DETERMINANTS OF SUSTAINABILITY OF OPEN DEFECATION-FREE STATUS AMONG ADULT RESIDENTS IN MWINGI WEST SUB-COUNTY, KITUI COUNTY, KENYA

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APPROVAL AND DECLARATION

This thesis is my original work and has never been presented for any academic award in any institution.

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DEDICATION

For their support during my studies, my dear wife Felistus Munandi, and our two young sons are honored in this thesis.

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ABSTRACT

In nations with limited resources, community-led total sanitation, or CLTS, is a popular strategy for reducing open defecation in rural areas. Communities that participate in CLTS programs are deemed ODF once household-level latrine coverage hits the national guidelines' threshold (e.g., 100% in Kenya). This is accomplished by granting community members the power to build and maintain latrines on their own, without the assistance of funding from outside sources. Therefore, encouraging populations to use sanitation facilities and doing away with defecation in the open is the main objective of CLTS. It's unclear whether CLTS can permanently lower open defecation, though, as hygiene standards are rarely checked after populations are declared ODF. The study looked at the social, economic, environmental, and cultural factors that influence Mwingi West Sub County, Kitui County, adult residents' ability to maintain their ODF status over the long term. A representative sample size of 439 individuals was selected from the total Mwingi West Sub County study population using a formula created by Yamane (1967). Only adults who were Mwingi West sub-county citizens were included in the study; those under the age of eighteen were excluded. This investigation utilized a cross-sectional investigation design. Key informant interviews and targeted group discussions were utilized to gather qualitative data, while structured questionnaires were utilized to gather quantitative data. The gathered data was cleaned, arranged, coded, and examined using the SPSS software. Quantitative data was presented using tables and pie charts. An interview guide was used to collect the qualitative data, which was then analyzed thematically and presented narratively. The Mount Kenya University Ethics and Review Committee, NAcosti, and the appropriate Kitui County government offices granted their ethical approval for the research investigation to be conducted. Engagement in this research was entirely voluntary. The sustainability of open defecation-free status among adult residents in Mwingi West Sub-County, Kitui County was at 75.3% which was way low as compared to the Kenya national target of 100% open defecation-free status by 2030 which is in line with sustainable development goal number six. Study respondents aged 35-44(OR=2.9,95%CI=0.14-0.89), the presence of safety when using pit latrines(OR=2,95%CI=0.29-0.81), the provision of lighting when using pit latrines(OR=2.2,95%CI=0.27-0.75), the presence of a sanitation program(OR=2.2,95%CI=0.27-0.75), having a tertiary level of education(OR=4,95%CI=0.07-0.81), and the presence of incentives(OR=2.1,95%CI=0.24-0.88) increased the odds of ODF status sustainability. While the absence of a sanction program in the community(OR=3.3,95%CI=1.43-7.48), earning below the poverty(OR=2.7,95%CI=1.49-4.98), and peasant type of occupation(OR=5.4,95%CI=2.38-12.50), the presence of a collapsed toilet(OR=1.9,95%CI=1.6-3.1) reduced the odds of ODF status sustainability. The results of this investigation will help the Ministry of Health and other pertinent parties fulfill Sustainable Development Goal Number Six on safe equitable access to water and sanitation by increasing the sustainability of ODF status to all.

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LIST OF ABBREVIATIONS AND ACRONYMS

CLTS	Community-Led Total Sanitation
CWAC	Central and West Africa Countries.
HH	Household
JMP	Joint Monitoring Program
KNBS	Kenya National Bureau of Statistics
MOH	Ministry Of Health
NACOSTI	National Commission of Science and Technology and Innovation
OD	Open Defecation
ODEL	Open Distance and Electronic Learning
ODF	Open Defecation Free
SSA	Sub Sahara Africa
SDG	Sustainable Development Goal.
TTM	Trans theoretical model.
UNICEF	United Nations International Children's Emergency Fun
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.0: Preamble

The current section contains the following: the background of the investigation; the problem statement; the justification; the general and specific objectives; the study's questions; the significance; the scope; the limitations and delimitations; and the investigation's assumptions.

1.1: Study Background

To build a more just and sustainable future for all people, the United Nations established the 17 interconnected global goals known as the Sustainable Development Goals (SDGs). According to the United Nations, 39 nations with low incomes, mostly in sub-Saharan Africa, have not been able to meet Target 6.2 of the Sustainable Development Goals (SDG) to end defecation in the open by 2030. To stop open defecation, 2.6 billion people will need to have access to latrines and sanitation, in addition to behavioral changes. To meet SDG sanitation targets by 2030, nearly one-third of member nations need to step up their efforts to end defecation in the open (Musoke et al., 2021)

Having access to suitable and reasonable sanitation is both an essential human right and a necessity. Ensuring universal access would dramatically reduce the death and illness rates, particularly among children. About 827,000 people die each year from diarrheal diseases in middle-class and low-income countries, which account for 60% of all diarrheal deaths. These countries also have inadequate access to clean water, sanitation, and hygiene. 432,000 of these deaths are thought to have been primarily brought on by insufficient sanitation. Along with offering the "basic" service level, which calls for an upgraded hygiene facility that is

exclusive to one family, sanitation facilities that are securely run offer an extra level of service that considers the final disposal of excreta.

An annual 297,000 child deaths under five could be prevented with improved sanitation, cleanliness, and access to water. Defecating outdoors perpetuates a poverty and disease cycle. The countries with the greatest number of cases of open defection also have the most prevalent rates of infant mortality, malnutrition, and impoverishment, as well as notable inequality in wealth (Musoke et al., 2021).

The world population increased by 1.7 billion between the years 2000 and 2020, but 2.4 billion additional individuals had access to well-managed sanitation services—basically, rudimentary facilities where waste is either treated or alternatively disposed of locally. But in 2020, approximately 3.6 billion individuals did not have access to well-managed hygiene services; of them, 1.9 billion did not even have access to the most basic. 616 million people relied on "unimproved" facilities out of the estimated 1.7 billion individuals who lacked access to even the most basic services, while 580 million people discussed improved hygienic conditions with other families. "Limited" services were provided to these individuals. According to the data, there are glaring disparities: two thirds of people without access to essential services reside in rural areas. In Sub-Saharan Africa, the majority of them were born (Cagnet, 2022).

The percentage of open defecation in Sub-Saharan African nations has decreased from 32% to 18%. But this is primarily being replaced by inadequate and shoddy sanitation, which has gone from 45% to 50% (Cagnet, 2022). Once more, these are not hygienic practices that are safe. Communities often resort to open defecation when they embrace such hazardous sanitation practices. The vast popular of people in these nations reside in rural areas, which

shows the same pattern. "Safely Managed Sanitation" is the term employed to describe the use of improved sanitation services where excreta is handled and handled elsewhere and is not shared with other families. In rural Sub-Saharan Africa, the rate of defecation in the open has dropped from 47% to 27%. Still, inadequate and worsening sanitation rose to make up for it. The practice of discarding human waste in open spaces such as fields and forests is referred to as "open defecation'(Cagnet, 2022).

Community-Led Total Sanitation (CLTS) is a method of behavior change that uses shame and disgust to get people to build latrines and stop open defecating. A community is deemed "open defecation free" (ODF) when there are no more any signs of defecation in the open and a specific percentage of homes have toilets (which can range from 80% to 100% according to national laws in an individual country) (Clarke et al., 2021). The majority of CLTS programs don't monitor sanitation warning signs after ODF, and the scant data that is available indicates that some people may return to open defecation in the years after ODF validation (estimated to range from 4% to 39% in prior studies). Moreover, the causes of households reverting to open defecation are frequently poorly understood and context-specific (Abebe & Tucho, 2020b).

Community Led Total Sanitation (CLTS), the project's primary methodology, was selected with the objective of having Kenya become Openly Defecating Free (ODF) by the end of 2025. Ending open defecation and encouraging neighborhood latrine use are CLTS's primary goals. When assessing ODF sustainability at the community level, the initial set of ODF status criteria is ODF Certification. (Kouassi et al., 2023). Failure to maintain the aforementioned indicators indicates that a community has not maintained Open Defecation Free status, and thus community members are considered to be eating their own feces.

Therefore, community members are required to utilize and maintain toilets hygienically by substituting full pits and fixing damaged pit-latrines after obtaining ODF status. Communities must therefore demonstrate progress by implementing new hygiene technologies and modernizing household latrines (Aluoch et al., 2022).

