UPTAKE OF COMMUNITY LED TOTAL SANITATION AMONG RESIDENTS OF ISIOLO COUNTY, KENYA

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE (WATER SANITATION AND HYGIENE) IN THE SCHOOL OF HEALTH SCIENCES OF KENYATTA UNIVERSITY

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DECLARATION

I declare that this thesis is my own original work and has not been submitted for the award of a degree in any other university or institution of higher learning.

Signature…… Date……

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We, the undersigned, confirm that the candidate carried out the work reported in this thesis under our supervision.

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DEDICATION

This thesis is dedicated to my family for their support, humble time, prayer and words of motivation.

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God's blessings be upon you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

CDC: Centre for Disease Control

CHW: Community Health Workers

CLTS: Community Led Total Sanitation

FGD: Focused Group Discussion

HHs: Households

ICRH: Isiolo County Referral Hospital

KII: Key Informant Interviewee

KNBS: Kenya National Bureau of Statistics

MOH: Ministry of Health

NACOSTI: National Commission for Science, Technology and Innovation

OD: Open Defecation

ODF: Open Defecation Free

SDG: Sustainable Development Goal

SPSS: Statistic Package for Social Sciences

UNICEF: United Nation Children's Funds

VIP: Ventilated Improved Pit (latrine)

WASH: Water Sanitation and Hygiene

WHO: World Health Organization

OPERATIONAL DEFINITION OF TERMS

Community-Led Total Sanitation: This is a community-based approach that focuses on eradicating open defecation by generating behavioral change in sanitation at a community level and by stimulating demand for latrines and hygiene facilities.

Functional Latrine: It is a latrine usable at the time of data collection and with evidence that it is indeed being used.

Open Defecation: The ODF criteria are not met by the households with the result that the faecal-oral route of diseases' transmission is not interrupted.

Open Defecation Free (ODF): A situation wherein no open defecation is practiced by community members and in which the cycle of faecal- oral route of disease transmission and/or contamination through faeces, flies, fingers, food and fluids is completely interrupted. It describes a state in which all community members practice use of latrine at all times (Vidya & Alexandra, 2015; Tyndale-Biscoe et al., 2013 and EAPRO, 2015)

ODF Certification: This is the official confirmation and recognition of the ODF status.

ODF Status: This is measured according to the four CLTS standards/requirements for ODF criteria i.e. (1) presence of functioning latrine with a superstructure and a means of keeping flies from the pit (either water seal or tight-fitting cover or lid), (2) absence of excreta in the vicinity of the household (3) hand washing facilities with water and soap or soap-substitute such as ash and (4) evidence that the latrine and hand washing facilities are being used (e.g. a well-trodden path).

ABSTRACT

The study aims to assess the uptake of Community Led Total Sanitation among residents of Isiolo County, Kenya, focusing on individual factors, latrine ownership and use, and institutional factors associated with uptake. Despite the global call for universal access to sanitation and hygiene, about 673 million people still defecate in the open, despite the Kenyan government's adoption of this program. The cross-sectional descriptive study design, using both quantitative and qualitative data collection methods, aims to provide a comprehensive understanding of the issue. The sample size comprised of 373 household heads systematically picked at an interval of 8 from villages in selected Wards of Ngare Mara and Oldonyiro wards. Isiolo County was purposively selected since it is among the top ten counties practicing open defecation. Key informants comprising of healthcare workers, religious leaders and chiefs/opinion leader were also interviewed. Isiolo sub-county was randomly selected using folded pieces of paper while Ngare Mara and Oldonyiro Wards were purposively chosen as they recorded the highest prevalence of diarrheal diseases. The researcher sought all required approvals from relevant institutions and obtained informed consent from participants. Quantitative data was collected using structured questionnaires from household heads while qualitative data was collected using Key Informant Interview schedules from opinion leaders. Quantitative data was analyzed using Statistical Package for Social Sciences version 22.0. Qualitative data was triangulated with quantitative results as direct quotes or narrations as presented by the key informants. Chi-Square tests were done at 95% confidence interval with a 0.05 margin of error of 0.05 to calculate inferential statistics. The study results revealed that the rate of community led total sanitation in Isiolo County was 31.9%. The majority (54.3%) of responded owned a latrine with only 42.1% showing evidence of use. Majority of individual factors such as awareness of negative effects of open defecation (P=0.011), willingness to use a latrine (P=0.024), ability to construct and maintain a pit-latrine (P=0.001) and decision makers of pit-latrine construction (P=0.001) influenced community led total sanitation uptake. Most (53.5%) of the households owned a pit-latrine with owning a pit-latrine (P=0.001), place of defecation (P=0.003), washing hands after visiting a pit-latrine (P=0.001) and disposal of child excreta (P=0.023) significantly associated with community led total sanitation uptake. Most institutional factors such as provision of incentives for pit-latrine ownership (P=0.013), source of information on health issues (P=0.001), community involvement in planning their health activities (P=0.041) and invitation for meetings on sanitation (P=0.038) significantly influenced uptake of community led total sanitation. The study concludes that the rate of community led total sanitation in Isiolo County was low. In fact, only three in every ten households in the county uptake community led total sanitation. The results will inform policy makers, academic researchers and other stakeholders to craft interventions for action to improve sanitation coverage by implementing community led total sanitation. This will help reduce open defecation rates and decrease diarrheal diseases thus contributing positively to the achievement of the Sustainable Development Goal number six by the year 2030.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Community-Led Total Sanitation (CLTS) is a strategy for community mobilization to eliminate open defecation. This involves triggering behavior change among members by initiating the availability and use of latrines and basic hygiene facilities (Harter *et al.,* 2018). Instead of utilizing latrines or covered pits, those who practice open defecation dispose of their waste in the open (MoH, 2016). It is projected that 673 million people globally still defecate in the open despite the urgent need for universal access to safe sanitation (UNICEF & WHO, 2020). People living in underdeveloped and rural areas are more at risk because it can be difficult to access even the most basic sanitation services. Despite enormous efforts to increase access to appropriate sanitation, over 4.2 billion people worldwide use inadequate sanitation facilities, leaving untreated human waste. This threatens the health of humans and the environment (UNICEF & WHO, 2020).

Poor sanitation is a devastating situation for public health, affecting economic and social development. Achieving Sustainable Development Goal (SDG) number six, which focuses on appropriate access to clean water, sanitation, and hygiene, will depend on adopting good sanitation and hygiene practices and ending open defecation (OD) (UNDP, 2015). This emphasizes the importance of supporting vulnerable groups, especially women and girls. Eliminating OD by 2030 requires closely examining the barriers and drivers of transitioning from OD to the use of latrines (Mara, 2017).

Worldwide, numerous nations have made strides toward ensuring widespread access to good sanitation to transform lives, economies, and the environment. However, the rate of progress differs. For example, India has reduced the problem of open defecation by half through the Clean India Program, which aimed to increase the number of

households owning and using latrines (Curtis, 2019). Although India has made significant progress, it remains the leading country in OD, followed by Nigeria and Indonesia (World Bank, 2019). Countries such as Cambodia, Nepal, and the Lao People's Democratic Republic have made significant progress toward using basic sanitation services, with rates ranging from 40 to 50 percent (Mara, 2017). Governments should help communities and individuals through programs that ensure universal access to sanitation and hygiene (Umar & Varma, 2018).

There has been a decrease in the percentage of people practicing OD worldwide, except in Sub-Saharan Africa, where the number of open defecators increased from 204 million to 220 million (Osumanu *et al.,* 2019). The most affected countries in Sub-Saharan Africa include Ghana, with an increasing trend of OD currently standing at 5 million people without access to any toilet, followed by Sudan (Alemu *et al.*, 2018). In Ethiopia, there is evidence of increased OD, with previously declared open defecation-free villages reverting to practicing OD (Abebe & Tucho, 2020). African governments need to devote their resources and efforts to transform their poor sanitation situation to mitigate the effects of illnesses and other health issues resulting from it.

Research by Venkataramanan *et al.* (2018) shows that the behavior-change program, Total Sanitation Led by the Community, significantly reduces OD. CLTS has demonstrated a significant influence on behavior change, resulting in the construction and increased use of toilets in communities (Alemu *et al*., 2018). The World Health Organization (WHO) released new recommendations on cleanliness and health, including developing sanitation interventions that ensure full access to toilets to contain human excreta by entire communities (WHO, 2018). The most widely applied and successful sanitation campaign to halt OD is the CLTS program (USAID, 2018). In

Kenya, the CLTS intervention was first introduced in May 2007 (Musyoki, 2016). An ambitious rural Kenya 2013 ODF campaign roadmap was developed by the government to reduce OD (Nzioki & Korir, 2018). Therefore, this study's objective is to assess how widely CLTS is used by the people of Isiolo County.

1.2 Problem Statement

Despite Kenya aiming to achieve 100% ODF status by 2030 and adopting CLTS, about 5.6 million (14%) of the population practice OD. Open defecation is highest among the poorest populations, especially in rural areas (Njuguna, 2019). According to Busienei *et al.* (2019), almost 50% of the population in rural areas lacks appropriate access to basic sanitary services. Open defecation in Isiolo County stands at 44.2%, despite several interventions to eliminate it (Nzioki & Korir, 2018). This has resulted in low levels of hygiene and poor protection at approximately 78% of water sources in the region, exposing them to fecal contamination. It is concerning that 43% of families lack access to a toilet facility (Okullo *et al.,* 2017).

Diarrhoeal diseases have become more prevalent as a result of open defecation. Improper fecal disposal affects water quality and increases human-to-human pathogen transmission. In most rural areas where OD is common, geophagy is largely practiced. Geophagy is mostly associated with medicinal, religious, cultural, psychological, and nutritional deficiencies (Ravuluvulu, 2018). Poor sanitation costs Kenya approximately 27 billion shillings annually (RoK, 2016), and diarrheal diseases account for 7 to 13 percent of under-five deaths. Isiolo County accounts for a prevalence of 10.5% of diarrheal diseases (Isiolo County Integrated Development Plan, 2013–2017).

Gastrointestinal illness has been on the rise in Isiolo County. Water was ranked as the highest risk factor for diarrhea and vomiting in Isiolo, followed by milk. Fruits and

vegetables were considered the least risky. In November 2020, an outbreak of Rift Valley fever occurred in Isiolo County, with symptoms including fever, headache, malaise, nausea, epistaxis/hematemesis, and abdominal pain/diarrhea. Despite CLTS interventions proving effective in reducing OD, their uptake remains a challenge to ensuring 100% ODF communities. Open defecation is more prevalent among nomadic and pastoral communities, as is the case in Isiolo County, Kenya. Information on the implementation of Community-Led Total Sanitation in this County is sparse. Most studies done worldwide have focused on OD and ODF status, not the uptake of CLTS.

1.3 Justification of the Study

Kenya implemented Community-Led Total Sanitation in May, 2007 to trigger and achieve 100% ODF by 2030. As far as the researcher is aware, there has never been a formal study on CLTS adoption in Isiolo County. It is among the top ten counties with the highest rates of open defecation at 44.2% (Nzioki & Korir, 2018). The county's OD status is three times that of the national average. The uptake of CLTS reduces OD practice, thus achieving proper sanitation and hygiene. This would improve ownership and use of latrines, resulting in a reduction of OD, thus contributing to the achievement of SDG number 6 and target 2 on ending open defecation and ensuring that everyone has access to sufficient sanitation and hygiene, with a focus on the needs of women, girls, and those in vulnerable situations (WHO and UNICEF, 2020). Studies have shown that OD villages report a prevalence of diarrheal diseases six times that of ODF villages (Abebe & Tucho, 2020). The benefits of safe sanitation are five times the cost of implementing proper sanitation facilities.

1.4 Research Questions

The study was guided by the following research questions:

1. What is the level of uptake of Community Led Total Sanitation among residents of Isiolo County?
2. What are the individual factors associated with uptake of Community Led Total Sanitation among residents of Isiolo County?
3. What is the influence of latrine ownership and use on uptake of Community Led Total Sanitation among residents of Isiolo County?
4. What institutional factors are associated with uptake of Community Led Total Sanitation among residents of Isiolo County?

1.5 Research Objectives

1.5.1 Broad Objective

To assess the uptake of Community Led Total Sanitation among residents of Isiolo County, Kenya.

1.5.2 Specific Objectives

The study investigated the following four objectives:

1. To assess the level of uptake of Community Led Total Sanitation among residents of Isiolo County.
2. To examine individual factors associated with uptake of Community Led Total Sanitation among residents of Isiolo County.
3. To investigate the influence of latrine ownership and use on uptake of Community Led Total Sanitation among residents of Isiolo County.
4. To identify institutional factors associated with uptake of Community Led Total Sanitation among residents of Isiolo County.

1.6 Significance of the Study

The results of this investigation may be useful to the County Government of Isiolo and the country at large in working towards achieving an open defecation-free status, thus reducing diarrheal and other diseases associated with poor sanitation. The results will also be important to the Ministry of Health and other policymakers in defining new interventions to curb the increased challenges of open defecation, as well as mobilizing resources and sensitizing the public on the effects of OD. As a vital addition to the body of knowledge already available, the results of this study will be used by other academics and scholars in the future.

1.7 Conceptual Framework

The study adopted the Health Belief Model by Andersen, which explains that for one to undertake a behavior change (uptake of CLTS), there must be an intention. According to this study, the intention to change behavior was influenced by independent variables categorized as individual factors (such as awareness of OD effects, the shamefulness of OD practice, latrine usage, cultural beliefs, and opinions on OD); institutional factors (such as incentives for owning latrines, support for latrine construction, knowledge of Community Health Workers (CHWs), and access to health information); and latrine ownership and use factors (such as owning a latrine, defecation site, cleansing materials, washing hands, and latrine cleaning). All these factors were thought to affect the uptake of CLTS, as depicted in the conceptual framework illustrated in Figure 1.1 below.

