

**ASSESSING THE INFLUENCE OF COMMUNITY LED TOTAL SANITATION
APPROACH ON DIARRHEA OCCURRENCE IN HOUSEHOLDS LIVING IN THE
INTERVENTION AND CONTROL VILLAGES, BORO DIVISION, SIAYA
COUNTY, KENYA**

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**SCHOOL OF PUBLIC HEALTH AND COMMUNITY DEVELOPMENT
(SPHCD)**

MASENO UNIVERSITY

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DECLARATION

Student's Declaration

I declare that this thesis is my original work and has not been presented for a degree in any other university. The work herein has been carried out by me and all sources of information have been specifically acknowledged by means of references.

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DEDICATION

I dedicate this thesis to my loving parents, friends and my children Stacey and Warren for their love, perseverance and support during this study. It has been a tough journey, but with your constant re-assurance, I have come this far.

ABSTRACT

Community Led Total Sanitation (CLTS) is an innovative way to achieve communities free from open defecation. Globally 1.1 billion people still practice open defecation and are at risk of diarrhea resulting in 2 million deaths annually. In Kenya 75.7 % population lack improved sanitation facilities and of these, 17.1% experience diarrhea cases. In Siaya diarrheal diseases are ranked third among the top ten diseases. Boro Division with latrine coverage 55%. However, there is still limited knowledge and documented evidence on the influence of CLTS approach on diarrheal occurrences. The objective of this study was to assess the influence of CLTS on diarrhea occurrence in households living in intervention and control villages in Boro Division, Siaya County targeting 3889 households. Comparative cross-sectional study design was used. Sample size of 398 was determined using Yamane 1969 (Isreal, 2009) sample size calculation formula. Sample random sampling was used to sample 398 households. Quantitative data was collected using semi structured questionnaires while qualitative data was collected using observation checklist. Descriptive statistics was used to assess the difference in the sanitation practices, compare the level of awareness and diarrhea occurrence while chi-square test was used to compare proportions between control and intervention villages. Association between independent variables and diarrhea occurrence was done using binary logistic regression. Odds ratio with 95% confidence intervals was used to measure the magnitude of diarrhea morbidity. P value < 0.05 denoted significant results. Analysis was done using SPSS version 20. The results showed that 83.7% households from the intervention villages had latrines compared to 45.5% of households in the control villages, the difference were statistically significant ($P < 0.0001$, $\chi^2 = 63.019$). About 83.3% in the intervention villages practiced safe waste disposal compared to 37.6% in the control villages. The result on water source showed that 83.8% household reported that their water source is safe compared to 67.8% in the control villages. The result indicated about 90.3% of the households from intervention villages were aware of CLTS compared to only 38.10 % in the control villages. Majority 83.7% of the respondents from control villages reported they were aware of people in their village who practiced open defecation compared to 18.9% from intervention villages. Majority 96.4 % of households in the intervention villages reported they are aware occurrence of diarrhea is associated with poor sanitation practices compared to 74.3% from the control villages. CLTS was significantly associated with reduced prevalence diarrhea in the intervention villages compared to control villages, 17.3% and 76.7% respectively. CLTS is therefore associated with improved sanitation practices, high level of awareness and reduced episodes of diarrhea. CLTS policy should be rolled out in all the rural areas in Kenya since it has shown potential for reduction in sanitation related diseases. This may help Kenya achieve sustainable development and vision 2030, Communities should be encouraged to practice CLTS. Future studies should target quasi experimental study to evaluate baseline and end line findings in intervention and control villages.

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LIST OF ABBREVIATIONS

CLTS	Community Led Total Sanitation
DALYS	Disability Adjusted Life Years
DFID-B	Department for International Development-Bangladesh
GDP	Gross Domestic product
KDDP	Kilifi District Development Plan
KDHS	Kenya Demographic Health Survey
LMP	Livelihood Monitoring Project
MDG	Millennium Development Goals
MOH	Ministry of Health.
MPH/S	Ministry of Public Health and Sanitation
MR	Mortality Rate
NGO	Non- Governmental Organization.
NL	Natural Leader
OD	Open Defecation
ODF	Open Defecation Free
PHAST	Participatory Hygiene and Sanitation Transformation
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal
SDG	Sustainable Development Goals
SPSS	Statistical Packages for Social Science
UNICEF	United Nations International Children's Emergency Fund
WASH	Water Sanitation and Hygiene
WatSan	Water and Sanitation
WHO	World Health Organization
WSP	Water and Sanitation Program
WSP-AF	Water and Sanitation Program in Africa
WSP-EAP	Water and Sanitation Programme of the World Bank
WSSCC	Water, Supply and Sanitation Collaboration Council

DEFINITION OF OPERATIONAL TERMS

- Attitude** : a hypothetical construct that represents an individual's degree of like or dislike for something either positive or negative.
- Awareness** : Is the state or ability to perceive, to feel, or to be conscious of events, objects, thoughts, emotions, or sensory patterns. In this level of consciousness.
- Community** : A group of people living in a particular local area with common interests.
- Community Led Total Sanitation** : Is sanitation approach which enables local communities to analyze their sanitation conditions and collectively internalize the terrible impact of OD on public health and on the entire neighborhood environment.
- Defecation** : The final act of digestion by which organisms eliminate solid, semisolid or liquid waste material (faeces) from the digestive tract via the anus.
- Diarrhea** : Diarrhea is the term given when an individual passes watery stools at least three times in a 24 hour period or more frequently than usual for the individual.
- Faeces** : Waste matter excreted from bowel consisting mainly of cellulose unabsorbed food, intestinal secretion and micro-organisms.
- Household** : Is a family unit made up of the farther, mother, or father or mother, and children living under one roof.
- Household Head** : An individual in one family setting who provides actual support and maintenance to one or more individuals who are related to him or her.

Hygiene	:	A science of the establishment and maintenance of health and Conditions or practices (as of cleanliness) conducive to health
Knowledge	:	Information received and internalized by pupils regarding hygiene, Water and sanitation.
Latrine coverage	:	This is the total number of latrines in the study area (schools) that are available and expressed as a percentage.
Latrine/ toilet	:	Is a communal space with multiple toilets, or a single stand-alone apparatus that is designed for defecation and urination.
Multivariate Analysis:		Statistical analysis that studies more than one variable at a time. It is generally used to refer to analyses that include at least three variables.
Open Defecation	:	Feacal matter is exposed on the environment
Open Defecation Free:		No feacal matter is exposed on the environment
Pathogen	:	An organism that causes disease.
Post triggering	:	Action planning for Follow up.
Practices	:	The action or process of performing or doing something.
Pre triggering	:	Selecting a community, introduction and building positive relationship.
Prevalence	:	The total number of diarrhea episodes experienced divided by the total population.
Prevention	:	Action taken to stop disease before it attacks.
Sanitation	:	Measures necessary for improving and protecting health and well being of the people

- Total Sanitation** : It concentrates on the whole community rather than on individual behaviours.
- Triggering** : The process of assisting the community to carry out a self-appraisal in terms of their sanitation status to a point that they self-motivated local action to end open defecation.
- Waste** : Discarded residue to be disposed of and for which reason, it is considered to be of no value.

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CHAPTER ONE: INTRODUCTION

1.1 Background Information

Community Led Total Sanitation (CLTS) is an integrated approach to achieving and sustaining open defecation free status in developing countries, especially where traditional rural sanitation programs have failed, this is a rural sanitation approach that facilitates communities to recognize the problem of open defecation and take collective action to clean up environment and become open-defecation-free (Okonkwo, 2006).

It uses community-led methods such as participatory mapping and analyzing pathways between feces and mouth as a means of galvanizing communities into action (Petra *at el.*, 2009). It is an innovative methodology for mobilizing communities to completely eliminate open defecation, by facilitating communities to conduct their own appraisals and analyses of open defecation and take their own action to become open-defecation-free (Plan Kenya, 2009). More so CLTS recognizes that merely providing toilets does not guarantee their use, nor result in improved sanitation and hygiene, CLTS therefore focuses on the behavioral change needed to ensure real and sustainable improvements, investing in community mobilization instead of hardware, and shifting the focus from toilet construction for individual households to the creation of open defecation-free villages and by raising awareness that as long as even a minority continues to defecate in the open everyone is at risk of disease, CLTS triggers the community's desire for change, propels them into action and encourages innovation, mutual support and appropriate local solutions, for greater ownership and CLTS is a radically different approach to sustainability (Kar, 2003, 2005, 2008, 2010).

Diarrhea is the term given when an individual passes watery stools at least three times in a 24 hour period or more frequently than usual for the individual, acute diarrhea appears rapidly and may last for up to several days, while chronic diarrhea may last 14 days or longer, when diarrhea continues for several days, the body loses the water and salts that is essential for survival (WHO, 2012). Globally there are nearly 1.7 billion cases of diarrhea disease every year, sanitation contributes to more 4 million cases of diarrhea and 1.9 million deaths each year among children under 5 years (Boschi, 2008). Roughly more than 80% of the cases of diarrhea are as a result of lack of improved sanitation (Manisha *et al.*, 2008). Systematic reviews have suggested that improved sanitation may reduce diarrhea diseases by 22% to 36% (Waddington , 2009).

The approach of CLTS emerged in Bangladesh in early 2000s, developed by Dr Kamal Kar, it is a participatory answer to traditionally subsidized sanitation programs that have not succeeded in getting people to use latrines (Kar, 2003). Introduced in Kenya in May 2007, CLTS has since been rolled out in all 8 Development Units where Plan international organization operates, from the first ODF village Jaribuni in Kilifi District in November 2007, the number of open-defecation-free villages is now more than 1,000 and by 2014; CLTS was formally approved by the Ministry of Public Health and Sanitation (MOPHS) as a potential approach for improving sanitation coverage in the country (Otieno, 2010).

Sanitation is a worldwide problem, according to WHO (2008) and UNICEF (2008), only 62% of the world's population has access to improved sanitation in 2008, up by 8% since 1990, while only 31% of the world population lived in houses connected to a sewer, overall 2.5 billion people lack access to improved sanitation and resort to open defecation or other unsanitary forms of defecation, such as public latrines or open pit latrines, including 1.2

billion people who do not have access to any facilities at all, this presents substantial public health risks as the waste could contaminate drinking water and cause life threatening forms of diarrhea. Yet as UNICEF (2008) observes, improved sanitation could save the lives of 1.5 million children who die from diarrheal diseases each year (Okonkwo, 2006). Five million people die each year from preventable water-borne diseases as a result of inadequate sanitation and hygiene practices (Petra *at el.*, 2009).

Sub-Saharan Africa has the lowest sanitation coverage, only 60 per cent of the African population has access to improved sanitation services, and the continent needs to increase coverage to more than 221 million unserved people to meet the 2015 MDG target date, despite significant efforts by governments, progress on sanitation targets has been slow and uneven, with only five countries in Africa predicted to meet the sanitation MDG, innovative approaches, urgent action and political good will are therefore needed to accelerate achievement of the Millennium Development Goal (MDG) targets for sanitation and achieve sanitation uptake, coverage and improvement at scale (WHO/UNICEF, 2008).

In Kenya 21 million use unsanitary or shared latrines, while 5.6 million have no latrine at all and defecate in the open and the poorest quintile is 270 times more likely to practice open defecation than the richest. OD costs Kenya US\$88 million per year yet eliminating the practice would require less than 1.2 million latrine to be built and use (JMP,2010). Over 17.1% diarrhea cases occur in households without improved sanitation facilities (KDHS, 2008-2009). The approach promotes 100% open defecation free communities to minimize the risk of contamination for all, breaking the cycle of fecal-oral contamination, contrary to most conventional sanitation approaches which aim simply at providing toilets, CLTS aims to promote collective behavior change as the key to sustainable, improved sanitation (WSSCC, 2011).

A study conducted in Khalanoo villages in India found that access to toilets and use of toilets was very meager in the non CLTS programme village while these figures were the highest in the CLTS village, access to toilet was 89% in the CLTS village as compared to 40.1% in the non CLTS village and households using toilets out of the total households was 84.5 percent in the CLTS village and only 26.9% in the non CLTS village. Himachal Pradesh in Indonesia was the only CLTS village where 100 % households had access to toilets, utilization of toilets was also highest in the CLTS village, based on this study there is potential influence of CLTS on improving provision and utilization of toilets in CLTS villages and low utilization in non CLTS villages (Manisha *et al.*, 2008).

Despite the worldwide acclaim on the positive influence of CLTS as a tool to address community based sanitation problems, there is still limited knowledge and documented evidence on influence of CLTS approaches on incidences of diarrheal occurrence in households in areas where CLTS has been implemented (Chummy *et al.*, 2012). Siaya county, is one of the counties often hit by diarrheal and even cholera outbreaks in Kenya, in Alego Usonga Sub County, diarrheal diseases are ranked third among the top ten diseases (KDHS, 2008-2009). Boro division with the lowest latrine coverage 55% (DHIS, 2012). Based on the available literature there is need to study the influence of CLTS on sanitation practices, level of awareness and occurrence of diarrhea in the households in Boro Division.

Community Led Total Sanitation was introduced in Kenya in 2007 as a revolution to challenge the already existing approaches to sanitation that was championed by many of the NGOs and government circles that promoted subsidies and handouts to enable communities construct latrines, these approaches were premised on the understanding that the communities did not have latrines because they were “poor”, and could therefore not afford to construct

latrines without external support, it was therefore imperative to provide them with subsidies for latrine construction in order to bring to an end the practice of open defecation, though this was done with very good intentions, it did not yield the desired results (Otieno, 2010).

Community-Led Total Sanitation represents a radical alternative to conventional top-down approaches to sanitation and offers hope of achieving the Millennium Development Goals, in contrast to state-led initiatives to improve sanitation that tend to focus on hardware and subsidies, CLTS emphasizes community action and behaviour change as the most important elements to better sanitation, it also focuses on enabling the local community to analyze the problems of faecal-oral routes of disease spread, and of finding locally appropriate, rather than externally prescribed, through exercises such as transect walks, mapping of open defecation sites, and the various routes of disease spread (e. g. through flies and animals), as well as calculation exercises aimed at drawing villagers' attention to the amount of faeces they are ingesting, powerful emotions of shame and disgust are triggered, a process is ignited where people are moved into action, drawing on local resources and knowledge to construct sanitary facilities that fit their particular needs and desires, within the constraints of household (Movik, 2010).

1.2 Statement of the Problem

Globally around 1.1 billion people practice open defecation, posing hazards to health and personal security, around 2.5 billion people lack the benefits of adequate sanitation and this contribute to more than 4 million cases of diarrhea and 2 million people die every year from diarrheal related diseases, over 60% of these deaths are attributed to poor hygiene and inadequate sanitation. An estimated 1.9 million deaths occur annually among children under five which are associated with sanitation; diarrhea contributes 750,000 of these deaths. According to WHO and UNICEF, regions with the lowest coverage of improved sanitation in

2006 were sub-Saharan Africa (31%), Southern Asia (33%) and Eastern Asia (65%). In Kenya about 30% of disease burden is sanitation-related, however, around 21 million Kenyans use unsanitary or shared latrines, estimated 5.6 million have no latrine at all and defecate in the open. The poorest quintile is 270 times more likely to practice open defecation than the richest. Around 17.1% diarrhea cases occur in households without improved sanitation facilities. However, only three out of the ten households have access to improved sanitation in Kenya. Siaya county, is one of the counties often hit by diarrhea and even cholera outbreaks in Kenya, In Alego Usonga Sub County, diarrheal diseases are ranked third among the top ten diseases, In recognition of the poor sanitation practices and the associated poor health indicators, the County has embraced CLTS approach in selected divisions/villages to improve sanitation and health outcome. Despite this effort, Boro division (with the lowest latrine coverage- 55%) and Siaya at large still record high cases of diarrheal diseases as self reported in their health facilities. The purpose of this study was therefore meant to determine the influence of CLTS approach on diarrhea occurrence in households living in intervention and control villages, Boro Division, Siaya County.

1.3 Justification of the Study

Despite the worldwide acclaim on the positive influence of CLTS as a tool to address community based sanitation problems, there is still lack of knowledge and documented evidence on the influence of CLTS strategy on diarrheal occurrences (Chummy *et al.*, 2012). The Millennium Development Goal 7 (MDG) which aimed to reduce by halves the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015.

Ministry of Public Health and Sanitation aimed to achieve an open defecation free Kenya by 2013 which was aimed at reducing sanitation related morbidity such as diarrhea (UNICEF

2012). The MDG 4 which aims to reduce by two-thirds the under-five mortality rate by 2015 (MDG Report , 2013). The economic benefits of improved sanitation include lower health system costs, fewer days lost at work or at school through illness or through caring for an ill relative, and convenience time savings (time not spent queuing at shared sanitation facilities or walking for open defecation) (Hutton *et al.*, 2007). Achieving the SDG target will mean extending sanitation services to an average of 660,000 people a day, every day, between 2011 and 2015 (MDG report, 2013). The result from this study will provide new knowledge and documented evidence on the effects on household diarrhea occurrences and will provide recommendations on policy, practice and further research both to the region and the general population with challenges. The study will be useful to target population, Government and partners to know the importance of CLTS on reducing diarrhea occurrence.

1.4 Objectives

1.4.1 Broad Objective

To assess the influence of Community Led Total Sanitation approach on diarrhea occurrence in households living in the intervention and control villages, Boro Division, Siaya County, Kenya.

1.4.2 Specific Objectives

1. To assess the difference in sanitation practices in households living in the intervention and control villages in Boro Division Siaya County, Kenya.
2. To compare the level of awareness on CLTS in households living in the intervention and control villages in Boro Division Siaya County, Kenya.
3. To determine the influence of CLTS on occurrence of diarrhea in the households living in intervention and control villages in Boro Division Siaya County, Kenya.