The construction of crude, easily-filled toilets that are susceptible to collapsing for instance, during periods of intense rain or flooding, is the widely praised cause of the return to open defecation in the surrounding area. Among low-income households, especially the poorest ones, the number of instances of open defecation has grown. The reason for this could be that households that are not poor are more likely than those with limited resources to leave the open defecation stage early. It might be necessary to target impoverished households more vigorously if Kenya is expected to be free of open defecation by 2030 (Njuguna, 2019).

The two UNICEF focus counties, Kitui and Siaya, had 4,930 and 2,245 villages, respectively, making them the second and third regions to achieve ODF region status in 2018 (Njuguna, 2019). Through the use of the Community-Led Total Sanitation (CLTS) approach, Kitui County has made significant strides toward becoming Defecation Openly Free as of 2024 (Aluoch et al., 2022). The county has already achieved ODF status in one district and aims to achieve full ODF status by the end of the year, with a target of at least 80% success if full ODF status is not reached(Aluoch et al., 2022). The adult residents of Mwingi West Sub County, Kitui County, Kenya, were the subject of the investigation, which sought to identify the factors that contributed to their sustained status as openly defecating Free (ODF).

1.2: Problem statement

Sanitation is a big problem in Kenya. Approximately thirty-three million individuals, or 70% of the overall population, do not have access to fundamental hygiene facilities, and more than five million people, or 10% of the population as a whole, are reported urinating in the open. Just 15% of people in rural areas and 3% of people in cities publicly defecate. Generally speaking, open defecation takes place in rural areas. One facet of Kenya's inadequate rural hygiene conditions is defecation in the open. Fifteen sizable regions account for about 85% of the country's defecation in the open cases, the majority of which are found in Arid and Semi-Arid Lands (ASAL). Transhumant pastoralists make up a significant portion of at least ten of the aforementioned fifteen counties, and they are challenging to reach with conventional sanitation interventions(Aluoch et al., 2022).

Kitui County was declared an open defecation-free county in 2018. Following the Kenya National Bureau of Statistics (KNBS) report of 2019, Kitui County with a population of 1,136,187 and a total of 261,814 households of which 9.2% were found to have reverted back to depending on bushes for human waste disposal. In the year 2022, the Mwingi West sub-county reported 3, 057 diarrheal cases despite the fact that it was declared ODF (KHIS 2022). The sub-county also reported 734 cases of stunting in the same year of 2022 (KHIS 2022). The low durability of ODF status and washing one's hands is probably one of the main causes of the high incidence of diarrhea and other hygienic illnesses. There is not enough information available on the long-term sustainability of defecation in the open in Kitui County, despite continuous efforts to stop it. along with an increase in diarrhea cases and stunting associated with defecationin the open. This indicated that further study was required to determine the factors that contribute to an adult resident of Kitui County, Kenya's Mwingi West sub-county's sustained status as an open defecation-free community.

1.3: Study Rationale

The objective of this study was to assess the variables that sustain adult Mwingi West, Kitui County, residents' abstinence from defecation in the open. Furthermore, despite the sub-counties being designated ODF, there is scant information regarding the ongoing viability of the ODF status there. Therefore, assessing the elements that maintain the Open Defecation Free (ODF) status of adult residents of Mwingi West Sub County was imperative. Findings from the investigation helped the community, local government representatives, and non-governmental organizations implement the CLTS program. The results of the study showed that in communities that implemented CLTS, the number of cases of waterborne illnesses like dysentery, cholera, and diarrhea had significantly decreased. Improved sanitation practices reduce contamination of water sources, leading to better overall public health. The study findings encouraged community participation, leading to empowerment as communities take charge of their sanitation.

1.4.0: Research objectives

1.4.1 General Objective.

To evaluate the contributing factors of sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya.

1.4.2 Specific Objectives.

1. To determine the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya.

2. To investigate social-demographic factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya.
3. To investigate socio-economic factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya.
4. To investigate socio-cultural factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya
5. To assess environmental factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya.

1.5: Research Question

1. What is the Open Defecation Free status sustainability among adult residents in Mwingi West Sub-County, Kitui County in Kenya?
2. What are the socio-demographic factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya?
3. What are the socio-economic factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya?
4. What are sociocultural factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya?

5. What are the environmental factors influencing the sustainability of Open Defecation Free status among adult residents in Mwingi West Sub-County, Kitui County in Kenya?

1.6: Study Significance

The results of these investigations were useful to Ministry of Health staff both at the national level and County level, and other relevant shareholders such as Non-Governmental organizations implementing the WASH program, Religious groups, WASH partners, and community members in scaling up the sustainability of Open Defecation Free status towards accomplishing general access to sanitation for all. The study findings will be useful to future scientists and academians in the field of Water Cleanliness and Hygiene programming for local communities in Kenya and globally. The study provided insights into the behavioral changes necessary to maintain ODF status. It can help identify cultural practices and social norms that support or hinder these changes. Understanding the factors that sustain ODF status helped in preventing the resurgence of waterborne diseases like diarrhea, cholera, and typhoid, which are closely linked to poor sanitation practices. Lastly,Sustaining ODF status ensured continuous improvement in public health, reducing healthcare costs and improving the quality of life for residents.

1.7: Scope of the study

The investigation scrutinized the long-term viability of ODF status among adult residents in Kitui County, Kenya's Mwingi West Sub-County, as well as the socioeconomic, sociocultural, and environmental factors that influence ODF sustainability.

1.8: Limitation of study

The targeted villages are extensive and located in remote rural areas with poor terrain, making access difficult for the researcher. As a result, motorbikes were used to access hard-to-read areas. A high level of illiteracy among elderly household heads is likely to result in a language barrier, resulting in information bias. To overcome this, Local language translation was done to ensure there was an easy understanding of the study aim and questionnaires.

1.9: Delimitation of study

To help the researcher visit the several targeted communities that are spread out in remote rural areas with difficult terrain, research assistants and local guides were hired. To avoid information bias, the researcher received assistance from local guides when administering questionnaires to the community's illiterate residents. The investigation was confined to Mwingi West Sub-County in Kitui County, Kenya. This specific area was selected due to its unique demographic, cultural, and environmental characteristics that were relevant to the research question. The study focused on adult residents within this sub-county, which allows for an in-depth analysis of the behaviors, practices, and factors influencing sanitation sustainability within a defined community. The study targeted adult residents of Mwingi West Sub-County, who were directly impacted by and responsible for maintaining ODF status.

1.10: Assumption of the study

The following presumptions supported the research:

1. The study sample would be sufficient and representative of the target population.
2. Data collection tools were able to measure the intended variables.

3. There was no inclination by outside forces to the respondents, and they would answer questions with honesty to the satisfaction of the researcher.

1.11 Operational Definition Of Terms

Basic Sanitation	This phrase describes upgraded toilets establishments that are private and not used by other households as well.
Behavior Change	this refers to progressive modification, acquisition, and adherence to new norms in regard to sanitation and hygiene technologies.
Improved Sanitation	enhanced amenities where waste is securely thrown of on site or shipped and processed off site, and where they are not divulged with other homeowners
Latrine and Toilet	latrine is commonly described as a direct pit, while a toilet is described as a structure with a water seal. In this study, both will be used in context-specific
Open defecation	this refers to defecating in the open and leaving the fecal matter uncovered.
Open Defecation Free	is a term used to characterize groups of people who have switched from open defecation to use of the toilet.
Sustainability	refers to the ability to be maintained at a certain level or status, achieved through some effort.
Social factors	these represent a mix of demographic and economic attributes of a household member that are attributed to the study.

Unimproved sanitation	The utilization of bucket latrines, dangling latrines, and latrines with pits lacking a slab or structure

CHAPTER TWO

LITERATURE REVIEW

2.0 Preamble

A literature review is included in this section under the following headings: theoretical, empirical, and critical reviews.

2.1: Empirical Literature Review

This section presents a comprehensive analysis of the population's understanding regarding the long-term viability of open-defecation-free status. The population's sociocultural influences on the maintenance of the open-defecation-free status, Environmental and population-level socioeconomic factors affect the long-term sustainability of the open-defecation-free status.