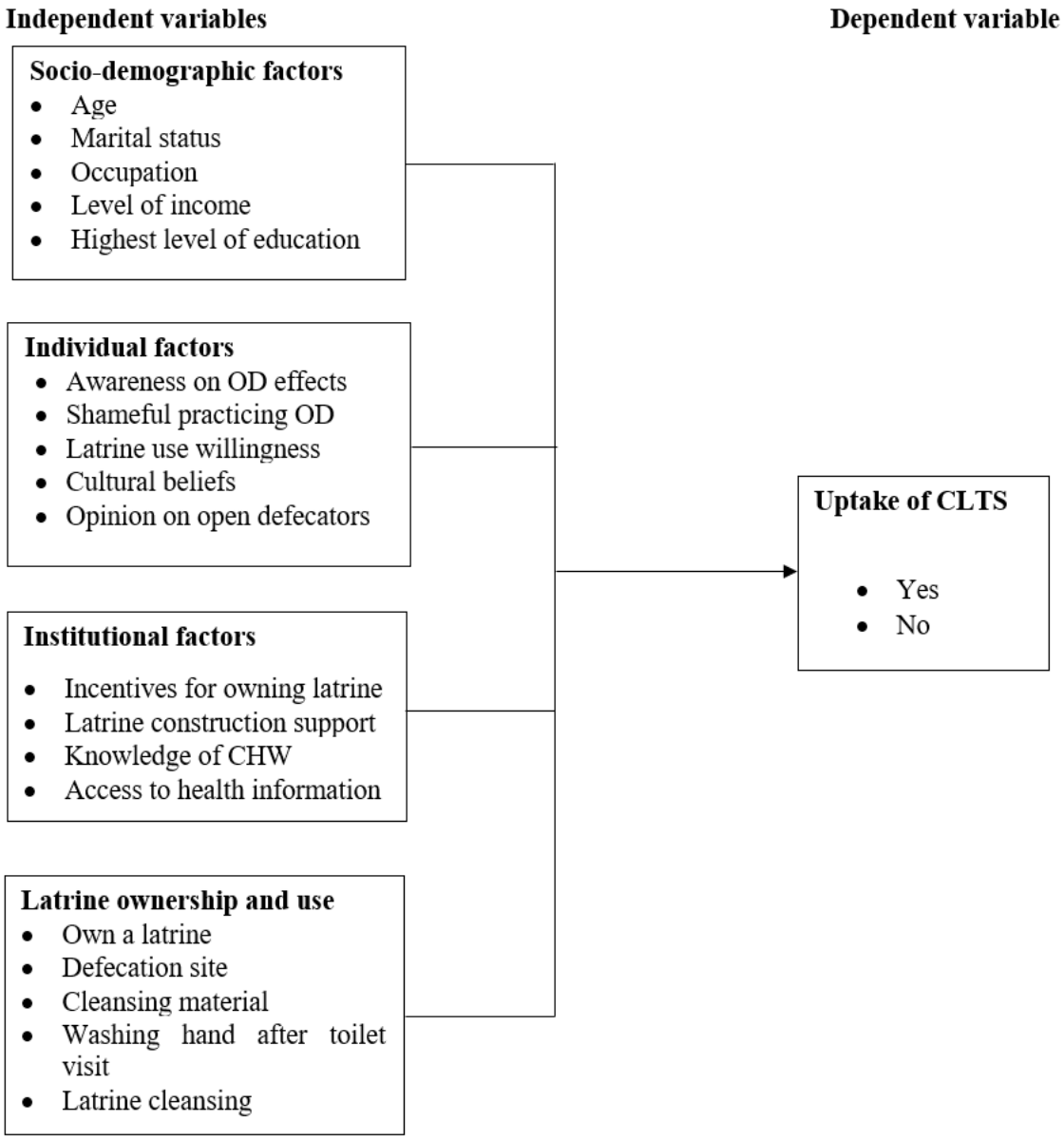

Figure 1.1 The conceptual framework

Source: Adopted and modified from literature review, 2018.

CHAPTER TWO: LITERATURE REVIEW

2.1 Status of Open Defecation

The WHO and UNICEF estimate that 673 million people globally still face the challenges of open defecation despite extensive efforts to guarantee everyone access to decent sanitation. Despite global improvements in sanitation, 20 percent of people in sub-Saharan Africa defecate in the open. Most of them reside in rural areas where it is still difficult to access even the most basic sanitation services (Nansubuga *et al.*, 2016). People are using sanitation facilities, leaving untreated human waste exposed, and this is a common practice among school-going children who lack basic sanitation facilities. Poor sanitation has an enormous effect on the environment, the quality of water, and the population's exposure to dangers (Abebe & Tucho, 2020). Practicing proper sanitation and hygiene, as well as ending OD, would play a crucial role in achieving SDG number six on proper access to sanitary conditions, sanitation, and hygiene by 2030 (UNDP, 2015).

In order to alter lives, economies, and the environment, several nations have made strides in ensuring widespread access to good sanitation. However, the rate of progress differs from country to country based on government efforts to end the practice. On average, in developing countries, open defecators comprise 16%, compared to 20% in the least developed countries (Sultana *et al*., 2020).

A study done in India revealed that from 2016 to 2018, open defecation in rural Rajasthan reduced from 63.3% to 45.8%, while in urban households, it decreased from 12.6% to 9.4% (Exum *et al.*, 2020). This was credited to the Clean India Program, which sought to increase the country's access to fundamental sanitary amenities. In Bangladesh, research findings showed that the main cause of unhygienic sanitation was

open defecation at 45%. Countries such as Cambodia, Nepal, and the Lao People's Democratic Republic have made significant progress towards the use of basic sanitation services, with rates ranging from 40 to 50 percent (Mara, 2017).

African countries have taken a large share of the global cases of open defecation. For instance, 18.75% of the population in Ghana was said to urinate in the open (Osumanu *et al*., 2019). Although the Nigerian government has pledged to end open defecation by 2025, this goal still faces obstacles because 26% of Nigerians still practice open defecation (Adeoti *et al.*, 2021). This is attributed to the slow progress and lack of commitment from the local community members towards the implementation of this noble idea.

In Ethiopia, there is evidence of increased OD, with previously declared open defecation-free villages reverting back to practicing OD (Abebe & Tucho, 2020). This is because the government ceased to make follow-ups, and some of the donors for the program left. In rural areas, about 37.9% and 8.7% of the rural and urban populations are practicing open defecation (Ayalew *et al.*, 2018). As of 2018–2022, open defecation is expected to increase from 11.8% to 12.0% of the total population in Tanzania, a nearby country (Nyoni & Nyoni, 2020).

In Kenya, it is estimated that about 5.6 million (14%) of the population practice OD, despite the nation aiming to achieve 100% ODF status by 2030 (Njuguna, 2019). The rural population is more affected by this issue. According to Busienei *et al.* (2019), 50% of them have inadequate access to basic sanitation facilities and defecate in the open. The counties in the northern part of Kenya are the most affected. Statistics from Turkana County revealed that only 18% of the households in the region have latrines, leading to increased cases of OD (Busienei *et al*., 2019). According to a study done in

Kajiado County, 59.2% of households lacked access to toilet facilities, with 98.4% of people reporting to be open defecators (Mbogo *et al.*, 2018). Only 32% of village communities in Kisii County have closed defecation rates, according to Trepanier et al. (2021). In the coastal regions of Kenya, Kwale County leads with 51.2%, followed by Kilifi at 34.0% of open defecators (MoH, 2014). The counties of Wajir, Samburu, West Pokot, and Mandera account for 76.7%, 73.4%, 67.1%, and 66.0% of the population defecating in the open, respectively. The rate of open defecation in Isiolo County stood at 44.2%, according to recent studies, despite several government interventions (Nzioki & Korir, 2018).

2.2 Uptake of Community-Led Total Sanitation

Community-Led Total Sanitation is a behavior modification program that significantly lowers OD rates (USAID, 2018). Its key elements include community self-discovery, ignition elements (fear, disgust, and shame), community-based decisions, effects of OD realization, collective action to ODF, community empowerment, and subsidizing interventions (Bateman & Engel, 2018). Triggering is the main element, and its quality determines sustainable behavior change (UNICEF, 2016). Over 60 nations, largely in Asia and Africa, have adopted the intervention. A €5.8 million CLTS project was launched by Plan International in seven African countries, including Kenya (Plan International, 2011).

The CLTS program has been rarely implemented consistently across countries, with varying rates of uptake. In Indonesia, after CLTS triggering, it was concluded that the sub-district with the lowest ODF status was at 28% in 2018 (Pertiwi et al., 2018). Only 19.5% of households had implemented CLTS at a 100% rate, according to a survey done in India among villages (Mahendra *et al.*, 2021). Lack of adequate information

and support for building latrines affected the full realization of this intervention. Improved uptake of CLTS in Zambia was attributed to a 30% surge in the number of people who had adequate sanitation after the involvement of the local leadership (Tiwari et al., 2017). This created the demand for sanitation facilities, coupled with a behavior change drive that attracted sustenance (Markle *et al*., 2017). Research conducted in Nigeria indicates that CLTS implementation is strong in other regular groups but low in pastoralist communities (Abramovsky et al., 2016).

In order to reduce OD, the government established an ambitious rural Kenya 2013 ODF campaign strategy, which was initially implemented in May 2007 (Musyoki, 2016; Nzioki & Korir, 2018). In 2014, 62,195 villages in Kenya were CLTS-triggered across its 47 counties, but only 10% claimed ODF. This indicates a low uptake rate from triggering to the phase of certification (Ogendo *et al*., 2016). In most cases, this intervention prompts household adoption of latrines but does not result in widespread latrine coverage (Radin *et al.,* 2020). In Busia County, CLTS implementation led to an increased rate of latrine coverage from 62% to 89% over a nine-month period, thus increasing the number of villages declared ODF. This resulted in a decrease in the number of diarrheal diseases by a 31% margin among children under five years within one year (Muchangi & Kimathi, 2017).

2.3 Individual Factors Associated with CLTS Uptake

The adoption and utilization of community-led comprehensive sanitation projects in particular communities have been demonstrated to be significantly influenced by several unique characteristics. Several research findings have indicated that awareness of the importance of CLTS implementation may impact its usage. In a study conducted in the Nigerian state of Benue, it was shown that residents had a good understanding of

the negative effects of open defecation (Alom *et al*., 2020). Low levels of awareness were reported in a study on the prevalence of OD in India, where two-thirds of those interviewed did not recognize the diseases spread through open-air defecation (Panda *et al*., 2017). High cases of open defecation in Indonesia have been associated with limited awareness among the general public, prompting the government to advocate for education programs (Winarningsih *et al*., 2019).

Perceiving OD as a shameful act may influence the implementation and uptake of CLTS interventions in communities. This calls for adequate triggering so that people can clearly see the effects this has on their environments. However, when latrine facilities do not provide adequate privacy, people may opt to defecate in bushes where they seem to get enough privacy (Gauri *et al*., 2018). In a rural Ethiopian study, it was found that people who practiced open defecation chose to hide and defecate in the open more frequently at night because it was so embarrassing (Tafese & Anato, 2019). The feeling of guilt and disgust as a component of triggering was effective, resulting in tremendous CLTS uptake in Ghana (Tomberge *et al*., 2021). According to a study done by Chebet *et al.* (2020), in Tanzania, it is believed that disposing of child excreta in latrines hinders developmental growth, thus infant feces are disposed of in the surrounding environment.

The willingness of individuals to use latrines is another factor that may be targeted to influence behavior change among open defecators. The availability of toilets and latrines does not necessarily mean people would use them. Community members should be encouraged to own and participate in CLTS interventions. Adequate education efforts should be made to increase people's understanding of the harm that open defecation causes to the environment and their health. In most towns in Ghana and

Kenya, there are several public toilets, but people have to pay to use them, which is a major impediment to CLTS uptake (Mariwah *et al*., 2017; Mulatya *et al*., 2021). A study conducted in India claims that long latrine queues in public sanitation facilities and having running bowels prompt people to relieve themselves in the open (Rashid & Pandit, 2019).

Some cultural beliefs may hinder the full implementation of CLTS intervention programs in communities. Cultural beliefs such as superstition, taboos, values, and norms held by some communities significantly influence the persistence of open defecation (Adjibolosoo *et al*., 2020). The facilitators of CLTS should focus more on issues around culture to change their stance on this. Key stakeholders and governments need to craft behavior change models and communication strategies best suited to this scenario.

2.4 Latrine Ownership and Use

The availability and condition of latrines significantly affect their usability. In most cases, a higher latrine-to-functional toilet ratio reduces the cases of OD. The number of people who visit a latrine facility at a time forces others to wait in long queues in the morning and evening hours, resulting in OD in the open air. In India, latrine ownership was a significant factor associated with open defecation status among community members (Yulyan *et al*., 2021). Ghanaian research revealed that 49.8% of households were unable to use a proper toilet, forcing them to urinate in the open (Osumanu *et al*., 2019). Open defecation is a common practice among poverty-stricken rural communities (Musyoki, 2016). A study done in Turkana, Kenya, found that an overwhelming majority of 82% of households lacked latrines, a factor that has significantly impacted open defecation (Busienei *et al*., 2019).

The condition of latrines also plays a key role in ensuring people use them when responding to the call of nature. According to a study done in Indonesia, it was determined that community members' use of latrine facilities was not influenced by the state of the facilities (Rafitha *et al*., 2018). A study carried out in Ethiopia claims that there is a higher chance that someone will use a clean latrine than one that has not been well-maintained, which makes people shy away from using it (Ashenafi *et al.*, 2018). Latrine blockage, especially in slum areas, affects latrine conditions, resulting in people choosing open defecation over latrines (Biswas *et al*., 2020).

Programs to implement total sanitation that are community-led must have hand-washing facilities and be used. Suitable amounts of water, soap, or ash should be present in a working hand-washing station to facilitate thorough hand washing. In Nepal, it was shown that 90% of households had adequate access to improved hand-washing facilities, thus increasing the utilization of CLTS facilities and reducing cases of open defecation in some communities (Kafle & Pradhan, 2018). According to a study done among university students, 10% of the participants engaged in open defecation despite having access to a hand-washing station in 64.8% of cases (Logo, 2020). According to a study conducted in Kenya, 70% of the families polled had access to enough soap and water when using the restroom (Mumbi & Choro, 2017).

The availability and usability of cleansing materials are likely to influence the use of latrine facilities. Several studies reviewed showed that unmet sanitation needs were associated with poor uptake of CLTS facilities (Capone *et al*., 2018). Another study indicated that people used sanitary facilities more often when cleaning supplies were available in the restrooms (Edgar *et al*., 2017). This persuades individuals and families to use latrines, thus improving sanitation. However, construction sites where anal

cleansing materials are rarely available result in people defecating in the bushes (Harter *et al*., 2019).

2.5 Institutional Factors Associated with CLTS Uptake

Institutional factors within the larger community significantly impact the utilization of latrines, thus influencing the success of CLTS implementation. Providing incentives to communities declared open defecation-free (ODF) is crucial for creating demand for latrine usage (Cameron *et al*., 2021). This may include offering cash rewards to encourage continued use of latrines. Financial incentives and improved sanitation have been shown to reduce open defecation in communities. In a study conducted in Baharat, financial resources used during the construction of latrines by households were reimbursed to ensure people did not revert to open defecation (Jain et al., 2020).