1.5 Research Questions

1. What are the differences in sanitation practices in the households living in the intervention and control villages in Boro Division, Siaya County, Kenya?
2. What is the level of awareness on CLTS in the households living in the intervention and control villages in Boro Division, Siaya County, Kenya?
3. What is the influence of CLTS on occurrence of diarrhea in the households living in intervention and control villages in Boro Division Siaya County, Kenya?

1.6 Significance of the Study

The study will add new knowledge on the effect of CLTS in reducing diarrhea cases in Siaya County. It will be used as reference material by students and the general public. The data formed the baseline information on the status of CLTS and has recommended for sustainable intervention strategies to address knowledge, attitude and practice.

1.7 Assumptions and Limitations

The study assumed favorable weather conditions and that there was political and social stability in the area of study. The study should have been carried in each and every sub location in Siaya Sub County but the scope would not allow. The researcher used the selected samples to make conclusions to the entire Siaya population. The study assessed the association between CLTS with diarrhea occurrence, sanitation practices and awareness. However, the study did not establish causality in the sense that reduced morbidity between households may also be attributed to other factors which were beyond the scope of this study. The study assumed the intention to treat approach in both intervention and control sites. The study assumed the tricking effects from both study areas.

1.8 Scope of the Study

The study was conducted in only two locations, one assigned as an intervention and the other as a control. The study was not conducted in all the location in Alego Usonga Sub County which could have provided a wider scope.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter present review of the published literature on CLTS in relation to diarrheal occurrence in various parts of the world as well as locally. The literature review is organized as per specific objectives of the study.

This is an innovative methodology for mobilizing communities to completely eliminate open defecation, by facilitating communities to conduct their own appraisals and analyses of open defecation and take their own action to become open-defecation-free (Plan Kenya, 2009).

It uses community-led methods such as participatory mapping and analyzing pathways between faeces and mouth as a means of galvanizing communities into action (Petra *at el.*,2009).

It recognizes that merely providing toilets does not guarantee their use, nor result in improved sanitation and hygiene. Community Led Total Sanitation therefore focuses on the behavioral change needed to ensure real and sustainable improvements investing in community mobilization instead of hardware, and shifting the focus from toilet construction for individual households to the creation of open defecation-free villages, by raising awareness that as long as even a minority continues to defecate in the open everyone is at risk of disease, CLTS triggers the community's desire for change, propels them into action and encourages innovation, mutual support and appropriate local solutions, for greater ownership and sustainability (Kar, 2008).

Currently it is widely accepted that CLTS is one of the most effective and successful approaches to achieving open-defecation-free communities, when triggered the feeling of 'disgust', 'shame', 'self-respect' and 'fear' prompts a self-realization amongst the individuals as well as the entire community of the negative consequences on health, environment and

economy such as chronic illness, poor drinking water quality, workdays lost, medical expenses and consequent impact on livelihood, community is triggered through hands-off facilitation and participatory analysis of a community's sanitation profile, which stimulates the basic desire to avoid contact with human excreta, self-respect, shame, disgust and fear of contamination drive communities towards an urgent collective local action to get out of the filth, these considerations then drive women, men and children to collectively work to create Open Defecation Free (ODF) communities (Marita *et al.*, 2008 and Plan Kenya, 2009).

Community Led Total Sanitation focuses on igniting a change in sanitation behavior rather than constructing toilets, it does this through a process of social awakening that is stimulated by facilitators from within or outside the community, it concentrates on the whole community rather than on individual behaviors, collective benefit from stopping open defecation can encourage a more cooperative approach, people decide together how they will create a clean and hygienic environment that benefits everyone, it is fundamental that CLTS involves no individual household hardware subsidy and does not prescribe latrine models, social solidarity, help and cooperation among the households in the community are a common and vital element in CLTS, other important characteristics are the spontaneous emergence of Natural Leaders (NLs) as a community proceeds towards ODF status; local innovations of low cost toilet models using locally available materials, and community innovated systems of reward, penalty, spread and scaling-up, CLTS encourages the community to take responsibility and to take its own action (Musyoki, 2008).

The following are CLTS Steps - CLTS practice is context specific and though the principles are clear, the step may vary in chronology or emphasis, however the following are the main steps. Pre-triggering 1. Selecting a community 2. Introduction and building rapport

Triggering 3. Participatory sanitation profile analysis 4. Ignition moment Post-triggering 5 Action planning by the community 6. Follow up (Kar, 2010).

Given that CLTS has distinct features, they are what is called the certification process which applies to establish the residual effect of the CLTS intervention; CLTS is total, meaning that it covers all in the households in the community therefore the threshold is as high and all households must possess a latrine that is determined to be in use (MDG Report, 2012). According to Environmental Hygiene and Sanitation Policy, CLTS was initiated in Kenya in 2007 with the aim of achieving ODF Kenya by 2013 by promoting 100% ODF communities (Environmental Hygiene and Sanitation Policy, 2007). Where CLTS is properly adopted; a resultant scenario of a reduction of diarrhea diseases has been observed (Monserrat, 2010).

The approach of CLTS is not prescriptive, therefore the latrine shall not be assessed so as to fit within some blue print but rather, the latrine shall be an innovation of the household CLTS creates natural leaders and they are a critical cog in the wheel of action, implementation of CLTS and sustaining communities as ODF, defecation sites must not be active, and the certification team must inspect them and also household compound especially for children faeces (UNICEF, 2010).

2.2 Sanitation Practices

Sanitation practices includes a range of behaviours such as: stopping all open defecation; ensuring that everyone uses a hygienic toilet; washing hands with soap before preparing food and eating, after using the toilet, and after contact with babies' faeces, or birds and animals; handling food and water in a hygienic manner; and safe disposal of animal and domestic waste to create a clean and safe environment, CLTS concentrates on ending OD as a first significant step and entry point to changing behavior, it starts by enabling people to do their

own sanitation profile through appraisal, observation and analysis of their practices of OD and the effects these have, this kindles feelings of shame and disgust, and often a desire to stop OD and clean up their neighborhood (Kar, 2008).

Experts on water supply, sanitation and hygiene have identified three priorities for the years to come: no one should practice open defecation; everyone should have safe water and sanitation facilities at home and practice good hygiene; and all schools and health centers should have water and sanitation, while promoting good hygiene (WHO, 2012). In 2010, the United Nations General Assembly explicitly recognized the right to safe, clean water and sanitation and acknowledged that they are essential to the realization of all human rights (MDG Report, 2013).

Today CLTS is being implemented in many countries across the developing world; however a complete understanding of the social and behavioral processes involved is necessary for effective implementation (Kar, 2003). Based on the available literature there is still no clear consensus of level of awareness and whether CLTS approaches are improving knowledge or not community sensitive hence the need to do a comparative study to compare knowledge.

Globally 2.6 billion people still do not use improved sanitation; of these, about 565 million live in Sub-Saharan Africa, like large parts of Asia, the large majority of countries in Sub-Saharan Africa are seriously off track to achieve improved sanitation, and the region has the largest number of countries where less than 50% of the populations have access to improved sanitation, OD is the norm in rural areas in the majority of African countries, as well as in large parts of urban settlements (MDG Report, 2013). Globally an estimated 40 % of the

world population does not have access to a basic level of sanitation; one out of five practices open defecation (UNICEF/WHO/ JMP, 2008).

Globally 1.1 billion people practice open defecation, this results in a faecal load of 200,000 metric tons per day, which finds its way into soil and water bodies, contaminating them with pathogens, the practice of open defecation is reinforced by traditional behaviour patterns and lack of awareness about the health threats posed by it, at the same time, there is little awareness about the potential health and consequent economic benefits of sanitation facilities (Central Bureau of Health Intelligence, 2002).

In developing world over 1 billion people lack sanitation facilities and continue to practice open defecation that poses serious health and environmental risks to themselves and entire communities, new sanitation policies adopted in recent years throughout have shown remarkable success and have led to unprecedented increases in sanitation coverage, these policies focus on stopping the practice of open defecation through community level action and influencing social norms to the point where open defecation is no longer considered acceptable (WHO, 2012).

In Sumedang village in Indonesia, 80% toilet coverage is reported to be considered good enough for claiming open defecation free (ODF) status for the villages, in many cases, in the case of Muara Enim village in Indonesia, less than 100% toilet coverage coupled with sharing of toilets but with no open defecation has been largely the criteria for declaring a village ODF, which is closer to the CLTS approach and methodology, in Lembata village in Indonesia, 100% toilet coverage is the minimum criterion for declaring a village ODF, but

not necessarily on the basis of actual verification of the ODF status of the village concerned (Nisheeth *et al.*, 2012).

In developing world over 1 billion people lack sanitation facilities and continue to practice open defecation that poses serious health and environmental risks to themselves and entire communities, new sanitation policies adopted in recent years throughout have shown remarkable success and have led to unprecedented increases in sanitation coverage, these policies focus on stopping the practice of open defecation through community level action and influencing social norms to the point where open defecation is no longer considered acceptable (WHO, 2012).

Practices such as open defecation, unhygienic behaviour and haphazard garbage disposal are common in South and South-East Asia, Africa and Latin America; they result in environmental degradation which directly affects the health and quality of life of millions of people, especially the poorest, most vulnerable people in these regions (Cairncross *et al.*, 2010). The situation is acute and widespread in much of South Asia, where a significant proportion of the population bears the burden of disease that is attributed to inadequate access to water, use of unsafe drinking water, inadequate sanitation facilities and unhygienic practices (Boschi, 2008).

In Kenya, sanitation coverage is low at 43 %, the National Environmental Sanitation and Hygiene Policy calls for strategies to raise sanitation coverage but in some areas of Kenya only three out of 10 households have access to improved sanitation (Kamau, 2009). Estimated 75.7 % population lack access to an improved sanitation facility (KDHS, 2008-

2009). Around 21 million Kenyans use unsanitary or shared latrines and around 5.6 million have no latrine at all and defecate in the open (JMP, 2010).

Case study carried out in Bangladesh when pre and post intervention periods were compared rates of open defecation reduced by 92% in the CLTS areas compared to 28% in the non CLTS area ($p < 0.01$), a significantly higher proportion of poor households used latrines in the CLTS area compared to the non CLTS area (76.4% vs. 23.4%, $p < 0.01$), in terms of hygiene practices at 54% in the CLTS area and 90% in the non CLTS area, disposed children's excreta on an open surfaces higher proposition of the latrines in the CLTS area was considered clean and had amenities such as water, soap and sandals available compared to those in the non CLTS area, there was no significant difference in the prevalence of diarrhea among of five years old children in the two areas (Sabrine, 2009).

According to Water and Sanitation Programme Mission the critical times for hand washing as one of the effective sanitation practices with high impact on health includes hand washing after defecation, after washing child's bottoms, before cooking/handling food and before eating food. The safe disposal of infant's faeces is important because an infant's faeces are known to have five times more pathogens than the faeces of an adult, casually throwing an infant's faeces in the open is as dangerous as defecating in the open and, in turn, it pollutes our water sources, it is, therefore, very necessary that an infant's faeces is disposed in a safe manner (WSP, 2010). A recent systematic review of the impact of washing hands with soap shows that this specific practice may be three times as effective as improving water quality, reducing the risk of diarrhea by 47 % (Curtis *et al.*, 2003).

The more realistic estimate for latrines in rural area is less than 15 % in many villages, non-governmental organizations (NGOs) working in the water and sanitation sectors have found the latrine coverage at 5% -7% during pre-intervention surveys and estimated 20,000–25,000 metric tons of human faeces are being added every day in open areas, contaminating water sources and causing serious health hazards (Kar, 2005). A study conducted in Nepal indicated that hand washing at critical times referred to hand washing after defecation, before preparing food, before eating, before feeding children, after work and after washing children's bottom, the same study revealed that only 50 (28%) respondents washed hands and 127 (72%) respondents didn't wash their hands with soap or other agents at critical times (Anup, 2012).

The same pattern is observed when coverage figures are examined; 82% of the world's population has access to water supply yet only 60% has access to sanitation facilities, in Asia the difference is even more pronounced with 93% having access to water supply and only 48% with access to sanitation and amongst other things, this lack of progress in the sanitation sector could be attributed to a lack of political will and poor policy; sanitation is not a compelling “vote-getter” (UNICEF, 2000). A study conducted in Nepal found out that the proportion of the households who treated water were only 27.1% whereas 72.9% households didn't treat water (Anup, 2012). In addition, sanitation projects are complex; ensuring access does not guarantee latrine use by all members of a community and therefore the relationship between sanitation and health is not straightforward (Hunt, 2001).

As from 1990 to 2011, 1.9 billion people gained access to a latrine, flush toilet or other improved sanitation facility, a strong push is needed to ensure that this number increases by another 1 billion people by 2015 to meet the MDG sanitation target, in 1990, just under half (49 %) of the global population had improved sanitation, coverage must extend to 75 % to

meet the MDG sanitation target, up from the current level of 64 %, the greatest progress has been made in Eastern Asia, where sanitation coverage increased from 27 % in 1990 to 67 % in 2011 (MDG report, 2013). This specific objective assessed the difference in sanitation practices in households living in intervention and control villages in Boro Division Siaya County.

2.3 Level of Awareness on CLTS in the Households

In this global effort, to increase level of awareness in different countries CLTS have been implemented in Cambodia, beginning in 2005, this has been expanded to nine provinces and 258 villages where a total of 134 villages have attained Open Defecation Free (ODF) status, in addition to leading to a substantial increase in the number of latrines, the consistent use of CLTS has helped change behaviors among rural families, these changes are evident in use of latrines at home and in public places in Bangladesh, CLTS is being promoted at the national and regional levels, so far, CLTS promotion efforts have reached over 1.3 million people (over 550,000 children) who are now entirely ODF (Chambers, 2008).

The editorial article by Curtis and Cairncross in the British Medical Journal based on the results of the reviews of the impact of improved water, sanitation and hygiene on diarrheal diseases imply that improving the quality of water supplies reduces the risks of diarrhea by only about 16%, making water more available reduces the risk by 20%, installing adequate facilities to dispose of feces reduces risks of diarrhea by 36 % (Esrey *et al.*, 1991). Hygiene promotion reduces risk by 35% (Huttly *et al.*, 1997). Similar previous report has demonstrated the impact of Water, Sanitation and Hygiene on diarrheal diseases occurrence where traditional sanitation had been practiced, according to WHO, this results are below the recommended 80% effect of an effective intervention strategy adequate to reduce the risk and impact of a disease to the vulnerable group, this study therefore seeks to identify the

contribution of CLTS component, a comprehensive hygiene and sanitation approach involving the community participation (UNICEF, 2012). A study conducted in Nyando Sub County indicated that most of the households in the intervention sites were aware of CLTS program, only 20.9% were aware of CLTS in the control sites; prevalence of diarrhea was 17.4% with 11.1% in the intervention site compared to 21.6% in control site (Makotsi *et al.*, 2015).

Currently out of the 35 Sub Counties, a total of 19 Sub Counties have now embraced the CLTS concept with three of them (Nyando, Siaya and Kisumu West in that order) almost ready to celebrate District ODF status, success in the above three Sub Counties triggered a growing movement amongst NGOs and agencies such as UNICEF, Aga Khan, NETWAS, government line Ministries, Ministry of Public Health and Sanitation and Ministry of Water and Irrigation, Local Authorities and Natural Leaders (including children) from ODF communities to advocate for and scale-up CLTS (Mbeki, 2011).

In a study conducted in Zamboanga Sibugay province in Ghana in 2010 to find the effect of Community-Led Total Sanitation approach on the knowledge and practices regarding open defecation among residents in fishing village found that a round 80% of the interviewed people admitted that they had no idea about the purpose and content of CLTS despite they participated into the triggering event and community meeting, the difficulties led in the failure to listen, understand and failure to express their ideas, in the same study it was found that 70% of the interviewed people and officers did not remember the CLTS triggering event, partly because they did not participate and partly because it had been a few years, only when being reminded by the story told by health officer where human feces and water bottles were brought along with communication trip did they remember (Marty, 2010).

Case study conducted by UNICEF in Liberia show that The CLTS program seems to make great strides as about 26% (194) of respondents reported they have stopped defecation in open places as a result of the education and sensitization, majority 93% (184) of the respondents live in project communities compared with 1.6% (3) in non-project communities. However, this proportion only represents on 36% (516) of the sampled project population (UNICEF, 2008).

A study done by all ten respondents interviewed said that CLTS helped them by making them realize how poor their toilet's sanitary condition was, they also learned the importance of a sanitary toilet in the prevention of diarrheal diseases after attending the workshop seminar, a part from the knowledge and the realizations, all ten (10) respondents felt shame and disgust about their open defecation practices and they started planning to build latrines, despite the change in their perception and outlook regarding their unsanitary practice, they felt limited and desperate because of the many hindrances in constructing toilet (Stephen, 2010).

A study conducted in Ethiopia on Follow-up of a low cost latrine promotion programme in one district of Amhara to investing characteristics of early adopters and non-adopters among households who built their latrine in 2004, 96% (74/77) recalled being advised to build one, in most cases by a local administrator (70%) or health worker (28%), most respondents (74%) said they had not built one because of lack of awareness, of those without a latrine, 96% (27/28) had been advised to build one, 81% by their local administrator, the main reasons why they had not done so were lack of manpower (41%, 11/27), being too busy (15%, 4/27) and lack of awareness (11%, 3/27), among households using latrines 15% said that at least one member of the household did not use the latrine (Rosalyn *et al.*, 2006).

Conducting a community survey to confirm the success of the community mobilization, programme has motivated expansion of the programme to other districts, as people learn more about sanitation, this awareness spreads within the community and to other communities, as described in another African setting (Jenkins, 2004). Knowledge and access to information play key roles in meeting some of the challenges in enabling the poor and the disadvantaged to meet their sanitation needs in a sustainable, efficient and affordable manner (UN, 2004). This specific objective therefore compared the level of awareness on CLTS in households living in intervention and control villages.