2.1.1 Open Defecation globally and in Africa

Many regions of Africa face serious health and environmental problems as a result of open defecation. Although the circumstances differ from nation to nation and area to area, the issue still exists in a number of places. Between 2000 and 2022, the total amount of people who practiced open defecation fell by more than two-thirds, from 1,3 million to 419 million. In 36 countries, the rate of open defecation in 2022 stayed between 5% and 25%. Over forty percent of people still urinate in public in thirteen different countries. Approximately 215 million people in Africa still relieve themselves outside. Diarrheal illnesses are one of the leading causes of fatalities in Africa for children under five, and this practice helps them spread (Oswald et al., 2016). Efforts to eliminate open defecation in Africa involve a multi-

faceted approach, including investment in sanitation infrastructure, health education, community engagement, and policy changes to create an environment where proper sanitation and hygiene practices are accessible and widely adopted. These efforts are crucial for improving public health, reducing environmental pollution, and promoting sustainable development in the region.

2.1.2 Open Defecation in Sub-Saharan Africa

The prevalence of defecation in the open varies significantly across regions and amongst individual countries in Africa. Remember that although there have been improvements in many African countries, defecation in the open is still a common practice in other regions. According to estimates, 22.55% of households in sub-Saharan African countries openly defecate (Odagiri et al., 2020). While challenges related to open defecation still exist in Sub-Saharan Africa, it's important to note that there has been progress in many areas. The efforts to reduce open defecation often involve a combination of building sanitation infrastructure, changing behaviors, and addressing economic and social factors that contribute to open defecation(Odagiri et al., 2017).

2.1.2 Open Defecation in Eastern Africa

In Eastern Africa, the frequency of open defecation varies between countries and geographic areas. The nations of Eastern Africa are diverse, with each facing different obstacles and making different strides toward ending open defecation (Woyessa et al., 2022). In Eastern and Southern Africa, 340 million people, or more than 70% of the population, lack access to even the most basic sanitary facilities. Of them, 63 million people employ shared restrooms, 98 million people, or 19%, use ignored facilities, and 179 million people execute defecation in the open (Kaso et al., 2022).

2.1.3 Open Defecation in Kenya

There have been issues with open defecation in Kenya's rural as well as informal urban settlements, specifically with regard to sanitation and public health. Even with tremendous efforts made to address the problem, open defecation is still common in some areas. The national rate of open defecation in Kenya is projected to be 14%. There is a significant difference, though, with rates exceeding 70% in some municipalities, such as Turkana, Wajir, and Kitui (Aluoch et al., 2022).

2.2.1: Open defecation-free status sustainability.

Defecation in the open is a "way of life" in many emerging economies, especially in the rural and urban slums of India, where it is an integral part of daily life. In order to decrease fecal-oral infections like helminthiases, typhoid, and cholera, these individuals' knowledge needs to be increased. Eliminating fecal contamination from water sources could drastically slow the spread of illness (Budhathoki et al., 2017).

Because many stakeholders are unaware of the problems associated with this practice, a sizable portion of people in India defecate in the open. 2020: Jain and collaborators. Hence, it is critical to educate the general public and other pertinent stakeholders about the effects of human waste and the elements it contains, as well as the damage they do to the environment and the general public. The fact that one gram of human feces contains 100 parasite cysts, one million bacteria, and ten million viruses should also be known. Kids' excrement is more contaminated than adults' (Jain et al., 2020a).

As of 2020, the percentage of people in Papua New Guinea who practiced open defecation in rural regions was 17.99%. According to a collection of development indicators published

by the World Bank, the proportion of people in Papua New Guinea's metropolitan regions who practice open defecation was estimated to be 4.0536% in 2020(Angoua et al., 2018a).

2.2.2: Socio-Cultural factor of population on open defecation-free status

People defecating in public are also influenced by social and cultural factors. Sanitation in a community is dependent on technical, observable, and appropriate latrines. Open defecation is also strongly affected by a community's culture and social norms(Woyessa et al., 2022). Family members, friends, and neighbors publicly deviate from the norm, giving the impression that this is the most normal, customary, and everyday routine. It is assumed that community members with upgraded toilet facilities are wealthier and better educated than those without and who use open defecators(Cagnet, 2022). A culture of health and wellness should be instilled in children and carried out as a moral obligation throughout adulthood. It should also be deeply ingrained in the community, as traditions and customs demand and are closely adhered to.

In India, the number of households with toilet facilities has gone up, but open defecation has continued notwithstanding the rise in toilet ownership in recent years. Social norms in rural India prevent people from using toilets in at least two ways: they perpetuate the idea that people don't utilize bathroom facilities or find it improper to defecate in public; and they reinforce ritual conceptions of purity that separate toilets from hygiene. The first study (Hinton et al., 2023) found a positive correlation between bathroom usage and social norms in Uttar Pradesh, India. A trial education program was started to see if redesigning latrine use and encouraging positive social norms would help address these problems. By redesigning latrine use and linking it to water and sanitation, as well as increasing the

visibility of information about increasing latrine use among latrine owners, the measure aimed to target mental models.

All treatment households stopped using open defecation after the intervention was completed, and treatment villages' average latrine use score increased by up to 11% over baseline. There were also notable gains in pro-latrine attitudes. It also indicates that low-cost communication efforts can change people's perceptions of why many people nonetheless embrace open defecation while successfully enhance pro-latrine beliefs and practices. The method of measuring social norms that has been characterized can help identify obstacles to decreasing open defecation (GAURI et al., 2020).

About 20% of Haitians utilize open pits or underground toilets without a slab, while 40% use pit latrines with slabs. Additionally, projections indicate that more than 20% of people still engage in OD, the highest percentage in Latin America and the Caribbean, putting the nation at risk for the harmful health effects of the practice (Paul et al., 2022a).

Defecation in open areas remains an issue of national importance in sub-Saharan Africa. Defecation in public has been linked to factors at the individual level, including age, household wealth, media exposure, academic achievement, and availability of drinking water (Njuguna, 2019). Additionally, community-level factors like region in the SSA, national income status, and place of residence have a big impact on open defecation. Defecating in public is unfairly associated with the poor in SSA. Reports from the World Health Organization (WHO) Joint Monitoring Program (JMP) 2021 and the United Nations Children's Fund (UNICEF) indicate that 494 million people worldwide engage in defecation in the open. Of these ninety-two, about half were from sub-Saharan Africa, and most of them were from rural areas.

The percentage of defecation in the open cases decreased by almost half in Central and Southern Asia between 2015 and 2020 (from 23% to 12%), but it decreased by only a small amount in sub-Saharan African nations (22% to 18%) (Oppong et al., 2022). The primary causes of the rise in defecation in the open in Sub-Saharan Africa are high rates of population growth and a decrease in the number of ODF-certified communities—communities where residents do not adhere to all ODF standards. Studies conducted in African nations reveal an annual ODF slippage rate ranging from 10% to 13%. The present investigation investigated the origins of the term "ODF slipping" in relation to open fields and insufficient sanitation (Belay, Asratie, et al., 2022).

2.2.3 Socio-Economic factors of population on open defecation-free status

An important contributing factor to problems with open defecation is socioeconomic factors. Financial inclusion, defined as strategies for the future for household heads to have more straightforward access to practical and inexpensive financial products and services, can have an important effect on having access to sanitation and water services (Odagiri et al., 2017). Given that financial inclusion serves to make financial resources easily accessible to households and individuals, improving their ability to enjoy an environmentally conscious form of income, it is not surprising that it is viewed as a means for accomplishing several Sustainable Development Goals (SDGs). Thus, financial inclusion can help households buy latrine facilities by providing access to financial resources. Consequently, this may lessen the incidence of defecation in the open and home toilet sharing (Immurana et al., 2022a).

The amount of open defecation in rural families is influenced by social and economic factors globally. Despite the fact that the global population has increased by 1.7 billion between

2000 and 2020, 2.4 billion additional individuals are able to secure sanitation amenities, which are basically fundamental amenities where excreta is either dealt with off-site or disposed of(Ibnusantosa et al., 2021). Nevertheless, 616 million of the 3.6 billion people who lacked access to hygiene services that were properly managed in 2020 were using "unimproved" facilities, and roughly half of them (1.9 billion) had only basic sanitation facilities that were shared with other people's homes and were categorized as "limited" sanitation providers(Jain et al., 2020a). The stark disparities in the data show that two-thirds of people who live in rural areas do not have access to the most basic services. Almost fifty percent of them originated from Sub-Saharan Africa (Alhassan & Anyarayor, 2018). Numerous scholars agree that sanitation interventions must go beyond building latrines and concentrate on the social and economic aspects that affect latrine adoption and use.

