ related factors and quality of latrines ... 62
  5.1.4 Association between environmental factors and quality of latrines ... 63
5.2 Conclusions ................................................................................................ 64
5.3 Recommendation ....................................................................................... 64
5.4 Further research ........................................................................................ 65

REFERENCES ................................................................................................ 66

APPENDICES .................................................................................................. 72
Appendix: I Consent form ............................................................................. 72
Appendix II: Questionnaire ............................................................................ 75
Appendix III Checklist .................................................................................................................................................. 85
Appendix IV Budget ..................................................................................................................................................... 89
Appendix V Map .......................................................................................................................................................... 90
Appendix VI Work plan ............................................................................................................................................... 91
LIST OF TABLES

Table 3.1: Dependant variables ........................................................................................................27
Table 3.2: Primary schools and teachers sampled ........................................................................36
Table 4.1: Social demographic characteristics of the study respondents ................................41
Table 4.2: Latrine adequacy in Transnzoia East Sub County ......................................................44
Table 4.3: Teachers' related attributes affecting latrine quality ................................................57
Table 4.4: Environmental factors affecting latrine quality ..........................................................59
LIST OF FIGURES

Fig 1.1 Conceptual Framework ........................................................................................................9

Figure 3.1 Map of Transnzoia East ..................................................................................................25

Figure 4.1 Distribution of latrine quality in schools.........................................................................43

Figure 4.2: Availability of Coverage for the Latrine Hole .................................................................45

Figure 4.3: Availability of Vent Pipes in School Latrines .................................................................46

Figure 4.4: Complete latrine separation between boys and girls latrine. .......................................47

Figure 4.5: Latrine Doors Lock-ability by School Type. .................................................................48

Figure 4.6: Latrines with acceptable size of hole..............................................................................49

Figure 4.7: Availability of Hand-washing basin or tap in boys latrines ..........................................50

Figure 4.8: Availability of Hand-washing basin or tap in girls latrines ..........................................51

Figure 4.9: Availability of soap for hand washing ............................................................................52

Figure 4.10: Level of Latrine cleanliness .........................................................................................53
# ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>CEH</td>
<td>Children Environmental Health Issues.</td>
</tr>
<tr>
<td>DSHCO</td>
<td>Sub county School Health Co-ordinator.</td>
</tr>
<tr>
<td>FRESH</td>
<td>Focusing Resources on Effective School Health.</td>
</tr>
<tr>
<td>FPE</td>
<td>Free Primary Education.</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product.</td>
</tr>
<tr>
<td>HECA</td>
<td>Healthy Environment for Children Alliance</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus.</td>
</tr>
<tr>
<td>JICA</td>
<td>Japan International Co-operation Agency.</td>
</tr>
<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation.</td>
</tr>
<tr>
<td>MDGS</td>
<td>Millennium Development Goals.</td>
</tr>
<tr>
<td>MOD</td>
<td>Ministry of Devolution.</td>
</tr>
<tr>
<td>MOE</td>
<td>Ministry of Education.</td>
</tr>
<tr>
<td>MOLG</td>
<td>Ministry of Local Government.</td>
</tr>
<tr>
<td>MOPHS</td>
<td>Ministry of Public Health and Sanitation.</td>
</tr>
<tr>
<td>PTA</td>
<td>Parents Teachers Association.</td>
</tr>
<tr>
<td>SHN</td>
<td>School Health and Nutrition.</td>
</tr>
<tr>
<td>WASH</td>
<td>Water Sanitation and Hygiene.</td>
</tr>
<tr>
<td>WFP</td>
<td>World Food Programme.</td>
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<td>WHO</td>
<td>World Health Organisation.</td>
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DEFINITION OF TERMS

Environmental determinants
In this study environmental determinants referred to the physical environment including, the land size allocated to sanitation, soil structure and resources available locally for latrine facilities development.

Functional Hand washing facility
In this study a hand washing facility was interpreted to mean a container with soap, water and a tap for hand washing.

Latrine
In this study a latrine was interpreted to mean a human excreta disposal pit that separates the pupils from their waste and that it’s secure and provides adequate privacy for the pupils use.

Latrine adequacy
In this study latrine adequacy referred to the ratio of latrine to pupils as guided by the national school health policy.

Latrine quality
In this study latrine quality referred to the outlook and general usability of the toilet as indicated by the cleanliness of the latrine area, the type of wall, floor and roofing of the latrine, the cleanliness of the latrine at the time of inspection, privacy of the latrine, availability of the hand washing facilities,
separation of the latrines and hand washing between the ECDs and the main primary school pupils and the ratio of hand washing facilities to the latrines.

**Sanitation**

In this study sanitation referred to the disposal of excreta to either simple pit latrines or ventilated improved latrines.

**Teacher’s determinants**

In this study teacher’s determinants referred to the teacher’s knowledge of the school health policy, teacher’s knowledge of the environmental conditions in the school affecting latrine quality and teacher’s contribution towards proper sanitation in schools.

**WASH infrastructure**

In this study a WASH infrastructure was interpreted to mean latrines and hand washing facilities in the primary schools.
ABSTRACT

Many developing countries including Kenya are struggling to provide proper sanitation to their population with most reporting less than 50 percent adequacy in sanitation. Different research works indicate sanitation is worse in schools compared to the general population despite the fact that schools hold a significant 26 percent proportion of the entire population. Provision of quality latrines in schools is critical in dealing with sanitation and health challenges. Healthy Environment for Children Alliance (HECA) program was rolled out in Transnzoia East Sub County with the aim of improving sanitation in the primary schools within the sub county by emphasising on community led school sanitation; however seven years after its roll out there had been no follow up study to find out its success or failures and hence the need for this study. Teachers were hypothesized to influence the latrine quality in schools due to their role in sanitation improvement as outlined in the national school health policy. The environment components were also studied to find out if they had significant influence in the quality of latrines in schools. A total of 301 teachers were sampled from 44 schools. These included schools that participated in the HECA program and those that did not. The head teacher from each school was sampled purposively while other teachers in the school were selected randomly. Questionnaires were used to collect quantitative data and qualitative data on teachers and environmental determinants affecting the latrine quality while a checklist was used to collect data on the quality of the latrines. The latrine quality was studied by looking at five major parameters which were latrine adequacy for pupils use, latrine structure, latrine privacy, availability of functional hand washing facilities and the cleanliness levels of the latrine. Results from the study indicated that there was no significant difference in latrine quality between schools that participated in the HECA program and those that did not participate (p value 0.280) except on the sub parameters; level of latrine fill up (p value 0.024), lockability of doors (p value 0.004) and accepted size of the latrine hole (p value <0.002).The HECA program failures were mainly attributed to lack of sustainability measures (52%) and lack institutionalization of the program (22%). Among the teachers and environmental related determinants found to be significant on the quality of latrines in schools included knowledge on the national school health policy (p value <0.026), availability of local building materials (p value <0.0466) and teachers practice (p value <0.008). This information from the study will be key in informing the decision makers and stakeholders on issues of improvement of latrine quality in the schools and on future HECA program implementation. Some of the main recommendations from the study include implementation of measures that ensure continuous training on the national school health policy; adequate sustainability of future HECA program by ensuring more teachers are trained and ensuring adequate inclusion of the school health clubs to the program.
CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Sanitation is described as the disposal of excreta (WHO, 2014). Sanitation facilities are further defined to include latrines, toilets and hand washing facilities (UNICEF, 2010). The national school health policy looks at school sanitation wholesomely by defining latrine quality based on the following parameters: latrine adequacy, latrine cleanliness, latrine privacy, latrine structures, latrine cleanliness and availability of hand washing facilities (MOE & MOH, 2009). The policy further defines the required parameters for each quality aspect as follows: latrine adequacy as a school with a latrine:pupil ratio of at least 1 latrine to 25 girls and 1 latrine to 30 boys; latrine privacy as that latrine that has a lockable door with each gender having their latrines completely isolated; latrine structure as that latrine that has a vent pipe, latrine hole cover and acceptable fill up levels; latrine cleanliness as both slab cleanliness and environmental cleanliness and finally defines a functional hand washing facility as that which has both water and soap for washing hands.

Each of this latrine quality parameters play a role in ensuring latrine utilisation for example a study by Njomo linked lack of latrine privacy to poor utilisation of the latrines and absenteeism by girls in Mwea (Njomo et al, 2007). While another study by Esrey and Potash linked inadequacy of latrines to poor utilisation (Esrey & Potash, 1990). The challenge of quality latrines is worse in the developing world as compared to the developed world with countries such as Denmark having a hundred percent latrine/toilet...
coverage as compared to Kenya’s twenty four percent (Stephen, 2007). On average, approximately twenty six percent of the population in Kenya is of school going age (KNBS, 2015). Despite this high population in schools, approximately half of the primary schools in the developing countries do not have access to sanitary latrines and clean water and thus exposing the pupils to the risk of acquiring diseases related to inadequate sanitation facilities (UNICEF, 2010).

Poor latrine utilisation as a result of poor latrine quality plays a major role in the transmission of water related diseases such as diarrhoea (Ngure, 2014). Diarrhoea can hinder child development by impeding the absorption of essential nutrients that are critical to the development of the mind, body and the immune system (Mullee & Kaushik, 2007). Research indicates that lack of access to proper sanitation also contributes to about 88% of deaths from diarrhoea related diseases (Prüss & Bos, 2008) or about 1.5 million child deaths each year (Mathekgana & Chauke, 2001).

To reduce the health challenges associated with inadequate sanitation in primary school the world health organization recommended the adoption of a strategy called “focusing resources on effective school health (FRESH)” whose main aim is to ensure coordinated school health activities (Nagpal, 2010). To domesticate this strategy, Kenya undertook to consolidate the many assorted documents that dealt with the issues of school health to develop one comprehensive document: the national school health policy (MOE & MOH, 2009). The national school health policy gave teachers the mandate to implement it by providing health education to the pupils related to the importance of sanitation and
mobilising the community members and other stakeholders to provide adequate resources for the development of latrines in schools (MOE & MOH, 2009).

The ministry of health rolled out the “Healthy Environment for Children Alliance program (HECA)” in 2006 with Transnzoia East sub county becoming the only beneficiary of the HECA Program in the country on a pilot basis (MOPHS, 2007). The purpose of the HECA program was to promote the development of sanitation facilities in schools through a community oriented approach (MOPHS, 2007). During its implementation the teachers took a lead role. They were trained and empowered financially to implement the program. The teachers were charged with the implementation of the HECA program by assisting in resource mobilization and linking the school sanitation development to the community (MOPHS, 2007). The program was piloted in ten primary schools in Ngonyek educational zone and on success was to be replicated later in other zones (MOH, 2006). It was important to study the success and challenges facing the HECA program before replicating it in other areas.

Studies such as Dzwairo & Hokohave linked the environment to latrine development. Dzwairo & Hokolinked environmental factors such as soil type and level of ground water to the types of latrine that could be built in the different areas. A number of environmental factors were incorporated into the study to identify if they had any effect on the latrine quality status in the schools.
1.2 Problem Statement

About 40% of the world’s population practices open defecation or lacks adequate sanitation facilities (UN, 2015). This leads to environment sanitation degradation and human health problems (Ashbolt, 2001). In schools, lack of adequate latrines or poor latrine quality has been noted to lead to pupils absenteeism of up to 10% and especially so the female pupils due to lack of privacy (Freeman & Muga, 2011). Lack of basic sanitation also indirectly inhibits the learning abilities of millions of school-age children who are infested with helminthes which are transmitted through inadequate sanitation facilities and poor hygiene (Samwel, 2009).