2.4 Occurrence of Diarrhea in household living in the Intervention and Control Villages.

World Health Organization has estimated that half of the hospital beds in developing nations are occupied by the patients of water and sanitation related resulting to 3.5 million deaths annually, diarrhea is one of the devastating diseases resulting in 4 billion cases each year and 2.2 million deaths globally, more than 60% of death are associated with diarrhea annually disproportional falls upon children below five years of age (Watercan, 2012).

Frequent bouts of acute watery diarrhea seriously debilitate children, with each successive episode, a child moves further away from his/her normal weight for age, thereby greatly increasing the risk of malnutrition and impaired child development (Pelletier *et al.*, 1995). Children under five in India, sub-Saharan Africa, and Latin America suffer four or five episodes of diarrhea every year, resulting in permanent growth retardation and diminished learning abilities (Guerrant *et al.*, 2002). Diarrhea is not only an immediate health threat to children, but can also have long-term negative effects on a country's socioeconomic development (Berkman *et al.*, 2002).

The Department for International Development-Bangladesh (DFID-B) and CARE Bangladesh North West Baseline Livelihoods Monitoring Project (LMP) noted recently that communities reported over 65 % of their disease burden as water and sanitation related, due to inadequate sanitation and very poor hygiene practices, high incidence in diarrhea and other water related diseases cause 115,000 child deaths each year (11% of total deaths) and the loss of 5.75 million disability adjusted life years (DALYS) or 61% of total lost DALYS, of these DALYS, 90% were attributed to environmental causes and 65% of the DALYS could be averted through improvements in water supply and environmental sanitation, including latrines, drainage, garbage disposal and hygiene (Ahmet, 2012).

The situation is no better in Kenya where the primary causes of many childhood illnesses are sanitation-related (Ministry of Public Health and Sanitation, 2012). Amongst these illnesses, diarrhea remains one of the most important environmental health problems, diarrhea diseases cause 16 % of deaths among children below five years in Kenya and are second only to pneumonia as a cause of deaths in this cohort, millions of dollars are spent on treatment of diarrhea annually and yet in most rural public health facilities diarrhea is ranked number three of the leading causes of outpatient attendance (Ministry of Public Health and Sanitation, 2010).

Reports from the Ministry of Health further confirms that about 80% of hospital attendance is due to preventable diseases and 50% of these diseases are water, sanitation and hygiene related (Ministry of Health, 2007). The KDHS 2008-2009 survey also revealed that 17.1% diarrhea cases occur in households without improved sanitation facilities, Nyanza province was reported to have diarrhea prevalence of 16.2% (KDHS, 2008-09). In Siaya County Diarrheal diseases are ranked third among the top ten diseases in Siaya (DHIS, 2012). A study done in Nyando Sub County established that the overall two-week prevalence of

diarrhea in the study area was 17.4%, the comparison between prevalence of diarrhea between CLTS and Non CLTS indicated that households in CLTS intervention areas experienced less diarrhea compared to households in the control site (Makotsi *et al.*, 2015).

Approximately 19,500 Kenyans, including 17,100 children under 5 die each year from diarrhea nearly 90% of which is directly attributed to poor water, sanitation and hygiene, in addition poor sanitation is a contributing factor through its impact on malnutrition rates to other leading causes of child mortality including malaria and others leading to economic loss of US\$244 million each year due to premature death and at the sometime US\$51 million spent each year on health care, costs associated with health care seeking behaviour include consultation, medication, transport and in some cases hospitalization which place heavy burden on households and government spending (WSP, 2012).

Globally each year, more than 800,000 children under five die needlessly from diarrhea more than one child a minute, countless others fall seriously ill, with many suffering long-term health and developmental consequences, poor sanitation and hygiene are the primary cause of such deaths (Ban, 2013). Reported point prevalence and period prevalence of diarrhoea in children under six years of age was highest in the non CLTS village 47.8% and CLTS village at 14.3% (Manisha *et al.*, 2008).

Simply having more latrines does not guarantee a reduction of illness among communities in general and children in particular, on the other hand, it is possible to drastically reduce the prevalence of diarrhea by becoming open defecation free (WSP Asia, 2007). The table below illustrates the decrease of diarrhea due to ODF.

Table: 2.1: Trends of Diarrhea Due to ODF

Category	Latrine coverage (%)	Prevalence of diarrhea (%)
Open defecation-prevalent villages	29	38
Villages that are almost open defecation free (ODF)	95	26
ODF villages	100	7

Source: (WSP Asia, 2007)

Despite the logical association between environmental contamination with excreta and diarrhea disease transmission, excreta disposal is a frequently neglected area, with efforts focusing on water supply (Moraes *et al.*,2003). This specific determined the influence of CLTS on occurrence of diarrhea in the households living in intervention and control villages in Boro Division Siaya County.

2.5 Conceptual Framework

2.5.1 Sanitation Practices in Households

The sanitation practices at the households and community levels in Boro Division are provision and utilization of latrines, not practicing open defecation, provision of squat hole cover, practicing hand washing with water and soap at critical times, safe waste disposal, safe disposal of children feces, safe water source and practicing household water treatments at point of use. The expected result is to have total sanitation practices in the households and the community to prevent hygiene and sanitation related diseases.

2.5.2 Level of Awareness on CLTS in Households

The level of awareness on CLTS in Boro Division is guided by existing CLTS programs in the community, source of information on CLTS, community participation during triggering sessions and formation of CLTS committees to ensure sustainability. The expected result is to increase level of awareness on CLTS and prevent diarrhea.

2.5.3 Occurrence of Diarrhea in Households

Reduced occurrence of diarrhea among households and communities practicing CLTS and reduced episodes of diarrhea within two weeks and one month among household and communities practicing CLTS. The expected result is reduced prevalence of diarrhea.

2.6 Operational Framework

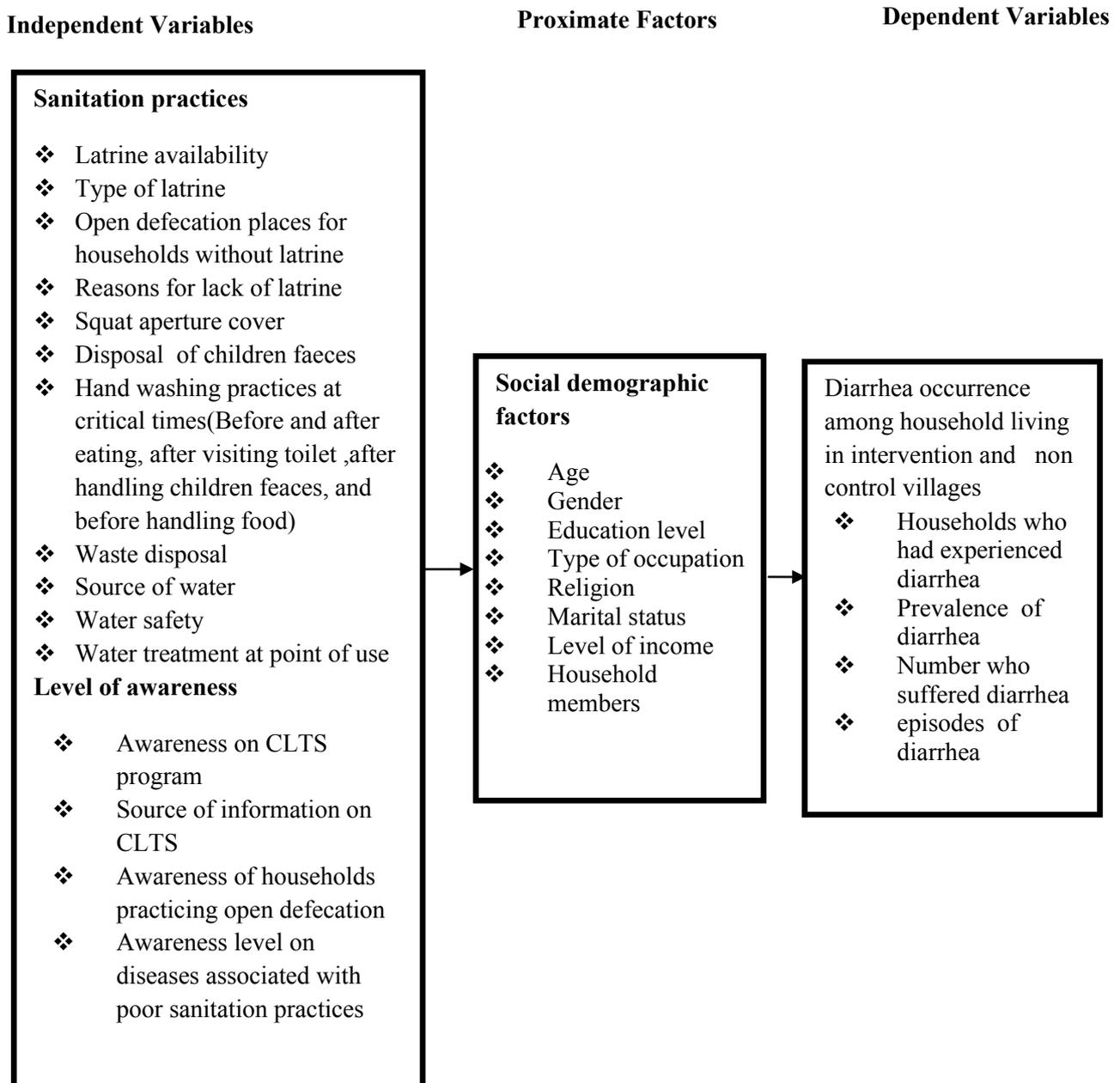


Figure 2.1: Operational Framework

Source: Researcher, 2016

CHAPTER THREE: STUDY METHODOLOGY

3.1 Introduction

This chapter describes the study site, the study design, the study population, the sampling design as well as data collection methodology, validity, data analysis, ethical considerations and scope and limitation of the study.

3.2 Study Area

The study was carried out in intervention and control villages in Boro Division, Alego Usonga Sub County, Siaya County. The intervention location was CLTS villages in Central Alego location and the control location was non CLTS villages in South Central Alego. Boro Division has the lowest latrine coverage 55.3% (DPHO, 2012). The selection of the two locations was done based on whether the site is implementing CLTS or not; Central Alego Location is fully implementing CLTS protocols while South Central Alego is not implementing the CLTS protocol.

3.3 Study Population

The study population included 1914 households living in Central Alego location where CLTS was implemented and 1975 households living South Central Alego location where CLTS was not implemented.

3.4 Study Design

The study design was Comparative cross-sectional study whereby survey was conducted in two locations, one being intervention locations and another being control location. This study was conducted by carrying out a survey of the target population to investigate the influence of CLTS on occurrence of diarrhea. The 398 household heads or any family member aged 18 years and above were interviewed.

3.5 Sample Size Determination

Sample size was calculated using the formula for sample size calculation for prevalence studies. Sample size was determined using Yamane 1969 (Isreal, 2009) sample size calculation formula i.e. $n = N / [1 + N (e)^2]$

Where by:

n = the sample population;

N = the population;

e = level of precision at 95% confidence interval = 0.05

Yamen's Formula

$$n = \frac{N}{1 + (N) e^2}$$

$$\frac{3889}{1 + (3889) 0.0025}$$

$$362.695$$

A 10% non response rate was added, hence

$$n = 362.695 \times 10\%$$

$$n = 362.695 + 36.2695$$

$$n = 398.9645$$

This was households proportionally divided into the two sites. Intervention villages 196 households and control villages 202. Sample size of 398 participants representing 398 households.

Table 3.5: Proportional distribution of sample size

Location	Sub- Locations	Villages	Status CLTS	Number of Households	Population	Sample Size of households
South	Kadenge	8	OD	1124	4190	115
Central Alego	Ratuoro					
	Obambo	11	OD	851	3335	87
Central Alego	Kochieng “B”	8	ODF	594	2602	61
	Koyeyo	15	ODF	1320	5472	135
Total		42		3889	15599	398

3.6 Sampling Methods

Purposive sampling technique was used to select study areas. The two locations have 3889 households (DHIS, 2012). A number of households were selected from both intervention and control location, Stratified sampling method was used to determine a representative sample of households in each village, the villages were group into stratum, Simple random sampling was used to select households in each village using random table digit; a list of all households in each village was obtained from household register with the help of CHVs.

3.7 Selection Criteria

3.7.1 Inclusion Criteria

Data was collected from household heads or any household member of 18 years and above who consented to participate in the study.

3.7.2 Exclusive Criteria

Respondents below 18 years and respondents who did not provide informed consent to participate in the study were excluded.

3.8 Study Variables

3.8.1 Dependent Variable

Diarrhea occurrence, these were the number of diarrhea cases reported in the prior two weeks and within one month among households living in intervention and control villages in Boro Division.

3.8.2 Independent Variables

These were the sanitation practices and level of awareness of CLTS households living in intervention and control villages in Boro Division, Siaya County.

3.9 Data Collection Instruments

Semi structured questionnaires were used to collect data from the selected households in the intervention and control villages on influence of CLTS on diarrhea occurrences. Observation checklist was used to collect data from the selected households on the observation made during the visit.

3.10 Data Collection Methods

The researcher and research assistants introduced themselves to the respondents who were selected for the study and explained the purpose of the research and assurance of confidentiality of the information given. Data was collected between 10th June to 10th July, 2015 from households by use of Semi structured questionnaires The responses were recorded

3.11 Research Questionnaire Pre Testing

Pre testing was carried out in two villages one being CLTS of Central Alego location and non CLTS of South Alego Central location of Boro Division in which households were interviewed and amendments were made. This was done in households with similar characteristic; the findings were not included in the study. The questionnaire was found to be accurate to measure what its intended to measure.

3.12 Selection and Training of Research Assistants

Trained research assistants worked in collaboration with CHWs to identify households. The research assistants were trained to assist in data collection. They were briefed on the purpose and procedures of the study and what was expected of them during data collection period. They were trained on interviewing techniques, the importance of complete and legible data.

3.13 Data Management

All completely filled questionnaires and observation checklist were checked for accuracy, consistency and completeness. Data collection was done through continued close supervision and monitoring. Data validation and data cleaning process was done by running logical checks and error listing using SPSS version 20. Security of data was ensured by having all under key and lock.

3.13.1 Quantitative Data Analysis

The quantitative data which was collected using the semi structured questionnaire was entered; cleaned and analyzed using Statistical Package for Social Science (SPSS) program Version 20. This was used to analyze both descriptive and inferential statistics. Descriptive statistics and frequency distribution were used to describe the occurrence of diarrhea in the study areas. Frequency distribution with proportions was used to describe categorical variables such as socio demographic characteristics of the study participants.

For objective one, frequency distribution such as percentages and proportions were used to describe sanitation practices among the households. Chi-square test using cross tabulation procedure was used to compare proportions of sanitation practices between intervention and control villages.

For objective two, both frequency distribution, proportion and chi-square square test were used to assess the level of awareness among the households on CLTS.

In objective three, to compare the proportion of households who have experiences cases and episodes of diarrhea, chi-square test was used to assess associations between the intervention and control villages. Occurrences of diarrhea cases as the dependent variable between households were compared using binary logistic regression where diarrhea occurrence was coded as Yes or No and the independent variables were also categorized. In all cases a p value <0.05 was considered threshold for statistically significant results. In this analysis, intention- to- treat approach was used. In this case households in the same villages were grouped as intervention villages or control villages even if the observed practices in either site may deviate from expected of CLTS principles. A multivariate binary logistic regression was used to establish the influence of multiple factors on occurrence of diarrhea beside CLTS. The factors included study sites, age, occupation, alternative defecation sites, education and income levels factors. Odds Ratio and 95% confidence intervals were used to establish the magnitude of effect and level of significance.

3.13.2 Qualitative Data Analysis

Data collected through the observation checklist were analyzed using themes, patterns and content analysis to which helped reinforce the findings from the quantitative data.

3.14 Validity and Reliability

According to Bryman(2004) validity is the ability of measuring instruments to give a true measure and reliability is the ability of measuring instruments to give consistent results on repeated trials. This leads to avoiding bias in the selection criteria and ensuring appropriate sampling methods. Data was collected by trained research assistants who were conversant with the area of study. Randomization technique was employed to avoid bias by using random table digit. Checking accuracy and completeness of data collection was done through continuous supervision and monitoring. Data collection tools were translated into local language.

Sample size 10% buffer was considered to take care of any attrition that may result from missed eligible household or non-participation. Proportional distribution and random selection of participants was adhered to ensure proper representation of the target population and to avoid bias.

Reliability of the tools was tested by administering 10% of the questionnaire to similar population and repeating the same after two weeks within the same population. Confirmation of reliability test was done using Cronbach's Alpha which is used to test internal reliability; it essentially calculates the average of all possible split half reliability coefficients. A computed alpha coefficient would vary between 1 (denoting perfect internal reliability) and 0 (denoting no internal reliability) the figure of 0.80 is typically employed as the rule to denote an acceptable level of internal reliability but we worked with 0.70, which is referred as satisfactory level. Correlation analysis was then conducted to assess the level of internal reliability between the test and the pre-test. The tools were considered reliable because the reliability index was at least 0.70.

3.15 Ethical Considerations

The research protocol was approved by the School of Graduate Studies, Maseno University. Authority to collect data was also granted by Public Health Officer Alego Usonga Sub County. The written informed consent was obtained from participants before start of interview. To maintain confidentiality the respondents' names were not written and the information remained anonymous. The data collected were treated confidential and access was limited to the authorized personnel only.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the findings of the study in response to the research questions. The findings were analyzed using descriptive and inferential statistics according to the objectives of the study. Findings from the quantitative data are summarized in tables and figures while qualitative findings are presented as description within the text. Between the month of June and July 2015, a total of 398 households were enrolled, 202 in the control villages and 196 households in the intervention villages and the response rate was 100%.