Open defecation has always been a problem in India. According to a World Bank estimate, more than 300 million Indians continued to feces outside in 2017(Clarke et al., 2021). While the number of toilets being built has increased, experts warned that efforts to abolish the practice have been hampered by a lack of water, poor upkeep, and gradual behavioral shifts. In four north Indian states between 2014 and 2018, the Research Institute for Compassionate Economics (RICE) interviewed 3,235 households. Their analysis, which was released in January 2018, showed that since Clean India was founded, open defecation has dropped by 26% and access to family toilets has risen from 37% in 2014 to 71% in 2018 (Sinha & Chaudhry, 2019).However, the study discovered that 23% of people who owned a toilet continued to defecate in the open, including in the ODF states of Rajasthan and Madhya Pradesh." The researcher discovered people defecating in the open in villages that had previously been declared ODF(Sinha & Chaudhry, 2019).

Modi announced India to be "ODF" in October 2019, but experts questioned this declaration, pointing to issues related to water access, problems with upkeep, and gradually changing behavior as obstacles that would keep India from reaching its target of being 100% openly defecating free (Bria et al., 2020).

In the WCAR, 122 million persons engaged in open defecation (OD), according to data released in 2015. Since 2000, this number has climbed by 34 million as a result of insufficient progress in eradicating OD to keep up with population expansion. Eight nations, including Nigeria, which is ranked second in the world with 47 million open defecators, account for 14% of the world's OD. Furthermore, in 12 of the twenty-four nations in the region, over 20% of the number of people practices OD. There are still differences in prosperity as well as location: approximately 85% of defecators in in the open reside in rural areas, and those in the lowest quintile are nine times more likely to be defecators than those in the group with the greatest income (Leshargie et al., 2018).

In Guinea-Bissau, over 1,152 villages were designated as ODF in 2018, impacting the behavior of about 265,000 people. On this historically significant World Toilet Day, local and federal authorities, along with groups, traditional rulers, and people in the community, reaffirmed their commitment to upholding an environment that is safe and clean (Eliud et al., 2023). There are clear benefits to using the restroom. Reduced diarrhea, reduced malnutrition among children and stunting (i.e., brain and body development not reaching full potential), and reduced treatment costs for illness that can be avoided because of inadequate sanitation are just a few of the benefits(Katwere Ssemwanga et al., 2021).

Due to inadequate hygiene, insufficient sanitation, and inequitable access to clean water for drinking, hundreds of thousands of children in Uganda are at risk of developing life-

threatening illnesses or passing away. There is no access to a toilet in three out of ten homes. Diarrhea is one of the three leading causes of death for children in Uganda; alone, it takes the lives of 33 children each day(Bria et al., 2020). Children usually get the illness from drinking tainted water or from touching contaminated hands—their own, their parents' or other caregivers, or other kids' fingers. Pediatric diarrhea is not only deadly but also a leading cause of stunting in Uganda, which affects children's intellectual development and performance in school. Inadequate restroom facilities at educational institutions are a major factor in the high absentee as well as dropout rates, especially for female students. Ten percent of Ugandans urinate outside, and two thirds of homes don't routinely clean their hands frequently with soap. The impoverished bear the brunt of the harmful consequences of poor sanitation. According to data from the World Bank, the probability of urinating openly is 13.5 times greater in the bottom 20% of the population than in the top 20%.

Approximately 14% of Kenyans defecate in the open. Defecating in the open has been connected to impoverishment. In line with SDG number 6, Kenya wants to be completely free of open defecation by 2030. The likelihood of diarrheal illnesses like cholera, helminthes passed on through the soil, and environmental enteropathy is elevated by open defecation. Stunting occurs in children due to the vice. Open defecation rates decreased by 22 million on average annually from 1.23 billion to 892 million worldwide (Njuguna & Muruka, 2017).

The projected prevalence of open defecation in Kenya is 14%. There is a significant difference, with rates exceeding 70% in certain municipalities (Turkana, Wajir, Samburu). By 2030, the goal of Kenya's cleanliness policy is to make the entire nation defecation in the open free(Njuguna, 2019). A risk component of disease is poverty. People who are poor may

be more susceptible to illnesses that are transmissible because they tend to live in more contaminated areas with insufficient access to nontoxic water and sanitary facilities. In Kenya, open defecation has been linked to poverty. After moving past the open defecation stage, impoverished households are more inclined to recurrence (Njuguna, 2019).

2.2.4 Environmental factors on open defecation-free status.

It has never been easy for communities to achieve defecation in the open-free status, especially in rural South and Eastern Africa. According to a Malawian investigation, between the time of the statement and the duration of the research period, 14% of the general population disappeared from sampled villages that had previously been deemed open-defecation-free(Abebe & Tucho, 2020a). Physical observation indicates that many latrines fill up, the superstructure sustains damage, and these latrines are seldom utilized. The fear of sanitation facilities collapsing owing to damaged superstructures and the disgust of full latrines with maggots discourage people from using them, especially during periods of precipitation (Immurana et al., 2022a).

Growing numbers of low social integration groups, like fishing communities and pastoralists, were also brought up as having an influence on sustainability. However, certain members of the community continue to be ODF regardless of the region's ODF communities slipping.

Njuguna et al. cited in an investigation steered in Kenya that the chief's fear of community by-laws, the ease and comfort of having a latrine, privacy and security, guilt and disgust about defecating in the bush, problems with health about preventing diseases that are transmitted by water and air, and the response to hygiene and sanitation advertising efforts

are some of the aspects that inspire these communities to stay outside the formalized frontier (Njuguna, 2019).

Examiners of the investigation noted that CLTS results were more likely to be sustained in settings with a favorable enabling the surroundings, such as sufficient follow-up visits, accessibility to the marketplace for latrine supplies and products, government backing, and socially integrated neighborhoods. UNICEF/JMP report(2020).

2.3 Critical Review

Each continent in the world has seen a decrease in open defecation, with the omission of Oceania and sub-Saharan Africa. In sub-Saharan Africa, between 204 and 220 million people were openly defecating. Kenya's national rates of open defecation are estimated to be 14%. Several jurisdictions have rates exceeding 70%, which involves Turkana, Wajir, and Samburu, despite the significant difference. Kenya's sanitary conditions policy aims to achieve and preserve the country's open defecation-free (ODF) status by 2030 (Katwere Ssemwanga et al., 2021). A risk component of disease is poverty. People who are poor may be more susceptible to illnesses that are transmissible because they tend to live in more contaminated areas with inadequate access to clean water and sanitary facilities. Defecation in the open and poverty have been connected in Kenya. After open defecation, impoverished households are more likely to continue the practice. One of the most praised reasons for the resurgence of defecation in the open that is open is the installation of basic, basic latrines that quickly fill up and have a tendency to collapse, especially during periods of high precipitation or flooding (Odagiri et al., 2020).

According to Njuguna's investigation, the prevalence of OD has increased among low-income households, particularly the most impoverished ones (2019). This might be the case because households without limited resources leave the open defecation stage earlier than households with limited resources. If Kenya is to eliminate defecation by 2030, a greater emphasis on low-income families may be required. In Kenya, 14% of people are thought to urinate outside. OD has been linked to poverty. Kenya aims to completely eradicating OD by 2030 in accordance with SDG number 6 (Njuguna, 2019).

Kitui County had 4930 villages certified as Open Defecation Free in 2018. After Busia and Nyanza, it was the third county to be certified ODF. However, with 9.2% slippage, maintaining the Open Defecation Free status in Kitui County's eight sub-counties has remained a challenge. Mwingi West Sub-County in Kitui County outperformed the other seven sub-counties in terms of ODF sustainability (98.8%)(KDHS, 2022).

In this regard, every Kenyan citizen is guaranteed the right to adequate sanitation and an environment that is healthy and clean by Article 43 of the country's 2010 constitution. According to KHIS (2019), the rates of diarrhea as well as typhoid morbidity are intolerably high, even when they are preventable. The justification for conducting this research in Kitui County's Mwingi West Sub-County on the factors that influence of ODF status sustainability stems from the argument presented above regarding villages returning to open defecation from ODF.