In many countries, program implementers often support individuals and communities in constructing latrines, encouraging behavior change, and subsequently affecting the implementation and use of CLTS facilities. This support has led to a reduction in open defecation cases, as witnessed by the Indian government's efforts (Gupta *et al.*, 2019). An investigation in Surabaya, Indonesia, claims that government support helped communities achieve ODF status (Soedjono *et al*., 2019). In Ghana, NGOs and individuals who served as role models in the construction of latrines helped reduce the use of open defecation practices (Harter *et al*., 2019).

The presence of community health workers (CHWs) advocating for latrine usage and changing attitudes toward open defecation is crucial. In Afghanistan, CHWs were responsible for making follow-ups on the progress of ODF status among communities (Hamat *et al*., 2017). They educated the public on the effects of OD and linked them to

healthcare services for conditions such as diarrheal diseases (Edward *et al*., 2019). In Kenya, CHWs helped craft and share information on CLTS (Nzioki & Korir, 2018). The source of information on CLTS also influences the behavior change associated with open defecation. Trusted sources can persuade community members to use latrines, reducing OD. In Nigeria, information on CLTS implementation and use was disseminated through leaflets, signposts, and posters (Alom *et al*., 2020). Information enables people to understand the negative effects of open defecation and the benefits of stopping the practice. Radios were the most common source of information, while healthcare workers were the most trusted source of information on CLTS interventions in Liberia (Capps *et al*., 2017).

A study in Kitui County, Kenya, discovered that the main source of information on CLTS was community health workers (Nzioki & Korir, 2018). Involving individuals in community activities is crucial for improving the uptake of CLTS programs. Active community involvement is key to eliminating OD. When community members are invited to give their views and opinions, they are more likely to feel a sense of ownership and thus be compelled to use latrines, reducing OD practices (Umar & Varma, 2018).

2.6 Summary of Literature Review and Existing Gaps

Reviewed literature reveals that open defecation remains a significant public health issue affecting many parts of the world today. There is still considerable work to be done to eliminate open defecation, which is a key component of achieving Sustainable Development Goal (SDG) number six on sanitation and hygiene, as highlighted in Vision 2030. Numerous interventions have been tried, but community-led total sanitation (CLTS) has emerged as the most successful method for significantly

reducing open defecation in various communities globally. However, its uptake remains a challenge to ensuring 100% ODF communities. Open defecation is more prevalent among nomadic and pastoral communities, such as in Isiolo County, Kenya. Most studies worldwide have focused on OD and ODF status rather than the uptake of CLTS. Therefore, the goal of this study is to identify the variables that affect the use of CLTS facilities in rural areas where there is some doubt about their usage.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Study Design

This study utilized a descriptive cross-sectional study methodology. This approach was preferred as it allowed for an in-depth description of the phenomenon at a specific point in time. The study design minimized bias in data collection, providing a comprehensive description of individual factors, institutional factors, and latrine ownership and use related to the uptake of Community Led Total Sanitation (CLTS) among residents of Isiolo County, Kenya.

3.2 Study Variables

3.2.1 Independent Variables

The independent variables of this study included: Individual factors which were associated with the uptake of CLTS. These factors included shame about defecating in the open, cultural beliefs about the construction of latrines, willingness to use latrines, decision-making on latrine construction, sharing latrines with relatives and neighbors, and being aware of the consequences of open defecation. Latrine ownership and usage practices are associated with the uptake of CLTS. These included factors such as owning a latrine, defecation site at home, cleansing material after defecation, cleaning of latrines, defecation site while away from home, washing of hands after toilet visits, provision of latrine privacy, and time taken to and from the defecation site.

Institutional factors are associated with the uptake of CLTS. These factors included the presence of community health workers (CHWs), visits by CHWs, invitations to community sensitization meetings for latrine construction and hygiene, sources of health information, external support for building latrines, and local government support for latrine construction.

3.2.2 Dependent Variable

The dependent variable was the uptake of the CLTS intervention strategy among residents of Isiolo County, Kenya. This was measured using an observation checklist. This checklist contained information on the presence of a latrine, evidence of use, the presence of a tight fitting or squatting lid, the absence of fecal matter in open spaces, and the presence of a functional handwashing facility. Households that met all these conditions were classified as having full uptake of community-led total sanitation, while those who missed at least one of them were considered otherwise.

3.3 Study Location

The study was conducted in Isiolo County, Kenya, which was selected due to its high incidence of open defecation. Isiolo County consists of three sub-counties: Isiolo, Garba Tulla, and Merti, and ten wards: Oldonyiro, Kinna, Bulapesa, Burat, Cherab, Garbatulla, Sericho, Chari, Ngare Mara, and Wabera (Isiolo County Integrated Development Plan, 2018). The county, located in Upper Eastern Kenya, is bordered by the Tana River, Garissa, Wajir, Meru, Samburu, Marsabit, and Kitui counties. It has an arid and semi-arid climate, with an estimated population of about 268,002 people and an average household size of 4.6, according to the 2019 Kenya National Bureau of Statistics data. The primary economic activity in the region is pastoralism.

3.4 Study Population

Household heads living in Isiolo County made up the study's population. This was made up of individuals with various sociocultural origins. only those who have spent at least a year residing in the county before the research period. The study was conducted in Oldonyiro and Ngare Mara wards in Isiolo sub-county. This was because they report high rates of diarrheal diseases. Oldonyiro ward has nine sub-locations, while Ngare

Mara ward has eight sub-locations. It was estimated that there are 62 villages with 14576 households in Oldonyiro Ward and 27 villages with 7294 households in Ngare Mara Ward.

3.4.1 Inclusion Criteria

The study recruited household heads from villages in selected sub-locations of Ngare Mare and Oldonyiro Wards of Isiolo Sub-County. Those who consented were included in the participation. Prior to the survey, they had to have spent at least a year living in the county. The key informants were automatically included in the study.

3.4.2 Exclusion Criteria

Heads of households who refused to participate were not included in the survey. Household heads who had not lived in the area for a year were also excluded from the survey.

3.5 Sample Size Determination and Sampling Techniques

3.5.1 Sample Size Determination

For populations larger than 10,000, the Fisher's et al formula is used to calculate the sample size. Fishers et al. (1998)state that sample size

$$n = \frac{Z^2 pq}{d^2}$$

$$\frac{1.96^2 \text{ x } 0.5 \text{ x } 0.5}{0.05^2} = 384$$

Cochran's correction formula was used to modify the sample size for populations under 10,000;

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

$$nf = \frac{384}{1+\left(\frac{384}{2904}\right)} \quad = 339.15$$

Where;

n= the desired sample size when approximate population is greater than 10,000.

nf= adjusted sample size when the approximate population is less than 10,000.

N= approximate number of household heads from villages in selected sub-locations of Ngare Mare and Oldonyiro wards of Isiolo Sub-County.

z= the standard normal deviates at 95 % confidence level which is 1.96.

p= assumed proportion of households utilizing CLTS intervention program (50%=0.5)

q=1-p=0.5

d= the margin of error at 95% confidence interval set at 5% =0.05

To ensure the sample was representative and to account for potential non-responses, an additional 10% of respondents were included. This resulted in a total sample size of 373 individuals meeting the inclusion criteria. Proportionate sampling was used to determine the number of respondents from each selected ward. The distribution of the sample is shown in Table 3.1.

Table 3.1 Proportion of Respondents Selected from Each Ward Isiolo County

Sub-county	**Wards**	**Sub-locations**	**Villages**	**House Holds**	**Sampled HHs**	**Per cent (%)**
Isiolo	Ngare Mara	Attan	3	296	38	12.8%
		Gotu	5	364	47	12.8%
		Nakuprat	2	362	46	12.8%
	Oldonyiro	Lenguruma	7	969	124	12.8%
		Kawalash	6	411	53	12.8%
		Rumate	8	502	65	12.8%
Total		**6**	**31**	**2904**	**373**	

3.5.2 Sampling Techniques

Isiolo County was purposefully selected due to its high rates of open defecation and WASH-related illnesses. A random selection process using folded pieces of paper was employed to choose the Isiolo sub-county. This sub-county includes five wards: Wabera, Ngare Mara, Burapesa, Oldonyiro, and Burati. Oldonyiro and Ngare Mara wards were specifically selected for their reported high rates of diarrheal diseases. In Oldonyiro Ward, which has nine sub-locations, four were randomly chosen: Kawalash, Lenguruma, and Rumate. Ngare Mara Ward has eight sub-locations, from which three were randomly picked: Attan, Gotu, and Nakuprat. The selection was made from a tin containing folded pieces of paper with the names of the sub-locations. All 31 villages from the selected sub-locations were included in the sample. Systematic random sampling with an eight-point interval (2904/373) was used to choose households from these villages to minimize bias and homogeneity associated with immediate neighborhoods. Study participants were selected from each sampled household, with the head of the household chosen as the respondent. If the head was absent during data collection, an assistant was selected instead

3.6 Research Instruments

To gather quantitative data for the study, questionnaires with both closed- and open-ended items were used. The inquiries centered on sociodemographic, personal, latrine ownership and use, institutional, and CLTS adoption aspects. Depending on the comprehension of the respondents, the surveys were given in English, with research assistants interpreting the questions' contents as needed. Data on CLTS uptake were also collected using an observational checklist. The checklist included information on whether there was a restroom, whether there were signs of usage, whether there was a tight-fitting or squatting lid, whether there were no feces in the open, and whether there

was a working hand washing station. Additional qualitative data were also gathered from public health officials, community health workers, religious leaders, and local leaders using Key Informant Interview (KII) protocols. This featured inquiries that addressed each goal (Okolimong et al., 2020). This encapsulated their viewpoints and beliefs.

3.7 Pretesting of Research Instruments

The Longopito Sub-location in the Oldonyiro ward of the Isiolo Sub-County served as the pre-test site for the study instruments, with 10% of respondents. Consequently, 37 household heads were used for pretesting the research tools. This guaranteed the validity and dependability of the research tools. Corrections that were required to enhance the research tools for improved data collection were made.

3.7.1 Validity

The study solicited the advice of subject-matter specialists, particularly research supervisors. These resources were organized in accordance with the study's goals. A survey of the literature served as a guide for each question variable. The sampling methods employed made sure that representative and random samples were acquired in order to achieve internal validity.

3.7.2 Reliability

This was improved by choosing research assistants who had received the appropriate training. Pre-tests were conducted on the research questionnaires and KII schedules. The identical research instruments were given to a group of respondents twice over the course of a week in order to ensure test-retest reliability. The reliability test of Cronbach's alpha was applied. In order to guarantee that the instruments were

dependable, reliability coefficients greater than 0.7 were acceptable, while those less than 0.6 were regarded as poor, and the questions were changed appropriately.

3.8 Data collection techniques

HH heads were given semi-structured questionnaires to complete in order to gather quantitative data. To aid respondents in responding to the research questions, the questionnaires were distributed by trained research assistants. The researcher facilitated focus groups with representatives from the public health sector, community health organizations, local authorities, and religious leaders. Research assistants took notes and recorded the participants' opinions. Only the lead researcher had access to the locked cabinets containing the research tools. The research booked an appointment with the identified and sampled key informants and probed the uptake of community-led total sanitation among residents of Isiolo County.

3.9 Data Presentation and Analysis

Prior to analysis, quantitative data were cleansed to ensure completeness and consistency. The Statistical Package for Social Sciences (SPSS) version 22.0 was used to analyze the data after it had been coded and entered into Microsoft Excel. Charts, graphs, frequency tables, and percentages were used to show descriptive data. Inferential statistics were calculated using Chi-Square tests with a 95% confidence interval and a 0.05 margin of error to find variable relationships. Direct narrations of quantitative data and qualitative data from KIIs were triangulated.

3.10 Ethical considerations

The graduate school at Kenyatta University was consulted for permission. Additionally, the researcher received ethical approval from the Kenyatta University Ethics Review Committee. The National Council for Science, Technology, and Innovation

(NACOSTI) granted the researcher's request for research permission. Prior to gathering data, the researcher also asked Isiolo County and municipal authorities for permission to conduct the study. Before taking part, the respondents gave their permission. It was discovered that the data gathered was private and confidential. In the appendix section, a list of all these clearances is provided. The study findings were made public for future use by being presented at conferences and barazas.

CHAPTER FOUR: RESULTS

4.1 Introduction

In this study, sampled household heads from Isiolo County were given 373 questionnaires. They were required to fill in their responses regarding the uptake of CLTS in their community. However, 361 questionnaires were returned and analyzed, representing a 96.8% response rate.

4.2 Socio-demographic Characteristics of Respondents

The goal of the study was to ascertain how the respondents' socio-demographic variables were distributed. The results of this are presented in Table 4.1 below.

Table 4.1 Distribution of Socio-demographic Characteristics among Respondents

Variable	Respondent response	Frequency (N=361)	Percentage (%)
Age in years	≤ 19	22	6.1
	20-29	106	29.4
	30-39	133	36.8
	40-49	69	19.1
	≥ 50	31	8.6
Highest level of education attained	No formal education	116	32.1
	Primary	154	42.7
	Secondary	64	17.7
	Post-secondary	27	7.5
Marital status	Married	237	65.7
	Single	69	19.1
	Divorced/widowed/separated	55	15.2
Religion	Christians	347	96.1
	Muslims	14	3.9
Gender	Male	339	93.9
	Female	22	6.1
Occupation	Not employed	222	61.5
	Self-employed	109	30.2
	Employed	30	8.3
Average monthly family income (KShs)	< 5,000	161	44.6
	5,001-10,000	121	33.5
	10,001-15000	43	11.9
	15001-20,000	22	6.1
	≥ 20,000	14	3.9
Number of household members	Less than 3	50	13.9
	4-6	109	30.2
	7-9	138	38.2
	≥ 10	64	17.7

The age distribution of the respondents revealed that 133 (36.8%) were between the ages of 30 and 39, while 106 (29.4%) were between the ages of 20 and 29. The highest level of education acquired by the respondents was primary education, with 116 (32.1%) having achieved this level. Sixty-nine respondents (19.1%) were single, while 237 (65.7%) were married. Christians made up the majority of the participants, with 347 (96.1%); Muslims made up the remaining 14 (3.9%). Results on the gender of respondents showed that 339 of them (93.9%) were men, while 22 (6.1%) were women. The majority of respondents, 222 (61.5%), were unemployed, followed by 109 (30.2%) who were self-employed. Results for the average monthly household income in Kenyan Shillings (Kshs) revealed that 161 (44.6%) of the respondents made less than Kshs 5,000, while 121 (33.5%) made between Kshs 5,001 and 10,000. Additional findings indicated that 138 (38.2%) of the respondents had 4 to 6 household members, followed by 109 (30.2%) who had 7 to 9 household members.