4.2 Socio Demographic Characteristics of the Respondents

4.2.1 Age of the Respondents

Among the 398 respondents interviewed, 106 (26.6 %) were aged less than 39 years. Those in the age bracket of 40 - 49 years were at 146 (36.7%), those respondents who were aged between 50 - 59 years were at 118 (29.6%). While those aged between 60 – 69 years were 18 (4.5%) and 10 (2.5%) were aged above 70 years. In the intervention villages the majority of the respondents were aged between 40-49 years were at 92/196 (46.9%) while in the control villages the majority of the respondents were aged between 50-59 years were at 105/202 (52.0%). There was significant different in the proportion of age group of respondents who participated in the intervention being younger compared to those in the control villages ($P < 0.0001$) (Table 4.2.1).

Table 4.2.1: Age of the Respondents

Respondents age	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=99.495$ P<0.0001
18-29	24(6.0)	17(8.7)	7(3.5)	
30-39	82(20.6)	57(29.1)	25(12.4)	
40-49	146(36.7)	92(46.9)	54(26.7%)	
50-59	118(29.6)	13(6.6)	105(52.0)	
60-69	18(4.5)	11(5.6)	7(3.5)	
70 and >	10(2.5)	6(3.1)	4(2.0)	
Total	398(100.0)	196(100.0)	202(100.0)	

4.2.2 Gender of the Respondents

Of the 398 respondents who participated in the study 145 (36.4%) were male while 253 (63.6%) were female, in the intervention villages the majority of the respondents were female at 128/196 (65.3%) compared to 125/202 (61.9%) from control villages. Comparing the gender difference in proportion between gender in intervention and control, the results shows there was no significant difference (P=0.478). (Table 4.2.2).

Table 4.2.2: Gender of the Respondents

Gender	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=0.504$ P=0.478
Male	145 (36.4)	68 (34.7)	77 (38.1)	
Female	253 (63.6)	128 (65.3)	125 (61.9)	
Total	398(100)	196 (100)	202(100)	

4.2.3 Education Level of the Respondents

Of the 398 respondents who participated in the study 51(12.8%) had no formal education, 144(36.2%) had primary education, the rest of the respondents 203(51%) had at least secondary education and above. The results indicated that 9(4.6%) respondents in the intervention villages had no formal education compared to 42(20.8%) in the control villages, the results indicated that they were significant difference in proportion of education levels of respondents between intervention and control villages (Table 4.2.3).

Table 4.2.3: Education Level of the Respondents

Level of Education	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=36.876$	P<0.0001
	n (%)	n (%)	n (%)		
No formal education	51(12.8)	9(4.6)	42(20.8)		
Primary	144(36.2)	62(31.6)	82(40.6)		
Secondary	150(37.7)	88(44.9)	62(30.7)		
Tertiary	53(13.3)	37(18.9)	16(7.9)		
Total	398(100.0)	196(100.0)	202(100.0)		

4.2.4 Religious Affiliation of the Respondents

Overall 394 (99.0%) of the respondents were Christians and only 4 (1.0%) of the respondents were Muslims. In the intervention villages 195/196 (99.5%) were Christians compared to 199/202 (98.5%) in the control villages. (Table 4.2.4).

Table 4.2.4: Religious Affiliation of the Respondents

Religious affiliation	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=0.950$	P=0.330
Muslim	4(1.0)	1(0.5)	3(1.5)		
Christian	394(99.0)	195(99.5)	199(98.5)		
Total	398(100.0)	196(100.0)	202(100.0)		

4.1.5 Occupation of the Respondents

Of the 398 respondents 207 (52.0%) were self employed, 90(22.6%) were not employed while 101(25.4%) were employed. Majority of the respondents 114(56.4%) in the control villages were self employed compared to 93(47.4%) in intervention villages (Table 4.2.5)

Table 4.2.5: Occupation of the Respondents

Occupation	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=18.617$	P<0.0001
	n (%)	n (%)	n (%)		
Self employed	207 (52.0)	93(47.4)	114(56.4)		
Not employed	90(22.6)	35(17.9)	55(27.2)		
Employed	101(25.4)	68(34.7)	33(16.3)		
Total	398(100.0)	196(100.0)	202(100.0)		

4.2.6 Marital Status of the Respondents

Of the 398 respondents who participated in the study 5(1.3%) were single, 373(93.7%) were married while 20 (5.0%) were widowed. Majority of the respondents from intervention villages 185(94.4%) and control villages 188(93.1%) were married ($\chi^2=0.934$, P<0.627) (Figure 4.2.6).

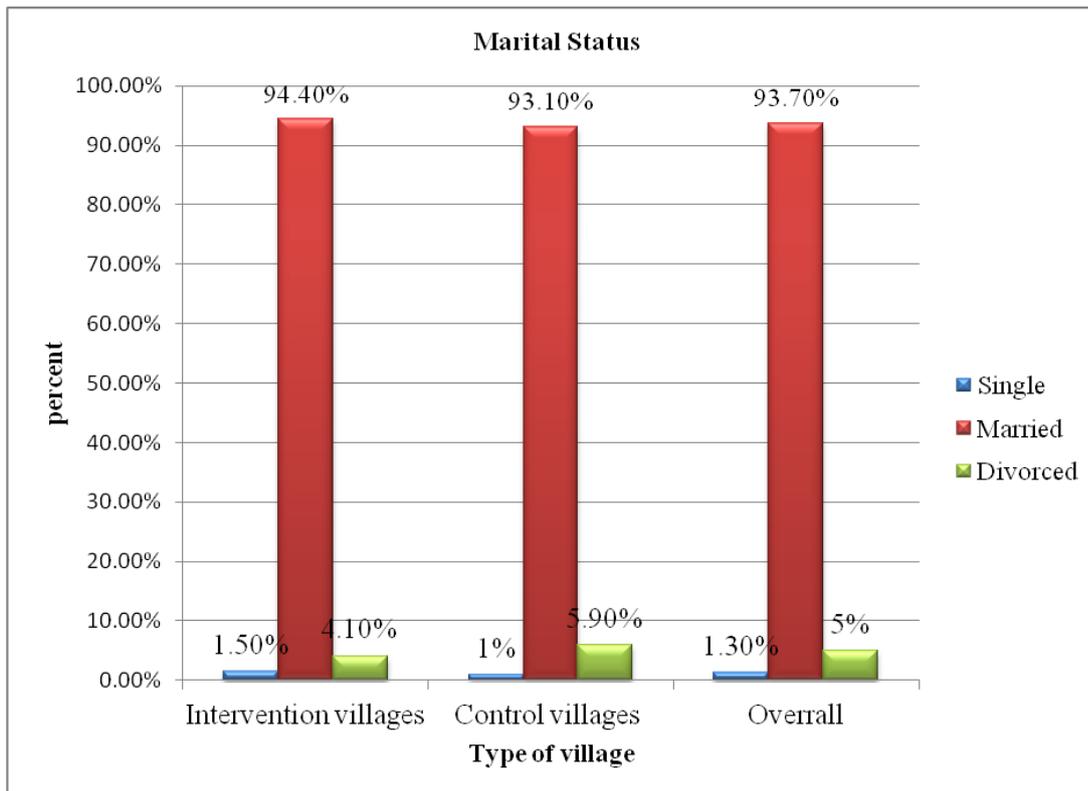


Figure 4.2.6: Marital Status

4.2.7 Income Level of the Respondents

Of the 398 respondents who participated in the study, a round 169(42.5%) had income levels of less than Kshs 5000/=, 94(23.6%) had income levels of Kshs 5000-10000/=, 55(13.8%) had income levels of Kshs 10000-15000/=, 23(5.8%) were with income levels of Kshs 15000-20000,23 (5.8) also with income levels of Kshs 20000- 25000/= ,13 (3.3%) had income levels of Kshs 25000-30000 while 21(5.3%) had income levels of more than Kshs 30000/=. Majority of 110(54.5%) respondents from control villages had income levels of less than Kshs 5000/= compared to 59(30.1%) from intervention villages (4.2.7).

Table 4.2.7: Income Levels

Income Level	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=107.696$ P<0.0001
<5000	169(42.5)	59(30.1)	110(54.5)	
5000-10000	94(23.6)	58(29.6)	36(17.8)	
10000-15000	55(13.8)	36(18.4)	19(9.4)	
15000-20000	23(5.8)	8(7.7)	15(4.0)	
20000-25000	23(5.8)	10(5.1)	13(6.4)	
25000 – 30000	13(3.3)	6(3.1)	7(3.5)	
>30000	21(5.3)	12(6.1)	9(4.5)	
Total	398(100)	196(100)	202(100)	

4.2.8 Number of Household Members

Of 398 respondents who participated in the study. About 245(61.6%) of the households had between 1-5 members, 127(31.9%) had between 6-10 member while 26(6.5%) had between 11-15 members in the household. Majority 126/202(62.4%) of the households in the control villages had the between 1-5 members compared to 119/196(60.7%) in the intervention villages, there was significant difference (Table 4.2.8).

Table 4.2.8: Number of Household Members

Household members	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=0.117$	P=0.943
1-5	245(61.6)	119(60.7)	126(62.4)		
6-10	127(31.9)	64(32.7)	63(31.2)		
11-15	26(6.5)	13(6.6)	13(6.4)		
Total	398(100.0)	196(100.0)	202(100.0)		

4.3 Household Sanitation Practices

4.3.1 Availability of Latrine

Of the 398 households surveyed, 256 (64.3%) had latrines while 142 (35.7%) of the households did not have latrine, results show that 164 (83.7%) households in the intervention villages had latrines compared to 92/202 (45.5%) in the control villages. The difference were statistically significant ($P < 0.0001$) (Table 4.3.1)

Table 4.3.1: Availability of Latrine

Availability of latrine	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=63.019$	$P < 0.0001$
Yes	256(64.3)	164 (83.7)	92 (45.5)		
No	142(35.7)	32 (16.3)	110 (54.5)		
Total	398(100)	196 (100)	202 (100)		

An observation checklist was used to observe presence or absence of latrine in the households. Results indicated that 64.3% had latrine while 35.7 % did not have latrine.

4.3.2 Type of Latrine

Majority of the households 194/256 (75.8%) had ordinary pit latrine, 56(21.9%) of the households had ventilated Improved Pit Latrine while 4 (2.3%) had water closet. The study has showed that majority 121 (73.8%) of the respondents from intervention villages has ordinary pit latrine compared 73 (79.3%) of the respondents from non control villages. However, 39 (23.8%) of the respondents from CLTS site had VIP latrine while only 17 (18.5%) of the respondents from non CLTS site had VIP latrine (Table 4.3.2).

Table 4.3.2: Type of Latrine

Type of latrine	Overall Villages n=256	Intervention Villages n =164	Control Village s n=92	$\chi^2=1.016$	P<0.602
Overall	n (%)	n (%)	n (%)		
VIP Latrine	56(21.9)	39 (23.8)	17 (18.5)		
Ordinary Latrine	Pit 194 (75.8)	121 (73.8)	73(79.3)		
Water Closet	6 (2.3)	4 (2.4)	2 (2.2)		
Total	256(100)	164 (100)	92 (100)		

An observation checklist was used to observe the type of latrines in the households. Results indicated that majority of the households had ordinary pit latrine both in the intervention and control sites.

4.3.3 Defecation Places for Households without Latrine

Of 142 household without latrines, 84(59.2%) of the households reported that they defecated in the bush, 48 (33.8%) used neighbors' latrines, 9(6.3%) defecated in a special place within the compound while 1(0.7%) defecated at the road side. This study indicated that 74 (67.3%) of the household from control villages defecated in the bush while only 10 (31.3%) of the households from the intervention villages defecate in the bush. The difference was statistically significant ($p < 0.0001$) (Table 4.3.3).

Table 4.3.3: Defecation Places for Households without Latrine

Alternative defecation sites	Overall n=142	Intervention Villages n=32	Control Villages n=110	$\chi^2=19.612$	P<0.0001
Overall	n (%)	n (%)	n (%)		
Neighbors' latrine	48(33.8)	20(62.5)	28(25.5)		
Bush	84(59.2)	10(31.3)	74(67.4)		
Special place	9(6.3)	1(3.1)	8(7.3)		
Road side	1(0.7)	1(3.1)	0(0.0)		
Total	142(100.0)	32(100.0)	110(100.0)		

Results from observation checklist indicated that there were presences of open defecation sites were present with faeces in both villages. However, more were observed in the control villages.

4.3.4 Reasons for Lack of Latrine

Of the 142 households without latrines 105(73.9%) reported that they lacked latrine due to lack of money, 17(12.0%) lacked land to build the latrine, 14(9.9%) of the households had soil and ground water problems, 3(2.1%) of the household reported they lacked knowledge on the importance of latrine while 3(2.1%) of the households had just constructed a new home had not constructed latrines

The study showed that most of the households 21/32 (65.6%) from the intervention villages did not have latrine due to lack of money compares to 84/110 (76.36%) of the respondents from non control villages. The differences in reasons for lack of latrines were not significant between intervention and control villages. (Table 4.3.4).

Table 4.3.4: Reasons for Lack of Latrine

Reasons for Lack of Latrine	Overall n=142	Intervention Villages (n=32)	Control Villages (n=110)	$\chi^2=18.140$	P<0.0001
Overall	n (%)	n (%)	n (%)		
Lack of money	105(73.9)	21(65.6)	84(76.36)		
Lack of knowledge	3(2.1)	0(0)	3(2.7)		
Lack of land to build latrine	17(12.0)	1(3.1)	16(14.5)		
Soil or ground water problems	14(9.9)	9(28.1)	5(4.5)		
New home	3(2.1)	1(3.1)	2(1.8)		
Total	142(100.0)	32(100.0)	110(100.0)		

4.3.5 Provision of Squat Hole Cover

Of those households with latrine 106/256 (41.4%) had squat hole cover while 150/256 (58.6%) of the households did not have squat hole cover. The result also indicates that 85(51.8%) of the respondents from intervention villages had squat hole cover compared to 21 (22.8%) of the respondents from control villages. (Table 4.3.5). The difference were statistically significant ($P < 0.0001$).

Table 4.3.5: Provision of Squat Hole Cover

Provision of squat hole cover	Overall (n=256)	Interventio	Control	$\chi^2=20.435$ P<0.0001
		n Villages (n=164)	Villages (n=92)	
Overall	n (%)	n (%)	n (%)	
Yes	106 (41.4)	85(51.8)	21 (22.8)	
No	150 (58.6)	79 (48.2)	71 (77.2)	
Total	256 (100)	165 (100)	92(100)	

4.3.6 Disposal of Faeces of Children

Majority 264(66.3%) of the households disposed children faeces in latrine, 79 (19.9%) in the bush, 43(10.8%) in the garden while 12(3.0%) of the household disposed children faeces in the bush. Households in the control villages were more likely to dispose faeces of children in the bush compared to households in the intervention villages. (Table 4.3.6).

Table 4.3.6: Disposal of Faeces of Children

Characteristics	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=94.055$	P<0.0001	OR (95%CI)
Bush	79(19.9)	8(4.1)	71(35.1)			2.2[0.09-5.02]
Road side	12(3.0)	4(2.0)	8(4.0)		<0.0001	4.1[1,9-7.0]
Garden	43(10.8)	9(4.6)	34(16.8)		<0.0001	0.32[0.15-0.55]
Latrine	264(66.3)	175(89.3)	89(44.1)		Ref	Ref
Total	398(100.0)	196(100.0)	202(100.0)			

4.3.7 Hand Washing with Soap and Water at Critical Times

In the study hand washing at critical times referred to hand washing after defecation, before preparing food, before eating, before feeding children, after work and after washing children's bottom. Of 398 households, 196(49.20%) of households wash hands with soap and water at critical times, 137 (69.90%) in the intervention villages and 59(29.20%) from control villages also wash their hands with soap and water at critical times. Households in the intervention villages were more likely to wash hands with soap and water at critical times compared to those in control villages.(OR=5.6; 95% CI =3.7-8.7;P<0.0001).(Table 4.3.7).

Table 4.3.7: Hand Washing with Soap and Water at Critical Times

Response	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=65.896$	P<0.0001	OR (95% CI)
Yes	196(49.20)	137 (69.90)	59(29.20)		P<0.0001	5.6[3.7-8.7]
No	202(50.80)	59(30.10)	143(70.80)		Ref	Ref
Total	398(100.00)	196(100.00)	202(100.00)			

In many cases hand washing facilities were there mostly in the intervention villages but rare in control villages. Most of the leaky tins were not having water at the time of visit.

4.3.8 Critical Hand Washing Times with Soap and Water

Out of 196 respondents who wash their hands with water and soap at critical times, 64(32.7%) wash their hands after visiting latrine, 114(58.2%) before and after eating, 9(4.6%) after handling children faeces while 9(4.6%) before and after handling food. Most of the respondents 71(51.8%) from the intervention villages wash their hand before and after eating compared to 43(72.9%) respondents from the control villages. (Table 4.3.8).

Table 4.3.8: Critical Hand Washing Times with Soap and Water

Critical Hand Washing Times with Soap and Water	Overall	Intervention Villages (n=137)	Control Villages (n=59)	$\chi^2 = 11.687$ (P<0.009)
Overall	n (%)	n (%)	n (%)	
After visiting the latrine	64(32.7)	48(35.0)	16(27.1)	0.6767
Before and after eating	114(58.2)	71(51.8)	43(72.9)	0.0260
After handling children faeces	9(4.6)	9(6.6)	0(0.0)	0(0.0)
Before and after handling food	9(4.6)	9(6.6)	0(0.0)	0(0.0)
Total	196(100)	137(100)	59(100)	

4.3.9 Waste Disposal

Of the 398 respondents, 240(60.3%) of the households were practicing safe waste disposal while 158(39.7%) of them were practicing unsafe waste disposal. Out of 196 household in the intervention villages 164(83.7%) were practicing safe waste disposal compared to 76(37.6%) household who were practicing safe waste disposal from control villages. The

difference was statistically significant ($\chi^2= 88.120, P<0.0001$). In the study the safe disposal of waste referred to the disposal of both organic and inorganic waste inside refuse pit or waste receptacles or disposal by burning and the unsafe disposal meant the way of disposing by crude method or indiscriminate disposal ($\chi^2= 88.120, P< 0.000$) (Figure 4.3.9).