2.4: Summary of the Literature Review and Research Gap Identification

Open defecation (OD) is a prevalent hygiene practice in low-income countries (Delaire et al., 2022). Due to this practice, 760,000 people die from illnesses related to diarrhea each

year. Many strategies, including Community-Led-Total Sanitation (CLTS) plans that involve participation, have been developed to eradicate OD (Lette et al., 2022). CLTS is special because, as its name suggests, it is run by community members itself and the infrastructure was built without the use of outside funding or subsidies.

Although the CLTS is successful in treating OD in the short term, the long-term outcomes are not promising: Individuals who reside in communities that prohibit open defecation (ODF) either utilize latrines solely or occasionally. Many societal, demographic, cultural, and economic factors influence an area's capacity to achieve and maintain open defecation freedom (ODF) (Wolf et al., 2022). Sustainable ODF status is not achieved by addressing just one of these factors but by integrating a holistic approach that takes into account the complex interplay of social, cultural, demographic, and economic elements within a specific community or region. Tailoring interventions to the unique circumstances of each area is essential for long-term success in achieving and maintaining an ODF status(Delaire et al., 2022). Very few investigations have examined the long-term impact of open defecation-free status in municipalities where ODF is an issue for the public, despite numerous research efforts on the topic. Therefore, the purpose of this investigation was to evaluate the variables related to the ODF sustainability status of adults who live in Kenya's Kitui County's Mwingi West Sub-County.

2.5: Theoretical literature review

Within the context of previous investigations on behavior modification and environmental sustainability, the social cognitive theory, the health belief model, and the trans-theoretical models are reviewed in this chapter as relevant theories.

2.5.1 Health Belief Model (HBM)

A psychological framework known as the Health Belief Model (HBM) examines the views and opinions of individuals in order to comprehend and forecast health behaviors (Becker, 1974). When it comes to the environmental sustainability of an ODF status, the Human Behavior Model (HBM) can provide important insights into the factors influencing the choices and behavior of individuals related to sanitation practices (Strecher et al., 1986).

The HBM is made up of various essential parts:

"Perceived susceptibility" refers to an individual's belief about their probability of developing a particular health issue. People's awareness of the dangers of defecation in public, such as the transmission of disease and contamination of the environment, is essential to maintaining ODF status.

Perceived Severity: This is a term used to describe how seriously a person takes the consequences of a health problem. It entails being aware of how serious the health risks are that come with open defecation, including how they affect one's own health as well as the health of the community and the environment.

Benefits Perceived: Individuals evaluate the advantages or benefits of implementing a particular health-related behavior. People may think about the advantages of using appropriate sanitation facilities, such as better health, a cleaner environment, and community well-being, in the context of maintaining ODF status.

Perceived barriers refer to the impediments that people may encounter when attempting to adopt a specific health behavior. Obstacles to ODF sustainability could be lack of resources, cultural norms, or the expense of constructing and maintaining sanitary facilities.

Cues to Action: These are the things that cause people to act. Cues that encourage and remind people to maintain proper sanitation practices can include educational campaigns, community engagement, policy incentives, or health promotion initiatives in the context of ODF sustainability.

What's involved in using the Health Belief Model to maintain ODF status is:

Increasing Awareness: Educating people about the risks associated with open defecation and emphasizing how detrimental it is to both the environment and their own well-being.

Highlighting Benefits: Stressing the advantages of using facilities for proper sanitation, including better health, a cleaner environment, and the general well-being of the community.

Resolving Barriers: Determining and resolving any financial, cultural, or infrastructure-related obstacles that prevent people from using sanitation facilities. This could be supplying funds or other resources, or it could entail interacting with the community to change cultural attitudes.

Implementing techniques that encourage and remind people to uphold appropriate sanitation practices is known as "Cues to Action." This could entail ongoing public health initiatives, community engagement, and legislative initiatives that uphold and strengthen ODF practices.

By creating actions that focus on the attitudes, beliefs, and perceptions that influence people's decisions to adopt and uphold good sanitation practices, it is possible to improve the sustainability over time of ODF status within a community. The components of the model for health beliefs can be taken into consideration when developing these interventions.

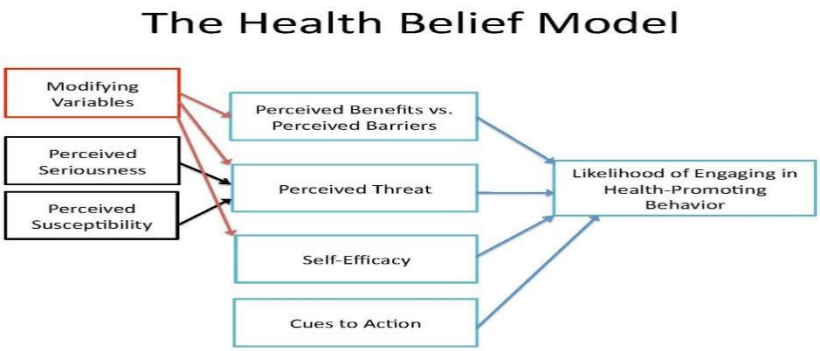

Figure 1 : Health Belief model.

Source:(Strecher et al., 1986).

2.5.2 Social Cognitive Theory (SCT)

To comprehend and encourage the sustainability of an Open Defecation Free (ODF) status within a community, Social Cognitive Theory (SCT) can be utilized. Albert Bandura, a psychologist, developed the Social Cognitive Theory, which places emphasis on the interplay between behavior, personal factors, and environment.

The sustainability of ODF status can be addressed using SCT in the following ways:

Behavioral Elements SCT places a strong emphasis on how the environment and one's own characteristics can affect behavior. It's critical to take into account the behavioral factors influencing people's sanitation practices when maintaining ODF status. In order to create interventions that support long-lasting behavior change, it can be helpful to understand the attitudes, beliefs, and motivations surrounding open defecation.

Observational Learning: An important component of SCT is observational learning. Observing others, especially role models, helps people learn. One way to set an example for

others in the community is to highlight successful cases where people have embraced and maintained good hygiene habits. This can entail highlighting achievements or people who have persisted in upholding hygienic habits.

Self-efficacy: This is the conviction that one is capable of carrying out a particular action. It is essential to empower and inspire people to think that they are capable of keeping their ODF status. Campaigns for education, community involvement, and the provision of funds and assistance for hygienic facilities are ways to accomplish this.

Environmental Factors: SCT also emphasizes how behavior is influenced by the surroundings. Maintaining ODF status requires establishing an atmosphere that encourages and supports good sanitation habits. This entails making sure that hygienic facilities are accessible and in good working order, encouraging hygiene, and establishing social norms that value and encourage these behaviors.

Interventions for Behavioral Change: Social Cognitive Theory (SCT) posits that interventions for behavioral change ought to address various dimensions, such as individual, social, and environmental factors. To support and maintain ODF status, these interventions could take the form of policy implementation, infrastructure development, community involvement, and educational campaigns.

Social Support: Promoting networks of social support within the community has a big impact on sustainability. It is essential to establish support networks that uphold good hygiene habits, promote peer accountability, and cultivate a sense of group responsibility for preserving ODF status.

Sustaining ODF status through the application of SCT principles requires a multifaceted strategy that takes into account social, environmental, and individual factors. The key to ensuring the long-term viability of an ODF community is to cultivate an environment where members feel competent, given authority, and encouraged to maintain acceptable hygiene standards.

2.5.3 The Trans-Theoretical Model (Stages of Change)

The Trans Theoretical Model, also known as the Stages of Change Model, was created by Prochaska and DiClemente in the late 1970s in response to studies comparing the findings of people who smoke who were able to effectively give up smoking on themselves with those who needed additional support. It must have done so in order to understand why some people were able to achieve this (Prochaska et al., 1992).The Stages of Change model, also referred to as the Transtheoretical Model (TTM) of behavior change, is an additional psychological framework that can be utilized to comprehend and encourage the maintenance of an ODF status in a community.

According to the model, when someone changes their behavior, they go through five stages:

Precontemplation: People do not intend to alter their behavior at this point. They might not have thought about the advantages of using proper sanitation facilities or they might not view open defecation as a problem.

Contemplation: People in this stage are conscious of the issue and are thinking about changing. They may be considering the benefits and drawbacks of implementing good hygiene procedures.

Preparation: People in this stage are planning to act shortly. They may be preparing to switch to using hygienic facilities, like installing or using toilets.

Action: People in this stage have already begun to modify their conduct. In an effort to stop open defecation, they are actively using sanitation facilities and forming new routines.