The HECA program was rolled out in Transnzoia East Sub County due to persistent high morbidity of water borne diseases as a pilot program in the country. Health data from the sub county indicates typhoid disease, diarrhoea cases and intestinal worms had been contributing to 25% in 2008, 26.5% in 2009, and 24% in 2010 of all reported morbidities within the Sub County with health facilities indicating that most of the cases had been reported from school going children (MOPHS, 2011). Seven years from the roll out of the HECA program, there had been no follow up study to find out if the program had had an effect on latrine quality. The focus of this study was to compare the HECA participating schools and Non HECA participating schools to ascertain if there was a significant difference in the schools latrine quality.

The environment components such as levels of water table and the soil structure are crucial in latrine establishment since poorly established latrines can lead to
undergroundwater contamination and collapse of latrines (Dzwairo & Hoko, 2006). Studies indicate that poorly constructed latrines contribute up to 27% of all ground water pollution in Africa (David, 2012). No studies on the environmental factors in relation to latrine quality were found to have been carried out in Transnzoia East Sub County. Poor knowledge on sanitation issues and poor attitude by the teachers has a direct negative effect on the sanitation level in the schools (Adhikari, 2008). The HECA program had a component of behaviour change among the teachers. No follow up has been done on the program thus it was key to study the teachers and find out their knowledge, attitude and practices.

1.3 Justification of the Study

Access to basic sanitation is not only a fundamental element of human rights but also an important factor in health, survival and growth of human beings (Kar, 2004). The Kenyan constitution under article 43 (b) also guarantees every Kenyan to reasonable standards of sanitation. The sustainable development goals also call for countries to achieve adequate and equitable sanitation and hygiene for all and end open defecation while paying special attention to the needs of women and girls and those in vulnerable situations by the year 2030 (UN, 2015).

It is important to note that school going children spend 70% of their active time in school and thus need to be protected from morbidity related to poor latrine quality (MOE, 2008). Proper latrine quality is crucial in ensuring pupils continuously and properly use latrines and thus reduced morbidity (Njomo et al, 2007). Different studies
have linked availing of adequate School latrine infrastructure in ensuring smooth learning in schools. For example a study in Kwale sub county associated school absenteeism with inadequate latrines in schools (p value <0.001) and further established that toilet use and hand washing are related to fewer absenteeism cases for pupils (p value <0.02) (Njuguna & Thuranira, 2008). Another study done in Kenya gave a significance association between latrine state and latrine usage in Kenya at a p value = 0.01 (Joshua & Saboori, 2013).

A Previous study by Adhikari linked teachers’ lack of knowledge on sanitation issues with poor sanitation levels in schools (Adhikari, 2008). It was thus important to study the knowledge of teachers in relation to sanitation issues as guided by the national school health policy, to understand if there were any gaps that would require to be addressed. The HECA program was implemented in Transnzoia East Sub County as a pilot program and thus it was important to establish the role it played in the improvement of the sanitation facilities.

### 1.4 Research Questions

This study was guided by the following research questions:

1. What is the difference in latrine quality between HECA piloted primary schools and HECA non-piloted primary schools in Transnzoia East sub county?

2. What are the teachers’ related determinants affecting the quality of latrines in public primary schools in Transnzoia East sub county?
3. What are the Environmental related determinants affecting the quality of latrines in public primary schools in Transnzoia East sub county?

1.5 Hypothesis

Participation in the HECA program, teachers and environmental related determinants are not associated with the latrine quality in public primary schools in Transnzoia East Sub County.

1.6 Objectives

The broad objective of this study was to determine the role of the HECA program, teachers and environmental factors to the quality of the latrines in public primary schools in Transnzoia East Sub County. The study was guided by the following specific objectives:

1. To compare the quality of latrines between HECA piloted areas and HECA non piloted areas in primary schools in Transnzoia East sub county.

2. To determine teachers’ related factors affecting the quality of latrines in public primary schools in Transnzoia East sub county.

3. To determine environmental related factors affecting the quality of latrines in public primary schools in Transnzoia East sub county.

1.7 Significance of the Study

Teacher’s knowledge on the national school health policy was found to be a significant factor affecting the quality of latrines in schools. This is important in planning for the
proper dissemination of the policy. Highlighting of the key issues identified in the HECA program implementation is equally important in informing future implementers of HECA and HECA replica programs. The study also contributes to the national efforts of ensuring sustainable sanitation interventions.

1.8 Study Assumptions and Limitations

The study assumed that the schools would be visited at almost the same time of the day and thus there was no time bias on the state of the latrine quality. The study also assumed that there would be no diffusion of knowledge from HECA piloted schools to non HECA piloted schools.

The study relied on checklist as the source of the quality of latrines data. The checklists were filled in by the interviewers and thus occasioning a risk of interviewer bias. The interviewers were trained in data collection methods in a bid to minimize this.
(Modified from (WSP & MOPHS, 2009)

Fig 1.1 conceptual framework
1.9 Conceptual Framework

The conceptual framework is a modification from the water and sanitation program framework that explains the effects of software components and the hardware components interactions to the sanitation programs in schools. The software component targets knowledge, attitude and practise towards the issue of sanitation while the hardware component targets physical structures that would affect sanitation for example land availability among others. For the case of this study the participation in the HECA program was supposed to have a positive effect on the software component i.e. the knowledge of national school health policy and also ensure that the teachers would have a good attitude towards sanitation in schools.

The HECA program trained the teachers to take charge of mobilising the resources from within the local community that would be channelled towards school latrine improvement. The study hypothesised that schools that participated in the HECA program would have teachers with more knowledge on sanitation and thus a better attitude which would see them mobilise more resources for latrine improvement and thus result in better quality latrines in the HECA schools as compared to the non-HECA participating schools. The hardware component is hypothesised in the study to affect the quality of latrine in that if the components were available for example adequate land size, we expect the latrine quality in the schools to be better. The hardware component in this focused on the environmental components that are: the availability of clean water for hand washing and the land size allocated to sanitation.
CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter looks at the magnitude of the sanitation problem globally, regionally, nationally and in Transnzoia East Sub County and the importance of addressing this problem. The chapter has also explained the HECA program and other strategies which are currently being utilised in school sanitation. The chapter has also explained why school teachers are important in tackling sanitation issues in schools and the influence of the environment on sanitation. The chapter has finally explained the latrine types that can be used in schools and the diseases related to sanitation.

2.1.1 Sanitation coverage

Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and faeces (Melosi, 2000). Generally, sanitation in the world is below standard with up to 2.4 billion people globally lacking proper sanitation (Elizabeth & steve, 2004). The sanitation problem is worst in sub Saharan Africa and south Asia where about 30% still open defecate while another 44% have unimproved latrines (WHO, 2014). Different studies indicate lower latrine coverage in schools as compared to the general latrine coverage in the same areas (WHO, 2008). A study in China for example revealed that despite a 59% improvement in general sanitation coverage, less than 10% of 15,000 rural schools had adequate latrine and hand-washing facilities (WHO, 2008). Recent research on the Kenyan situation indicates that approximately 27% urban and 32% rural Kenyans have access to private improved sanitation (UNICEF, 2010). In the urban areas an additional 51% of the population use shared
latrines while in the rural areas, open defecation was estimated to be still practised by 18% of the population (UNICEF, 2012). By the year 2012, sanitation coverage in Transzoia county stood at 24.2% with pit latrines leading as the main mode of waste disposal (81.2%) (MOD, 2013). There was no specific data on sanitation coverage in schools in Transnzoia County.

2.1.2 Latrine quality

Latrine quality is determined by a number of factors such as latrine to pupil ratio, privacy of the latrines, cleanliness of the latrines among others (Rutega, 1999). In Kenya, latrine coverage has always been grossly inadequate with an average of 30.5% urban population and 21.6% rural population having access to any form of latrine (KNBS, 2015) as opposed to the school health policy requirement of latrine to population ratio of 4 latrines for the first 30 boys/girls, the next 270 boys/girls to have a ratio of 1:30 boys/girls and 1:50 for the remaining boys/girls. At the same time, a third of the latrines for boys should be urinals (GOK, 2012). Universal free primary education was introduced in 2003 in Kenya leading to an increase in pupil enrolment from 5,900,000 in the year 2002 to 7,200,000 in the year 2003 and 8,200,000 in the year 2007 (KNBS & Macro, 2010). Transnzoia East sub county was also affected by the increase in enrolment with the number of pupils enrolled increasing from 39,869 in 2001 to about 54,880 in 2011 (MOE, 2011). This increase in the population of pupils in Kenyan schools was not commensurate with the increase in latrines in the schools leading to over strained latrine facilities in public schools (UNDP, 2006).
In Kenya, hand washing is low with research indicating that only 1 percent of pupils wash their hands with soap and water and about 28% wash their hands without soap (Mooijman & Snel, 2010). To improve sanitation in schools; provision of adequate latrines and hand washing facilities and health education on sanitation is key (Mooijman & Snel, 2010). In this study the focus was on the provision of ventilated improved latrines. Ventilated improved latrines had been recommended by the Transnzoia East Sub county Health Management Team in its annual operation plan (MOPHS, 2010).

2.1.3 Importance of quality latrines

School latrines are subject to high sanitation usage and thus making them potential zones for transmitting faecal related diseases with a positive association between a high number of latrine users to a low disease prevalence with odds ratio of 1.63 (Migele & Ombeki, 2007). Provision of quality latrines may lead to increased usage of the latrines among the school going children and this may lead to reduction of morbidity (Vernon & Lundblad, 2003). Studies have shown that adequate provision of latrines in schools has led to reduction of diarrhoea incidences by up to 36% (Esrey & Potash, 1990). More recent studies have also linked provision of adequate water and latrines in schools to upto 50% reduction in incidences of upper respiratory diseases (UNICEF, 2010). Washing hands with soap at the right times can reduce instances of diarrhoea by between 35 to 50 percent. Evidence also suggests that hand washing with soap can actually reduce acute respiratory infections by up to 30 percent (WSP & UNICEF & GOK, 2012). Provision of adequate latrine facilities also leads to reduction of health
problems such as renal problems caused by urine back flow and stress associated with 
an over stretched bladder (Migele & Ombeki, 2007).

Studies indicate that schools that have proper sanitation facilities attract and retain more 
students, particularly girls, as compared to those that have dilapidated sanitation 
facilities (Hutton & Haller, 2004). In Bangladesh for example, by establishing separate 
facilities for boys and girls; the class attendance increased by up to 11% (UNICEF, 
2000). Adequate latrines in schools have been estimated to assist in the gaining of up to 
194 million school days and this would lead to improved education standards (Freeman 
& Muga, 2011). Adequate latrines also ensure the rights to dignity and privacy for 
everybody especially school going girls (Rabie & Curtis, 2006).

Poor sanitation facilities have been associated with economic losses i.e. the direct costs 
of treating sanitation-related illnesses and income lost through reduced or lost 
productivity and time (Samwel, 2009). In India for example inadequate sanitation 
facilities caused India considerable economic losses equivalent to 6.4 % of India’s GDP 
in the year 2006 at US$53.8 billion (Christian & Bartram, 2012). According to the 
World Health Organization, there are a number economic benefits in that for every $1 
invested in water and sanitation; there is an economic return of between $3 and $34 
(WHO, 2010). In south Asia, Improved sanitation brought multiple economic benefits, 
which included: direct economic benefits of avoiding illnesses i.e. the amount of money 
that is saved from healthcare expenses; indirect economic benefits, which included a
decrease in work days lost to illness, a longer lifespan; non-health benefits such as time, and up to 10% increase in female literacy (Hutton & Haller, 2004).