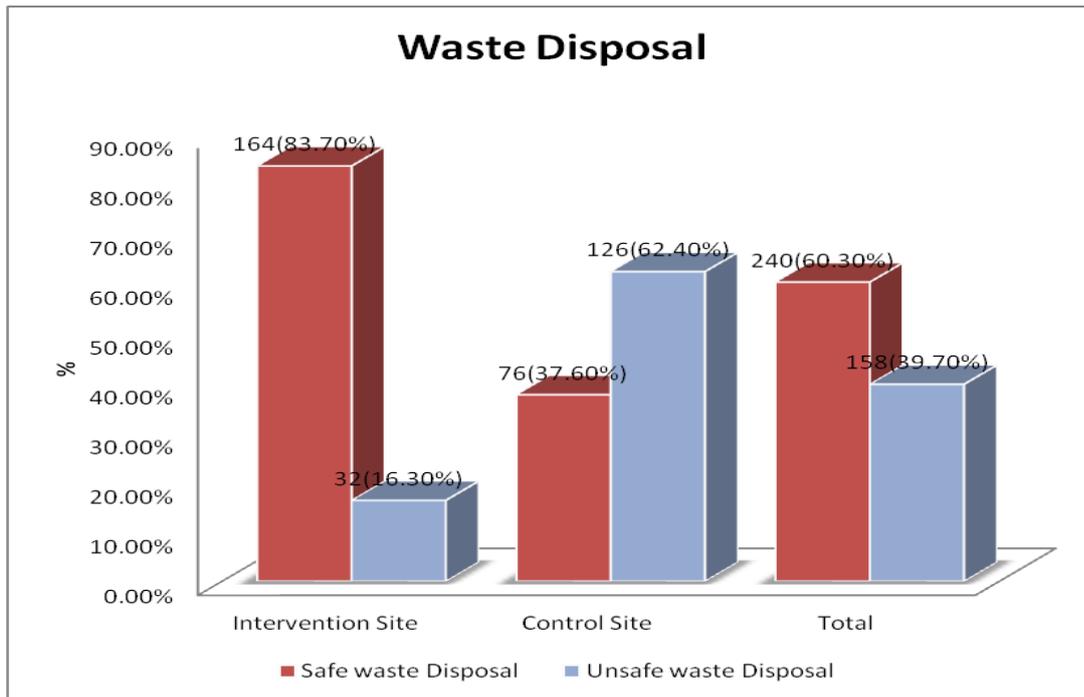


Figure 4.3.9: Waste Disposal

4.3.10 Water Source

Overall 105(26.4%) of household use water from the river,131(32.9%) spring water, 137(34.4%) borehole while 25(6.3%) households use piped water. Among those from intervention villages 80(58.4%) of the households use water from the borehole compared to 57(41.6%) from the control villages, ($\chi^2= 31.756, P< 0.001$) (Figure 4.3.10).

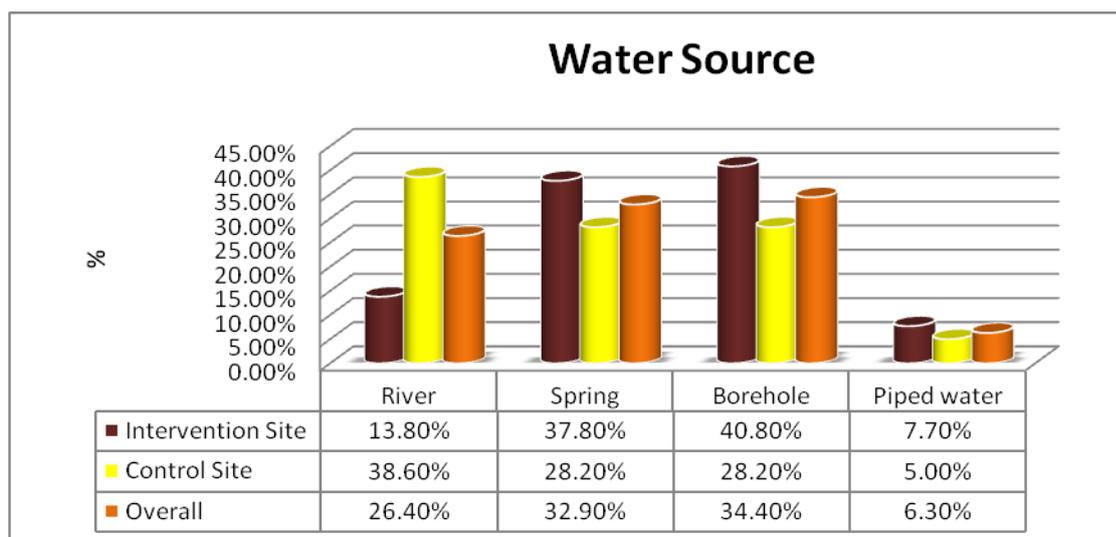


Figure 4.3.10: Water Source

4.3.11 Water Safety

The study further investigated the safety of water source according to the respondents' opinion, overall 301(75.6%) of the respondents said their water source is safe water while 97(24.4%) of the respondents said their water source is not safe. Majority 164(83.7%) of the respondents from intervention villages said that their water source is safe compared to 137 (67.8%) from the control. (Table 4.3.11)

Table 4.3.11: Water Safety

Response	Overall	Intervention Villages n (%)	Control Villages n (%)	P<0.0001	OR at 95%CL
Yes	301(75.6)	164(83.7)	137(67.8)	2.432[1.504- 3.930]
No	97(24.4)	32(16.3)	65(32.2)	Ref	
Total	398(100.0)	196(100.0)	202(100.0)		

4.3.12 Household Water Treatment at the Point of Use

Out of 398 respondents interviewed, 246 (61.8%) of the households treat water at the point of use while 152(38.2%) do not treat water at the point of use. The study indicated that 159(81.1%) household from intervention side treat water at point of use compared 87(43.1%) household from the control villages. (Table 4.3.12).

Table 4.3.12: Household Water Treatment at the Point of Use

Household Water Treatment	Overall n (%)	Interventio n Villages n (%)	Control Villages n (%)	$\chi^2=61.023$	$P<0.000$	Odds Ratio (95% CI)
Yes	246(61.8)	159(81.1)	87(43.1)		$P<0.000$	5.680[3.610-8.939]
No	152(38.2)	37(18.9)	115(56.9)		1	Ref
Total	398(100.0)	196(100.0)	202(100.0)			

4.4 Assessment on Level of Awareness on CLTS amongst Households

4.4.1 Level of CLTS Awareness

Of 398 respondents, 254 (63.80%) respondents were aware of CLTS while 144 (36.20%) were not aware of CLTS, Majority 177 (90.30%) who were aware of CLTS were from the intervention villages compared 77 (38.10) to the control villages. The level of awareness between intervention and control villages were statistically significant ($P<0.0001$) (Figure 4.4.1).

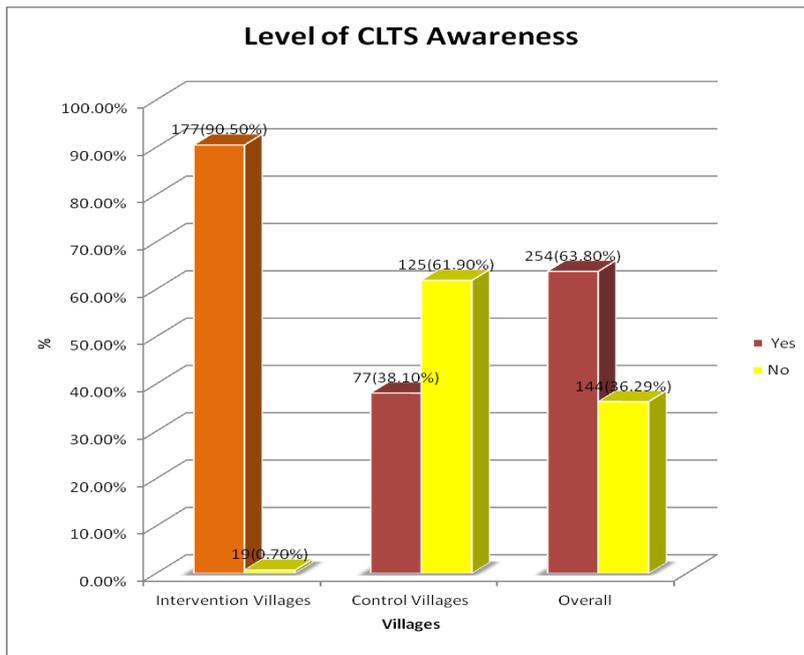


Figure 4.4.1: Level of Awareness

4.4.2 Source of Information on CLTS Awareness among the Household

Out of 254 respondents who had information about CLTS, 163 (64.2%) of the respondents got information on CLTS from CHV/W, 21(8.3%) from natural leader, 33(13.0%) from family member while 37(14.6%) got information from MOH/GOK workers. Households in the intervention were more likely to receive information, 122(68.9%) in the intervention received information from the CHVs compared to 41(53.2%) from control villages. The difference was statistically significant ($P < 0.000$). (Table 4.4.2)

Table 4.4.2: Source of Information on CLTS Awareness

Source of Overall Information on CLTS Awareness	Overall (n=254)	Intervention Villages (n=177)	Control Villages (n=77)	P<0.0001
Overall	n (%)	n (%)	n (%)	
CHV/W	163(64.2)	122(68.9)	41(53.2)	0.0683
Natural Leaders	21(8.3)	21(11.9)	0(0.0)	0(0.0)
Family member	33(13.0)	17(9.6)	16(20.8)	0.3682
MOH / NGO worker	37(14.6)	17(9.6)	20(26.0)	0.9541
Total	254(100.0)	177(100.0)	77(100.0)	

4.4.3 The Respondents who were Aware of Households Practicing Open Defecation

Overall 206 (51.8%) of the respondents were aware of people practicing open defecation while 192(48.2%) were not aware. About 169(83.7%) of respondents from control villages were aware of people practicing open defecation compared to 37(18.9%) from intervention villages. Households in the control villages were more likely to practice open defecation. (Table 4.4.3).

Table 4.4.3: Awareness of Households Practicing Open Defecation

OD	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=167.22$	P-Value	OR at 95%CI
Yes	206(51.8)	37(18.9)	169(83.7)		0.0001	0.045[0.027-0.076]
No	192(48.2)	159(81.1)	33(16.3)			Ref
Total	398(100.0)	196(100.0)	202(100.0)			

4.4.4 Awareness Level of Diseases Associated with Poor Sanitation Practices

Of the 398 of the respondents, 339 (85.2%) were aware there is an association between diarrhea and poor sanitation practices, 164(41.20%) were aware cholera is associated, 63 (15.80%) of the respondents were aware ambiasis is associated with poor sanitation practices while 126 (31.70%) of the respondents were aware typhoid is associated with poor sanitation practices. Majority 189 (96.4%) of the respondent from the intervention villages were aware diarrhea is associated with poor sanitation practices compared to 150 (74.3%) respondents from control villages who were aware there is an association between diarrhea and poor sanitation practices ($P < 0.0001$) and the difference was significant. (Table 4.4.4).

Table 4.4.4: Awareness Level of Diarrheal Diseases Associated with Poor Sanitation Practices

Diseases	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	P<0.000	$\chi^2=$	OR at 95% CI
Awareness of Diarrhea						
Yes	339 (85.2)	189 (96.4)	150 (74.3)	<0.0001	38.727	9.360 [4.132-21.202]
No	59 (14.8)	7(3.6)	52 (25.7)			
Awareness of Cholera						
Yes	164(41.20)	80(40.80)	84(41.6)	0.876	0.024	0.969[0.650-1.444]
No	234(58.80)	116(59.20)	118(58.4)			
Awareness of Ambiasis						
Yes	63 (15.80)	34 (17.3)	29 (14.40)	0.414	0.668	1.252[0.730- 2.148]
No	335 (84.20)	162 (82.7)	173(85.6)			
Awareness of Typhoid						
Yes	126 (31.70)	69 (30.1)	67(33.2)	0.515	0.432	0.868[0.567-1.325]
No	272 (68.30)	137 (69.9)	137(66.8)			

4.5 Assessment of Occurrence of Diarrhea among Households

4.5.1 Prevalence of Diarrhea Two Weeks)

Overall prevalence of two weeks diarrhea occurrence was 189 (47.5) among households. The prevalence of diarrhea was 34(17.3%) in the intervention villages compared to diarrhea 155 (76.7%) in the control villages [OR= 0.064, 95% CI =0.08 - 0.101].CLTS was associated with reduced occurrence of diarrhea in the intervention villages. The difference was significant (P<0.0001) (Table 4.5.1).

Table 4.5.1: Prevalence of Diarrhea (Two Weeks)

Prevalence	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=140.685$	P-Value	Crude 5%CL	OR at
Yes	189(47.5)	34(17.3)	155(76.7)		<0.0001	0.064[0.08 - 0.101]	
No	209(52.5)	162(82.7)	47(23.3)		REF		
Total	398 (100)	196 (100)	202 (100)				

4.5.2 Prevalence of Diarrhea (One Month)

Overall prevalence of one month diarrhea occurrence was 172 (43.2%) among households. The prevalence of diarrhea was 66(33.7%) in the intervention villages compared to diarrhea 106(52.5%) in the control villages, [OR= 0.46, 95% CI = 0.31-0.71], P<0.0001.CLTS was associated with reduced occurrence of diarrhea in the intervention villages. (Table 4.5.2).

Table 4.5.2: Prevalence of Diarrhea (One Month)

Prevalence	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	$\chi^2=14.330$	P<0.0001	Crude OR(95% CI)
Yes	172 (43.2)	66(33.7)	106(52.5)		<0.0001	0.46 [0.31- 0.71]
No	226 (56.8)	130(66.3)	96(47.5)		Ref	
Total	398(100)	196(100)	202(100)			

4.5.3 Episodes of Two Weeks Diarrhea Occurrence

Of the 189 households who had prevalence of diarrhea in the past two weeks, 96(50.8%) had experienced less than 5 episodes of diarrhea, 78 (41.3%) experienced 5 to 10 Episodes and 15(7.9%) experienced more than 10 Episodes of diarrhea. About 7(20.6%) of households from the intervention villages experienced less the 5 episodes of diarrhea compared to 89(57.4%) in the control villages and the difference was significant. (Table 4.5.3).

Table 4.5.3: Episodes of Two Weeks Diarrhea Occurrence

Diarrhea Episodes	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	P<0.0001
<5 Episodes	96(50.8)	7(20.6)	89(57.4)	0.0597
5 to 10 Episodes	78(41.3)	20(58.8)	58(37.4)	0.0954
>10 Episodes	15(7.9)	7(20.6)	8(5.2)	0.3660
Total	189(100)	34(100)	155(100)	

4.5.4 Episodes of One Month Diarrhea Occurrence

Of the 172 households who had prevalence of diarrhea in the last one month, 114(66.3%) had experienced less than 5 episodes of diarrhea, 42(24.4%) experienced 5 to 10 Episodes and 7(20.6%) experienced more than 10 Episodes of diarrhea. About 40(60.6%) of households from the intervention villages experienced less the 5 episodes of diarrhea compared to 74(69.8%) in the control villages and the difference was significant.

Table 4.5.4: Episodes of One Month Diarrhea Occurrence

Diarrhea Episodes	Overall n (%)	Intervention Villages n (%)	Control Villages n (%)	P <0.408
<5 Episodes	114(66.3%)	40(60.6%)	74(69.8%)	
5 to 10 Episodes	42(24.4%)	18(27.3%)	24(22.6%)	
>10 Episodes	16(9.3%)	8 (12.1%)	8(7.5%)	
Total	(172)100.0%	66(100.0%)	106(100.0%)	

4.6 Association between Socio-Demographic Characteristics, Sanitation Practices, Level of Awareness and Diarrhea Occurrence among Households.

4.6.1 Association between Socio-Demographic Characteristics and Diarrhea Occurrence among Households

Socio demographic characteristics associated with diarrhea occurrence among households living in intervention and control villages were evaluated using chi square Statistics. In this analysis the respondents age was significantly associated with diarrhea ($\chi^2 = 46.501$, $P < 0.001$). The households with respondents aged between 40-49 years reported high levels of diarrhea occurrence in control villages at 46 (85.2 %) compared to other age groups. This study revealed that there was significant association between the respondents educational status and the diarrhea occurrence ($\chi^2 = 22.635$, $P < 0.001$). Overall proportion of respondents

with tertiary education reported the lowest level of diarrhea occurrence 14(26.4%), at intervention and control villages 2 (5.4 %) and 12 (75%) respectively. There was no significant association between gender of the respondent and occurrence of diarrhea in both villages ($\chi^2 = 2.220$, $P < 0.136$). A large proportion of reported incidences of diarrhea were reported by male participants 61 (79.2%) in the control villages.

There was no significant association between occurrence of diarrhea and Occupation of the respondents ($p = 0.238$, $\chi^2 = 2.875$). This study revealed that there was significant difference with the respondents level of income and the diarrhea ($\chi^2 = 30.42$, $P < 0.001$).