Maintenance: Maintaining the altered behavior over time is the focus of this stage. People try to keep from reverting to open defecation and strive to incorporate their new sanitation habits into their daily lives..

Applying the Transtheoretical Model to sustain ODF status involves:

Finding the Stage of Change: Determining the stage at which a person or the community as a whole is changing with regard to open defecation. This can assist in customizing tactics and interventions to meet individuals where they are in terms of their preparedness to embrace and uphold good hygiene habits.

Personalized Interventions: creating interventions tailored to each stage of the transformation process. For instance, educating people about the social and health repercussions of open defecation may be important for those in the pre-contemplation stage. Supporting individuals in the action stage is essential to helping them keep up these new habits.

Supporting Maintenance: Concentrating on tactics that assist people and the community in preserving their ODF status. This could entail providing ongoing instruction, praising positive behavior, and fostering an environment that is conducive to and supports good hygiene habits.

Relapse prevention is the process of recognizing the potential for relapse and developing plans to avoid it. This could entail continuing community involvement, recurrent evaluations, and tackling issues or obstacles that could lead to a resurgence of open defecation.

The stages of change in the Transtheoretical Model take into account the different stages individuals may be at in terms to their preparedness to change their cleanliness habits, making interventions more targeted and effective in maintaining ODF status.

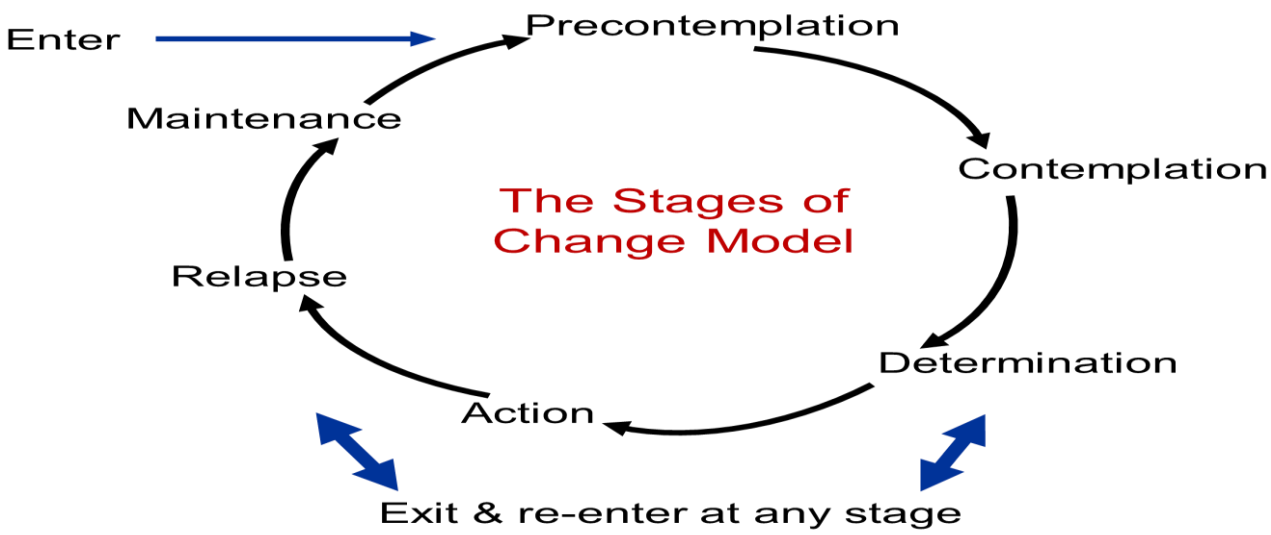

Figure 2:The Trans-Theoretical Model

Source: (Prochaska et al., 1992)

Prochaska and DiClemente's trans-theoretical framework, developed in the late 1970s, was employed by the investigator in conjunction with the theoretical literature review. This model is often associated with this thesis because it was appropriate for this research. It

addresses methods of behavior modification that the people of Mwingi West Sub County, Kitui County, can use to maintain their status as an open-defecation-free community.

2.6 The Conceptual Framework

As per the conceptual framework, the independent variables that impact the long-term sustainability of open defecation status are the socioeconomic and demographic characteristics, sociocultural elements, and external factors that are known to the public. Examining all moderating factors, such as governmental sanitation regulations, helped to better understand the relationship between the independent and dependent variables.

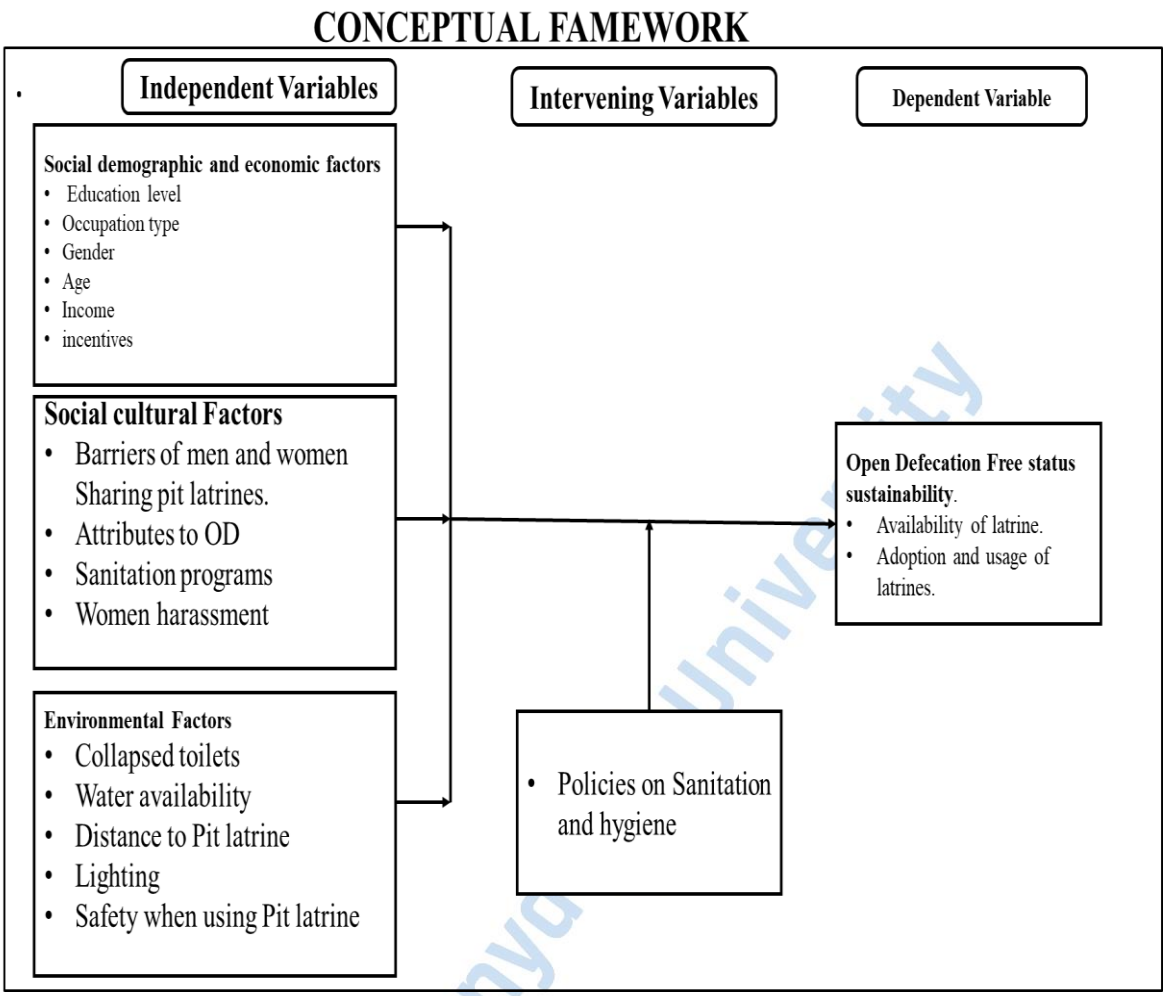

Figure 3:Conceptual framework adapted from a literature review.

Source:(Murad et al., 2022a).

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Preamble

This section explains the various methodologies used in the study: This chapter covers the following topics: research design, research location, size of sample calculation, method of sampling, gathering data tools, validity of research tools, data management & analysis technique, and research ethics principles.