4.2.1 Association between Socio-demographic Factors and Uptake of CLTS

The study sought to establish the socio-demographic factors associated with uptake of CLTS among respondents. The results were as presented in table 4.2 below.

Table 4.2 Socio-demographic Factors Associated with Community Led Total Sanitation Uptake

Independent variable	Respondent response	Uptake of CLTS		Statistical significance
		Yes (N=115)	No (N=246)	
Age in years	≤ 19	10(8.7%)	12(4.9%)	χ^2=2.366
	20-29	39(33.9%)	67(27.2%)	df=4
	30-39	31(27.0%)	102(41.5%)	p=0.091
	40-49	29(25.2%)	40(16.3%)	
	≥ 50	6(5.2%)	25(10.2%)	
Highest level of education attained	No formal education	32(27.8%)	84(34.1%)	χ^2=66.866
	Primary	25(21.7%)	129(52.4%)	df=3
	Secondary	38(33.0%)	26(10.6%)	p=0.001
	Post-secondary	20(17.4%)	7(2.8%)	
Marital status	Married	64(55.7%)	173(70.3%)	χ^2=11.837
	Single	23(20.0%)	46(18.7%)	df=2
	Divorced/widowed/separated	28(24.3%)	27(11.0%)	p=0.003
Religion	Christians	110(95.7%)	237(96.3%)	χ^2=0.809
	Muslims	5(4.3%)	9(3.7%)	df=1 p=0.109
Gender	Male	107(93.0%)	232(94.3%)	χ^2=0.219
	Female	8(7.0%)	14(5.7%)	df=1 p=0.640
Occupation	Not employed	66(57.4%)	156(63.4%)	χ^2=12.690
	Self-employed	37(32.2%)	72(29.3%)	df=2
	Employed	12(10.4%)	18(7.3%)	p=0.002
Average monthly family income (KShs)	< 5,000	15(13.0%)	146(59.3%)	χ^2=43.373
	5,001-10,000	50(43.5%)	71(28.9%)	df=4
	10,001-15000	29(25.2%)	14(5.7%)	p=0.012
	15001-20,000	14(12.2%)	8(3.3%)	
	≥ 20,000	7(6.1%)	7(2.8%)	
Number of HH members	Less than 3	14(12.2%)	36(14.6%)	χ^2=6.948
	4-6	44(38.3%)	65(26.4%)	df=3
	7-9	43(37.4%)	95(38.6%)	p=0.044
	≥ 10	14(12.2%)	50(20.3%)	

Results revealed that 102 (41.5%) respondents who were between the ages of 30 and 39 had not upgraded CLTS. Age and CLTS uptake did not have a statistically significant relationship (P = 0.091). More than half of the 129 respondents (52.4%) with

primary-level education did not take the CLTS. The highest level of education that respondents had acquired and their use of CLTS were statistically significantly correlated (P = 0.001). The majority of married respondents (173, 70.3%) had not taken CLTS. The respondents' marital status was substantially correlated with their use of CLTS (P = 0.003).

The majority of Christians, 237 (96.3%), had not completed CLTS. However, religion and respondents' usage of CLTS did not have a statistically significant relationship (P = 0.109). In terms of the respondents' gender, the findings revealed that 232 (94.3%) of the men had not taken CLTS. The respondents' gender and the adoption of CLTS did not have a statistically significant relationship (P = 0.640). The results for the respondents' employment status showed that 156 (63.4%) of those who were unemployed had not taken CLTS. The respondents' employment status was substantially correlated with their use of CLTS (P = 0.002).

Results showed that 146 (59.3%) of the respondents, whose average monthly family income was less than Kshs 5,000, did not take CLTS. The average monthly income of the respondents was also strongly related to their use of CLTS (P = 0.012). Further findings showed that 95 (38.6%) of respondents with households of seven to nine people had not taken CLTS. The respondents' use of CLTS was statistically substantially correlated with the number of household members (P = 0.044).

4.3 Uptake of Community Led Total Sanitation

The first objective focused on determining the uptake of Community Led Total Sanitation in Isiolo County in which results were presented as in figure 4.1.

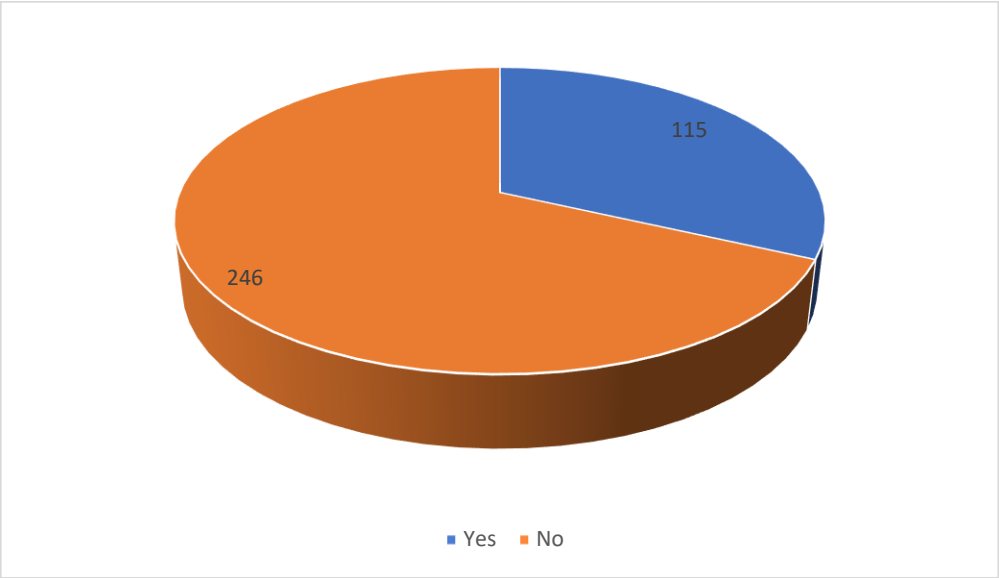

Figure 4.1 Uptake of Community Led Total Sanitation in Isiolo County, Kenya

The findings showed that whereas 115 (31.9%) of the respondents had taken CLTS, 246 (68.1%) of the respondents had not. The results were echoed by a public health officer who was part of a Key Informant Interview session. This shows that there was low uptake of CLTS in the community with significant effects well highlighted.

> *"…indeed, the rate of uptake of CLTS has been low in this county. This has led to increased cases of diarrheal diseases, especially among the children. We are trying to put measures like sensitization and supporting those household heads who are willing to construct pit-latrines but are unable due to one reason or another. We will not tire until we reduce significantly the cases of open defecation in this area. The county government has been supportive together with the NGOs around here. We have reduced the cases but we can always do more. The community health and extension workers are also instrumental in these initiatives…"* **(KII Respondent).**

4.3.1 Utilization of the Components of Community Led Total Sanitation

Results on distribution of the components of community led total sanitation (CLTS) were collated from the observation checklist (appendix III) as presented in table 4.3.

Table 4.3 Utilization of Community Led Total Sanitation Components among Respondents

CLTS component	Respondent response	Frequency (N)	Percentage (%)
Presence of pit-latrine	Yes	196	54.3
	No	165	45.7
Evidence of pit-latrine use	Yes	152	42.1
	No	209	57.9
Presence of tight fitting or squatting lid on latrine	Yes	116	32.1
	No	245	67.9
Absence of faecal matter	Yes	124	34.3
	No	237	65.7
Hand washing facility	Yes	122	33.8
	No	239	66.2

The findings showed that 196 respondents (54.3%) had pit latrines, whereas the remaining 165 respondents (45.7%) did not. Regarding the evidence of pit latrine use, results showed that 209 (57.9%) did not show any evidence of use, while the rest, 152 (42.1%), showed evidence of use. More than half (245, or 67.9%) of the respondents' latrines did not have a tight-fitting or squatting lid, while the rest, 116 (32.1%), did. Results showed that 237 (65.7%) of the households did not show the presence of fecal matter, while the rest, 124 (34.3%), did have fecal matter present. Additional findings indicated that while 122 (33.8%) of the households had a handwashing facility, 239 (66.2%) did not.

4.4 Individual Factors

4.4.1 Distribution of Individual Factors

The distribution of the various variables influencing respondents' adoption of CLTS is shown in table 4.4.

Table 4.4 Distribution of Individual Factors among Respondents

Variable	Respondent response	Frequency (N)	Percentage (%)
Aware of negative effects of open defecation	Yes	210	58.2
	No	151	41.8
Open defecation is a shameful act	Agree	218	60.4
	Neither agree nor disagree	108	29.9
	Disagree	35	9.7
Willingness to use a pit latrine	Yes	234	64.8
	No	127	35.2
Presence of cultural barriers to latrine usage	Yes	134	37.1
	No	227	62.9
Use alternative means to pit-latrines to relieve yourself	Yes	175	48.5
	No	186	51.5
Ability to construct and maintain a pit-latrine	Yes	180	49.9
	No	80	22.2
	Cannot tell	101	28.0
Decision making regarding pit-latrine construction	Husband	132	36.6
	Wife	50	13.9
	Healthcare workers	59	16.3
	Local leadership	34	9.4
	Husband and wife	86	23.8
A family member suffered from a diarrheal disease in the past six months	Yes	187	51.8
	No	174	48.2

The results showed that 151 respondents (41.8%) were unaware of the harmful effects of open defecation, while 210 (58.2%) were aware. Most respondents, 218 (60.4%), agreed that open defecation was a shameful act, followed by 108 (29.9%), who neither agreed nor disagreed. The majority of respondents, 234 (64.8%), were willing to use a pit latrine, while the rest, 127 (35.2%), were not willing. Regarding the presence of cultural barriers to latrine usage, most respondents, 227 (62.9%), agreed, while the rest,

134 (37.1%), did not. A little over half of the respondents—186 (51.5%)—agreed they would utilize alternatives to pit latrines to relieve themselves, while the remaining 175 (48.5%) did not. On whether the respondents had the ability to construct and maintain a pit latrine, slightly less than half, 180 (49.9%), had the ability, while 101 (28.0%) could not tell.

Concerning decision-making regarding pit latrine construction, results showed that 132 (36.6%) picked the husband as the sole decision-maker, followed by 86 (23.8%) who picked both husband and wife. More than half, 187 (51.8%), of the respondents revealed that a family member had suffered from a diarrheal disease in the past six months, while the rest, 174 (48.2%), did not report any diarrheal disease cases.

4.4.2 Association between Individual Factors and Uptake of CLTS

The second objective focused on the association between individual factors and the uptake of community-led total sanitation among the respondents, and the results were as presented in Table 4.5 below.

Table 4.5 Individual Factors Associated with Uptake of Community Led Total Sanitation in Isiolo County, Kenya.

Independent variable	Respondent response	Uptake of CLTS		Statistical significance
		Yes (N=115)	No (N=246)	
Aware of negative effects of OD	Yes	72(62.6%)	138(56.1%)	χ^2=5.365
	No	37(37.4%)	108(43.9%)	df=1 p=0.011
Open defecation is a shameful act	Agree	60(52.2%)	158(64.2%)	χ^2=1.459
	Agree nor disagree	45(39.1%)	63(25.6%)	df=2 p=0.482
	Disagree	10(8.7%)	25(10.2%)	
Willingness to use a pit latrine	Yes	85(73.9%)	149(60.6%)	χ^2=5.096
	No	30(26.1%)	97(39.4%)	df=1 p=0.024
Presence of cultural barriers to latrine usage	Yes	33(28.7%)	101(41.1%)	χ^2=0.005
	No	82(71.3%)	145(58.9%)	df=1 p=0.942
Use alternative means other than pit-latrines to relieve yourself	Yes	50(43.5%)	128(50.8%)	χ^2=1.688
	No	65(56.5%)	121(49.2%)	df=1 p=0.194
Ability to construct and maintain a pit-latrine	Yes	47(40.9%)	133(54.1%)	χ^2=13.976
	No	29(25.2%)	51(20.7%)	df=2
	Cannot tell	39(33.9%)	62(25.2%)	p=0.001
The decision makers on regards pit-latrine construction	Husband	63(54.8%)	69(28.0%)	χ^2=25.631
	Wife	11(9.6%)	39(15.9%)	df=4
	Healthcare workers	7(6.1%)	52(21.1%)	p=0.001
	Local leadership	6(5.2%)	28(11.4%)	
	Husband and wife	28(24.3%)	58(23.6%)	
Family member suffered from a diarrheal disease in the past six months	Yes	56(48.7%)	131(53.3%)	χ^2=3.754
	No	59(51.3%)	115(46.7%)	df=1 p=0.053

The results showed that most of the respondents who were aware of the negative effects of open defecation, 72 (62.6%), had taken CLTS. Individual factors and uptake of CLTS were statistically significantly associated (P = 0.011). The majority of respondents, 158 (64.2%), who thought that open defecation was an embarrassing behavior, had not undergone CLTS. Statistically, there was no significant association

between open defecation being considered a shameful act and the uptake of CLTS (P = 0.482). Regarding willingness to use a pit latrine, results showed that 85 (73.9%) of the respondents who were willing had taken CLTS. Further results showed that willingness to use a pit latrine was significantly associated with the uptake of CLTS (P = 0.024).

Most respondents, 82 (71.3%), who reported the absence of cultural barriers to latrine usage, had taken CLTS. Cultural obstacles to latrine use were not statistically significantly correlated with CLTS adoption (P = 0.942). Regarding whether the respondents would use alternative means other than pit latrines to relieve themselves, results showed that 65 (56.5%) of those who agreed had taken CLTS. There was no statistically significant correlation between using methods other than pit latrines to relieve themselves and using CLTS (P = 0.194). Results showed that 133 respondents (54.1%) of those with the ability to build and maintain a pit latrine had not undergone CLTS. The ability to use and maintain a pit latrine was statistically substantially associated with taking CLTS (P = 0.001).

Concerning the decision-makers regarding pit latrine construction, results showed that 63 (54.8%) of the respondents who picked the husband as the decision-maker had taken CLTS. There was a statistically significant association between decision-makers regarding pit latrine construction and the uptake of CLTS among the respondents (P = 0.001). Regarding family members who had suffered from diarrheal disease in the past six months, results showed that 131 (53.3%) of the respondents whose family members had suffered from the disease had not taken CLTS. However, there was no statistically significant link between respondents' use of CLTS and a family member's history of diarrheal illness in the previous six months (P = 0.053).