2.2 HECA program strategy and other Strategies adopted do deal with sanitation

problem globally

Globally Schools provide an important avenue for promoting health because through schools we are able to reach over 1 billion children (Mooijman & Snel, 2010). In Kenya 42% of the population is under the age of 15 years (KNBS & Macro, 2010) and thus targeting the primary school is a good opportunity to bring awareness to a large group of people (Nagpal, 2010). Schools also provide good unique opportunities for passing information as they bring large groups of people together for learning purposes and usually have systems for dissemination of health educational material (Schaap & Steenbergen, 2001). Schools usually provide unique systems for production and dissemination of educational material to the community.

A number of strategies have been identified by the World Health Organisation that could create an impact on improving sanitation in schools and they include creating stronger institutions to deal with sanitation, additional of resources, training more people on appropriate hygiene education, having better legislation and making political commitments to support improvement in access and quality of sanitation and hygiene services (WHO, 2010). It is also important to support small-scale entrepreneurs to ensure the society has financial ability to sustain proper sanitation (WHO, 2010). In
Pakistan for example, the empowerment of women to support sanitation in schools led to a great improvement in the sanitation status (Bakhteari & Schuringa, 1992).

There is also need to ensure that there is linkage among stakeholders in dealing with the sanitation problem in schools. For example the linkage between teachers and health workers in provision of health services in schools was very successful in Bangladesh. It improved from 42% to 56% between 2002 to 2005 (Rudan & Liu, 2013). In Kenya this “linkage” strategy has been implemented in a number of projects with great success: for example a pilot project in Mwea in which linkage between teachers and health workers was initiated, where teachers were trained by health workers to administer anti-helminths to de-worm all the school children resulting in a great increase in the number of dewormed pupils (Njomo et al, 2007). Another strategy “active student participation” through child to child, child to community has also given great results in the improvement of general sanitation (UNICEF, 2009). A good example of this is in Baijalpur village in Kapilvastu Nepal South Asia where school children led the community sanitation latrine drive (Mooijman & Snel, 2010). Before the intervention, in 2005, south Asia had only 39% of the population having access to a toilet while today every home in the village has a latrine (Mooijman & Snel, 2010). In Nepal India the active student strategy under the school led total sanitation program led to a 20% upscale of school latrines (Adhikari, 2008). In Kenya this strategy has been tried in Kwale Sub County with positive results reported (Kar, 2004).
FRESH (Focusing Resources on Effective School Health) as a strategy has been implemented successfully in many parts of the world for example in Namibia under the behavioural and attitudinal changes by gender project (Hutton & Haller, 2004). In Kenya the use of the FRESH strategy has been emphasised. The strategy entails integrating the four main pillars which are: health related policies, skills-based health education, WASH, and school health services (MOE & MOH, 2009). The HECA program is a good example of local implementation of the FRESH strategy. This study focused on the water and sanitation pillar of the FRESH strategy in Transnzoia East public primary schools, where the teachers were tasked with spearheading the improvement of sanitation facilities. The program entailed teaching the community, pupils and teachers on hygiene and triggering them to ensure that water and sanitation infrastructure was set to standard by encouraging network between the school and the community. The community would assist in ensuring that the infrastructure in schools was provided and maintained.

2.3 Teachers role in sanitation improvement

After the family, the school is the next most important place of learning for children (Njomo et al, 2007). A sanitation program is only feasible if the school's management and teachers are committed to its implementation (Njomo et al, 2007). To ensure full support by the teachers, they must be fully informed and involved in all the programmatic steps being taken (MOE & MOH, 2009). They should also be included as members of the school hygiene committee (Snel, 2002). Specifically, teachers roles include; being role models by giving high priority to hygiene and sanitation in the
school, making and using sanitation educational materials within the class, monitoring and evaluating whether or not students have been equipped with sanitation oriented education, assisting health clubs in making annual work plans, conducting health inspection parades, inspecting the cleanliness of the sanitation facilities and the school compound, conducting on-the-spot correction of unsanitary practices and stimulating development, use and maintenance of sanitary facilities within the school (Christian & Thanh, 2012). In order for the teachers to be able to perform the above functions they should be familiar with the school health policy and thus the reason why the component of knowledge about the school health policy was incorporated into the study.

2.4 Environmental issues affecting latrine construction

Existing environment conditions affect the selection and design of the latrine (Chindwi & Jali, 2003). The following are some factors that should be taken into consideration when designing and constructing a latrine; self-supporting properties of the soil against collapse, depth of excavation possible i.e. this is influenced by shallow water tables and shallow restrictive layer such as bedrock and the infiltration rate i.e. if the soil has low-permeability rate (Chindwi & Jali, 2003). Other factors that should be considered include ground water pollution risk, storm water drainage and prevailing climatic conditions such as rainfall (Dzwairo & Hoko, 2006). This study hypothesised the effects of the environmental factors such as availability of local building materials and availability of adequate land in regard to the latrine quality.
It’s however important to note that latrines pose a major environmental concern since the Latrine leachate has been noted to increase ground water contamination (Mariwah & Olof, 2011). This poses a delicate balance challenge as countries try to achieve the millennium development goals on adequate sanitation and also protect the ground water as it is a main water source in the world (Yirsaw & Endale, 2012).

2.5 Diseases related to poor sanitation

Poor sanitation and water borne diseases are the cause of high morbidity especially in developing countries (Kinniburgh, 2001). For example, every year, an estimated 2.8 million cases of cholera and about 91 000 deaths occur in the developing world as compared to 87 000 cases and 2500 deaths occurring in the developed countries (Manna & Deen, 2008). About 1.5 billion people suffer from parasitic worm infections stemming from poor disposal of human excreta and solid wastes in the environment which could be associated with poor latrine infrastructure (Simpson, 1998). Notably, the bulk of these cases are in Africa and Asia (Dzwairo & Hoko, 2006). These diseases can be further categorised as explained below.

2.5.1 Health Problems as a result faecal oral contamination.

Low latrine adequacy leads to low latrine utilisation leading to a number of diseases many of them being transmitted by the faecal-oral route (Cairncross & Vivian, 2006). Diseases transmitted via the faecal-oral route include typhoid, poliomyelitis and bacillary dysentery while intestinal helminths such as *Ascaris lumbricoides* and *Trichuris trichiura* are also transmitted via the faecal oral route (Kilama & Winblad, 1985).
Faecal-oral route infection happens where the pathogens are transmitted from the faeces to the mouth via contaminated food and drink (Werner, Thuman, & Maxwell, 2011). Helminths such as *Ascaris lumbricoides* are associated with abdominal discomfort and intestinal ulcers and diseases such as Loffler’s syndrome while *Enterobius vermicularis* lead to itchiness of the anus resulting in impairment of learning and also absenteeism and consequently poor school performance (Vernon & Lundblad, 2003). Recent studies document higher rates of infections, gastrointestinal, neuro-cognitive and psychological illnesses where school children were exposed to inadequate water and sanitation facilities with the availability of adequate water and sanitation facilities being a significant factor at a p value = 0.003 to the morbidity of gastrointestinal diseases (Christian & Thanh, 2012). In Transnzoia East, typhoid and amoeba infections accounted for 29% of all the reported morbidities in the 2009 (MOPHS, 2010).

### 2.5.2 Health Problems Due To Soil Contamination

Inadequate latrine coverage may lead to poor excreta disposal which has been associated with the increase in morbidity of bilharzias and hook worm (Morgan p, 2000). About 238 million people were infected by bilharzias in the year 2010; 85% of these living in Africa while the rest in the Caribbean and Asia (Vernon & Lundblad, 2003).

The hookworm is classified as a soil transmitted helminth since it needs to spend time developing outside the host in the soil before the larvae reaches the infective stage. During this stage the egg hatches usually within 24 hours. The first stage larva lives in a
mixture of faeces and soil feeding on faecal bacteria. It moults to a second stage larva, which also feeds on bacteria. The third stage is the infective larvae. It does not feed, but searches for a human host to penetrate (Logan, 2009). Human infection occurs from contact with contaminated soil (Werner, Thuman, & Maxwell, 2011). Hook worm infection in a child may lead to iron deficiency and this may result in anaemia (Vernon & Lundblad, 2003). A study in Bangladesh indicated significant association between the prevalence of worms among school going children and the provision of adequate latrines at a p value of 0.004 (Kinniburgh, 2001).

2.6 Types of latrines in the developing world

There are different types of toilets in the developing world ranging from the traditional and insanitary pit latrines to advanced flush toilets depending on the locations access to electricity, water and sanitation services and the environmental conditions (UNICEF, 2009). Some of the common latrine types include:

2.6.1 Earthworm Toilets

These toilets have unique use of both earthworm and aerobic bacteria that compost the human excreta. The human waste is decomposed into limited odour loam. Its main advantage is that it has limited odour while its main disadvantage is that it is quite expensive to maintain (Kilama & Winblad, 1985).
2.6.2 The Sulabh Toilet

The Sulabh toilet is a squat toilet that uses a 2 pit system. When the first pit in use is full, the flow is diverted to the second pit and the filled up pit should be dislodged after 1.5 to 2-year rest period. The first pit can then be put to reuse when the second pit fills up minimizing both odour and water waste (Janine, 2011). Its main advantages are that it requires less water to flush and that it eliminates mosquitoes, fly breeding, and minimizes odour due to the enclosed and detachable pan (David, 2012).

2.6.3 Bucket latrine

A bucket latrine consists of a shelter, slab and platform enclosing a bucket. Operating a bucket latrine involves emptying the bucket every one to three days, carting the excreta to a disposal site and usually burying it. The bucket latrine has an advantage in that it’s a latrine that can be used in areas with a high water table. Its main problem is its strong odour (Winblad and Kilama, 1985).

2.6.4 Ventilated improved pit

The ventilated improved latrine is a modified pit latrine in which a vent pipe is fitted to the pit and fly screen fitted at the top of the pipe. Its main advantages as compared to the ordinary pit latrine is that it’s able to deal with flies and the odour nuisance i.e. the smell is carried upwards by the chimney effect and flies are prevented from leaving the pit and spreading disease (Tiley E et al, 2014). The working mechanism in VIP latrines is the action of wind blowing across the top of the vent creating a strong circulation of air through the super structure and down through the squat hole out vent pipe and thus
leaving the super structure odour free (David, 2012). The fly screen prevents flies from entering through the vent pipes while those which enter the pit via the squat hole are attracted towards the light at the top of the vent pipe but are not able to escape since there is a fly screen. Eventually the flies die and fall back into the pit (David, 2012).

In this study the focus was on the provision of ventilated improved latrines (VIP latrines). This is because the sub county annual plan has emphasised on provision of VIP latrines over the years (MOPHS, 2010). Some of the advantages of the VIP latrine include: They do not require water so are appropriate in areas where there is inadequate water supply, VIP latrines avoid contamination of the surface water and top soil if properly installed and maintained, VIP latrines can be constructed with minimum cost using local material and local skills and that if the VIP latrine is made with properly constructed slabs, it will allow easy cleaning and avoid flies, foul smell and unsightliness (Melosi, 2000).
CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction
This chapter presents the study area, study design and methodology, data collection techniques, data analysis, criteria for interpretation of results and ethical considerations applied in the study.

3.2 Study Design
This was a descriptive cross-sectional study seeking to establish environment and teachers determinants affecting the latrine quality in public primary schools in Transnzoia East Sub County. This study design was carried out to ensure that the results would not be influenced by the time factor.