3.1 Study Design and Approach

Given that the objective of the research investigation was to measure the relationship between the independent and dependent variables, an analytical cross-sectional approach was used. Both quantitative and qualitative data were collected simultaneously. To fully grasp the community's perspective on ODF long-term viability, qualitative data was employed in conjunction with quantitative data for generalization. Over the course of a month, both quantitative and qualitative data were gathered (May 2023).

3.2 Study Location

The Mwingi West Sub County of Kitui County served as the investigation's location. The Sub County as a whole has 133,349 residents, per the 2019 KNBS survey. Through independent observers, UNICEF Kenya and the Ministry of Health confirmed Mwingi West as an Open defecation-free sub-county in 2018. This indicated that every home in the subcounty had a latrine and was using one as well as a sink for hand washing. According to

the same survey, 1.2% of households had returned to OD while 98.8% of them had maintained ODF.

Mwingi West Sub County Map With Coordinates

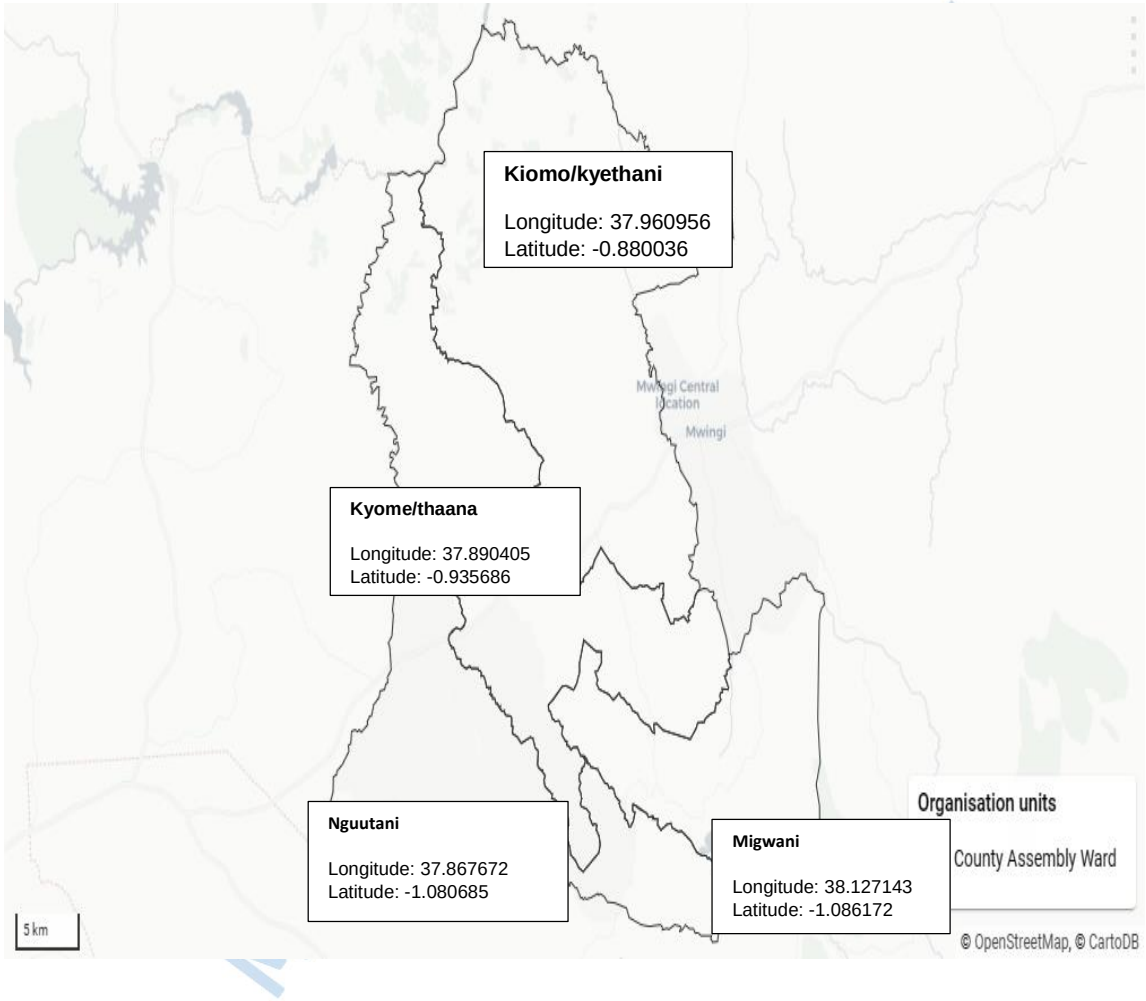

Diagram 5

3.3 Target Population

The investigation's target population consisted of 133,349 people who live in 28,607 families in Mwingi West Sub County (KNBS 2019).

3.4 Sample Size Determination

Using Yamane's formula, a sample size of 439 respondents was selected from the 133,349 people living in Mwingi West Sub-County, which was the target population(1967).

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

Where:

e = (probability of error, i.e., the desired precision, e.g. 0.05 for 95% confidence level).

N =the approximation of the population size, the target population being 133,349 individuals in the Mwingi West sub-county.

Application of the formulae: $n = \frac{133{,}349}{(1+133{,}349)\ x\ (0.05)^2} = 399\ participants$ and 10% Non-response rates to questionnaires: 10/100 x 399 = 40 participants making a total of 439 participants for this study, Yamane, (1968).

Table 1: Proportionate sample size distribution.

S/n	Ward	Population	%	Participants
1	Migwani	55,073	41.3	181
2	Nguutani	20,477	15.3	67
3	Kyome/Thaana	25,047	18.8	83
4	Kiomo/Kyetani	32,752	24.6	108
	Total	**133,349**	**100**	**439**

Source: Mwingi West Sub- County, (2022).

3.5 Sampling Procedure

Mugenda and Mugenda (2013) state that a stratified random multi-stage sampling technique was utilized to choose participants from the four wards of Kitui County, Kenya, while a purposive sample technique was used to select the key informants and arrange a Focused Group Discussion with the stakeholders involved in ODF status long-term viability in Mwingi West Sub-County, Kenya.

3.6 Inclusion exclusion criteria

3.6.1 Inclusion

Adult Mwingi West Sub County residents who volunteered to take part in the investigation were included.

3.6.2 Exclusion

The investigation did not include residents of the Mwingi West sub-county who were beneath the age of 18 or adults who declined to take part in it.

3.7 Data collection instruments

Data that was primary was gathered in Kitui County, Kenya's Mwingi West Sub-County, regarding the ODF status' long-term viability. A self-administered, structured questionnaire was also utilized to gather quantitative data. Data on the long-term viability of open defecation-free status were collected using a section of structured questionnaires; social demographic and economic status data were collected using section B; cultural and social factors were collected using section C; and environmental factors related to the long-term viability of open defecation-free status were collected using section D. Ten (10) participants

in the field Focused Group Discussion were the subject of a distinct Focus Group Discussion (FGD) and Key Informant Interview guide, which was additionally utilized to gather qualitative data from ten (10) randomly selected key informants from the four wards of Mwingi West Sub-County, Kitui County, Kenya. Using an audio recorder, group moderators took charge of the data recording process while gathering qualitative data.

3.8 Data Management and Analysis Technique

We coded, cleaned, and analyzed the quantitative data using SPSS version 27.0, the statistical package for social sciences. Descriptive statistics, such as graphs, percentages, means, and standard deviation, were employed to depict the correlation between the variables. The chi-square test was used for bivariate analysis, and binary logistic regression was used for multivariate analysis. The cutoff point for statistical significance was set at $p<0.05$. A thematic analysis was performed on the qualitative data using Vivo version 11, employing narratives based on themes and sub-themes.

3.9 Validity of the instrument

Validity denotes to how well a research instrument measures what it is supposed to assess or how precise the research findings are. To determine how closely the sample represents the overall population, expert advice was sought rather than just the opinions of supervisors. Research questions were used to represent each variable in the study in both the questionnaire and the guide for interviews. Factor analysis was done to check the construct validity of the pilot research data.

3.10 Reliability of the Instrument

Reliability is the extent to which study results are valid over time and fairly represent the whole population under investigation. Reliability assessment is a manner of estimating the likelihood that a method for measuring will produce the same result if it is repeated according to the same conditions. Miller (2009).