Qualitative results on willingness to use a pit latrine supported the quantitative findings. More needs to be done to change people's attitudes towards CLTS uptake in the community. This was echoed by a religious leader during a Key Informant Interview session;

> *"…having witnessed increased cases of diarrheal diseases in the community, we the religious leaders decided to talk to our members on the effects of open defection. Talking itself proved not to help a lot, that's why we decided to increase the number of pit latrines as well as open them for use to the public. Community members around accepted this initiative and have always been receptive and willing to use. From the recent statistics it has been confirmed that the cases have reduced slightly. We are also educating members on cultural issues regarding latrine usage to increase willingness…"* **(KII Respondent).**

Regarding suffering from previous diarrheal diseases and uptake of CLTS, the qualitative results indicated a significant influence on CLTS uptake. A community health officer, part of a Key Informant Interview session said;

> *"…whenever we get cases of diarrheal diseases it's our duty to find out the causes and address them appropriately. Sometimes you get these cases concentrated in a specific area, we always go there to give health talks and also advise people to take care of their hygiene and sanitation. Those who have suffered from episodes of diarrheal diseases normally visit them in their homes with the assistance of community extension specialists and advise them to avoid defecating in the open which has been identified as the main cause. Some may be defecating in the pit latrines, but they don't wash their hands after visiting the latrines, thus we educate them and advise them to adhere to CLTS…"* **(KII Respondent).**

4.5 Latrine Ownership and Use

4.5.1 Latrine Ownership by Households

Figure 4.2 below shows the findings on respondents' ownership and use of latrines.

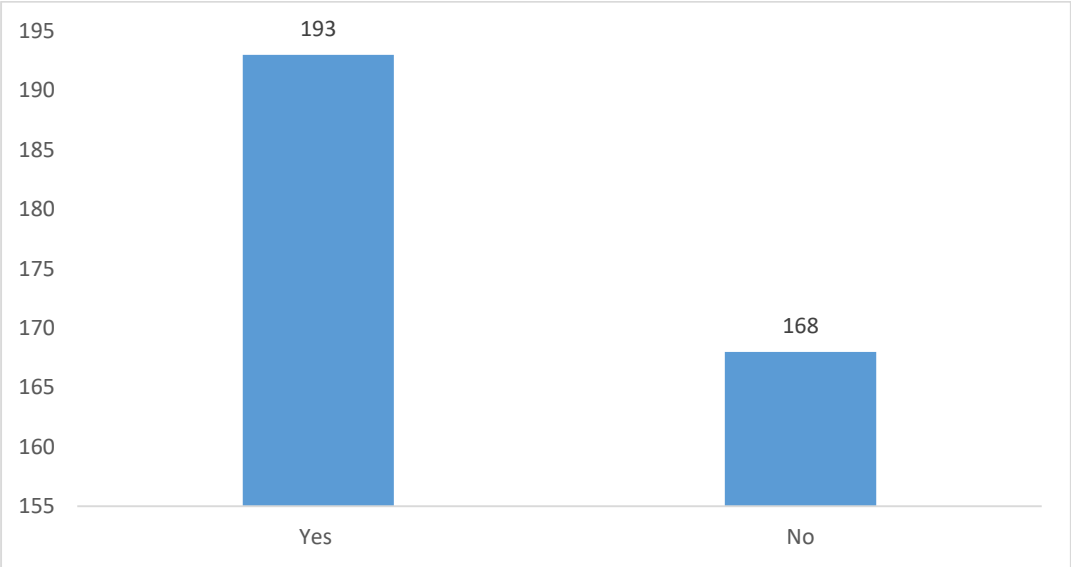

Figure 4.2 Pit-latrine ownership among study participants

Results showed that 193 (53.5%) of the respondents owned a pit latrine while the rest 168 (46.5%) of them did now own one.

4.5.2 Responses on Latrine Use

The participants' responses on latrine use were as presented in table 4.6 below.

Table 4.6 Responses on Latrine Use among Participants

Variable	Respondent response	Frequency (N)	Percentage (%)
Cleaning of the pit-latrine	Daily	15	7.8
	Weekly	43	22.3
	Twice monthly	48	24.9
	Monthly	87	45.1
Place of defecation	Bush/ground surface	72	19.9
	Our pit-latrine	142	39.3
	Neighbor's pit-latrine	122	33.8
	Water body	25	6.9
Anal cleansing material	Water	79	21.9
	Leaves	163	45.2
	Papers	61	16.9
	Tissue paper	58	16.1
Washing of hands after visiting a pit-latrine	Always	108	29.9
	Sometimes	162	44.9
	Never	91	25.2
Disposal of child excreta	Burying in soil	77	21.3
	Pit-latrine	182	50.4
	Throwing to bushes	102	28.3

The results showed that 87 (45.1%) cleaned the pit latrine monthly, followed by 48 (24.9%) of them cleaning it twice monthly. The findings on the defecation location revealed that 142 (39.3%) of the respondents used a pit latrine, followed by 122 (33.8%) who defecated in their neighbor's pit latrine. Concerning anal cleansing material, results showed that 163 (45.2%) used leaves, followed by 79 (21.9%) who used water.

Results regarding how often respondents cleaned their hands after using a pit latrine revealed that 108 respondents (29.9%) always washed their hands, followed by 162 respondents (44.9%) who did so only occasionally. Concerning the place of disposal of child excreta, results showed that 182 (50.4%) disposed in the pit-latrine, followed by 102 (28.3%) who threw to bushes.

4.5.3 Association between Latrine Ownership and Use on CLTS Uptake

The third objective focused on determining the association between latrine ownership and use and uptake of CLTS among the respondents and the results were as presented in table 4.7 below.

Table 4.7 Latrine Ownership and Use and Its Association with Community Led Total Sanitation Uptake

Independent variable	Respondent response	CLTS uptake		Statistical significance
		Yes (N= 115)	No (N=246)	
Own a pit-latrine	Yes	79(68.7%)	114(46.3%)	χ^2=13.994
	No	36(31.3%)	132(53.7%)	df=1 p=0.001
Cleaning of the pit-latrine	Daily	9(11.5%)	6(5.2%)	χ^2=4.117
	Weekly	26(33.3%)	17(14.8%)	df=3
	Twice monthly	23(29.5%)	25(21.7%)	p=0.061
	Monthly	20(25.6%)	67(58.3%)	
Place of defecation	Bush/ground	15(13.0%)	57(23.2%)	χ^2=20.472
	Our pit-latrine	58(50.4%)	84(34.1%)	df=3
	Neighbor's latrine	31(27.0%)	91(37.0%)	p=0.003
	Water body	11(9.6%)	14(5.7%)	
Anal cleansing material	Water	28(24.3%)	51(20.7%)	χ^2=7.815
	Leaves	39(33.9%)	124(50.4%)	df=3
	Papers	26(22.6%)	35(14.2%)	p=0.057
	Tissue paper	22(19.1%)	36(14.6%)	
Wash hands after visiting a pit-latrine	Always	62(53.9%)	46(18.7%)	χ^2=25.479
	Sometimes	36(31.3%)	126(51.2%)	df=2
	Never	17(14.8%)	74(30.1%)	p=0.001
Disposal of child excreta	Burying in soil	22(19.1%)	55(22.4%)	χ^2=7.528
	Pit-latrine	78(67.8%)	104(42.3%)	df=2
	Throwing to bushes	15(13.0%)	87(35.4%)	p=0.023

Results showed that 79 (68.7%) of the respondents who owned a pit latrine had taken CLTS. Owning a pit latrine substantially predicted respondents' use of CLTS, according to statistics (P = 0.001). 58.3% of the respondents who cleaned their pit latrines on a regular basis did not take CLTS, which is more than half of all respondents. The frequency of cleaning the pit latrine was not statistically associated with the uptake of CLTS among the respondents (*P = 0.061*).

As a result of using a pit latrine, 58 (50.4%) of the respondents had taken CLTS, according to the findings. Place of defecation and CLTS uptake were statistically significantly correlated (P = 0.003). Only 50.4% of the 124 respondents (or slightly

more than half) who utilized leaves as the anal cleansing material had taken CLTS. Between anal cleansing substances and uptake of CLTS, no association was statistically significant (P = 0.057). The respondents' use of CLTS was significantly correlated with how frequently they washed their hands after using a pit latrine (P = 0.001).

Concerning the place of disposal of child excreta, results showed that 78 (67.8%) of the respondents who disposed of it in the pit-latrine had taken CLTS. Place of kid excreta disposal and uptake of CLTS showed a statistically significant connection (P = 0.023). Qualitative results showed that pit latrines have not been well maintained in the community. This affects their usage, consequently slowing down the uptake of CLTS. One Chief who took part in the Key Informant Interview session reported;

> *"…honestly most people here don't own toilets. We are currently visiting homes and advising them to build even simple toilets since the cases of diarrheal diseases keep on increasing. Through government support we have been able to build pit-latrines in some homes and also others in public places. Unfortunately, they haven't been well maintained in terms of cleaning and usage but we try to sensitize the public in our usual Barazas and we have noted some improvements. We request you to help talk to them as you do your research and also share with us your findings on finishing to help make administrative decisions…"* **(KII Respondent).**

4.6 Institutional Factors

4.5.1 Responses on Institutional Factors

Results on institutional factors were presented in table 4.8 below.

Table 4.8 Distribution of Institutional Factors among Respondents

Independent variable	Respondent response	Frequency (N)	Percentage (%)
Given incentives for pit-latrine ownership	Yes	173	47.9
	No	188	52.1
Supported to construct a pit-latrine	Yes	200	55.4
	No	161	44.6
Source of support for pit-latrine construction	NGO	35	17.5
	Government	165	82.5
Visited by a Community Health and Extension Worker	Yes	229	63.4
	No	132	36.6
Source of information on community health issues	Healthcare worker	151	41.8
	Local authority	37	10.2
	Religious leader	45	12.5
	Friends/relatives	28	7.8
	Radio/TV/newspaper	78	21.6
	Social media	22	6.1
Community involved in planning their health activities	Yes	207	57.3
	No	154	42.7
Ever been invited for a meeting on sanitation and hygiene	Yes	225	62.3
	No	136	37.7

The results revealed that 188 (52.1%) of the respondents were not given incentives for pit-latrine ownership. More than half, 200 (55.4%) of the respondents, supported constructing a pit-latrine, while the rest, 161 (44.6%), did not. Among those respondents who supported constructing a pit-latrine, 165 (82.5%) got support from the government.

On whether the respondents had ever been visited by a community health and extension worker, results revealed that 229 (63.4%) had ever been visited. Concerning the source of information on community health issues, results showed that 151 (41.8%) got information from healthcare workers, followed by 78 (21.6%) who got it from radio, television, or newspapers. Also, results showed that 207 (57.3%) of the respondents were involved in planning their health activities. Additionally, 225 of them (62.3%) had received an invitation to a meeting on sanitation and hygiene.

4.5.2 Association between Institutional Factors and CLTS Uptake

The fourth objective focused on determining the association between institutional factors and uptake of CLTS and the results were as presented in table 4.9 below.

Table 4.9 Institutional Factors Associated with Uptake of Community Led Total Sanitation

Independent variable	Respondent response	CLTS uptake		Statistical significance
		Yes (N= 115)	No (N=246)	
Given incentives for pit-latrine ownership	Yes	71(61.7%)	102(41.5%)	χ^2=11.773 df=1 p=0.013
	No	44(38.3%)	144(58.5%)	
Supported to construct a pit-latrine	Yes	61(53.0%)	139(56.5%)	χ^2=0.086 df=1 p=0.770
	No	54(47.0%)	107(43.5%)	
Source of support for pit-latrine construction	NGO	22(35.4%)	13(10.2%)	χ^2=1.660 df=1 p=0.071
	Government	42(64.6%)	123(89.8%)	
Visited by a Community Health and Extension Worker	Yes	72(62.6%)	157(63.8%)	χ^2=0.050 df=1 p=0.824
	No	43(37.4%)	89(36.2%)	
Source of information on community health issues	Healthcare worker	55(47.8%)	96(39.0%)	χ^2=53.549 df=5 p=0.001
	Local authority	10(8.7%)	27(11.0%)	
	Religious leader	14(12.2%)	31(12.6%)	
	Friends/relatives	13(11.3%)	15(6.1%)	
	Radio/TV/newspaper	11(9.6%)	67(27.2%)	
	Social media	12(10.4%)	10(4.1%)	
Community involved in the planning their health activities	Yes	78(67.8%)	129(52.4%)	χ^2=4.171 df=1 p=0.041
	No	37(32.2%)	117(47.6%)	
Invited for a meeting on sanitation and hygiene	Yes	83(72.2%)	142(57.7%)	χ^2=6.915 df=1 p=0.038
	No	32(27.8%)	104(42.3%)	

The results revealed that 71 (61.7%) of the respondents who were given incentives for pit-latrine ownership had taken CLTS. Giving incentives to possess a pit latrine and using CLTS were statistically significantly associated (P = 0.013). A pit latrine was endorsed by 139 people, or more than half (56.5%) of them, but none of them had taken

CLTS. Being encouraged to build a pit latrine had no correlation with taking CLTS (P = 0.770).

Most of the 123 (89.8%) of those who got government support for pit latrine construction had not taken CLTS. Statistically, the source of support for pit-latrine construction was not significantly associated with CLTS uptake (*P = 0.071*). Most 157 (63.8%) of those who had been visited by a community health and extension worker had not taken CLTS. The implementation of CLTS did not significantly correlate statistically with receiving a visit from a community health and extension worker (P = 0.824). About 55 (47.8%) of the respondents who obtained information from healthcare workers had taken up CLTS. The statistical relationship between the source of information on community health issues and the uptake of CLTS was statistically significant (P 0.001). Concerning community involvement in planning health activities, results revealed that 78 (67.8%) revealed to have been involved had taken CLTS. The adoption of CLTS was significantly statistically associated with community involvement in planning health activities (P = 0.041).

The additional data revealed that 83 (72.2%) of the respondents who had ever been asked to a meeting on sanitation and hygiene had completed CLTS. A conference on sanitation and hygiene invitations and the use of CLTS were statistically significantly associated (P = 0.038). Qualitative results on the source of information on community-led total sanitation indicated that there are sessions held in the community to educate people on hygiene and sanitation, including the uptake of CLTS services.

A Public Health Officer, a part of a KII session reported;

> *"…as the county we always pass information on health matters though hospitals and to homes with the help of community extension workers. Like now in the hospitals, we have health talks in the MCH department where we educate mothers on matters of hygiene and sanitation. To encourage members to stop OD we provide some support for construction of pit-latrines as well as giving some incentives like toilet paper to encourage usage. This has helped reduce cases of diarrheal diseases in the county…"* **(KII Respondent).**

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter includes discussions, conclusions, and recommendations on the use of CLTS that are based on the goals of the study. This encompasses socio-demographics, individual factors, latrine ownership, and institutional factors influencing the uptake of CLTS.