3.3 Study Area
This study was carried out in Transnzoia East Sub County. The sub county is located in the larger Transnzoia County, Rift Valley province in Kenya. Water catchment in the region is mainly from the Cherangany hills. It has five educational zones namely Makutano, Ngonyek, Kipsaina, Kachibora and Chepsiro. The Sub County which has a population of 210,289 (KNBS, 2011) also has a relatively good number of key infrastructures including 14 government health facilities (MOPHS, 2011). It also has 120 primary schools with a population of about 54,880 pupils (DEO records, 2011) and 238 early child development Centres with about 12,173 ECD pupils (DEO, 2011). The study area comprised mainly soils and rocks of the Pre-Cambrian basement system,
quartzite, schist’s, black cotton soils, the tertiary lavas of Mt. Elgon volcanics and the lateritic (Namwamba, 2012).

![Map of Transnzoia East](image)

**Figure 3.1 Map of Transnzoia East**

### 3.4 Study Population

The study population were teachers in public primary schools in Transnzoia East Sub County. They were a total of 1370 teachers in the sub county at the time of study (DEO, 2011). To check on the quality of latrines a sample was obtained as explained in the sampling from the study population of 120 schools.
3.4.1 Inclusion criteria

The study included the head teacher and other teachers who had been in the public primary school for more than a year. The head teachers were sampled purposively due to their lead role in latrine infrastructure development while other teachers were interviewed due to their role in health education concerning sanitation and their role in mobilizing the community to participate in latrine infrastructure development. In each school, a specific number of teachers were sampled randomly as explained in the sampling methodology. The public primary schools included in the study were those that were in existence before 2006 the year when HECA was initiated.

3.4.2 Exclusion criteria

All private primary schools and public primary schools established after 2006 were excluded from the study. The study also excluded teachers who had been in the public primary school for less than a year. The head teachers who were less than a year old in the school were also excluded and their deputy teachers who met the inclusion criteria were instead interviewed.

3.5 Study Variables

Dependent Variables

The dependent variable in this study was quality of the latrines in primary schools in Transnzoia East Sub County. Five main parameters were used to determine the latrine quality i.e. the latrine adequacy, the latrine structure, the latrine privacy and the latrine cleanliness. Each parameter was given a weight and score awarded as explained from
3.5.1. The summary of how quality of latrine was scored is summarised in the table below. The scoring of the latrines was done by the researcher guided by the different government policies for example; adequacy was guided by the national school health policy while latrine structure was guided by the annual operation plan.

<table>
<thead>
<tr>
<th>Main Parameter</th>
<th>sub parameters</th>
<th>max scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Latrine Adequacy</td>
<td>Latrine to pupils ratio</td>
<td>25%</td>
</tr>
<tr>
<td>2. Latrine Structure</td>
<td>Covering of latrine hole</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Acceptable Fill up level</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Availability of Vent pipe</td>
<td>10%</td>
</tr>
<tr>
<td>3. Latrine Privacy &amp; Accessibility</td>
<td>Lock ability of doors</td>
<td>2.5%</td>
</tr>
<tr>
<td></td>
<td>Complete separation of boys from girls latrine</td>
<td>2.5%</td>
</tr>
<tr>
<td></td>
<td>Acceptable size of latrine</td>
<td>5%</td>
</tr>
<tr>
<td>4. Latrine Cleanliness</td>
<td>Environmental cleanliness</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Slab cleanliness</td>
<td>12%</td>
</tr>
<tr>
<td>5. Hand washing Facilities.</td>
<td>Functional hand washing facility</td>
<td>12.5%</td>
</tr>
<tr>
<td></td>
<td>Availability of soap</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

**TOTAL** 100%
3.5.1 Scoring of quality parameters

The weights were designed by the researcher based on the sub county priorities in school sanitation as was contained in the annual operation plan six (MOPHS 2010). Latrine adequacy and good structures were given top priority within the sub county plan indicating it hoped to give the two factors 50 percent of her efforts and thus each factor was given a 25% maximum score. The availability of hand washing facilities with soap and latrine cleanliness were to be given a maximum of 20% in priority each with latrine privacy getting 10%. The detailed explanation of the scoring is explained below. Latrines that scored a total of 60% and above were deemed to be quality while those that scored 59% and below were deemed not to be of quality.

3.5.2 Latrine adequacy

The national school health policy requires one latrine to be shared by a maximum of 25 girls or a maximum of at least 30 boys. A maximum weight of 25% was awarded to this parameter. Those schools with a ratio of at least 1 latrine: 25 girls and 1 latrine to 30 boys were classified as adequate while those with greater ratio than that were classified as having inadequate latrines. This parameter was studied by actual counting of latrines functional at the time of inspection and comparing that with the school pupil’s enrolment data from the office.

3.5.3 Structure of the latrine

The latrine structure is important in ensuring maximum usage of the latrine (water aid, 2011). The researcher identified three parameters in the study of the structure and
awarded scores based on priorities as contained in the UNICEF technical guidelines for the construction and management of latrines (UNICEF, 2009). The covering of the latrine was awarded a maximum of 5%. The total number of latrines with pit covers at the time of inspection against the total number of latrines. The school that had covers for all its latrines scored the maximum 5%; this was done through observation.

The level of latrine fill up was also studied with a maximum score of 10% being awarded. The Public Health Act Cap 242 Section 118(K) requires that all latrines should be at an acceptable fill up rate so that users may be comfortable using them. In this study the standard was set up at 3 metres from fill up, in line with technical guidelines issued by UNICEF on latrine construction (UNICEF, 2009). To study this, the researcher used a calibrated stick and recorded the status. In case the school latrines had more than one pit, a percentage was calculated. A school with all latrine pits having a fill up of below 3 metres scored the maximum 10%.

Availability of vent pipes in latrines was also studied with a maximum score of 10% being awarded. A percentage was calculated i.e. the total number of latrines with vent pipes at the time of inspection against the total number of latrines. A school that had vent pipes on all its latrines scored the maximum 10%. This parameter was studied by observing and actual counting of latrines with vent pipes.
3.5.4 Accessibility and Privacy

The National school health policy requires all the school latrines be lockable from inside to ensure maximum privacy (MOE & MOH, 2009). This has however been difficult to achieve due to the continuous destruction of the locks by the pupils (Irene, 1999). After consultation with the sub county medical officer of health, a school with at least 80% percent of its doors lockable was scored as having lockable doors and was awarded the maximum score of 2.5% while those below 80% were awarded 0%. This parameter was studied by actual counting of latrines with lockable doors.

Complete separation of boys and girls latrines was also studied with a maximum score of 2.5% being awarded. The school health policy requires that boys’ latrines be built away from the girls’ latrines. Schools that observed this scored a maximum of 2.5%. This was done through observation using a checklist.

The National school health policy requires that latrines should be built in a child friendly way to ensure its usability and this is done by ensuring that the latrine hole is not too small or too big. Based on the technical guidelines issued by UNICEF the latrine diameter was set at 200mm and this was measured using a standard stick and recorded. A maximum score of 5% was awarded to a school which had an acceptable size of latrine hole in all its latrines, while 0% was awarded to a school which had any of its latrines without the acceptable latrine hole size.
3.5.5 Cleanliness

The environmental sanitation of areas surrounding the latrines was studied with a maximum score of 8% being awarded. This was done through observation and scores being awarded. A school where all bush was cleared and all solid and liquid waste well managed was awarded a score of 8%. For every missing parameter 2% was deducted. Slab cleanliness was also studied with a maximum score of 12% being awarded. This was done by the researcher visiting each latrine and making observations. A score based on the percentage of the number of clean toilets (no faeces spotted on the slab) was awarded to a maximum of 12%.

3.5.6 Hand washing facilities

Functional hand washing in the study was set as availability of the hand washing facility that had water and any form of tap. In a school where this was found a score of 12.5% was awarded. In case the hand washing lacked water at the time of study no score was awarded, as the study was not longitudinal. In schools where soap for hand washing was available, an additional 7.5% score was awarded. However, if soap was available and no water for hand washing the school scored zero since the pupils could not wash their hands.

3.5.7 Independent Variables

The main independent variables for this study were teachers and environmental determinants affecting the quality of latrines in primary schools in Transnzoia East Sub County. Specifically, the study focused on: teachers’ knowledge on the National school
health policy, teachers’ knowledge on environmental determinants affecting the latrine quality, teachers’ attitude on sanitation issues in schools and teachers’ practice in the development of latrines in schools. On the teacher’s knowledge on school health policy, the teachers were asked questions on the policy and their answers were recorded in the questionnaires. A teacher who scored at least two questions out of the four on the National school health policy was categorised as having knowledge. To make observations on the teachers practice in regard to sanitation in schools, the following three parameters were studied: teaching of pupils on sanitation, supervisory visits to the latrines and mobilization of resources to develop latrines. A teacher who practiced at least two parameters was regarded as having good practice while where one or none of the parameters was practiced was classified as having poor practice.

The teachers were interviewed using questionnaires with questions prepared in line with the Kenya school health policy. Secondary data was also obtained from the school office. Participation in the HECA project was also included as an independent factor as it was deemed that it would affect the latrine quality in the participating schools since the project’s main target was to improve latrine infrastructure in the schools. The data on participation on HECA was obtained from the sub county public health office. The teachers were also asked during the interviews if they had participated in the HECA program. The type of soil was determined by asking the head teacher and confirming the same through visualization and touching to feel the soil texture. The adequacy of land was analysed by asking the teachers questions on the school plan. If a school had at least an acre reserved for future latrine expansion or had a space for an extra septic tank
construction (for urban schools) it was deemed to have adequate land. A scale was used to determine the ease of getting latrine building materials. During the interview the respondent would first answer on the materials readily available to construct a latrine for example timber or bricks and then a follow up question would be on the ease of getting the materials.

3.6 Pre-testing of tools

This was done to pre-test the study instruments. The tools were pre-tested in Kwanza zone of neighbouring Kwanza Sub County. Pre-testing was done to ensure that the required data would be captured, the questions were well framed and that the questions were in a systematic order. Twenty data tools were pre tested after which the data generated was analysed and amendment to the tools done.

3.7 Sample Size Determination

The sample size was determined by the Cochran (1963:75) formula to yield a representative sample for proportions (Särndal et al, 2003)

\[ n_0 = \frac{Z^2pq}{\epsilon^2} \]

Where

- \( n_0 \) is the sample size
- \( Z^2 \) is the abscissa of the normal curve that cuts off the area desired at 95% confidence level (The value for Z is found in statistical tables which contain the area under the normal curve.)
\( p \) = estimated proportion of teachers with standard required knowledge and practise on latrine quality enhancement. No previous study has been done on this and thus 0.5 was used as the p value.

\( q \) = is 1-p

\( e \) = is the desired level of precision (sampling error i.e. range in which the true value of the population is estimated to be) (5%)

\[
\begin{align*}
n_0 &= \frac{\left(1.96\right)^2 \times 0.5 \times 0.5}{0.05^2} \\
&= 384 \text{ teachers}
\end{align*}
\]

Since the number of teachers that fit the inclusion criteria was less than 10000, the finite population correction for proportions was applied.

\[
\begin{align*}
n &= \frac{n_0}{1 + \frac{n_0 - 1}{N}} \\
&= \frac{384}{1 + \frac{384 - 1}{1370}} \\
n &= 300.103
\end{align*}
\]

\( n = 301 \) Teachers

### 3.8 Sampling

The sample was determined using the cluster sampling technique. The teacher population was clustered into schools participating in the HECA program and those that were not participating. Samples were drawn from either cluster based on weighed proportions of 10.75% and 89.25% giving a sample of 33 and 267 teachers from schools
in HECA and non-HECA schools respectively. Schools participating in HECA were drawn from one educational zone while non-participating schools were drawn from all zones. As a result it was necessary to further cluster the non-participating schools and weigh them, with the weights assigned in respect to number of schools in each zone. The sample size of teachers to be interviewed from the selected schools was determined using weights.

\[ n_{ij} = \frac{N_{ij}n}{N} \]

Where \( n_{ij} \) is the sample size for sub-stratum \( j \) in stratum \( i \).