Table 4.6.1: Socio-Demographic Characteristics and Diarrhea Occurrence between Control and Intervention Villages

Variables	Overall	Diarrhea occurrence	Intervention villages	Control villages	χ^2	P- Value
Marital status					6.466	P=0.039
Single	2(40%) 3(60.0%)	Yes No	0(0.0) 3(100)	2(100) 0(0.0)		
Married	172(46.1%) 201(53.9%)	Yes No	30(16.2) 155(83.8)	142(75.5) 46(24.5)		
Windowed	15(75%) 5(25%)	Yes No	4(50.0) 4(2.5)	11(91.7) 1(8.3)		
Income Level					S=30.421	P=0.0001
<5000	126(58.1%) 91(41.9%)	Yes No	12(20.3) 47(79.7)	144(72.2) 44(27.8)		
5000-10,000	37(33.3%) 49(57%)	Yes No	9(15.5) 49(84.5)	28(100) 0(0.0)		
10,000-15,000	12(33.3%) 24(66.7%)	Yes No	12(33.3) 24(66.7)	0(0.0) 0(0.0)		
15,000-20,000	2(11.8%) 15(88.2%)	Yes No	0(0.0) 15(100)	2(100) (0.0)		
20,000-25,000	2(15.4%) 11(84.6%)	Yes No	0(0.0) 10(100)	2(66.7) 1(33.3)		
25,000-30,000	4(40%) 6(60%)	Yes No	0(0.0) 6(100)	4(100) 0(0.0)		
>30,000	5(27.8%) 13(72.2%)	Yes No	1(83) 11(27)	4(66.7) 2(33.3)		
Variables	Overall	Diarrhea occurrence	Intervention villages	Control villages	χ^2	P- Value
Age of the respondents					46.501	P<0.0001
18 -29	5 (20.8%) 19(79.2%)	Yes No	0(0.00) 17(100%)	5(71.4) 2(28.6)		
30-39	19 (23.2%) 63 (76.8%)	Yes No	0(0.00%) 57(100%)	19 (76) 6 (24)		
40-49	80 (54.8%) 66 (45.2%)	Yes No	34 (37.0%) 58 (63.0%)	46 (85.2 %) 8 (14.8 %)		
50-59	80 (67.8%) 38 (31.2%)	Yes No	0(0.0%) 13(100%)	80 (72.6%) 25 (23.8%)		
60-69	5 (27.8%) 13 (72.2%)	Yes No	0(0.0%) 11 (100%)	5(71.4%) 2(28.6%)		
70 and >	0 (0.0%) 10 (100%)	Yes No	0 (0.0%) 6 (3.7%)	0 (0.0%) 4(100%)		
Gender of the respondents					2.220	0. 136
Male	76 (52.4%) 69 (47.6%)	Yes No	15 (22.1%) 53 (77.9%)	61(79.2%) 16(20.8%)	OR=1. 365,CI	

Female	113 (44.7%)	Yes	19 (14.9%)	94(75.2%)	=[0.90 6- 2.055]	22.635	P<0.0001
	140 (55.3%)	No	109 (85.1%)	31(24.8%)			
Education level of the respondents							
No formal education	37(72.5%)	Yes	3(33.3%)	34(81.0%)			
	14(27.5%)	No	6(66.7%)	8(19.0%)			
Primary	70(48.6%)	Yes	10(16.1%)	60(73.2%)			
	74(51.4%)	No	52(83.9%)	22(26.8%)			
Secondary	68(45.3%)	Yes	19(21.6%)	49(79.0%)			
	82(54.7%)	No	69(78.4%)	13(21.0%)			
Tertiary	14(26.4%)	Yes	2(5.4%)	12(75.0%)			
	39(73.6%)	No	35(94.6%)	4(25.0%)			
Occupation of the respondents							
					2.875	P=0.238	
Self employed	101(44.8%)	Yes	16(17.2%)	85(74.6%)			
	106(51.2%)	No	77(82.8%)	29(25.4%)			
Not employed	47(52.3%)	Yes	7(2.0%)	40(72.7%)			
	43(47.8%)	No	28(80.0%)	15(27.3%)			
Employed	41(40.6%)	Yes	11(16.2%)	30(90.9%)			
	60(59.4%)	No	57(83.8%)	3(9.1%)			

...Continued; Table 4.6.1

4.6.2 Association between Sanitation Practices and Diarrhea Occurrence in Households

Sanitation practices associated with diarrhea occurrence among households living in intervention and control villages were evaluated using chi square Statistics. In this analysis the availability of latrine was significantly associated with diarrhea occurrence ($\chi^2 = 12.052$ P<0.001). Households with latrines reported high levels of diarrhea occurrence in control villages at 81.5 % compared to household from intervention villages at 18.3%. This study revealed that overall there was significant association between the disposal of children's faeces and the diarrhea occurrence ($\chi^2 = 53.675$, P<0.001). The proportion of respondents who disposed children's faeces in the bush experienced significantly higher level of diarrhea occurrence in the control villages at 75.4% compared to households from intervention villages at 17.3% ($\chi^2 = 13.727$ P<0.002). There was significant association between hand washing with water and soap at critical times and occurrence of diarrhea in both villages ($\chi^2 = 10.417$, P<0.001). The respondents from intervention villages who practiced hand washing

with water and soap at critical points reported low levels of diarrhea occurrence at 22.6% compared to households from control villages at 78%. The respondents from intervention villages who practiced household water treatment at point of use reported low levels of diarrhea occurrence at 11.3% compared to households from control villages at 66.7%. ($\chi^2 = 71.120$, $P < 0.001$). Respondents from households who practiced safe waste disposal reported the lowest level of diarrhea occurrence at 20.1% from intervention villages compares to 69.7% from control villages. The association was significant ($\chi^2 = 32.92$, $P < 0.001$).

Table 4.6.2: Sanitation Practices and Diarrhea Occurrence between Control and Intervention Villages

Variables	Overall	Diarrhea occurrence	Intervention villages	Control villages	χ^2	P-Value
Availability of latrine					$\chi^2= 12.052$	P<0.001
Yes	105 (41)	Yes	30(18.3)	75(81.5)		
	151(59)	No	134(81.7)	17(18.5)		
No	84(59)	Yes	4(12.5)	80(72.7)		
	58(40.8)	No	28(87.5)	30(27.3)		
Defecation Places for households without latrine					$\chi^2 = 3.192$	P=0.363
Neighbour	25(52.1)	Yes	1(5)	24(85.7)		
s latrine	23(47.9)	No	19(95)	24(32.4)		
Bush	53(63.1)	Yes	3(30)	6(75)		
	31(36.9)	No	7(70)	2(25)		
Provision of squat hole cover					$\chi^2=4.782$	P<0.029
	35(33)	Yes	17(20)	18(85.7)		
	71(67)	No	68(80)	3(14.3)		
	70(46.7)	Yes	13(16.5)	75(80.3)		
	80(53.3)	No	66(83.5)	14(19.7)		
Disposal for children faeces					$\chi^2=53.675$	P<0.001
Bush	66(83.5)	Yes	3(37.3)	63(88.7)		
	13(16.5)	No	5(62.5)	8(11.3)		0.002
Roadside	7(58.3)	Yes	1(25)	6(75)		
	5(41.7)	No	3(75)	2(25)		0.152
Garden	18(41.9)	Yes	0(0.0)	18(52.9)		
	25(58.1)	No	9(100)	16(47.1)		0.004
Latrine	98(37.1)	Yes	34(17.3)	68(75.4)		
	166(62.9)	No	162(82.7)	21(23.6)		<0.001

... Continued Table 4.6.2

Variables	Overall	Diarrhea occurrence	Intervention villages	Control villages	χ^2	P- Value
Hand washing with soap and water					$\chi^2=10.417$	P<0.001
Yes	77(39.3)	Yes	31(22.6)	46(78)		
	119(60.7)	No	106(77.4)	13(22)		
No	112(55.4)	Yes	3(5.1)	109(76.2)		
	90(44.6)	No	56(94.9)	34(23.8)		
Hand washing with soap and water at critical times						
After visiting the latrine	21(32.8)	Yes	6(12.5)	15(93.8)	35.934	p<0.001
	43(67.7)	No	42(87.5)	1(6.2)		
Before and after eating	47(41.2)	Yes	16(22.5)	31(72.1)	27.145	p<0.001
	67(58.8)	No	55(77.5)	21(29.9)		
Water Source					$\chi^2=41.497$	P< 0.0001
River	77(73.3)	Yes	12(44.4)	65(83.3)		
	28(26.7)	No	15(55.5)	13(15.4)		
Spring	55(42)	Yes	16(21,6)	39(68.4)		
	76(58)	No	58(78.4)	18(31.6)		
Borehole	45(32,8)	Yes	4(5.0)	41(71.9)		
	92(67.2)	No	76(95)	16(28.1)		
Piped water	12(48)	Yes	2(13.3)	10(100)		
	13(52)	No	13(86.7)	0(0.0)		

... Continued Table 4.6.2

Variables	Overall	Diarrhea occurrence	Intervention villages	Control villages	χ^2	P- Value
Water Safety					$\chi^2=3.872,$	P < 0.049
Yes	131(44.6) 163(55.4)	Yes No	22(14) 135(86)	109(79.5) 28(20.4)		
No	58(55.8) 46(44.2)	Yes No	12(30.8) 27(69.2)	46(70.8) 19(29.2)		
Household water treatment at point of use					$\chi^2=71.120,$	P< 0.001
Yes	76(30.9) 170(69.1)	Yes No	18(11.3) 141(88.7)	58(66.7) 29(33.3)		
No	113(74.3) 39(25.7)	Yes No	16(43.2) 21(56.8)	97(84.3) 18(15.7)		
Waste Disposal					$\chi^2=32.927,$	P< 0.001
Safe Disposal	86(35.8) 154(64.2)	Yes No	33(20.1) 131(79.9)	53(69.7) 23(30.3)		
Unsafe Disposal	103(65.2) 55(34.8)	Yes No	1(3.1) 3(96.9)	102(81.0) 24(19.0)		

4.6.3 Association between Level of Awareness and Diarrhea Occurrence

Respondents' level of awareness on CLTS was associated with the diarrhea occurrence. Results indicated that 16.8% of households from intervention villages were aware of CLTS experienced diarrhea compared to 79.3% from control villages. The level of awareness on CLTS was significantly associated with diarrhea ($\chi^2 = 12.219$ P<0.001).

Table 4.6.3: Association between Level of Awareness and Diarrhea Occurrence

Characteristics	Diarrhea	Overall n=196	Intervention villages n=196	Control villages n=202	P-Value	χ^2	OR at (95%CI)
Association between level of awareness and diarrhea occurrence		n(%)	n(%)	n(%)	P<0.001	12.219	OR=0.488,CI [0.325-0.731]
Aware	Yes	93(40.1)	24(16.8)	69(79.3)			
	No	70(59.9)	10(19.6)	86(74.8)			
Not Aware	Yes	139(59.9)	121(83.4)	18(20.7)			
	No	70(42.2)	41(80.4)	29(25.2)			

4.7 Influence of CLTS on Diarrhea Occurrence

CLTS was significantly associated with reduced prevalence of two weeks diarrhea in the intervention villages compared to control villages, 17.3% vs. 76.7% respectively, OR=0.064; 95% CI=0.08-0.1. CLTS was significantly associated with reduced prevalence of one month diarrhea in the intervention villages compared to control villages, 33.7% vs. 52.7% respectively P<0.0001. CLTS was associated with the prevalence of diarrhea (Table 4.7).

Table 4.7: Influence of Diarrhea Occurrence

Logistic Regression on Diarrhea Occurrence	Response	Intervention Villages (n=196)	Control Villages (n=202)	Crude Adjusted		Adjusted ,P –value
				OR	95%CI, p-value	
Prevalence of diarrhea						
Diarrhea occurrence in 2 weeks	Yes	17.3%	76.7%	0.064[0.08-.10],<0.0001		0.58[0.34-0.1]<0.0001
	No	82.7%	23.3%			
Diarrhea occurrence in one month	Yes	33.7%	52.5%	0.46[0.31-0.7] <0.0001		0.46[0.3-0.71]<0.0001
	No	66.3%	47.5%			

4.8 Multivalent Logistic Regression on Diarrhea Occurrence

Overall, 76.7% households in the control villages experienced diarrhea compared to 17.3% in the intervention villages. In a multivariate logistic regression adjusting for education, age, income level, occupation and alternative defecation sites as potential confounders, households in the intervention villages had significantly lower odds of diarrhea occurrence compared to households in the control villages.

Table 4.8: Multivalent Logistic Regression on Diarrhea Occurrence

Factors	Crude OR 95% CL	Adjusted OR 95%	P	-Value
Arm Intervention	0.06 [0.04- 0.1]	0.03[0.007-0.2]		<0.0001
Control	Ref			
Age	0.7[0.6-0.9]	1.4[0.8-2.3]		0.189
Occupation	1.2[0.9 – 1.5]	0.8[0.4- 1.9]		0.359
Defecation sites	0.8[0.5 – 1.4]	1.3[0.6-2.6]		0.480
Education	1.7[1.3-2.1]	1.05[0.6-1.7]		0.845
Income level	1.4[1.2-1.6]	0.9[0.7-1.2]		0.489

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter presents comparisons and opinions about the study results while comparing with findings of similar studies undertaken in other places. Similarities and differences are highlighted. The study had three objectives:

1. To assess the difference in sanitation practices in households living in intervention and control villages in Boro Division, Siaya County.
2. To compare the level of awareness on CLTS among households living in intervention and control villages in Boro Division, Siaya County.
3. To determine the occurrence of diarrhea among households living in intervention and control villages in Boro Division, Siaya County.

Thematic discussion of the results is presented below according to the study specific objectives.

5.2 Sanitation Practices among Households.

This study revealed the overall 64.7% of the households had latrines, majority of households with latrines were from the intervention villages 83.7% compared to 45.5% in the control villages. This finding has concurred with a study conducted by Manisha *et al.*, 2008 in Maharashtra India which found that the latrine coverage was highest at 89% in the CLTS villages compared to 40.1% in the non CLTS villages. The result of this study is not in agreement with a study conducted in Himachal Pradesh in India which indicated that in CLTS villages the households had 100% access in latrines (Manisha *et al.*, 2008).

Overall 59.2% of the households reported that they defecated in the bush, 33.8% used

neighbors' latrines, 96.3% defecated in a special place within the compound while 7% of the households defecated at the road side. This study indicated that 67.3% of the household from control villages defecated in the bush while only 31.3% of the households from the intervention villages defecate in the bush. The result from this study can be compared with a case study conducted in Bangladesh which found that open defecation was reduced by 92% in the CLTS area compared to 28% in the non CLTS (Sabrine, 2009).

A round 66.3% of the households disposed children faeces in latrine, 19.8% in the bush, 10.8% in the garden while 3.0% of the household disposed children faeces in the road side. This study finding contradict a case study carried out in Bangladesh which showed that hygiene practices were at 54% in the CLTS area compared to 90% in the non CLTS area. Higher proportion of households dispose their children's excreta in latrine, households in the control villages were more likely to dispose faeces of children in the bush compared to households in the intervention villages. A study conducted in Nepal indicated that (61%) of household who had disposed faeces in an improved way while only still 31% of household disposed their children's faeces in non-improved ways (Anup, 2012).

In this study hand washing at critical times referred to hand washing after defecation, before preparing food, before eating, before feeding children, after work and after washing children's bottom. Of 398 household, 49.20% of households wash hands with soap and water at critical times, 69.90% in the intervention villages and 29.20% from control villages also wash their hands with soap and water at critical times. Households in the intervention villages were more likely to wash hands with soap and water at critical times compared to those in control villages, this find is in a agreement with a study conducted in Nepal which indicated that hand washing at critical times referred to hand washing after defecation, before preparing

food, before eating, before feeding children, after work and after washing children's bottom, the same study revealed that only 50 (28%) respondents washed hands and 127 (72%) respondents didn't wash their hands with soap or other agents at critical times (Anup,2012).

Out of 196 respondents who wash their hands with water and soap at critical times, 32.7% wash their hands after visiting latrine, 58.2% before and after eating, and 4.6% after handling children faeces while 4.6% before and after handling food. Most of the respondents 51.8% from the intervention villages wash their hand before and after eating compared to 72.9% respondents from the control villages. This finding is not in agreement with Scott *et al.*, (2007) which indicated that the rates of hand washing around the world are low and the observed rates of hand washing with soap at critical times for example, before handling food and after using the toilet range from 0% to 34%. According to Curtis *et al.*, (2003) in a recent systematic review of the impact of washing hands with soap showed that this specific practice may be three times as effective as improving water quality, reducing the risk of diarrhea by 47%.

This study revealed that of the 398 respondents, 60.3% of the households were practicing safe waste disposal while 39.7% of the households were practicing unsafe waste disposal, out of 196 household in the intervention villages 83.7% were practicing safe waste disposal compared to 37.6% household who were practicing safe waste disposal from control villages. In this study the safe disposal of waste referred to the disposal of both organic and inorganic waste inside refuse pit or waste receptacles or disposal by burning and the unsafe disposal meant the way of disposing by crude method or indiscriminate disposal. In agreement with Cairncross *et al.*, (2010).

Practices such as open defecation, unhygienic behaviour and haphazard garbage disposal are common in South and South East Asia, Africa and Latin America; they result in environmental degradation which directly affects the health and quality of life of millions of people, especially the poorest, most vulnerable people in these regions.

In this study the result showed that 81.1% household from intervention villages treated water at Point of Use compared 43.1% household from the control villages. In a study done in Nepal found out that the proportion of the households who treated water were only 27.1% whereas 72.9% households didn't treat water (Anup, 2012). The evidence on water quality from other study appears to be so convincing that the WHO (2008) concluded that point-of-use water treatment is the most cost-effective approach to reach the Millennium Development Goal of halving the number of persons with no access to safe water.

5.3 Level of Awareness on CLTS in Households

The study sought to establish level of awareness of CLTS amongst households. The result indicated that overall, 63.80% of the households were aware of CLTS. The level of awareness of CLTS was significantly higher in interventions villages where 90.3 % of households were aware of CLTS compared to only 38.10 % of those living in the control villages. The result of this study can be compared with the result of a study conducted in Nyando Sub County which indicated that the level of awareness of CLTs was significantly higher in interventions site where 100% of households were aware of CLTS compared to only 20.9% of those living in the control sites (Makotsi *et al.*, 2012). A study conducted in Indonesia on Improving CLTS from a Community Perspective Approach in Indonesia is in agreement with this study where the level of awareness in CLTS villages was 96% compared to 41% non CLTS villages. This study is not in agreement with a study conducted in

Zamboanga Sibugay province which found out that a round 80% of the interviewed people admitted that they had no ideas about the purpose and content of CLTS (Marty, 2010). The result from this study further revealed that households from the intervention villages were more likely to receive information from CHVs, in the intervention villages 68.9% received information from the CHVs compared to 53.2% from control villages. This finding does not concur with a study conducted in Ethiopia in one district of Amhara to investigate characteristics of early adopters and non adopters among households who built their latrines in 2004;96% recalled being advised to build one, in most cases by a local administrator 70% ,or health workers 28% (Rosalyn *et al.*, 2006).