5.2 Discussions

5.2.1 Socio-demographic Factors

The goal of the study was to identify the sociodemographic elements that affected household heads' adoption of community-led total sanitation in Isiolo County. The results on the distribution of age showed that most of the household heads were aged 30-39 years. This is a prime age where most people have stable families and own homes. According to a study on the effects of CLTS interventions on sanitation and hygiene in Pallisa District, Uganda, the majority of respondents were in their 40s (Okolimong *et al*., 2020), and the findings were in contrast to those findings. Uncertainty in the results of a second Kenyan study on the uptake of CLTS in Siaya County revealed that the majority of household heads were in their 40s and 49s (Joseph, 2020). Age and CLTS uptake did not, however, show any statistically significant correlation. This may be the result of other factors, such as culture, which may be dominant, thus hindering CLTS uptake. In Ghana, age was found to be a significant factor that influenced CLTS uptake across households (Radin *et al*., 2020).

The majority of respondents attained a primary level of schooling. This may be accounted for by the fact that the study was carried out in the county of Isiolo, where

locals commonly encounter obstacles while trying to access educational institutions, which causes early school dropouts. This result conflicts with a study on the factors influencing open defecation-free innovations carried out in Ghana, where the majority of people interviewed lacked a formal education (Alhassan and Anyarayor, 2018). The use of CLTS was statistically significantly correlated with the greatest degree of education acquired. As education levels rose, so did the adoption of CLTS. This is because education empowers people with information regarding the importance of observing environmental hygiene by avoiding open defecation and adopting CLTS to avoid diarrheal infections. The results concur with a Cambodian study on determinants of CLTS utilization, which showed that education level predicted CLTS uptake among participants (Hendrix, 2020).

The majority of respondents were married, according to the study's findings. The majority of respondents were above 30 years old, indicating that they were in stable relationships and were happily married with families, which may help to explain this. The findings supported a study carried out in Uganda, where it was found that most of the respondents were married. Additionally, it was discovered that the majority of married household heads did not use CLTS (Okolimong *et al*., 2020). This was comparable to the recent study that found a strong relationship between marital status and CLTS uptake. This is because marital status means there is an increased number of family members who could probably take matters of hygiene seriously and may have their own pit latrines. The majority of individuals surveyed were married, according to a study on the effectiveness of a community-led complete sanitation program conducted in Kwale County, Kenya (Mwatsahu, 2022). The majority of the participants were Christians. This shows that the study site was predominantly inhabited by the Christian religion. This is in agreement with a Ghanaian study on CLTS uptake among household

heads, where it was reported that most participants were of the Christian fraternity (Radin *et al*., 2020). However, there was no statistically significant correlation between religion and the adoption of CLTS. This is due to the fact that Christians made up the majority of the respondents. This is inconsistent with a study in rural Bali, Indonesia, where it was reported that religion was one of the determinants of CLTS uptake (Dwipayanti *et al*., 2020). It was noticed in a study on the effectiveness of CLTS in Zurich, Switzerland, to promote good sanitation that the majority of respondents were Christians and that CLTS uptake was influenced by religion (Harter, 2018).

Regarding respondents' gender, the results revealed that most of them were male. This is because the study was conducted among household heads, and according to true African tradition, men are the sole decision-makers and heads of families across different communities. The findings were consistent with a study that was conducted in a few Kenyan counties on gender outcomes for community-led total sanitation, which found that men dominated the population (Wamera, 2019). The respondents' gender and adoption of CLTS did not have any statistically significant relationships. Therefore, CLTS uptake could have been influenced by other factors apart from gender. The findings were in contrast to a study on gender integration in community-led total sanitation done in Timor-Leste, where gender was not linked to CLTS adoption (Ashinhurst, 2020).

Most of the respondents were not employed. This could be attributed to the majority of respondents only having received elementary or no formal education, which would have an impact on their employability. This concurs with research findings from Kakamega County in Kenya on factors contributing to the sustainability of open defecation-free status, where it was reported that most of the respondents were not

employed (Lenai *et al.*, 2021). However, occupational status was significantly associated with CLTS uptake. Those who were employed were more likely to take up CLTS among respondents. This is because they could have the resources required to ensure better CLTS uptake.

Similar research on sustainable total sanitation in Nigeria found that participants' work level affected their use of CLTS (Abramovsky *et al*., 2019). Concerning the average monthly family income, according to the findings, the majority of respondents made less than Kshs 5,000. The results revealed that most of the respondents earned less than Kshs5,000. These might be attributed to the difficult economic conditions in the country as well as the fact that few respondents had jobs, which constrained their alternatives for employment. Similar findings were reported by a study from Migori County in Kenya, where it was reported that most of the respondents had an average family income of less than Kshs 5,000 (Aluoch *et al.*, 2022). The average monthly income was significantly associated with the uptake of CLTS, as those who earned less than Kshs 5,000 had not taken CLTS. This is probably because they could not afford to construct a pit-latrine and other materials associated with CLTS uptake. According to a Cambodian study, it was revealed that the provision of subsidy programs in CLTS implementation led to an improvement in its uptake among the poorest (Hoo *et al.*, 2022).

Further, more than a third of the respondents had between 4 and 6 household members. This is because most of the respondents were married, thus probably having children, which could increase the number of household members. The findings were in opposition to a study carried out in Timor-Leste, which found that most households with more than two members did not adopt CLTS (Clarke *et al*., 2021). Statistics show

a strong correlation between the size of the household and the uptake of CLTS. The more members in the household, the more likely it was to observe CLTS uptake. Study findings around Africa showed that CLTS uptake was low among communities where households with extended families were more common (Musyki, 2020).

5.2.2 Uptake of Community-Led Total Sanitation

The results revealed that the level of community-led total sanitation uptake was 31.9%. This demonstrates that Isiolo County is one of Kenya's counties with a high rate of open defecation and, consequently, inadequate sanitation coverage. This explains the reasons behind increased cases of diarrheal diseases, especially among children in the region. The findings were in contrast to a study carried out in Siaya County, Kenya, where the percentage of CLTS implementation was limited to 83% (Joseph, 2020). In another study done on the benefit-cost analysis of CLTS in rural Ghana, it was reported that the majority of the villages surveyed had a high uptake of CLTS, standing at 63.5% (Radin *et al*., 2020).

The CLTS program has been rarely implemented consistently across countries with varying uptake rates. In Indonesia, after CLTS triggering, it was concluded that the sub-district with the lowest ODF status was at 28% in 2018 (Pertiwi *et al.,* 2018). Only 19.5% of Indian homes had implemented CLTS at a 100% rate, according to a survey done in villages (Mahendra *et al*., 2021). Lack of adequate information and support for building latrines affected the full realization of this intervention.

After the local leadership was involved, there was a 30% increase in the number of individuals who had access to proper sanitation, which was attributed to improved CLTS uptake in Zambia (Tiwari *et al*., 2017). This increased demand for sanitation facilities, coupled with a behavior change drive, is attracting its sustenance (Markle *et*

al., 2017). The adoption of CLTS was low in pastoralist communities in Nigeria but high in other everyday groups (Abramovsky *et al.*, 2016). On the CLTS components, it was reported that most (54.3%) households had a pit latrine. This is supported by the fact that most of these households receive support for latrine construction. However, this may not translate to CLTS uptake since possessing a latrine may not translate to its use due to other community factors. This disagrees with a study from Kajiado County, Kenya, where 59.2% of households lacked access to latrines (Mbogo *et al.*, 2018).

In Busia County, CLTS implementation led to improved latrine coverage, from 62% to 89% (Muchangi & Kimati, 2017). In Ghana, CLTS triggering led to 67.6% latrine coverage among different villages (Harter *et al.*, 2019). In Northwest Ethiopia, it was found in a study on CLTS and latrine ownership that 47% of households had access to latrines (Zeleke *et al.*, 2019). In Northwest Ethiopia, it was found in a study on CLTS and latrine ownership that 47% of households had access to latrines (Zeleke *et al.*, 2019).

The results also showed that only 42.1% of households had evidence of pit latrine use. Despite the presence of pit- latrines in homesteads, some households did not use them. This could be attributed to reasons such as cultural beliefs or the construction of pit latrines without the full involvement of community members. Studies from Ethiopia reported that there is a high likelihood of people using a well-maintained latrine compared to a dirty one, which results in people shying away (Ashenafi *et al.*, 2018). Latrine blockage, especially in slum areas, affects latrine conditions, resulting in people choosing open defection over latrines (Biswas *et al*., 2020). Despite evidence of the availability of pit latrines from villages in rural India, its evidence of usage was low (Lee and Radcliff, 2021). There were indications of open defecation along streams in

this area, according to research done in the Kyangwali refugee community (Monje *et al.*, 2020).

Most (67.9%) of the pit latrines in Isiolo County lacked a tight fitting or squatting lid. This contributes to low CLTS uptake by barring household members from using these pit latrines. Contrary to a study conducted in Northwest Ethiopia, where the majority of latrines were traditional pit latrines without a tight fitting, the findings on latrines were found there. Another study from Malawi revealed that 30% of household latrines lacked a tight fitting. This prevented better CLTS uptake among the community members (Mwapasa *et al.*, 2022).

Results showed that 34.1% of the households in the study area showed the presence of fecal matter in their surroundings. This indicated that they were involved in open defecation. In contrast, a survey done in Ghana found that 18.75% of people urinated in public (Osumanu *et al*., 2019). Although the Nigerian government has pledged to end open defecation by 2025, this goal still faces obstacles because 26% of Nigerians still practice open defecation (Adeoti *et al*., 2021). In the rural areas of Ethiopia, about 37.9% and 8.7% of the rural and urban population are practicing open defecation, with those previously declared ODF villages reverting back (Ayalew *et al.,* 2018; Abebe & Tucho, 2020). In Tanzania's neighbor, open defecation is expected to increase from 11.8% to 12.0% of the population from 2018 to 2022 (Nyoni & Nyoni, 2020). According to a study done in Kajiado County, Kenya, 59.2% of households lacked access to toilet facilities, of which 98.4% reported being open defecators (Mbogo et al., 2018). In Kenya’s Kisii County, only 32% of village communities were declared ODF (Trepanier *et al*., 2021). In the coastal regions of Kenya, Kwale County leads with 51.2%, followed by Kilifi with 34.0% of open defecators (MoH, 2014).

Additionally, the data showed that 239 families, or the bulk of them, lacked a hand-washing facility (66.2%). Any practical hand washing station should provide enough water, soap, or ash to allow for thorough hand cleaning. In Nepal, it was revealed that 90% of households had adequate access to improved handwashing facilities, thus increasing CLTS uptake (Kafle & Pradhan, 2018). In spite of having access to a handwashing station, 10% of university students who participated in the study (Logo, 2020) admitted to engaging in OD. 70% of the households polled in a study conducted in Kenya had access to enough soap and water when using the restrooms (Mumbi & Choro, 2017). Only 36.2% of Ugandan families in the research had access to a handwashing station (Keera, 2019).

5.2.3 Individual Factors Associated with CLTS Uptake

The results indicated that most respondents were aware of the negative effects of OD. This shows that people actually know the importance of taking CLTS implementation seriously, which could help avert cases of diarrheal diseases. The results concur with findings from Benue State in Nigeria, where it was noted that people were adequately aware and knowledgeable about the effects of OD (Alom *et al*., 2020). Low levels of awareness were reported in a study done on the prevalence of OD in India, where two-thirds of those interviewed did not recognize the diseases that are spread through open-air defecation (Panda *et al.,* 2017). Given that most people who were aware of the harmful effects of OD had already adopted CLTS, the adoption of CLTS and awareness were statistically significantly correlated. Similar results were reported from Indonesia, where high cases of OD were associated with limited awareness among the general public, and this prompted the government to advocate for education programs (Winarningsih *et al.*, 2019).

The vast majority of respondents believed that open defecation was shameful conduct. This component of CLTS triggering provokes them against OD, thus influencing the implementation and uptake of CLTS interventions in communities. This outcome was in line with research conducted in rural Ethiopia that found OD was so shameful that people who practiced it chose to hide and performed the act more frequently at night (Tafese & Anato., 2019). The feeling of guilt and disgust as a component of triggering was effective, resulting in tremendous CLTS uptake in Ghana (Tomberge *et al.*, 2021). In India, study findings noted that most respondents interviewed felt shameful to defecate in the open (Pathak *et al.*, 2022). The adoption of CLTS did not, however, appear to be significantly statistically associated with OD shame. Because CLTS had not been introduced, the majority of people who felt ashamed about OD did not. At times, people may feel shameful to defecate in the open but may lack latrines to relieve themselves. The results were contrary to findings from a qualitative study on women's experience defecating in the open, which noted that the fear of defection in the open lured them to dispose of their feces in latrines (Negi and Mishra, 2019).

The majority of people surveyed were willing to use a pit latrine, according to the study's findings. This could be attributed to the fact that OD is shameful, and people may not want others to know that they do so. However, the availability of toilets and latrines does not necessarily mean people would use them. Sometimes one may respond to a call of nature in places far from their homes, especially when they are on their nomadic pastoral mission. In most towns in Ghana and Kenya, there are several public toilets, but people have to pay to use them, hence a major impediment to CLTS uptake (Mariwah *et al*., 2017; Mulatya *et al*., 2021). Long lines at public restrooms and runny bowel movements, as shown in an Indian study, cause people to waste themselves in public (Rashid & Pandit, 2019). The adoption of CLTS was highly correlated with the

likelihood of using a pit latrine. The likelihood of CLTS uptake increased with the willingness to use a pit-latrine-reducing drug in cases of OD. The findings were in line with a study on CLTS knowledge and attitudes carried out in Bandung Municipality, which came to the conclusion that CLTS interventions were widely adopted in areas where communities were eager to use latrines (Sarr *et al.,* 2019). Most respondents reported that there were cultural barriers to latrine usage. This hinders the full implementation of CLTS intervention programs. Some cultural beliefs, such as superstition, taboos, values, and norms held by some communities, significantly influence the continued practice of OD (Adjibolosoo *et al*., 2020).

According to a Tanzanian study, infant feces are dumped into the environment because latrine use affects child development and growth (Chebet *et al.*, 2020). In another Tanzanian study, the most frequently cited barrier to implementing CLTS was culture (Tough *et al*., 2022). Between the introduction of CLTS and the presence of cultural barriers to toilet usage, there was no statistically significant correlation. However, there could be other factors that influence CLTS uptake, regardless of the presence of cultural factors. Contrary findings were reported in a study conducted on CLTS implementation in Zambia, where culture and traditional values were the main barriers that significantly hindered CLTS implementation (Hazyondo, 2020).