\( N_{ij} \) Is the total number of elements in sub-stratum \( j \) in stratum \( i \).

\( N \) Is the population size

\( n \) Is the assumed sample size

\( i \) Is stratum

\( j \) Is substratum in strata \( i \)

Using the weighted Cochran formula, correction for proportions and the 3-stage cluster sampling illustrated above, we obtained the school samples from each educational zone and the number of teachers who filled in questionnaires in each of the sampled schools is as shown in tables below. The three stage sampling involved first cluster sampling the schools to HECA piloted schools, the second stage involved sampling of the schools within the different zones while the third stage was sampling of the specific teachers in the schools. The schools and teachers to be included in the study were sampled using
the simple sampling methodology where the eligible schools and teachers were fed into a computer and the names randomly generated by the computer.

<table>
<thead>
<tr>
<th>Educational zone</th>
<th>Weights associated with schools</th>
<th>No of schools per zone</th>
<th>Teachers interviewed per school</th>
<th>Weights associated with teachers</th>
<th>Total number of teachers per zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chepsiro</td>
<td>0.228915</td>
<td>9</td>
<td>7</td>
<td>0.2131638</td>
<td>63</td>
</tr>
<tr>
<td>Kachibora</td>
<td>0.228915</td>
<td>9</td>
<td>7</td>
<td>0.2169035</td>
<td>63</td>
</tr>
<tr>
<td>Ngonyek</td>
<td>0.180722</td>
<td>7</td>
<td>9</td>
<td>0.2557965</td>
<td>63</td>
</tr>
<tr>
<td>Makutano</td>
<td>0.168674</td>
<td>6</td>
<td>6</td>
<td>0.1465968</td>
<td>36</td>
</tr>
<tr>
<td>Kipsaina</td>
<td>0.192771</td>
<td>7</td>
<td>6</td>
<td>0.1675392</td>
<td>42</td>
</tr>
<tr>
<td>HECA participating</td>
<td>-</td>
<td>6</td>
<td>6</td>
<td>0.1675392</td>
<td>36</td>
</tr>
</tbody>
</table>

A total of 44 head teachers from 44 schools were purposively interviewed due to the position they hold in improving latrine infrastructures. The other teachers were sampled randomly per school as outlined in the table above.

3.9 Validity and Reliability of the study

3.9.1 Validity

Validity deals with accuracy of the information collected by use of research tools. This was ensured by pre-testing the study instruments before undertaking the final study. The tools were pre tested and the data captured was analysed. Using the pre-testing
information, the tools were corrected to ensure that they would capture the intended data accurately.

### 3.9.2 Reliability

Reliability deals with consistency of measures. This was ensured by use of well-designed questionnaires and interview schedules. Proper scales were used in the measuring of all the attributes during the data collection and the same scales were used consistently in the whole study. For example, in measuring the latrine quality the attributes were given weights and those weights were used consistently. There was also proper selection, training and supervision of research assistants and daily monitoring and collection of completely filled questionnaires to ensure there were no gaps.

### 3.10 Data collection

#### 3.10.1 Questionnaire

A structured questionnaire was used to collect data from the teachers. The questionnaire had both closed and open ended questions that were administered by trained research assistants. The questionnaire had 3 sections which are: the social demographic section, the teacher’s determinants and environment determinants sections. A sample of the questionnaire has been attached in appendices.

#### 3.10.2 Checklist

A checklist was constructed based on the existing legal requirements as defined by the different laws such as the public health act cap 242 and the school health policy. The
checklist was used for visual assessment in all the 38 schools sampled that did not participate in HECA and the 6 that participated in HECA to collect data on status of water and sanitation facilities. The checklist provided a guide to record the quality of hand washing facilities and the quality of the latrines in the schools. A sample of the checklist has been attached as appendix three.

3.10.3 Additional data measurement instrument

A calibrated stick was used to check the level of latrine fill up before the figures were recorded in the checklist. The stick was calibrated in metres.

3.11 Data collection method

After sampling all the eligible schools and teachers as indicated in section 3.8, the research assistants introduced themselves to the respondents, sought consent from the respondents, assured them of their confidentiality and explained to them the importance of the research before administering the questionnaire. The research assistants did the actual recording of the answers from the respondent. The checklist on latrine quality was filled by actual observation. The quality of the latrines were observed and recorded as they were found to be in order to avoid any bias. The research assistant had also been trained to ensure that any observation bias was minimised.

3.12 Data processing and analysis

Once the research assistant had filled up the questionnaires and the checklist, data cleaning would be done before leaving the school. The statistical package for the social
sciences (SPSS) program version 19 was used for statistical analysis of the data. Chi square test was used to compare categorical variables between HECA participating against HECA non participating schools. All the \( p \) values are 2-tailed with the significance level set at 0.05. Qualitative data was summarized according to themes, to determine the quality of latrines in the schools five main parameters as studied, guided by the national school health policy requirement as explained in chapter 3.4. Latrines that scored 60% and above were deemed to be quality while those that scored 59% and below were deemed to be not of quality.

3.13 Ethical considerations

The study was performed under the protocol approved by the Graduate School of Kenyatta University, the Kenyatta University Ethical Review Committee and the National Council of Science and Technology (NCST). The Confidentiality of the participants was also strictly kept and their names did not appear in any questionnaire or in the report of the study. Each participant signed an informed consent form after being explained to the nature and purpose of the study.
CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter comprises the findings from the study. The findings include social demographic characteristics of the study population, assessment of the quality of latrines between HECA piloted and Non-HECA piloted schools, teachers’ and environmental related determinants affecting the quality of latrines in the schools. All the graphs had an error of 5% factored in (see the error bars).

4.2 Social demographic characteristics of the study population

The study analysis as shown in table 4.1 indicated that majority of the teachers that participated in the study were aged between 30-39 years (39.6%) while a few of the respondents were between the ages of 20-29 years (8.5%). The age distribution was statistically significant at a (p-value of <0.001). There was an insignificant statistical difference (p value <0.905) in the gender of respondents with the male taking up 49.5% and female 50.5%. Looking at the respondents marital status, majority of them were married (89.4%) and the marital status was statistically significant at (p value <0.001). The education level was also analysed with the majority of teachers (67.3%) having a certificate as the highest level of education. The distribution of the education level among the teachers was also statistically significant at the (p value of <0.001). Majority of the respondents were found to have served in the school for more than 15 years (33.8%) and also majority of the respondents had their children attending the same schools that they were teaching in (78.5%).
Table 4.1: Social demographic characteristics of the study respondents

Summary of the characteristics of teachers sampled as defined by their age group, gender, marital status, educational level, years served in school and if they had children attending the sampled school summarised into categories, frequencies and percentage

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Categories</th>
<th>Frequency</th>
<th>Percent</th>
<th>Test (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td></td>
<td>26</td>
<td>8.5%</td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td></td>
<td>119</td>
<td>39.6%</td>
<td>p value &lt;0.001</td>
</tr>
<tr>
<td>40-49</td>
<td></td>
<td>84</td>
<td>28.1%</td>
<td>df 3</td>
</tr>
<tr>
<td>50-59</td>
<td></td>
<td>71</td>
<td>23.8%</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>149</td>
<td>49.5%</td>
<td>p value &lt;0.905</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>151</td>
<td>50.5%</td>
<td>df 1</td>
</tr>
<tr>
<td>Marital status</td>
<td>Married</td>
<td>268</td>
<td>89.4%</td>
<td>p value &lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Single</td>
<td>31</td>
<td>10.2%</td>
<td>df 2</td>
</tr>
<tr>
<td></td>
<td>Windowed</td>
<td>1</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td>Certificates</td>
<td>202</td>
<td>67.3%</td>
<td>p value &lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Diplomas</td>
<td>61</td>
<td>20.3%</td>
<td>df 3</td>
</tr>
<tr>
<td></td>
<td>Degrees</td>
<td>32</td>
<td>10.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Masters and above</td>
<td>5</td>
<td>1.7%</td>
<td></td>
</tr>
<tr>
<td>Years served in the school</td>
<td>1-5 years</td>
<td>68</td>
<td>22.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6-10 years</td>
<td>85</td>
<td>28.3%</td>
<td>p value (&lt;0.001)</td>
</tr>
<tr>
<td></td>
<td>11-15 years</td>
<td>45</td>
<td>15.1%</td>
<td>df 3</td>
</tr>
<tr>
<td></td>
<td>Over 15 years</td>
<td>101</td>
<td>33.8%</td>
<td></td>
</tr>
<tr>
<td>Teachers with their children attending the same schools</td>
<td>Attending</td>
<td>236</td>
<td>78.5%</td>
<td>p value &lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Not attending</td>
<td>64</td>
<td>21.5%</td>
<td>df 1</td>
</tr>
</tbody>
</table>
4.3 Quality of latrines

The quality of latrines was the dependent variable in the study. Based on the five parameters that were studied in relation to quality as explained in chapter three, the results indicated that 28(63.6%) schools had quality latrines while 16(36.4%) did not have quality latrines.

4.4 Comparison between HECA participating and Non HECA participating schools

Non-HECA participating schools had a total of 23(60.5%) schools with quality latrines while HECA participating schools had 5(83.3%) schools with quality latrines. A t-test was carried out to compare the latrine qualities between HECA participating and HECA non participating schools. There was insignificant statistical association between latrine quality and school participation or non-participation in the HECA program ($X^2 = 1.165$, df = 1, p-value = 0.280). Some of the respondents in the HECA piloted schools said that the vigour of the HECA program had diminished with time since some of the teachers who had been trained had left the school either on retirement or transfer to other schools while others said that the vigour had reduced because the same had not been pegged to the school health clubs. About 52% of the respondents indicated that there were inadequate sustainability measures in the program while 22% believed that the program should have been anchored and integrated into the school health clubs activities.
Figure 4.1 Distribution of latrine quality in schools

The study also looked at the specific parameters that made the quality of latrines as explained below.

4.4.1 Latrine adequacy

The first parameter studied on latrine quality was latrine adequacy. Latrine adequacy was assessed in respect to the ratio of number of latrines to pupils. The average ratio of number of latrines to pupils was 1:34 for HECA and 1:31 for Non-HECA schools. The ratio of boys and girls latrines was 1:28 and 1:36 for Non-HECA schools while in HECA schools the ratio was 1:34 and 1:34 for boys and girls respectively. A Mann Whitney U test was carried out to compare latrine adequacy in HECA participating and non HECA participating schools with the results indicating that there was an insignificant statistical difference in latrine adequacy between HECA and Non-HECA
schools (U = 104.50, p-value = 0.850 for girls and U = 99.00, p-value = 0.746 for boys). The latrine pupil ratio is summarised in the table below. Some of the teachers interviewed indicated that they did not understand the rationale behind the pupil latrine ratio and this is an indication of the existence of a knowledge gap.