Households from control villages were likely to practice open defecation, 83.7% of the respondents from control villages reported they were aware of people in their village still practicing open defecation compared to 18.9% from intervention villages. This study results is in agreement with a study conducted by UNICEF in Liberia which showed that the CLTS program seems to make great strides as about 26% of respondents reported they have stop open defecation in open places as a result of the education and sensitization, majority 93% of the respondents from CLTS villages had stopped open defecation compared 1.6% in non CLTS villages (UNICEF, 2010).

Majority 96.4 % of households in the intervention villages reported they are aware occurrence of diarrhea is associated with poor sanitation practices compared to 74.3% from the control villages. The difference was statistically significant. This study compares with another study in Ghana to evaluate strategies for the scaling up of Community Led Total Sanitation where the CLTS process focused on Open Defection Free (ODF) status in the pilot projects; 60% of the communities visited had attained ODF status, sanitation practices mostly

involved upgrading or repairing the existing communal latrines which was the first priority for most communities and Provision was made for construction of separate communal latrines for men and women (Joyce , 2009).

5.4. Occurrence of Diarrhea among Households

This study has established that there was significant reduction in risk of diarrhea in households where CLTS was adopted. This study has established that prevalence of diarrhea was about 17.3% in intervention villages. This study finding is in agreement with a study conducted in Asia which established that prevalence of diarrhea in CLTS villages was 7% with 100% latrine coverage compared to 38% prevalence in non CLTS villages with latrine coverage of 29% (WSP, 2007). A study by Manisha *et al.*, 2008 reported that point prevalence and period prevalence of diarrhea in children under six years of age was highest in the non CLTS villages 47.8% and CLTS villages at 14.3%. Based on this finding CLTS was associated with reduced risk of diarrhea in households living in intervention and control villages.

This study has revealed that 50.8% of the households had experienced less than 5 episodes of diarrhea; this study finding is in agreement with a study conducted in India, Sub Saharan Africa, and Latin America among under five children who suffer four or five episodes of diarrhea, resulting in permanent growth retardation and diminished learning abilities (Guerrant *et al.*, 2002). Frequent bouts of acute watery diarrhea seriously debilitate children, with each successive episode, a child moves further away from his/her normal weight for age, thereby greatly increasing the risk of malnutrition and impaired child development (Pelletier *et al.*, 1995). Roughly more than 80% of the cases of diarrhea are as a result of lack of improved sanitation (Manisha *et al.*, 2008).

5.5 Association between Sanitation Practices and Diarrhea Occurrence in Households

Households with latrines reported high levels of diarrhea occurrence in control villages at 81.5 % compared to household from intervention villages at 18.3%. This study revealed that overall there was significant association between the disposal of children's feaces and the diarrhea occurrence ($\chi^2 = 53.675$, $P < 0.001$). The proportion of respondents who disposed children's feaces in the bush experienced significantly higher level of diarrhea occurrence in the control villages at 75.4% compared to households from intervention villages at 17.3% ($\chi^2 = 13.727$ $P < 0.002$). This study finding is in agreement with study which had indicated that roughly more than 80% of the cases of diarrhea are as a result of lack of improved sanitation (Manisha *et al.*, 2008). Systematic reviews have suggested that improved sanitation may reduce diarrhea diseases by 22% to 36% (Waddington , 2009).

5.6 Association between Level of Awareness and Diarrhea Occurrence

Respondents' level of awareness on CLTS was associated with the diarrhea occurrence, results indicated that 16.8% of households from intervention villages were aware of CLTS experienced diarrhea compared to 79.3% from control villages. The level of awareness on CLTS was significantly associated with diarrhea ($\chi^2 = 12.219$ $P < 0.0001$). This study is in agreement with a study conducted in Nyando Sub County which indicated that most of the households in the intervention sites were aware of CLTS program, only 20.9% were aware of CLTS in the control sites, prevalence of diarrhea was 17.4% with 11.1% in the intervention site compared to 21.6% in control site. (Makotsi *et al.*, 2015).

5.7 Influence of CLTS on Diarrhea Occurrence

The study established that CLTS was significantly associated with reduced prevalence of two weeks diarrhea in the intervention villages compared to control villages, 17.3% and 76.7% respectively, OR=0.064; 95% CI=0.08-0.1. This study is in agreement with findings of a study done in Nyando Sub County which established that the overall two-week prevalence of diarrhea in the study area was 17.4%. The comparison between prevalence of diarrhea between CLTS and Non CLTS indicated that households in CLTS intervention areas experienced less diarrhea compared to households in the control site (Makotsi *et al.*, 2015).

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents summary of the main findings, conclusions drawn, recommendations and suggestions for further research.

6.1 Summary of the Main Findings

In summary, the study had sought to address three objectives; to assess the difference in sanitation practices, to compare the level of awareness on CLTS and to determine the influence of CLTS on occurrence of diarrhea in households living in intervention and control villages in Boro Division, Siaya County.

Community Led Total Sanitation is associated with high level of awareness, improved sanitation and reduced episodes of diarrhea

6.1.1 Household Sanitation Practices

The study concluded that intervention villages had better sanitation practices. Latrine coverage in intervention villages was 83.7 % compared to 45.5% in the control villages. Around 67.3% of households in the control villages were more likely to defecate in the bush.

6.1.2 Awareness Level of CLTS

The study have revealed that the level of awareness of CLTS was significantly higher in interventions villages where 90.3 % of households were aware of CLTS compared to only 38.10 % control villages.

6.1.3 Assessment of Occurrence of Diarrhea

The findings of this study indicated that CLTS was significantly associated with reduced prevalence of diarrhea in the intervention villages compared to control villages, 17.3% and 76.7% respectively. CLTS was associated with the prevalence of diarrhea.

6.2 Conclusion

Based on the study findings and discussions, the study concluded the following as regards assessing the influence of Community Led Total Sanitation approach on diarrhea occurrence in households living in the intervention and control villages, Boro Division, Siaya County, Kenya. The following conclusions are drawn according to the specific objectives.

6.2.1 Household Sanitation Practices

The study concluded that intervention villages had improved sanitation practices. Latrine coverage in intervention villages was 83.7% which is still lower than the expected 100%. Around 67.3% of households living in the control villages where CLTS was not implemented were more likely to defecate in the bush. A round 69.90% of households in the intervention wash their hands with soap and water. Majority 81% of the households in the intervention villages practice water treatment at point of use. The result has also revealed that 83% of households in the intervention villages practice safe waste disposal compared to control villages.

6.2.2 Comparison on the Level of Awareness on CLTS in the Households

The study have revealed that the level of awareness of CLTS was significantly higher in interventions villages where 90.3 % of households were aware of CLTS compared to only 38.10 % control villages. The result from this study further revealed that households from the intervention villages were more likely to receive information from CHVs; in the intervention villages 68.9% received information from the CHVs, most 74.5 % households in the intervention villages. Households from control villages were likely to practice open defecation, Majority 83.7% of the respondents from control villages reported they were aware of people in their village who are still practicing open defecation compared to 18.9% from intervention villages, majority 96.4 % of households in the intervention villages reported they

are aware that occurrence of diarrhea is associated with poor sanitation practices compared to 74.3% from the control villages.

6.2.3 Assessment of Occurrence of Diarrhea in Households

This study has established that there was significant reduction in risk of diarrhea in households where CLTS was adopted. The two week prevalence of diarrhea was 17.3% in the intervention villages compared to 76.7% in the control villages. In a multivariate logistic regression, CLTS was significantly associated with reduced prevalence of two weeks diarrhea in the intervention villages compared to control villages. In intervention villages 20.6% episodes of diarrhea were reported compared 57.4% in control villages. Implementation of CLTS was associated with significantly lower number of diarrhea episodes and this offered some protective effect to households against diarrhea.

6.3 Recommendations

Based on the objectives of the study and the conclusions drawn from the study makes the following recommendations on policy, practices and future research:

6.3.1 Recommendation for Sanitation Practices

Initiating of CLTS in the control site and strengthening sanitation practices in both sites

For practices, Ministry of Health in conjunction with other stakeholders should intensify health education campaigns on the importance of CLTS in improving sanitation practice and awareness. There is need to roll out CLTS in all the rural and urban areas in Kenya since it has shown a significant reduction in sanitation related diseases so that Kenya can not only be able to meet it SDG goals and vision 2030 but also be able to meet its goal of achieving an ODF Kenya. Future research to assess social impact of CLTS on rural communities (for example changes in behaviour, impact on the daily lives of women). Such studies will link CLTS to the achievement of the SDGs.

6.3.2 Recommendation on Level of Awareness

Ministry of Health and other stakeholders should develop CLTS policy on Advocacy, Communication and Social Mobilization with the aim of promoting community behaviour change. The study recommends scaling up of CLTS more to enhance on the CLTS practices through creation of awareness. Community should be made aware of improved latrine options based on the sanitation ladder amongst the communities using the social marketing approach after the demand is created by the CLTS triggering process. For future research quasi experimental study is necessary to evaluate baseline and end line in intervention and control villages.

6.3.3 Recommendation on Occurrence of Diarrhea

This study recommends that CLTS policy should be adopted by all counties to reduce diarrhea occurrence. For better practices proper awareness and more participatory approach should be encouraged in less educated and low income households and future research is recommended to assess economic impact of CLTS to evaluate financial and economic benefits to households.

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LIST OF APPENDICES

Appendix 1: Written Informed Consent

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE (MUERC)

P. O BOX PRIVATE BAG MASENO

MASENO

A. ENGLISH VERSION

INFLUENCE OF COMMUNITY LED TOTAL SANITATION APPROACHES ON DIARRHEA OCCURRENCE AMONG HOUSEHOLDS LIVING IN INTERVENTION AND CONTROL VILLAGES, BORO DIVISION, SIAYA COUNTY.

Good Morning/ Afternoon. My name is.....I am part of the team assessing influence of Community Led Total Sanitation on diarrhoea occurrences in household. Our team will interview 398 households in this area. We have been granted permission by your local leaders to conduct this study. Your house has been selected randomly to participate. We would very much appreciate your participation in this survey.

Purpose of the study

The main objective of the study is to assess the influence of Communities Led Total Sanitation on diarrhea occurrence among households living in intervention and control villages in Boro division, Siaya County. The study will form the baseline information on the influence of CLTS approaches on the occurrence of diarrhea in order to recommend for sustainable intervention strategies that will address knowledge, attitude and practice of the community members. The study will be useful to target population, Government and partners to know the important of CLTS on the reduction to diarrheal cases. The study will add new knowledge on the association of CLTS on occurrence of diarrhea in Siaya County.

Study procedures

If you agree to take part in this study, you will be interviewed on various issues such as socio-demographic characteristics, sanitation practices and occurrence of diarrhea. The questionnaire will take about 30 minutes. It will be conducted at household level.

Benefits

You may not have a direct benefit as an individual however your participation would benefit society by helping in providing vital information that would enhance preventive rather than treatment measures in diarrhoeal management and in policy making. The aim of this study is to assess the influence of Communities Led Total Sanitation on diarrhea occurrence. The information you give will help come up with ways of helping in the design of policies and programs.

Confidentiality

Your identity and other records about you will remain confidential and will not appear when we present this study or publish its results. You will receive a copy of the consent form.

Right to refuse or withdraw

It is important that you understand the following general principles that will apply to all participants in the study:

1. Participation is entirely voluntary.
2. You may withdraw from this study at any time without penalty or loss of benefits.

I acknowledge that this consent form has been fully explained to me in a language that I understand and had the opportunity to ask questions which have been answered to my satisfaction. I agree voluntarily to participate in this study and understand that I have the right to withdraw at any time without penalty.

Code No: _____

Investigator's Name: _____ Date _____

Contact: If you have questions in future, please contact,

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE (MUERC),
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MASENO.

B. TRANSLATED VERSION

Kaka Chenro Mag Telo Mar Gweng' Eweche Mag Ler Nyalo Geng'o Muoch Mag Tuoche Kaka Ambululu Kuom Joma Odak Emiere Mag Boro Division, Siaya County

Amosi ahinya ni oyaore/iriyo nade? Nyinga en An achiel kuom jotim nonro manono Kaka Chenro Mag Telo Mar Gweng' Eweche Mag Ler Nyalo Geng'o Muoch Mag Tuoche Kaka Ambululu Kuom Joma Odak Emiere. Wabiro timo nonro ka wapenjo penjo e ute 398 e Gweng'ni, kendo wayudo thuolo mar timo mano kuom jotendu mag gweng'ka. Odi en achiel kuom ute manyocha wayiero eyor kwanyo ute aluoma-aluoma. Wakwayi kod muolo ahinya nimondo iyie iduokie penjo ma wabiro penji etimo nonroni.

Thoro mar Timo Nonro (Gimomiyo Watimo Nonroni)

Thoro maduon'g momiyo watimo nonroni en nimondo wayang anena malong'o Kaka Chenro Mag Telo Mar Gweng' Eweche Mag Ler Nyalo Geng'o Muoch Mag Tuoche Kaka Ambululu Kuom Joma Odak Emiere Mag Boro Division, Siaya County. Duoko mabiro wuok bang' timo nonroni, wageno mondo wati godo eyor chano okenge mowinjore, kendo mabiro konyowa kuom ndalo mabiro eyor loko pachwa egigo ma wang'eyo, kaka watimo gik moko e gweng'wa kaa.

Tomaduon'g moloyo, duoko mar nonroni biro konyo ahinya sirikal marwa, jochiu kony kaachiel kod jogo machano chenro mag dongruok eyor ng'eyo ber malong'o Kaka Chenro Mag Telo Mar Gweng' Eweche Mag Ler Nyalo Geng'o Muoch Mag Tuoche Kaka Ambululu Kuom Joma Odak Emiere Mag Boro Division, Siaya County. Ewimago duto, rieko ma nonroni biro medowa, biromiyo wayang malong'o ni nitie tudruok mantie ekind telo mar gweng' e weche mag ler togi muoch kod touché machalo ambululu ei Siaya County.

Kaka Wadhitayo Nonroni

Kaponi iyie mondo ibed achiel kuom ute ma watimoe nonroni, wabiro penji penjo motenore kod hiki, sombi, tiji mitimo makeloni yuto, in jading mane, un ji adi eodu kaa tokod penjo makamago, ka watenogi kod kit dak mudak godo tokod muoch mar touché machalo kaka ambululu. Wabiro kao dakika maok oingo 30 ka wapenji penjogi kendo wabiro wuotho eot kaot.

Ber Mar Nonroni

Kata obedoni onge ber ma aching' mibiro yudo kuom bedo achiel kuom joma oyie nimondo watim nonro eode, daher mar nyisi mor ma wan godo kiiyie nimondo ikony e sumo riekni mibiro tii godo eyor geng'o touché machalo kaka ambululu maok warito mana thiedho tuochege eseche magisemuoch kendo mako jii e gweng' kaa.

Tokaka Thoro maduon'g momiyi watimo nonroni en nimondo wayang anena malong'o Kaka Chenro Mag Telo Mar Gweng' Eweche Mag Ler Nyalo Geng'o Muoch Mag Tuoche Kaka Ambululu Kuom Joma Odak Emiere Makaa, riekni ma ibiro miyowa nokony ahinya e chano chenro mong'ith kendo keto okenge mabeyo mag geng'o touché machalo ambululu.

Maling'-ling' Mopandi

Nyingi tokod weche duto mibiro wachonwa ekinde ma watimo nonroni, biro bedo maling'-ling' mopandi maonge ng'ama nong'e kamoroo amora. Wabiro miyi kopi mar oboke manyisoni nene iyienwa mondo wapenji penjo e seche mane watimo nonroni.

Ratiro Mari Mar Tamori Kata Weyo Duoko Penjo

Daher nimondo iyang adimba kendo iwinj wechege, mabiro bedo kaka gigo matenore kod nonroni;

1. Ibiro duoko penjo eyor hero mari maonge achune moro amora
2. In kod thuolo mar tamori duoko penjo miwe wach mar nonroni e saa asaya, kendo onge rach moro amora kata wito ber moro amora mibiro wito.

Ayieni en adier ni oboke makwaya thuolo mondo openja penjo mag nonroni, olerna eyoo mahuyanga kendo kod dhok mawinjo maliu, manyaka penjo duto mapenjo oduoka eyo maowinjore kendo motucha. Omiyo, ayie eyor hero mara maok ochuna nimondo openja penjo mag nonroni, tobende wayiere ni anyalo weyo maok aduoko penjo mopenja maonge wach marach mabiro timorena.

Code No: _____

Investigator's Name: _____ Date _____

Contact: If you have questions in future, please contact,

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE (MUERC),
P. O BOX PRIVATE BAG
MASENO.

Appendix 2: Household Questionnaire

Introduction

This questionnaire is strictly for the purpose of learning and shall not be used for any other purpose whatsoever. The information obtained from respondents shall be treated with ultimate confidentiality and shall not be diverged to anybody or any other use than the intended. Kindly, answer to the best of your knowledge.

SOCIO-DEMOGRAPHIC INFORMATION

Questionnaire number.....

Date.....