The vast majority of respondents were able to build and manage a pit latrine. This is because in most rural communities, they construct simple structures that may not necessarily attract a lot of resources. The results differed from findings from Ghana, where it was reported that most of the respondents were unable to construct and thus maintain a pit-latrine (Tsekpetse-Akauamoah *et al*., 2022). The construction of toilets for usage was only possible for individuals who were financially stable (Issahaku *et al.,*

2022). The use of CLTS was significantly statistically associated with the capacity to consult and maintain a pit latrine. This is attributed to the fact that the ability to construct a pit-latrine influences its usage once it is available. According to another study from India, many residents expressed their inability to construct their own toilets, hence using alternative means of relieving themselves, resulting in low CLTS uptake (Adlakha *et al.,* 2022).

Further, husbands were noted as the sole decision-makers for pit-latrine construction. This is because the study was done in a true African community where decisions are predominantly made by male household heads. The results were similar to research findings from Tanzania on gender dynamics in community-led total sanitation, where men were responsible for making decisions regarding pit-latrine construction (Tough *et al.,* 2022). However, it was noticed in a different study carried out in rural Ghana that decisions regarding the construction of latrines were made jointly by the husband and wife (Harter *et al.,* 2019). Decision-makers' involvement in the installation of pit latrines and the adoption of CLTS were statistically significantly correlated. The majority of respondents who chose their husbands as the only decision-makers had completed CLTS, which supports this.

The majority of respondents, according to the survey, reported having diarrhea in the six months prior to the study, either personally or through a family member. This signifies contamination of food or drinking water as a result of OD. These findings were replicated in a study conducted in Banjar, India, on the effects of CLTS, where recent cases of diarrheal diseases among family members were reported (Marlinae *et al.,* 2019). No statistically significant correlation was found between the use of CLTS and having a family member who had recently had diarrhea. This result conflicts with a

study on the prevalence of diarrheal diseases in children under five years old, which found that in Southeast Ethiopia, diarrheal disease cases were higher in non-ODF groups than ODF groups (Megersa *et al*., 2019).

5.2.4 Latrine Ownership and Use by Households

The findings indicated that most respondents had a pit latrine at home. They were able to construct and maintain latrines, coupled with the reception of support from different stakeholders. The findings were at odds with research conducted in Ghana, which found that 49.8% of the families lacked a proper latrine or toilet, forcing people to urinate in public (Osumanu *et al*., 2019). Open defecation is a common practice among poverty-stricken rural communities (Musyoki, 2016). Owning a pit latrine considerably increased the likelihood that CLTS would be used, according to statistics. This is because the availability of pit- latrines in the homesteads increases the chances of implementing CLTS, thus significantly affecting their usability. These findings concur with a study conducted in India where latrine ownership was noted to be a significant factor associated with OD status among community members (Yulyan *et al.,* 2021). In a study done in Turkana, Kenya, it was shocking to note that an overwhelming majority of 82% of households were lacking latrines, a factor that has significantly impacted open defecation (Busienei *et al*., 2019).

The condition of the latrine also affects its usability among household members. Less than half of the respondents cleaned the pit latrine once a month, according to the findings. According to a study conducted on the urbanization of sanitation crises, it was reported that people did not frequently clean their pit latrines due to a lack of available water (McFarlane, 2019). The frequency of cleaning the pit-latrine was not statistically associated with CLTS uptake. The availability of a pit latrines may not translate to its

usage if the community holds other cultural beliefs that may influence CLTS uptake. A study conducted in Indonesia came to the conclusion that community members' use of latrine facilities was unrelated to the state of the facilities (Rafitha *et al.,* 2018). According to a study done in Ethiopia, people are far more likely to use a clean toilet than one that has been well maintained, which makes them reluctant to use it (Ashenafi *et al*., 2018). Latrine blockage, especially in slum areas, affects latrine conditions, resulting in people resorting to OD over latrines (Biswas *et al*., 2020).

The findings on the defecation location revealed that around a third of the respondents used their pit latrine. This is because the presence of latrines reduces cases of OD as members resort to using available latrines. The results corroborated a study on the challenges of handling fecal sludge in CLTS, where it was reported that the majority of respondents were using pit latrines for defecation (Mariwah *et al*., 2022). The place of defecation was statistically significantly correlated with CLTS uptake. The majority of respondents who feces in their pit latrines had implemented CLTS, which lends support to this. Research conducted in rural Ghana revealed comparable results, where most of the participants were more likely to use pit latrines for defecation (Trimmer *et al.,* 2022).

The majority of respondents used leaves as a method of anal cleansing, according to the study's research findings. This might be explained by the fact that the study was conducted at a remote location where it might be difficult to obtain tissue paper because of the accompanying costs. Several studies reviewed showed that unmet sanitation needs were associated with poor uptake of CLTS facilities (Capone *et al.,* 2018). Anal washing materials included soap and water, according to a study done on rural Solomon Island (Biran *et al.,* 2022). The statistical relationship between anal cleansing material

and CLTS uptake was not statistically significant. The availability and usability of cleansing materials are likely to influence the use of latrine facilities. According to a study done by Edgar and colleagues (2017), their study found that the availability of cleansing materials in latrines attracted the use of sanitation facilities. This persuades individuals and families to use latrines, thus effectively improving sanitation. However, construction sites where anal cleansing materials are rarely available result in defecating in the bushes (Harter *et al*., 2019).

About half of respondents sometimes washed their hands after visiting a pit-latrine, as shown by the study results. For a hand washing station to be effective, it must provide enough water, soap, or ash to allow for thorough hand cleaning. The results were consistent with research carried out in Kenya, where 70% of the families examined had access to sufficient soap and water while using the restroom (Mumbi & Choro, 2017). In Nepal, it was shown that 90% of households had adequate access to improved hand washing facilities, thus increasing utilization of CLTS facilities, resulting in reduced cases of open defecation in some communities (Kafle & Pradhan, 2018). This frequency of hand washing after visiting a pit latrine significantly influenced the uptake of CLTS. In spite of having access to a handwashing station, 10% of university students who participated in the study still defecated in the open (Logo, 2020).

Further, the study revealed that most of the households disposed of their children's excreta in pit- latrines. Nowadays, people are enlightened with information and understand the effects of OD. This was confirmed by research done in rural Solomon Island, which found that the majority of households used pit latrines to dispose of child excrement (Biran *et al*., 2022). The place of kid excreta disposal and the uptake of CLTS had a statistically significant relationship. This reduces the chances of open

defecation, thus increasing CLTS uptake. The findings are in line with a study on child defecation and related factors in community-led total sanitation conducted in Ethiopia, where disposal of child excreta was linked to CLTS adoption (Soboksa *et al.,* 2021).

5.2.5 Institutional Factors Influencing CLTS Uptake

Results on institutional factors revealed that most respondents were not given incentives for pit-latrine ownership and construction. The provision of incentives to communities that have been claimed to have ODF status is important for creating demand for latrine usage (Cameron *et al.,* 2021). Sanitation and financial incentives have been proven to work positively towards the elimination of OD in communities by encouraging them to continue using latrines. According to a study conducted in Cambodia, the poor were targeted with monetary incentives to build latrines and toilets so as to increase the uptake of CLTS (Hoo *et al*., 2022). The availability of incentives for pit-latrine ownership and the adoption of CLTS were statistically significantly correlated. This motivates people to ensure they use the available latrines they are assisted in building. A study conducted in Baharat noted that financial resources used during the construction of latrines by households were reimbursed to ensure that people did not revert back to open defecation (Jain *et al.,* 2020).

The majority of respondents received assistance in building a pit latrine. The main agencies that supported community members in the construction of pit latrines were the government and local non-governmental organizations. The findings are consistent with research done in Surabaya, Indonesia, where the government assisted communities in obtaining ODF designations (Soedjono *et al*., 2019). This was contrary to a study conducted on rural sanitation and CLTS uptake, where donors were the main supporters of pit-latrine construction (Zuin *et al.,* 2019). Studies on CLTS in Africa report that its

uptake was low; hence, strategies were invented to help the poor and marginalized construct and use latrines (Musyoki, 2020). In Ghana, non-governmental organizations and people who acted as role models supported the construction of latrines for the reduction of OD practices (Harter et al., 2019). There was no association between being supported to construct a pit-latrine and uptake of CLTS. This is because at times other factors, such as culture and the condition of the latrines, may influence its usage. Implementers should involve households when making decisions for latrine construction. This would encourage behavior change, consequently affecting the implementation and use of CLTS and reducing OD, as witnessed in India (Gupta *et al.,* 2019).

The findings revealed that a community health and extension worker had visited the majority of the respondents. The CHEWs, in conjunction with public health officers, advise households to construct and use pit latrines. The results were similar to a Kenyan study where CHWs helped in crafting and sharing information on CLTS (Nzioki & Korir., 2018). According to another study conducted in Pallisa District, Uganda, on CLTS interventions in sanitation and hygiene, it was reported that CHWs played a role in educating communities on the effects of OD (Okolimong *et al*., 2020). A community health and extension worker visiting you did not significantly affect whether you used CLTS, according to statistics. The role of community health workers in promoting toilet use and changing attitudes about open defecation is crucial. In a study done in Afghanistan, community health workers were accorded a responsibility to make follow-ups on the progress of open defecation-free status among communities (Hamat *et al.*, 2017). Community health workers educated the general public on the effects of OD and linked them to the healthcare system in case they needed referrals for diarrheal diseases (Edward *et al*., 2019).

Concerning the source of information on community health issues, the results showed that the majority of them got the information from healthcare workers. Radios were the most common source of information, while healthcare workers were the most trusted source of information on CLTS interventions in Liberia (Capps *et al.,* 2017). In Nigeria, information on CLTS implementation and use was mostly provided through leaflets, signposts, and posters (Alom *et al*., 2020). The acceptance of CLTS was significantly statistically associated with the source of information on community health issues. This is because healthcare workers are trusted sources of information on health issues, resulting in the uptake of CLTS as advocated by them. The source of information on CLTS is influential in altering behavior changes associated with OD. Information enables people to know the effects associated with OD and the positive effects of dropping the habit. In a Kenyan study conducted in Kitui County, it was noted that the main source of information on community-led total sanitation was community health workers (Nzioki & Korir., 2018).

The results showed the community was involved in planning their health activities. The majority of the respondents were invited to sanitation and hygiene meetings. The results were consistent with findings from Ghana on CLTS uptake, which reported that implementing partners involved communities through information centers and radio stations (Tsekpetse-Akuamoah *et al.,* 2022). There was a strong statistical correlation between inviting people to meetings about hygiene and sanitation, participating in CLTS, and community involvement in organizing health activities. This improves their participation, ownership, and utilization of CLTS interventions, thus eliminating OD (Umar & Varma, 2018). When invited to give their views and opinions, they are more likely to increase their ownership and thus be compelled to use latrines, lowering OD practice. According to a study on the evaluation of community-based sanitation

programs, community involvement was key to the implementation of sanitation programs (Sidjabat and Gunawan, 2020).

5.3 Conclusions

The study comes to the conclusion that Isiolo County has a poor uptake rate for community-led total sanitation. Only three out of ten households in the county uptake CLTS. Even though the majority of the households owned pit latrines, there was evidence of their use. The latrines lacked tight fittings or a squatting lid, and there was no handwashing facility. Individual factors such as awareness of the negative effects of OD, willingness to use a pit-latrine, ability to construct and maintain a pit-latrine, and decision-makers on pit-latrine construction significantly influence CLTS uptake in Isiolo County.

The survey also came to the conclusion that the majority of families had pit latrines. In Isiolo County, Kenya, CLTS uptake was really strongly correlated with owning a pit-latrine, position of defecation, washing hands after using a pit-latrine, and disposal of kid excreta. Finally, the study concludes that most institutional factors influenced CLTS uptake in Isiolo County. The availability of these incentives for pit-latrine ownership, information sources on health issues, community involvement in organizing their own health activities, and invitations to meetings on sanitation and hygiene all significantly influenced the acceptance of CLTS.

5.4 Recommendations

This section contains recommendations for practice, policy, and further study.

5.4.1 Recommendations for Practice

i. The study recommends that the County Government of Isiolo should scale up health education programs on community-led total sanitation, especially hand washing after visiting latrines and open defecation, to improve CLTS uptake.

ii. The County Government of Isiolo, the Ministry of Health, and local leadership should increase sensitization meetings through barazas stressing the importance of using latrines and the negative effects of open defecation as a way of addressing induvial factors for CLTS uptake.

iii. The county government of Isiolo and other relevant stakeholders should encourage the construction of latrines and support and sensitize CLTS uptake by ensuring that latrines are kept clean to improve the conditions of use.

iv. At the institutional level, the county government and relevant stakeholders should offer incentives such as anal cleansing materials (tissue papers) and rewards for households that have achieved open defecation-free status to avoid reverting back to open defecation.

5.4.2 Recommendations for Policy

The study recommends the enforcement of the implementation of the existing CLTS policy to address the gaps identified in the recommendations for practice.

5.4.3 Suggestions for Further Study

The research recommends a further study to be conducted on the level of knowledge on community-led total sanitation among household heads in Isiolo County.

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APPENDICES

Appendix I: Consent Form

Introduction

I am Osman Mahad Bagaja, a Kenyatta University student pursuing a Master of Science in Environmental Health. The topic of my study is "Uptake of Community Led Total Sanitation Among Residents of Isiolo County, Kenya." Please grant me permission to take part in this study. I respectfully ask for your assistance in supplying the necessary data.

Study purpose

The study aims at assessing uptake of Community Led Total Sanitation program among residents of Isiolo County thus address the issues associated with high cases of open defecation. This would enhance increase in utilization of latrine facilities while observing the sanitation protocols resulting to reduced cases of diarrheal diseases among those at risk.

Study procedure

Participation in this research involves answering questions which you will be asked in a research questionnaire concerning utilization of community led total sanitation in Isiolo County. You are required to fill your responses in the spaces provided. At any given time, you are free to ask questions and seek more clarification on all aspects related to this study.

Voluntary participation

Due to the fact that this research is entirely voluntary and hence optional, you have the freedom to decline participation. You could also choose not to respond to some

questions that you find annoying or go against your cultural views. You can decide to leave the interview session at any time without it having a negative impact.