<table>
<thead>
<tr>
<th>School category</th>
<th>1 latrine to number of girls</th>
<th>1 latrine to number of boys</th>
<th>1 latrine to pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-HECA</td>
<td>36</td>
<td>28</td>
<td>31</td>
</tr>
<tr>
<td>HECA</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
</tbody>
</table>

### 4.4.2 Latrine structure

The second parameter studied on latrine quality was latrine structure. As explained in chapter three, the latrine structure was defined by three parameters which were; covering of the latrine hole, level of fill up and availability of a vent pipe. The covering of the latrine hole was only practiced in 3 (7.9%) Non-HECA schools. Availability of a latrine hole cover was statistically not different between HECA and Non-HECA schools ($X^2 = 0.914, df = 1, p-value = 0.339$). Some of the head teachers indicated that the reason for vent pipe omission during latrine construction was to reduce on the cost of latrine building.
The acceptable level of latrine fill up was also studied as part of the latrine structure. In HECA participating schools the mean percentages of latrines with acceptable latrine fill up was 80.8% while among Non-HECA schools the mean percentage of latrines with acceptable latrine fill-up was 64.0%. A Mann Whitney U test was done to compare the rate of availability of latrines with acceptable levels of latrine fill-ups between HECA and Non-HECA schools with the results indicating a statistical significance (\( U = 43.00, \text{df}=1, p\text{-value} = 0.024 \)). The school health policy also requires all latrines to have a vent pipe. Vent pipes were available in all HECA schools as compared to 29(76.3%) of in Non-HECA schools. The availability of vent pipes in school latrines was not significantly different between HECA and Non-HECA schools (\( X^2 = 2.981, \text{df} = 1, p\text{-value} = 0.084 \)). A graph representation of vent pipes availability in the latrines is shown below.
4.4.3 Latrine privacy and accessibility

The third parameter studied on latrine quality was latrine privacy and accessibility. Privacy of latrines is observed by complete latrine separation of female pupils’ latrines from the male pupils’ latrines as outlined in the national school health policy and also by lockability of all doors from the inside (MOE & MOH, 2009). All HECA participating schools had the male pupils’ latrines completely separated from their female counterparts while 5.3% of the non-HECA schools did not observe this. Comparatively the difference in separation of latrines in HECA and Non-HECA schools was not statistically significant ($X^2 = 0.601$, df = 1, p-value=0.438). A graph representation of privacy in the latrines is shown below.

Figure 4.3: Availability of Vent Pipes in School Latrines
The study also analysed the lockability of doors. Majority 22(57.9%) of Non-HECA schools had latrines with lockable doors while a majority 5(83.3%) of HECA schools had un-lockable door latrines. A Mann Whitney U test was done to compare the lock ability of doors in non HECA and HECA participating schools and the results indicated that Non-HECA schools had a statistically significant higher rate of lockable doors as compared to HECA schools (U = 18.50, df =1, p-value = 0.004). A graphical presentation of the results is shown below.

**Figure 4.4: Complete latrine separation between boys and girls latrines**

- Heca participating: 100% complete separation, 0% no complete separation
- Heca non participating: 95% complete separation, 5.30% no complete separation
Latrine accessibility was also studied by researching on the latrines with an acceptable pit hole size. The average proportion of latrines with acceptable latrine hole size in HECA schools (53.8%) was lower than the average proportion of latrines with acceptable hole size in Non-HECA schools (84.5%). To compare if the proportion of latrines with an acceptable latrine hole size differed between HECA and Non-HECA schools, the number of latrines with an acceptable hole size was ranked for all schools and these ranks compared between HECA and Non-HECA schools. The difference in acceptable latrine holes between HECA and Non-HECA schools was statistically significant (U = 21.50, df=1, p-value=0.002) meaning Non-HECA schools had a higher proportion of latrines with acceptable latrine holes as compared to HECA schools. A graphical presentation of the results is shown below.

**Figure 4.5: Latrine Doors Lock-ability by School Type**
The fourth parameter of the quality studied was the availability of functional hand washing. The study sought to look into the availability of hand washing facilities in both boys and girls latrines. Functional hand washing facilities in boys’ latrines were available at 33.3% in HECA schools and at 18.4% in Non-HECA schools. To determine if functional hand washing facilities were similarly available in HECA and Non-HECA schools, a contingency table was obtained and cell frequencies compared. The difference in the distribution of the functional hand washing facilities in the boys’ latrines in HECA and Non-HECA schools was not statistically significant ($X^2 = 0.640, df = 1, p-value = 0.424$).
The girls had 33.3% of their latrines having functional hand washing facilities in HECA schools and 26.3% in Non-HECA schools. To determine if functional hand washing facilities were similarly available in HECA and Non-HECA schools on the girls’ side, a contingency table was obtained and cell frequencies compared. The difference in the distribution of the functional hand washing facilities in the girls’ latrines in HECA and Non-HECA schools was not statistically significant ($X^2 = 0.124$, df = 1, p-value=0.724) meaning that there was no difference in available functional hand washing facilities in girls’ latrines between HECA and Non-HECA schools. The availability of the hand washing facilities on the girls’ side is graphically displayed below.
Figure 4.8: Availability of Hand-washing basin or tap in girls latrines

The study further went to find out the availability of hand washing soap. Hand washing soap was only available in 16.7% of the HECA schools and in 2.6% of the Non-HECA schools. To determine if hand washing soap was similarly available in HECA and Non-HECA schools, a contingency table was obtained and expected frequencies compared to observed frequencies. The difference in availability of hand washing soap in HECA and Non-HECA schools was not statistically significant ($X^2 = 1.616$, df = 1, p-value = 0.204) meaning that there was no difference in availability of soap for hand washing in HECA participating and Non-HECA schools. Some of the teachers complained that the schools had scarce water supply and thus could not avail water for hand washing.
Sanitary cleanliness focused on sanitary conditions of the latrine slab and the environment surrounding the latrine as explained in chapter three. The results indicated that majority (83.3%) of the HECA schools had clean latrines. Similarly majority (78.9%) of Non-HECA schools had clean latrines. All HECA schools had a clean environment surrounding the latrine as compared to 84.2% of Non-HECA schools. In assessment of the difference in sanitary conditions of latrines between HECA and Non-HECA schools, their cleanliness level was ranked and compared using Mann Whitney U test. There was insignificant difference in the cleanliness of the latrines and the environment surrounding the latrine between HECA and Non-HECA schools ($U = 108.00$, $df=1$, p-value = 0.770 and $U = 96.00$, $df=1$, p-value = 0.300 respectively).

Figure 4.9: Availability of soap for hand washing

4.4.5 Sanitary cleanliness

Sanitary cleanliness focused on sanitary conditions of the latrine slab and the environment surrounding the latrine as explained in chapter three. The results indicated that majority (83.3%) of the HECA schools had clean latrines. Similarly majority (78.9%) of Non-HECA schools had clean latrines. All HECA schools had a clean environment surrounding the latrine as compared to 84.2% of Non-HECA schools. In assessment of the difference in sanitary conditions of latrines between HECA and Non-HECA schools, their cleanliness level was ranked and compared using Mann Whitney U test. There was insignificant difference in the cleanliness of the latrines and the environment surrounding the latrine between HECA and Non-HECA schools ($U = 108.00$, $df=1$, p-value = 0.770 and $U = 96.00$, $df=1$, p-value = 0.300 respectively).
Figure 4.10: Level of Latrine cleanliness

Figure 4.11: Level of environmental cleanliness
The respondents were further asked about what they believed could have been done better concerning the HECA program. 52% of the respondents suggested that sustainability measures should have been put in place, 33% suggested that more resources be availed for future programs, 8% suggested that more stakeholders’ involvement was necessary, while the rest (8%) gave several varying suggestions like more implementation time.

4.5 Teachers’ related determinants affecting the quality of latrines

On analysing the teacher’s determinants to latrine quality, the results showed that 10.0% of the sampled teachers claimed they had read the policy. In a bid to probe further on the knowledge of the policy, the findings indicated that only 48.1% of the teachers who claimed to have read the policy clearly knew the colour of the policy booklet. On probing further about 65.8% of the sampled teachers knew the average number of pupils to latrine ratio required by the policy while (34.2%) gave the wrong latrine to pupils’ ratio which implied low knowledge levels. The level of awareness on information contained in the policy was statistically significant to the latrine quality ($X^2 = 0.007$, df =1, p=0.026) which implied that lack of knowledge contributed to poor latrine quality.

There was insignificant association between awareness of the School health policy 2009 and latrine adequacy ($X^2 = .195$, df =1, p=0.659), latrine privacy ($X^2 = .000$, df =1, p=0.991), level of latrine cleanliness (U = 5126.0, df=1, p-value = 0.671) and latrine structure score (Mann Whitney U test: U = 5158.5, df=1, p-value =0 .686).
Soil structure and ground water table are important factors to consider in the construction of latrines as they dictate the cost and model. The study sought to determine how teachers’ knowledge on the soil structure and ground water table contributed in any way to the latrine quality. The results indicated that 42.2% of the sampled teachers were aware on the soil structure in the school in regard to building latrines, many having acquired the skill mainly through experience (76.4%). About 24.5% of the teachers had no idea about how deep a latrine could go without collapse depending on the soil structure. However, the head teachers’ level of awareness on soil structure in regards to building latrines was not statistically significant on the latrine quality ($X^2=0.114$, df = 1, p=0.461). There was insignificant association between the head teachers’ level of awareness on soil structure in regards to building latrines and latrine adequacy ($X^2=.753$, df =1, p=0.386), latrine privacy ($X^2=.002$, df =1, p=0.996), level of latrine cleanliness (Mann Whitney U test: $U = 9148.5.0$, p-value = 0.714) and latrine structure score (Mann Whitney U test: $U = 5558.5$, df=1, p-value =0.527). The teachers were asked about the best way to impact knowledge on the national school health policy to teachers and some suggested continuous seminars while others suggested incorporation of the same during the training course in teacher training colleges.

Teachers’ practice was studied as explained in chapter three. Good teachers’ practice is essential in ensuring good quality of latrines in schools. The findings indicated that 64.4% of the sampled teachers visited pupils’ latrines on a daily basis, 26.3% visited them weekly, and 0.4% visited them often while 8.9% rarely visited the pupils’ latrines.
A total of 57.5% of the sampled teachers conducted sanitation lessons in the schools. On average, 56.8% of the lessons on sanitation were conducted weekly in schools, 18.9% were conducted monthly while 24.3% were conducted once each term. A total of 51.5% of the lessons on sanitation were conducted by infusion while 48.5% were conducted through direct learning. A total of 42.7% of the head teachers of the sampled schools in Transnzoia East Sub County had approached partners to assist in the development of school latrines or hand washing facilities in the last one year. The partners approached included: CDF (40%), LATF(24%), Non-Governmental Organizations (16%), Parents (14%) and business people in the community (6%). A total of 63(42.9%) proposals submitted in the year were successful while 84(57.1%) were not successful. A total of 28.5% of the teachers stated that the party responsible for the development of sanitation in schools was the Government, 52.3% of the teachers stated that it was the parents, 2.8% stated that it was the Non-Governmental Organizations, 14.6% stated that it was all stakeholders, 1.1% stated that it was the public health officers while 0.7% stated that it was the parents and well-wishers. To determine if teachers’ practice was associated with latrine quality, a contingency table was obtained and cell frequencies compared to expected frequencies. The head teachers’ practice was statistically significant on the latrine quality (non-parametric Pearson Chi-square test of association $X^2 = 0.037$, $df = 1$, $p=0.008$). There was insignificant association between head teachers’ practice and latrine adequacy ($X^2 = 0.440$, $df =1$, $p=0.507$), latrine privacy ($X^2 = 0.442$, $df =1$, $p=0.506$), level of latrine cleanliness (Mann Whitney U test: $U = 7981.5$, $p$-value $=0.180$) and latrine structure score (Mann Whitney U test: $U = 7405.5$, $df=1$, $p$-value $= 0.180$). A total of 61.6% of
the teachers believed that parents should provide latrine building materials, 30.4% believed it should be the Government providing, 4.0% believed that it was both the parents and the Government while 4.0% believed that it should be all stakeholders.