Location Name

Village Name

1. Respondents' age..... Sex [Tick one]:
Male Female
2. What level of education have you attained [Tick one]?
University/College Secondary
Primary None
3. a) what do you do for a living [Tick one]?
Self-employed Formally Employed
Not employed
4. a) how many are you in the family?
5. Religion affiliation [Tick one]?
Muslims Christian
Other specify.....
6. Marital status
Married widowed Single Divorced
- 7 Level of income <5000 5000-10,000 10,000-15,000 15,000-20,000 20,000-25,000 25,000-30,000 >30,000

SANITATION PRACTICES

- 7a) Do you have a latrine [Tick one]?
 Yes [] No []
- b) If Yes in 6a, what type is your latrine [Tick one]?
 Ventilated improved latrine []
 Ordinary pit latrine [] Flush toilet []
 Water closet [] other, specify.....
- c) If No, in 6a above, where do you defecate [Tick one]?
 Neighbors' latrine [] Bush []
 Special place in the compound []
 Road side [] other, specify.....
- d) If No, in 6a above, why don't you have a latrine [Tick more than one]?
 Not necessary [] Lack of money []
 Lack of knowledge [] Difficult to keep it clean []
 No land to build latrine [] Soil or ground water problem []
 Don't know [] other, specify.....
8. Do you have squat hole cover [Tick one] ?
 Yes [] No []
9. Where do you throw young children's faeces after you have wiped them?
 [Tick one]?
 Bush [] Road side []
 Garden [] Latrine []
 Other specify.....
10. Do you wash your hands with soap and water at critical times?
 i. After visiting the latrine Yes [] No []
 ii. Before handling food? Yes [] No []
 iii. Before and after eating Yes [] No []
 iv. After handling children faeces Yes [] No []
11. Do your household practice safe waste disposal
 Yes [] No []

12. What is the main source of drinking water [Tick one]?
- | | | | |
|--------------------|-----|-------------|-----|
| River | [] | spring | [] |
| Borehole | [] | Piped water | [] |
| Lake | [] | Dam | [] |
| Other specify..... | | | |
13. In your opinion, is the water clean and safe [Tick one]?
- | | | | |
|-----|-----|----|-----|
| Yes | [] | No | [] |
|-----|-----|----|-----|
14. Do you practice water treatment at the point of use?
- | | | | |
|-----|-----|----|-----|
| Yes | [] | No | [] |
|-----|-----|----|-----|

ASSESSMENT OF AWARENESS ON CLTS

15. Are you aware of Community Led Total Sanitation?
- | | | | |
|----------------|-----|----|-----|
| Yes | [] | No | [] |
| Don't know [] | | | |
- b. If yes, where did you get the information about Community Led Total Sanitation?
- | | | | |
|---|-----|---------------|-----|
| Community Health Worker. | [] | Mass media | [] |
| Natural Leaders. | [] | Family member | [] |
| Health worker or private sector worker. [] | | | |
16. Are you aware of households practicing open defecation in this village
- | | | | |
|-----|-----|----|-----|
| Yes | [] | No | [] |
|-----|-----|----|-----|
17. Are you aware of any disease associated with poor sanitation practices?
- | | | | |
|------------------------|-----|---------|-----|
| Yes | [] | No | [] |
| If yes, which diseases | | | |
| Diarrhea | [] | Cholera | [] |
| Ambiasis | [] | Typhoid | [] |

ASSESSMENT OF OCCURRENCE OF DIARRHEA

18. Have any member of your household suffered from three or more watery loose stool within 24 hours in the last 2 weeks?
- | | | | |
|-----|-----|----|-----|
| Yes | [] | No | [] |
|-----|-----|----|-----|
19. Have any member of your household suffered from three or more watery loose stool within 24 hours in the last one month?
- | | | | |
|-----|-----|----|-----|
| Yes | [] | No | [] |
|-----|-----|----|-----|

20. How many episodes of diarrhea has your household experienced in the last 2 weeks?

1) > 5 episodes []

2).5 to 10 episodes []

3).10-20 episodes []

4).20-30 episodes []

21. How many episodes of diarrhea has your household experienced in the last one month?

1) > 5 episodes []

2).5 to 10 episodes []

3).10-20 episodes []

4).20-30 episodes []

Appendix 3: Observation Checklist

1. Does the household have a toilet? Yes / No
2. Observe the type of latrine [Tick one]?
Ventilated improved latrine [] Unimproved (unsanitary) latrine []
Flush toilet [] Open pit latrine []
Other specify.....
3. Does the latrine facility present adequate conditions of cleanliness [Tick one]?
Adequately clean [no faeces or urine] []
Not clean (faeces or urine on the floor []
4. Check if they are faeces in the compound (Walk around the compound)
Yes [] No []
5. Check if they are faeces in the village along the road sides/bushes/ Farm?
Yes [] No []
6. Does the squat hole have a cover?
Yes [] No []
7. Are there hand washing facility/ Leaky tin around the latrine facility (less than 3 metres)?
Yes [] No []
Hand washing facility
Yes [] No []
Sufficient water available
Yes [] No []

TRANSLATED VERSION: QUESTIONNAIRE

Appendix 4: Household Questionnaire (Penjo Mipenjo Eot-ka-Ot)

Introduction (Weche Motelo)

Penjo ma wabiro penji, gin nonro mag weche somo omiyo ok wanatii kod duokogi eyo moro amora kata nade. Weche duto ma wabiro yudo esama wapenjo penjo, gin weche ma wabiro kano kaka weche maling'-ling' kendo ok wanaliekgi ne ng'ato ang'ata, kata okwana tii kodgi marach eyo maok nomiyo watimo nonroni.

Wakwayi nimondo iduok penjogi eyor adiera kendo kaka ing'eyo maber ahinya.

SOCIO-DEMOGRAPHIC INFORMATION (Weche Mag Chal Jachuok Penjo)

Otas Penjoni Namba adi..... Date/Tarik.....

Nying Location-ni..... Nying Gweng'ni

1. Hiki en adi? Kit Chwech Mari/Sex [Tick one/Gotik achiel]:
Male (Dichuo) [] Female (Miyo) []
2. Esombi, isomo migik kanye [Gotik achiel]?
Mbalariany/Kolej [] Sekondari []
Primary [] Onge (Okasomo) []
3. a) En tich aina mane mitimo makeloni yuto [Gotik achiel]?
Atimo Ohala andikora kenda [] Ondika achamo osara []
Aonge kod tich/an okatii []
4. a) Eodu kaa, un ji adi modakie?
5. In Jadin Mane [Gotik achiel]?
An Ja Muislam [] An Jakristo [] An Jadin Machielo (Fulnwa
nyinge).....
6. Chal mari mar Jo-ot
Okendi/Ikendo [] In Chi-Liel [] Pok Okendi/Ikendo [] Ne Wawere gi Jaoda []
7. Yuto Mari Chal-nade? [Gotik achiel] <5000 [] 5000-10,000 [] 10,000-15,000 [] 15,000-
20,000 [] 20,000-25,000 [] 25,000-30,000 [] >30,000 []

SANITATION PRACTICES (Kit Chal Mar Weche Ler)

8. (a) Bende un kod Choo [Gotik achiel]?

Kamano Wangodo [] Ooyo Waongego []

(b) Kiduokoni Kamano e 8 (a), un kod cho kido machal nade [Gotik achiel]?

Choo Manyasani Molos maber [] Choo Mokuny Makawaida []

Choo Migoyone Pii ni Chwaaa [] Choo Mar Pii Miolo []

Choo aina machielo (Nyiswa ni en choo machal nade).....

(c) Kaponu duoko mari enni ooyo uonge kod choo e 8 (a), malo kanyo, ere kaka ulosoru dala kaa [Gotik achiel]? Wadhi Echoo Kajirani [] Wadhi e Bungu []

Wapielo kamoro ma waloso ei dala ka [] Wapielo e bath yoo []

Wapielo kod yoo moro machielo (Nyiswa nien yoo machal nade?).....

(d) Kaponu duoko mari enni ooyo uonge kod choo e 7a malo kanyo, en ang'o momiyo uonge kod choo dala kaa? [Inyalo goyotik moloyo nyadichiel]?

Ok wane tiende bedo kod choo [] Waonge kod pesa []

Koso ng'eyo [] Rito choo maler tek-ma []

Waonge kod loo kama dwagerie choo [] Lopwani rach gichoo []

Akia gimomiyo [] Gimomiyo machielo (nyiswa anena).....

9. Bende in kod raum miguomie sama idhi e choo [Gotik Achiel] ?

Kamano [] Ooyo []

10. Bang' kiseyweyo losruok mar nyathini/nyithindi, ere kuma iwitoe [Gotik achiel]?

E-bungu [] E-bath Yoo [] E-puodho [] E-choo []

Kamachielo(nyiswa anena nikanye).....

11. Bende iluokoga lweti gipii kod sabun bang; timo achiel kuom gigi?

v. Bang kisea losori e choo Kamano [] Ooyo []

vi. Kapok Imulo chiemo? Kamano [] Ooyo []

vii. Kapok kata kisechiemo? Kamano [] Ooyo []

viii. Bang' kiseumulo losruok mar nyathi? Kamano [] Ooyo []

12. Bende joodi wito losruok eyoo mowinjore adier? (Gotik achiel kende)?

Kamano [] Ooyo []

13. Pii ma umodho ugolo kanye [Tick one]?

Aora [] Soko [] Kisima [] Pii-Freji [] Nam [] Dam []

Wagolo kamachielo (Mano Kanyeno?).....

14. Gipachi iwuon, bende pii ma umodhone en pii maler adier? [Gotik achiel]?

Kamano [] Ooyo []

15. Bende uchwako kata thiedho pii kapok umodho adier? (Gotik achiel)

Kamano [] Ooyo []

Penjo Kuom Ng'eyo Weche Mag Ler Miteloe kod Jogweng'

16. a. Bende ing'eyo kata isewinjoe weche Weche Mag Ler Miteloe kod Jogweng'

Kamano [] Ooyo [] Akia Pokawinjo []

c. King'eyo, ere kaka ning'eyo Weche Mag Ler Mitelie kod Jogweng'

Jothieth Makor Gwengka [] Nyakalondo/Gazet/TV []

Jotendwa ma gweng'wa ka [] Achiel kuom jodalawa kaa []

Jathieth mar sririkal koso jathieth maok mar sirikal []

17. Bende ding'eye joot moro kata jodala moro mapielo e pap alanga e gweng' kaa?

Kamano [] Ooyo []

18. Bende ding'eye touché mabiro nikech kit ler maok orit maber?

Kamano [] Ooyo []

King'eyo Kamano, Gin kaka touché mage

Ambululu [] Kolera [] Ambiasis [] Typhoid []

NG'EYO KAKA AMBULULU OSEMUOCH KAA

19. Eodu kaa, bende nitie ng'ama osebedo kod losruok motimo pii didek kata dimokalo didek ei seche 24 kuom jumbe ariyo mokalo?

Kamano [] Ooyo []

20. Eodu kaa, bende nitie ng'ama osebedo kod losruok motimo pii didek kata dimokalo didek ei seche 24 kuom dwe achiel mokalo?

Kamano [] Ooyo []

20. Kuom Jumbe 2 okalo, en didi musebedo kod muoch mar tuo ambululu e-odu ka?

1) > 5 episodes [] 2).5 to 10 episodes []

3).10-20 episodes [] 4).20-30 episodes []

21. Kuom Dwe 1 okalo, en didi musebedo kod muoch mar tuo ambululu e-odu ka?

1) > 5 episodes [] 2).5 to 10 episodes []

3).10-20 episodes [] 4).20-30 episodes []

Appendix 5: Observation Checklist (Weche Maneno Kod Wang'a)

3. Bende Joodni nikod Choo? Kamano / Ooyo

4. Rang anena kit choo magin godo [Gotik achiel]?

Choo Manyasani Molos maber [] Choo Mokuny Makawaida []

Choo Migoyone Pii ni Chwaaa [] Choo Mar Pii Miolo []

Choo aina machielo (En choo machal nade).....

5. Kineno kit choo-no, bende en kod ler moromo maber adier [Gotik achiel]?

Oler Moromo [Oonge kod losruok kata lach] []

Okoler Ruok (Losruok kod Lach nitie edier-od chaa []

6. Rang anena kaponi inyalo neon minyaga e laru (Wuoth kirango dala maber)

Nitie [] Onge []

7. Rang anena kaponi inyalo neon minyaga e bath yoo kiwuotho /bungu/Puothe?

Nitie [] Onge []

8. Bende Dhobur mar choo kama iguomie nikod raum?

Nitie [] Onge []

9. Bende ineno gima ilogoe kaka tin a aluora mar choo madirom mita 3 kama)?

Nitie [] Onge []

Gima Ilogoe kaka Tin

Nitie [] Onge []

Pii Nitie Moromo

Nitie [] Onge []

Appendix 6 : Proposal Approval Letter



**MASENO UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

Office of the Dean

Our Ref: PG/MPH/06019/2012

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 06th March, 2015

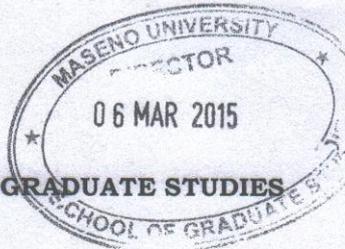
TO WHOM IT MAY CONCERN

**RE: PROPOSAL APPROVAL FOR JACINTER ATIENO ODIRA—
PG/MPH/06019/2012**

The above named is registered in the Master of Public Health Programme of the School of Public Health & Community Development, Maseno University. This is to confirm that her research proposal titled "Influence of Community Led Total Sanitation Approaches on Diarrhea Occurrence among Households Living in Intervention and Control Villages, Boro Division, Siaya County" has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

Prof. P.O. Owuor

DEAN, SCHOOL OF GRADUATE STUDIES



Appendix 5 : MUERC Approval Letter



MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221

Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 11th May, 2015

TO: Jecinter Atieno Odira
PG/MPH/06019/2012
Department of Public Health
School of Public Health and Community Development,
Maseno University, P. O. Box, Private Bag, Maseno, Kenya

REF: MSU/DRPI/MUERC/00156/15

RE: Influence of Community Led Total Sanitation Approaches on Diarrhoea Occurrence among Households Living in Intervention and Control Villages, Boro Division, Siaya County. Proposal Reference No.: MSU/DRPI/MUERC/00156/15

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 11th day of May, 2015 for a period of one (1) year.

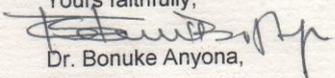
Please note that authorization to conduct this study will automatically expire on 10th May, 2016. If you plan to continue with the study beyond this date, please submit an application for continuation approval to MUERC Secretariat by 8th April, 2016.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach MUERC Secretariat by 8th April, 2016.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advise MUERC when the study is completed or discontinued.

Thank you.

Yours faithfully,


Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee.



Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED



Appendix 6: Research Authorization Letter from Public Health Office Siaya

MINISTRY OF HEALTH

Telegrams: "MEDICAL, Siaya
Telephone: Siaya 057-321031
E-mail Siyamoh@yahoo.com
When replying please quote
Ref. No.SYA/MOH/VOL III/11



SUB COUNTY MEDICAL OFFICE
SIAYA DISTRICT
P.O. BOX 144
SIAYA.
10TH JUNE ,2015

TO

JECINTER ATIENO ODIRA
PG/MPH/06019/2012
DEPARTMENT OF PUBLIC HEALTH
SCHOOL OF PUBLIC HEALTH AND COMMUNITY DEVELOPMENT
MASENO UNIVERSITY
P.O. BOX PRIVATE BAG
MASENO, KENYA

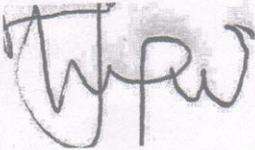
Dear Madam,

REF: AUTHORIZATION LETTER TO CONDUCT A STUDY AT BORO DIVISION, ALEGO USONGO SUB COUNTY.

This is to inform you that following the approval by Maseno University Ethics and Review Committee (MUERC) for you to conduct a study in Boro Division, Alego Usongo Sub County, formally Siaya Sub County; you are hereby granted permission by this office to carry out your study with effect from June 2015 to 10th May 2016. Please note that the study period automatically expires on 10th May 2016. Should you wish to continue with the study after this date, due process has to be followed as you have been advised by the Maseno University Ethics and Review Committee.

I would like to take this opportunity to wish you well in your study and am looking forward to receiving the results of the study.

Yours Faithfully



Hillary Okumu
Sub County Public Health Officer
Alego Usongo

Appendix 7: Showing Households in Boro Division, Siaya Sub County

District (Siaya)	Population Projection as per 2009 census	No of villages	Total No. of Households as per 2009 census	No. household with safe human waste disposal in urban and rural as of 30.06.2012	Rural	Urban/peri-urban
					Baseline Latrine coverage as of 30.06.2012	Baseline (Main sewer, Septic Tank, Cesspool) Coverage 30.06.2012
Boro	52,703	135	12,848	7,106	55.3	0

Source :(Census, 1999)

Appendix 8: Demographic Data for Boro Division

Wards	Sub location	Total Population	Villages		Households
			CLTS (ODF)	Non CLTS (OD)	
CENTRAL ALEGO	KAKUMU/KOMBEWA	3803	0	10 (with few claims)	932
	KOCHIENG 'A'	3086	0	9 (with few Claims)	766
	KOCHIENG 'B'	2602	4 ODF	0	594
	KOYEYO	5472	15 ODF	0	1320
	OJWANDO 'A'	4982	0	14 (with few Claims)	1276
	OJWANDO 'B'	3523	0	11 (with few Claims)	886
	KADENGE RATUORO	4190	0	8 (with no claims OD)	1124
	OBAMBO	3335	0	11 (with no claims OD)	851
	Sub Total	30,993	19		7749
NORTH ALEGO	HONO	6984	0	9 (with few Claims)	1634
	KOMOLO	6347	2	12 (with few Claims)	1513
	NYALGUNGA	3992	1	12 (with few Claims)	932
	NYAMILA	4387	0	11 (with few Claims)	1020
	Sub Total	21,710	3		
2	12	52703	24	110	12848

Appendix 9: Map of the Area of Study Boro Division, Alego Usonga Sub-County, Siaya County