Discomforts and risks

You could grow weary during this interview because it is quite comprehensive. You may notice that some questions make you think about your cultural and religious beliefs, therefore you may decide not to respond. I would appreciate it if you took the time to take part in this study even though it could interfere with your everyday routines.

Benefits and rewards

Your involvement in the study will give us the knowledge we need to create and implement initiatives that will improve sanitation operations by encouraging Isiolo County inhabitants to embrace a community-led complete sanitation strategy. This will reduce open defecation practices thus improved sanitation in the surrounding. Participants will not receive any financial incentives.

Confidentiality

Household heads chosen from Isiolo County will get the interview questionnaires. Your information will be treated confidentially and in strict confidence. Your identity will never be revealed, and the information you submit will only be used to accomplish the present study's goal.

Contact information

In case of any queries concerning this study, you may opt to contact my research supervisors Dr. Isabella King'ori **0720487431** and Dr. Anthony Ireri **0725365915**. You may also contact Kenyatta University Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke, for any clarifications on your rights as a study participant.

Participant's statement

I have been given more details about my participation in this study. My issues have been sufficiently handled, and I have the chance to ask for more explanation. It is elective and optional to participate in this study. I believe that this information will be treated in confidence and in secret. At any point, I can decide not to continue taking part in this study.

Name of participant…….

Sign/Thumbprint……

Date……

Name of Representative/Witness (where necessary) Relationship to subject.

Principal Investigator's statement

I, the undersigned, have explained to the participant in a language that he/she best understands, the procedures to be followed in the research and the risks and benefits to be involved.

Name: Osman Mahad Bagaja.

Signature…… Date…….....

Tel. no…….

Appendix II: Research Questionnaire

Assessing Uptake of Community Led Total Sanitation and associated factors among Residents of Isiolo County, Kenya.

Participant number…… Date of the interview……

Instructions: Please tick or insert the option that best fits you

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age in years……..
2. What is your highest level of education?
   [1] No formal education [2] Primary
   [3] Secondary [4] Post-secondary
3. What is your marital status?
   [1] Married [2] Single [3] Divorced/widowed
4. What is your religion?
   [1] Christian [2] Muslim [3]Others
5. What do you do for a living?
   [1] Employed [2] Self-employed [3] Not employed
6. What is the average monthly Family income in your household? .....
7. How many members does your household have? .....

SECTION B: INDIVIDUAL FACTORS

8. Are you aware that open defecation has negative effects to your health?
   [1] Yes [2] No
9. Practicing open defecation is a shameful act.
   [1] Agree [2] Neither agree nor disagree [3] Disagree
10. Do you willingly use a latrine when responding to the call of nature?
    [1] Yes [2] No
11. Do you have any cultural barriers to latrine usage?
    [1] Yes [2] No
12. I would rather use alternative means to relieve myself than waiting to use the latrine?
13. [1] Yes [2] No
14. Are you able to construct and maintain a pit-latrine for you household members?
15. [1] Yes [2] No [3] Cannot tell
16. Who makes decisions on latrine construction in this household?

[1] Husband [2] Wife

[3] Children [4] Everyone

17. Has any of your family members suffered from diarrheal disease in the last six months?

[1] Yes [2] No

SECTION C: LATRINE OWNERSHIP AND USE

18. Do you own a latrine in this household?

[1] Yes [2] No

19. If yes in 8 above, how often do you/member of your household clean your latrines in a week?

[1] Daily [2] Weekly

[3] Once monthly [4] Twice per month

20. Where do members of this household defecate?

[1] Bush/Ground [2] Our latrine [3] Neighbor's latrine

[4] Public Latrine [5] Water body [6] Others (specify)……...

21. What anal cleansing materials do the members of this household use after visiting toilets?

[1] Water [2] Leaves [3] Papers

[4] Tissue Paper [5] Others (specify)……

22. How often do members of this family wash their hands with soap/ash immediately after visiting latrines?

[1] Always [2] Sometimes [4] Never

23. How do mothers dispose of excreta of children and the sick?

[1] Burying them [2] Pit-latrine

[3] Throwing in to the bush [3] Others (specify)…….

SECTION D: INSTITUTIONAL FACTORS

24. Are there incentives given to members who own latrines in this community?

[1] Yes [2] No

25. Do you receive support for constructing latrines?

[1] Yes [2] No

26. If yes, who assisted you?

[1] Government [2] NGO

[3] Community [4] Others (specify) ……

27. Have you been visited by a Community health and extension worker?

[1] Yes [2] No

28. What is the source of health information on community health issues?

[1] Health facility [2] Chief/assistant chief/religious leader

[3] Friends/relatives [4] Radio/ television/ newspaper

[5] Social media [5] Others (specify) ……

29. Community involvement in planning of community programs?

[1] Yes [2] No

30. Have you ever been invited for a meeting on sanitation and hygiene?

[1] Yes [2] No

Thank you for your participation

Appendix III: Observation Checklist

	CLTS component	**Yes**	**No**
1.	Presence of a pit-latrine in the compound		
2.	Evidence of use of latrine		
3.	Presence of a tight fitting/squatting lid		
4.	Absence of faecal matter in open spaces		
5.	Presence of a functional hand washing facility		

Appendix IV: Key Informant Interview Schedule

Dear KII participant,

You are hereby invited to participate in a Key Informant interview session on assessing the uptake of community led total sanitation in Isiolo County, Kenya. You have been chosen purposively due to the expected level of information and knowledge you are likely to give pertaining to this study. You are requested to be honest, free and active in your participation. All information gathered will be held under strict confidentiality and will be used for purposes of this research only.

1. What is your opinion on the utilization of community led total sanitation programs among residents of Isiolo County?
2. In your own assessment, what are the challenges of using implementing community led total sanitation activities among residents of this county?
3. Do you think there are individual factors that hinder implementation CLTS programs in this community? If yes, which are some of these?
4. What are the institution factors that predict utilization of CLTS services among residents of Isiolo County?
5. Do you think there are adequate number of functional toilets among households in this community? In your own comparison, how can you rate the cases of open defecation in this community currently? Has it reduced or increased?
6. Are there enough hand washing facilities with readily available soap/ash for people to use during and after visiting latrines? Do you think the public health officers are effective in their work with regards to sanitation and hygiene coverage in the community?
7. What suggestions would you recommend to the members of this community to ensure improved uptake of CLTS programs which would result to better sanitation services in Isiolo County?

Thank you!

Appendix V: Focus Group Discussion Guide

Dear participants,

This is a focus group discussion, open to every member and you are allowed to speak your views without any fear.

i. What is the level of uptake of Community Led Total Sanitation among residents of Isiolo County?
ii. What are the individual factors associated with uptake of Community Led Total Sanitation among residents of Isiolo County?
iii. What is the influence of latrine ownership and use on uptake of Community Led Total Sanitation among residents of Isiolo County?
iv. What institutional factors are associated with uptake of Community Led Total Sanitation among residents of Isiolo County?

Thank you.

Appendix VI: Research authorization from Kenyatta University Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School

DATE: 8th September, 2022

TO: **Mr. Osman Mahad Bagaja**
Department of Environmental & Occupational Health

REF:Q21/CE/25461/2014

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your Research Proposal after fulfilling recommendations raised by the Graduate School Board of 20th June, 2022.

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation and Ethics Review Committee, Kenyatta University.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking and Progress Report Forms per semester. The Forms are available at the University's Website under Graduate School webpage downloads.

Also, please ensure that you publish article(s) from your thesis before submitting it to Graduate School for examination as per the Commission for University Education and Kenyatta University guidelines.

Thank you.

DR. HARRIET ISABOKE
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Department of Environmental & Occupational Health

Supervisors:
1. Dr. Isabella Kingori
   C/o Department of Environmental & Occupational Health
   Kenyatta University
2. Dr. Anthony Ireri
   C/o Department of Educational Psychology
   Kenyatta University

Appendix VII: Ethical clearance from KU Ethics and Review Committee

KENYATTA UNIVERSITY
CENTRE FOR RESEARCH ETHICS AND SAFETY

Fax: 8711242/8711575
Email: chairman.kuerc@ku.ac.ke
Nairobi, 00100

P. O. Box 43844,

Tel: 8710901/12

Website: www.ku.ac.ke
Our Ref: **KU/ERC/APPROVAL/VOL.1**

Date: 18th /10/2022

Osman Bagaja
P.O Box 43844, 00100
Nairobi.

Dear Mr. Bagaja,

APPLICATION NUMBER: PKU/2607/I1731- UPTAKE OF COMMUNITY LED TOTAL SANITATION AMONG RESIDENTS OF ISIOLO COUNTY, KENYA

This is to inform you that ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** has reviewed and approved your above research proposal. Your application approval number is **PKU/2607/I1731.** The approval period is **18th /10/*2022 to 18th /10/2023***

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE***
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.

vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.

vii. Submission of an executive summary report within 90 days upon completion of the study to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE***

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

To serve you better, researchers are kindly requested to access and complete a customer feedback form and sent it back online as you continue with research and upon completion of data collection found on the following website link; ;(https://docs.google.com/forms/d/1ytWefDwvyz5h1oz_VIn0xbxg3uGdlDzMXFWNDsMrRPQ/edit?usp=sharing

Yours sincerely

Prof. Judith Kimiywe

Director: Centre for Research Ethics and Safety

Appendix VIII: Research Authorization from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **821148**

Date of Issue: **04/November/2022**

RESEARCH LICENSE

This is to Certify that Mr.. OSMAN MAHAD BAGAJA of Kenyatta University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Isiolo on the topic: Uptake of community led total sanitation among residents of Isiolo county, Kenya for the period ending : 04/November/2023.

License No: **NACOSTI/P/22/21383**

821148

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix IX: Research authorization from Isiolo County

THE OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Telegrams 'DISTRICTER' Isiolo
Telephone: Isiolo 064-52011.
isiolocc@yahoo.com
Fax :064- 52160
When replying please quote

OFFICE OF THE COUNTY COMMISSIONER
P.O. BOX 3-60300
ISIOLO

Ref: No: CC ST. 1/7 VOL. I/153

18th November, 2022

Deputy County Commissioner
ISIOLO SUB COUNTY

RE; RESEARCH AUTHORIZATION – OSMAN MAHAD BAGAJA – S/NO:Q21/CE/25461/2014

The above named has been authorized to carry out research on **"Uptake of Communit led total sanitation among residents of Isiolo County."** His key area of focus is Oldonyiro and Ngaremara locations in Isiolo Sub County, Isiolo County. He should adhere to rules and regulations of carrying out the research.

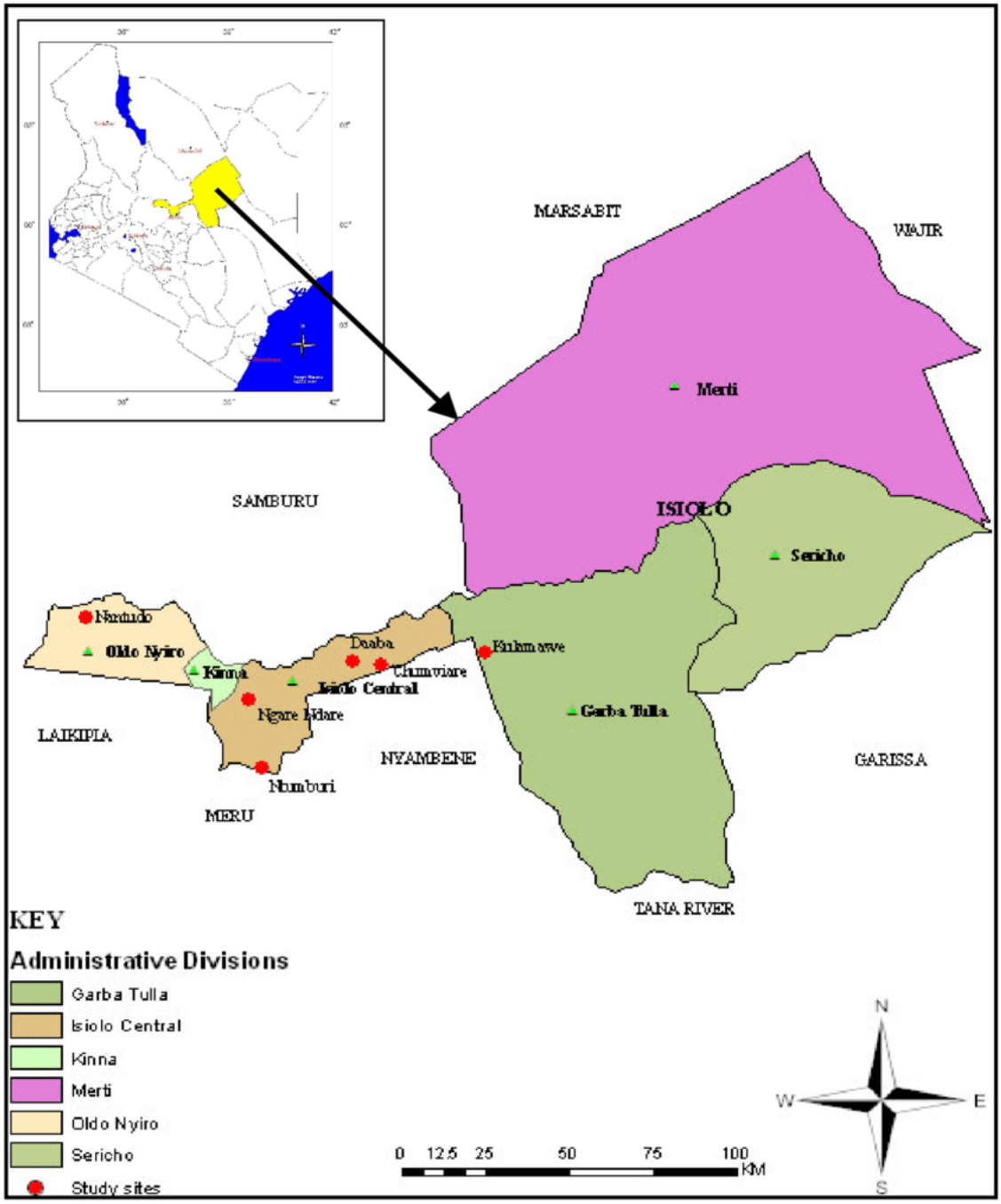
The research will be carried out from 18th November, 2022 to 18th November, 2023

In view of the above, please accord him necessary support.

COUNTY COMMISSIONER
ISIOLO COUNTY
P. O. Box 3 - 60300
ISIOLO

Samuel Gichohi
For: County Commissioner
ISIOLO COUNTY

Appendix X: Map of Isiolo County



Source, Kenya National Bureau of Statistics (KNBS), 2019.