<table>
<thead>
<tr>
<th>Teachers’ related attributes</th>
<th>Category</th>
<th>Quality of latrines</th>
<th>Chi-square test p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of the School</td>
<td>Knowledgeable</td>
<td>13.63%</td>
<td>25%</td>
</tr>
<tr>
<td>Health Policy of 2009</td>
<td>Not Knowledgeable</td>
<td>22.72%</td>
<td>38.60%</td>
</tr>
<tr>
<td>Awareness on soil structure in regards to building a latrine</td>
<td>Aware</td>
<td>25%</td>
<td>29.54%</td>
</tr>
<tr>
<td></td>
<td>Unaware</td>
<td>11.36%</td>
<td>34.09%</td>
</tr>
<tr>
<td>Awareness on water table in regards to building a latrine</td>
<td>Aware</td>
<td>13.60%</td>
<td>22.70%</td>
</tr>
<tr>
<td></td>
<td>Unaware</td>
<td>22.70%</td>
<td>40.90%</td>
</tr>
<tr>
<td>Teachers' practice</td>
<td>Good</td>
<td>22.70%</td>
<td>40.90%</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>13.60%</td>
<td>22.70%</td>
</tr>
</tbody>
</table>

### 4.6 Environmental related determinants affecting the quality of latrines

Environmental factors highly determine the model of latrines to be constructed. These factors include the type of soil, availability of construction materials, adequacy of school land and natural catastrophes like flooding. Bricks were the most available (93.2%) material for latrine construction, timber was available (3.2%) and natural
stones (3.6%). About 24.99% of the schools had clay soils, 49.99% had black cotton soils while the rest about 24.72% had a mixture of soils.

Different environmental parameters were compared with the latrine quality to check if there was any statistical association. As indicated in table 4.4, the type of soils in the schools was not statistically significant on the latrine quality ($X^2=0.340$, df = 2, $p=0.303$) meaning that the type of soils did not determine the latrine quality. The availability of building materials however influenced the latrine quality ($X^2=0.165$, df =1, $p=0.047$).

Further analysis indicated that there was also no significant association between the type of soil in the school and latrine adequacy ($X^2=1.835$, df =4, $p=.776$), type of soil in the school and latrine privacy ($X^2=4.851$, df =4, $p=0.302$) and type of soil in the school and latrine structure score ($X^2=6.517$, df =4, $p=.1644$). The level of latrine cleanliness was however significantly associated with the type of soil in the school ($X^2=15.576$, df =4, $p=0.004$).

The studies also sort to determine further if the availability of latrine building materials had any influence on the different latrine quality parameters. The study indicates that there was an insignificant association between the availability of toilet building materials and latrine adequacy ($X^2=3.508$, df =3, $p=.766$) meaning that latrine adequacy was not affected by availability of toilet building materials. Latrine privacy was not also influenced by availability of toilet building materials ($X^2=3.778$, df =3, $p=0.287$) and so
was the level of latrine cleanliness ($X^2=1.445$, df =3, $p=0.695$). Latrine structure score was however significantly associated with the availability of toilet building materials ($X^2=10.882$, df =3, p value =0.012) meaning that areas where the materials were easily available had toilets of a better structure.

<table>
<thead>
<tr>
<th>Environmental related attributes Category</th>
<th>Quality of latrines</th>
<th>Chi-square test p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not quality</td>
<td>Quality</td>
</tr>
<tr>
<td>Type of soil in school environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clay soil</td>
<td>13.63%</td>
<td>11.36%</td>
</tr>
<tr>
<td>Black cotton soils</td>
<td>11.36%</td>
<td>38.63%</td>
</tr>
<tr>
<td>Mixed soils</td>
<td>11.36%</td>
<td>11.36%</td>
</tr>
<tr>
<td>Availability of building materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not readily available</td>
<td>11.36%</td>
<td>25.00%</td>
</tr>
<tr>
<td>Readily Available</td>
<td>13.63%</td>
<td>50.00%</td>
</tr>
</tbody>
</table>
CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Latrine quality

The present study has examined the schools latrine quality in respect to the standards set by the school health policy. In Transnzoia East Sub County, the latrine to pupil’s ratio stood at 1:34 which is higher than that recommended by the policy of about 1 latrine to every 25 pupils (Joshua & Saboori, 2013) and thus the sub county stakeholders need to work on improving the latrine adequacy. The stakeholders should involve the teachers so that they understand the rationale behind the need for latrine adequacy. Inadequate latrine facilities lead to health problems such as typhoid which was a major health concern in the sub county (Christian & Bartram, 2012).

Provision of quality latrines is important in ensuring maximum usage of the same by the pupils (Hutton & Haller, 2004). A national study in Kenya gave a significance association between latrine state and latrine usage in Kenya at a p value of 0.01 (Joshua & Saboori, 2013). From the study 64.3% of the latrines in the sub county were categorized as quality while 35.7% were not of the standard quality and thus needed improvement so that they could conform to the school health policy requirement.

Key to ensuring quality latrines is the provision of privacy in the latrines by complete separation of the boys from girls latrines, ensuring the doors are intact and lockable and ensuring that the walls are not worn out (MOE & MOH, 2009). About 18.9% of the
schools did not provide adequate privacy in the latrines which is against the schools health policy requirement. Lack of adequate privacy in school latrines leads to pupils’ absenteeism of up to 10% especially so in female pupils (Freeman & Muga, 2011).

Provision of a vent pipe is key in the control of foul smell while provision and use of a latrine cover is important in control of flies (Winblad & Kilama, 1985). About 79.5% of the sampled schools had a vent pipe against the sub county annual work plan that required all the latrines in schools to have vent pipes (MOPHS, 2010). The teachers should also be trained on this so that they appreciate the need to have good latrine structures.

Hand washing for pupils is important in the control of illnesses such as typhoid (Christian & Bartram, 2012) which was a main problem in Transnzoia East Sub County. The sampled schools had the ratio of about 1 functional hand washing facility to 1189 pupils which is way higher than findings of a similar study done in Nairobi that gave the ratio of 1 hand washing facility to about 330 pupils (UNICEF, 2012). This had the implication that few pupils got to wash their hands.

5.1.2 Difference between HECA participating schools and HECA non-participating schools

HECA was supposed to provide a sustainable way of dealing with sanitation issues in the schools by engaging the community in the sustainability of adequate and quality latrines in the schools. It was however noted that there was no significant difference in latrine quality between HECA participating schools and HECA non participating
schools (p value=0.280). This was due to the fact that there were no measures to sustain HECA activities put into place (52% of respondents indicating this). The rate of availability of latrines with acceptable levels of latrine fill-ups significantly differed between HECA and Non-HECA schools (Mann Whitney U test p-value = 0.024). HECA schools had a lower rate of availability of latrines with acceptable latrine fill-ups as compared to Non-HECA schools and this could be, by way of hypothesis, attributed to the fact that no more effort was put on sanitation after the conclusion of the HECA program. Non-HECA schools had an average lockable latrine door rate of 79.9% while HECA schools had an average lockable latrine door rate of 41.0%. Non-HECA schools had a higher rate of lockable doors as compared to HECA schools (Mann Whitney U test p-value = 0.004). The difference in acceptable latrine holes between HECA and Non-HECA schools was statistically significant (Mann Whitney U test p-value=0.002) meaning Non-HECA schools had higher proportion of latrines with acceptable latrine holes compared to HECA schools. The teachers were asked to outline any issues that they would want included in future HECA programs and they suggested that all the teachers should be trained on HECA so that in case a teacher was transferred to another schools the program would continue to run and that HECA implementers should involve the school health clubs actively and at all levels. The issues raised by the teachers could be hypothesised to have contributed to the results of the latrine qualities.

5.1.3 Association between teachers’ related factors and quality of latrines

From the study only 10% of the sampled teachers had knowledge on the policy. Teachers’ knowledge on the National School Health Policy of 2009 was compared to
the latrine quality and was found to be statistically significant at p-value 0.026 to latrine quality. Awareness of the soil structure and the water level was not a significant factor affecting latrine coverage and this could be because most of the schools rely on other experts’ knowledge during latrine pegging and construction. The teachers who practiced good sanitation traits as explained in 3.5.7 positively influenced the latrine quality at p value of 0.0081. This is similar to other studies that emphasized the importance of the use of teachers in schools wash programs (Rutega, 1999). The suggestions given by the teachers on the best way to disseminate the information on the national school policy should be considered by policy makers after more studies have been conducted on the more appropriate approach between engaging teachers in seminars and incorporating it in the teachers training curriculum.

5.1.4 Association between environmental factors and quality of latrines.

Most of the environmental factors studied did not have a significant association with latrine quality. Availability of building materials (p value=0.0466) was the only environmental factor which influenced latrine quality. Ease of availability of building material is important in any development and availability of bricks in the sub county seemed to influence the building of permanent latrines made of bricks. Ease of availability of materials was influenced by local availability of the materials. Type of soil did not significantly affect the latrine quality and this could be explained by the fact that most teachers had experience in dealing with problems related to soil structure and that there were experts to consult. It is also important to develop ways of ensuring
adequate supply of hand washing water or better still develop ways of hand washing using minimum water.

5.2 Conclusions

Based on the results of this study the following conclusions were drawn: there was no significant difference in the latrine quality between HECA and non HECA schools. Teacher’s knowledge on the national school health policy is a significant factor affecting the quality of latrines. The type of materials available within or near the school influences the latrine quality.

5.3 Recommendation

As a recommendation future HECA projects should be implemented and sustainability measures put in place. Some of the measures suggested by the teachers include: ensuring that more teachers are trained on HECA in order to ensure continuity in case a teacher is transferred, retires or dies. The teachers also suggested that the HECA activities be anchored in the school health clubs to ensure continuity of the program.

It is important to put measures in place to ensure continuous training of teachers on the school health policy for example by ensuring that training on school health policy is incorporated in the teachers training curriculum or seminars on the same be organised. Teachers should be empowered by the stakeholders such as the school management to ensure that they improve on their good sanitation practice and on their understanding concerning the quality of latrines.
The school management should also be encouraged to utilize the locally available materials to increase latrine quality and also develop ways of acquiring adequate water for hand washing.

5.4 Further research

A similar study could be carried out in the same geographical area after implementation of the recommendations of this study.
REFERENCES


WSP, UNICEF, & GOK. (2012). *are your hands clean?* Nairobi: WSP.

APPENDICES

Appendix: I Consent form

Hello my name is Nyaga James MPH (M&E) student at Kenyatta University in the department of public health. I am carrying out a study on “school environmental determinants affecting the latrine coverage and quality in public primary schools in Transnzoia East sub county Kenya.

Why is the study being carried out?”

The study is being carried out in a bid to find out the environmental determinants affecting latrine coverage in our schools, level of knowledge on the school health policy by the teachers and the success of the HECA project with the ultimate aim of finding out ways of improving the coverage and qualities of latrines in our schools.

How many people are taking part in the study?

A total of 300 teachers in the sub county will be sampled from 44 schools within Transnzoia East Sub County

What is involved in the study?

The study will involve the interviewer asking questions from the questionnaire and the interviewer filling the answers. The answers will later be analyzed to provide information that can be used in informing the different stakeholders on the study findings. The interviewer will also visit the school latrines to fill out a checklist.

How long will this study take?

The interview will take about an hour to fill.
What are risks of the study?
It is unlikely that they are any risks in taking part in the study. However if you get tired of answering the questions you can take a break at any given time.

What are the benefits of taking part in the study?
There might not be any direct benefit to you from the study but the findings may be used in decision making aimed at improving latrine coverage and quality in the schools.

What are other options that are available?
You do not have to participate in the study. The study is voluntary and once you enrol you can choose to stop participating in the study at any given time.

What are the costs?
There is no cost to you for taking part in the study. You will also not receive any payment for taking part in the study.

Contact information
Nyaga James has explained to you the risks and benefits of participating in the study and can be contacted on the cell phone number 0723443612. Further information can be got from Kenyatta university department of community health P.O BOX 43844 Nairobi.

Confidentiality of the study
Any information given will be treated with outmost privacy and confidentiality. The information will be useful in finding the solutions to teachers and environmental determinants affecting latrine quality in public primary schools in Transnzoia East Sub County and will be important for policy makers in the sub county and other sub counties. The information given will be used for general reports and will not include any name of the information source.
Signature

Signing below indicates that you have been informed about the research in which you voluntarily agree to participate and that you have asked any questions that you may have and that the information given to you has permitted you to make a fully informed and free decision about your participation in the study. A copy of this consent will be provided to you.

Signature……………………..date…………………………..

Instructions

1. One questionnaire per person

2. Do not include the name of the respondent anywhere

3. Tick as appropriate and provide respondents answer where applicable

4. All questions to be answered

Date of interview

Time interview started………………….Time interview ended………………..

Signature of interviewer………………..
Appendix II: questionnaire

QUESTIONNAMIRE

Questionnaire NO…….. DATE………………………………………………………….

NAME OF SCHOOL…………………………………………………………………….

The information from this questionnaire will be used strictly for academic work and utmost confidentiality will be observed. Kindly tick where applicable?

Respondent profile:

1. Age (in years) ………………

2. Sex

Female □ Male □

3. Marital Status:

Single □ Married □ Others □ Specify……………………

4. Religion

Christian □ Muslim □ Others □ Specify……………………

5. Level of education

a) Certificate--□

b) Diploma --□

c) 1st degree--□

d) Masters --□

e) Others (specify)-□ ………………………………..

6. For how long have you served as a teacher in the school?……………………………

7. Do you have your own school going pupils?

Yes □ No □
8. What subjects do you teach at school? .......................................................... 

Section 2. Teachers factor 

1. Are you aware of the soil structure in the school in regard to building of a latrine (probe further) 

   Yes [ ] no [ ] 

   If yes how did you learn on the structure? 

   Expert opinion [ ] journal [ ] experience [ ] any other specify…..

2. Are you aware of the water table in the school in regards to building of a latrine (probe further) 

   Expert opinion [ ] journal [ ] experience [ ] any other specify…..

3. Are you aware of how to deal with the problem of soil structure in regard to building of a school latrine (probe further) 

   Yes [ ] no [ ] 

   If yes, specify……………………………………………………………………………………………………

4. Are you aware of how to deal with the problem of the water table level in regard to building of a school latrine (probe further) 

   Yes [ ] no [ ] 

   If yes, specify……………………………………………………………………………………………………

5. Have you heard of the school health policy of 2009? 

   Yes [ ] No [ ] 

   If yes what is the policy about? 

   a. Guidelines to implementing of schools health activities [ ] 

   b. By laws to be used in case of health issues in schools+ [ ]
c. Don’t know □

d. Other………………………………………………

6. Have you read the school health policy implementation guidelines?

Yes □ No □

If yes what colour is the booklet………………..

Correct answer (green) □

Incorrect answer □

Any additional comment on the policy?……………………………………………………………..

7. On average what do you think is the average pupil : latrine ratio that is required by the policy

a) 1 latrine : 10 pupils □

b) 1 latrine : 25 pupils □

c) 1 latrine : 50 pupils □

d) 1 latrine :100 pupils □

Any comment on the ratio……………………………………………………………..

8. What are the critical times for hand washing?

a) Correct answer □

b) Incorrect answer □

9. Do you ever practise hand washing in all the critical times

Yes □ no □

10. How do you perceive the status of the hand washing facilities in your school?

a. Good □
b. Fair 

c. Poor 

d. Very poor 

11. Do you think there is room for improvement? (Yes/No)......................

Explain………………………………………………………………………

………………………………………………………………………

12. How do you perceive the status of the latrines in the school

a. Good 

b. Fair 

c. Poor 

d. Very poor 

13. Do you believe there is room for improvement of the latrines (yes/no)......

Explain……………………………………………………………………

………………………………………………………………………

………………………………………………………………………

14. Who do you think is Key responsible for the schools sanitation development? (tick where that is applicable)

a. Government 

b. Parents 

c. Non Governmental Organizations 

d. Other (specify) 

14) Have you approached any partner/worked on any initiative to develop school sanitation in the last one year?

Yes ☐ no ☐

15) What do you think is the major role of the pupils in enhancing school sanitation?

a. Assist in the design of the latrine ☐
b. Washing the latrines ☐
c. Mobilizing for resources from their parents ☐
d. Others (specify) ☐

16) Are there sanitation lessons in the school? (if no proceed to question 19)

a. Yes ☐

b. No ☐

17) How often are the lessons?

a. Weekly ☐

b. Monthly ☐

c. Others (specify) ........................................................................................................

18) Do you continuously teach pupils about proper sanitation?

(probe further)

Yes ☐ no ☐

19) What is the mode?

a. Infusion ☐

b. Direct learning ☐

c. Others (specify) ........................................................................................................
20) What role should a sanitation teacher play?
   a. Inspect wash facilities
   b. Discipline pupils who don’t comply to the required sanitation standards
   c. Others (specify) .................................................................

21) How often do you visit the pupils latrines
   Daily □ Weekly □ others (specify) .................................

22) What do you think is the current situation of latrine in terms of pupil to latrine ratio?
   Adequate □ Inadequate □ Very inadequate □ others (specify) ……

23) If inadequate what proportion of latrines to pupils do you think is practical in the school
   1:25 Pupils □ 1:35 Pupils □ 1:45 Pupils □ 1:55 Pupils □
   Other (specify) ……

24) What do you think about the school budget for latrines expansion/maintenance?
   Adequate □ Inadequate □ Very inadequate □ Other (specify) …

25) On a scale of 1-5 are you satisfied on your contribution on development of latrines in the school? ................. if the score is not 5 what can be done better? ........................................................................................................

Environmental factors

26) What do you think is the most available and affordable material that can be used to construct a school latrine?
   Timber □ bricks □ natural stones □ others specify □
27) How readily available are the materials?

Very readily  
readily  
not readily

28) Who should provide the material

Parents  
the government  
any other specify

29) In your opinion how adequate is the school land for latrine construction (probe further)

Very adequate  
adequate  
not adequate

30) Who should provide land for school latrines construction?

The government  
the parents  
other (specify)

31) What do you think has been the biggest barrier to the development of latrines in the school? Tick where applicable.

Inadequate land  
shallow water levels  
poor soil
structure  
others specify..........................

32) Is there water available for hand wash in the school (Yes/No)...............

If yes specify the source

a. River  
b. Spring  
c. Borehole  
d. Rain harvesting  
e. Others (specify)..........................

33) What kind of soil is there in school

a) Clay soil  
b) Black cotton soil
34) How deep can the soil structure allow the latrine to go without collapse
   a) Shallow (less than 2 metres)
   b) Deep (2 metres to 10 metres)
   c) Very deep (above ten metres)

35) How deep can the water level allow the depth of latrine to go?
   a) Shallow (less than 2 metres)
   b) Shallow (less than 2 metres)
   c) Very deep (above ten metres)

36) Has the school experienced problems in latrines set up due to soil structure? Yes/no
    if yes explain more
    ...........................................................................................................................
    ...........................................................................................................................

37) Is the water table level a problem in the availability of latrines in the school? Yes/no
    (b) If yes what? Explain more
    ...........................................................................................................................

38) Has the school experienced problems in latrines set up due to flooding?
    Yes/No
    38(b) if yes explain more
    ...........................................................................................................................
    ...........................................................................................................................
39) Do you have the knowledge on how to counter the environmental challenges in regard to protecting the school latrines? Probe further Yes [ ]

no [ ]

Participation in HECA

40) Did the school participate in the HECA project? Yes/no………... (If no proceed to question section c).

(a) How many latrines have been build after the year 2007………

(b) How many hand washing facilities have been added after the year 2007………

41) How many of the HECA hand washing facilities/toilets are still functional? hand washing……………toilets

42) How did you view the success of HECA project in promotion of sanitation facilities?

a) Very successful [ ]

b) Fairly successful [ ]

c) Not successful [ ]

b) If answer in 42 (a) is not very successful. What could have the reasons been………

43) What do you think could have been done better in HECA project?………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………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45) If yes which partner
a) CDF
b) LATF
c) PARENTS
d) BUSINESS PEOPLE IN THE COMMUNITY
e) OTHER (SPECIFY)

46) If yes was the proposal successful? Yes No

47) If yes explain the success if no explain the challenges faced

48) If the answer in question 43 is no. explain the challenges
Appendix III Checklist

Quality of the sanitary latrine

Section c; To be filled through observation/measurement by the interviewer with consultation with the head teacher and document review.

49) Current school population: boys……..girls……………………

50) Availability of hand washing (to be functional at time of observation)

At boys latrine area? Yes ☐ no ☐ number of hand washing facilities…………………..

At girls latrine area? Yes ☐ no ☐ number of hand washing facilities…………………..

51) Ratio of hand washing facility to number of latrines 1 hand washing to ….latrine doors

52) Right Height of the hand washing facility for the user group? Yes ☐ no ☐ for yes what percent……

53) Availability of soap for hand washing boys area yes ☐ no ☐

54) Availability of soap for hand washing girls area yes ☐ no ☐

55) Number of latrines for boys……………girls……………………

56) Latrine to pupils ratio girls…1:……………boys…1:……………

57) Covering of the latrine hole yes ☐ no ☐ for yes what percent……
For question 58-60) in instances where the school has different type of latrines kindly indicate the number beside the box

58) Type of latrine wall.

a) Iron sheets

b) Bricks

c) Mud

d) Any other

59) Type of latrine floor

a) Cemented

b) Earthen floor

c) Wooden

d) Any other (specify)

60) Type of latrine roofing

Iron sheets

Grass

Non

Any other (specify)

61) Level of latrine cleanliness

Very dirty

Dirty

Clean

Very clean
62) Level of environmental cleanliness in the latrine surrounding
  Very Dirty
  Dirty
  Clean
  Very clean

63) Number of latrines with doors?
  <25%
  <50%
  <75%
  75-100%

64) Number of latrines with lockable doors
  <25%
  <50%
  <75%
  75-100%

65) Is privacy observed in latrine area
  Yes
  no

66) If yes on (no.65) how is it ensured?
  Separation of the areas between boys and girls
  Card board/wall separating the boy’s latrines from girls’ latrines.
  Any other specify…………………………………………………...
67) Number of latrines within acceptable levels (3 metres and below)

- <25%
- <50%
- <75%
- 75-100%

68) Do the school latrines have a vent pipes?

- <25%
- <50%
- <75%
- 75-100%

69) What percentage of the latrines have acceptable size of the latrine hole

(not too big not too small?)

- 25%
- <50%
- <75%
- 75-100%

70) In your opinion what could enhance the quality of sanitary latrines in school? Explain………………………………………………………………
………………………………………………………………
………………………………………………………………

The end
### Appendix IV Budget

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Appendix V Map

STUDY AREA TRANSNZOIA EAST
## Appendix VI Work plan

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Appendix VII Graduate school Approval of research proposal
Appendix VIII Graduate school Research Authorization
Appendix IX Ethics Committee Approval
Appendix X NACOSTI Authorization