In order to establish the questionnaire's reliability using SPSS software, an initial investigation was conducted in Kitui West Sub County in Kitui County with fifty residents who met similar eligibility requirements and were involved in ODF status processes. The same program was used to calculate the Cronbach-alpha coefficient. The reliability test result was 0.89, indicating that the data-gathering tools were trustworthy. Values less than 0.5 are regarded as unreliable, whereas values above 0.7 indicate that the measurement technique is reliable (Miller, 2009).

3.11 Ethical Consideration

Prior to conducting the investigation, a letter of introduction and ethical clearance from the ethics and review committee of Mount Kenya University were used to ask for authorization to collect data in the Mwingi West Sub-County of Kitui County, Kenya. A critical mass of technically and skillfully trained labor is produced by research, and Kenya Vision 2030 and other national development goals aim to position Kenya as a highly skilled, newly became industrialized, middle-income country built on a strong foundation of science, technology, and innovation. In order to achieve this, the 2013 Science, Technology, and Innovation Act was developed. The Act repealed Kenyan law's Cap. 250 and developed the National Commission for Science, Technology, and Innovation (NACOSTI), which took the place of the National Council for Science and Technology (NCST). The Act will make it easier to

promote, coordinate, and regulate the nation's progress in ST&I (Science, Technology, and Innovation). Authority was sought from NACOSTI in Kenya, to collect data through interaction with the residents of Mwingi West Sub-County, Kitui County Kenya, In this case, a research license was provided by Nacosti. Permission was sought out in the Kitui County Government from the Department of Interior and National Coordination. Research participants over the age of eighteen (18) who took part in the ODF sustainability process in Mwingi West Sub-County, Kitui County, Kenya, signed a consent form. Participants received assurances that the research would only be used for educational purposes and would not be used for any other purposes. They were also assured that any information collected from them would be kept private and would only be used for academic purposes.

CHAPTER FOUR

RESULT FINDINGS AND DISCUSSIONS

4.0:Preamble

The social demographic, socioeconomic, cultural, and environmental factors linked to the sustainability of ODF status are analyzed descriptively, bivariately, and binary logistics regression in this section. Additionally, the investigation's response rate is given in this section.

4.1 Response Rate

The investigation's response rate was 90.2%, meaning that 396 investigation questionnaires were deemed suitable for data analysis.

4.2 Sustainability of Open defecation Free Status

The percentage of adult residents in Mwingi West Sub-County, Kitui County, who reported being 100% defecation-free by 2030, was 75.3%, compared to the national target of 100%, which aligns with environmentally friendly development goal number six. This was a great deal less. These findings were close to those of a study in Kenya where open defecation-free status was at 76.5%(Njuguna & Muruka, 2017). Another study conducted in Ghana revealed a higher open defecation-free status sustainability of 98%(Delaire et al., 2022).

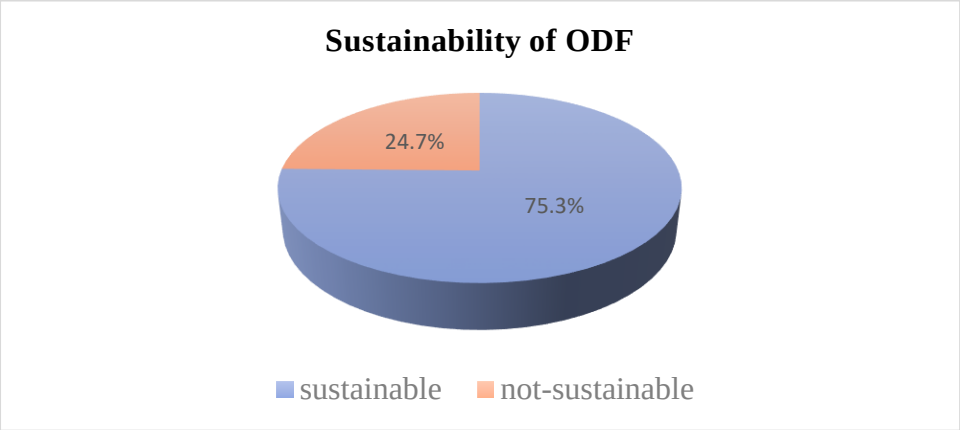

Figure 4: Sustainability of Open defecation Free Status

4.3 Social-demographic Factors Influencing the Sustainability of Open Defecation-Free Status

4.3.1 Social Demographics of the Study Respondents.

Table 2 below shows that, in terms of the head of the household, only 7.8% of the investigation's participants were female, while the vast majority of study participants—92.2%—were men. In terms of the participants' marital status, the majority of those involved in the study were married (81.6%), with only a small percentage reporting being single (3.8%), widowed (6.6%), divorced (1%), and separated (7.1%). With respect to educational attainment, nearly half (45.7%) of the investigation's participants had completed secondary school, nearly a quarter (26.8%) had completed primary school, only a small percentage (8.8%) had completed tertiary education, and a further portion (18.7%) had not completed any formal education at all. When it came to the size of the households, nearly a quarter (28.5%) of the households surveyed had 1-4 members, and more than half (61.1%) of the households had 5-8 members. Only a few(10.4%) of the interviewed households had a household size of more than nine members.

Table 2: Social Demographic Characteristics of the Study Respondents

Independent Variables	Categories	Frequency	%
Gender	Male	365	92.2%
	female	31	7.8%
Age	25_34	73	18.4%
	35-44	86	21.7%
	45-54	203	51.3%
	54-64	34	8.6%
Marital Status	married	323	81.6%
	single	15	3.8%
	window	26	6.6%
	divorced	4	1%
	separated	28	7.1%
Educational Level	primary	106	26.8%

	secondary	181	45.7%
	tertiary	35	8.8%
	No formal education	74	18.7%
Household Size	1-4	113	28.5%
	5-8	242	61.1%
	More than 9	41	10.4%

Source: Primary Data

4.3.2 Association between Social Demographic Factors and Sustainability of Open Defecation-Free Status.

As shown in Table 3 below, 85.7% of the participants in the investigation who reported being able to continue living without defecating in public had completed post-secondary education. Higher education is correlated with better sanitation and hygiene standards. A majority of the study participants, specifically 35.8%, who reported being unsustainably unsanitary and not using defecation, had completed at least primary school. A statistically significant correlation was found between the degree of education and the sustainability of ODF status after conducting a bivariate analysis ($X^2=15.521$, $df=3$,$p=0.001$).

Table 3 shows that only those who participated in the study reported being sustainably free of open defecation, with the majority of the investigation's respondents (85.7%) being male. Women made up nearly a quarter (25.8%) of those surveyed who said that their open defecation-free status was unsustainable. This could be attributed to their susceptibility when attempting to use pit latrines, particularly at night, as well as concerns about security. Upon conducting the bivariate analysis, the type of gender and sustainability of ODF status were not found to be statistically correlated ($X^2=0.02$,$df=1$,$p=0.887$).

These results contrasted with the qualitative findings, which showed that most focused group participants mentioned that:

"*Females are likely to practice open defecation at night due to security concerns, especially at night Men are likely to use pit latrines no matter the situation of security in this area. A lot needs to be done by ensuring pi latrines are close to the homes and there is adequate lighting to ensure there is constant security for all*.."

The findings from this study were in agreement with a study done in South Africa which found no association between the two variables(Katwere Ssemwanga et al., 2021). However,

another study done in Sudan where females were more likely to lead to poor sustainability of open defecation status as compared to men(Odagiri et al., 2017).

As indicated in Table 3 below, From this investigation, more than three quarters (75.6%) of study respondents who reported sustainability of open defecation-free status were aged 35-44 years, while half(50%) of the study partakers who reported open defecation-free status unsustainability were aged 54-64 years and this could be linked to their old and in sufficient care from the community. After the bivariate analysis was completed, there was a statistically significant relationship between age and sustainability of ODF status ($X^2=19.182$, $df=3$,$p=<0.001$). These findings were consistent with multivariate analysis where there was a statistical association between Age and the sustainability of open defecation-free status(p=0.009). In addition, those participating in the study between the ages of 35 and 44 were 2.9 times more likely to maintain their status as free of open defecation than participants between the ages of 54 and 64. This may be related to the fact that they are now adults and understand the advantages of being free from open defecation. The results of this investigation aligned with those of a Brazilian research that found that the sustainability of open defecation-free living was correlated with young age (Jain et al., 2020b). This was contrary to two other studies done in Vietnam which found no association between respondent age and open defecation-free status sustainability (Bria et al., 2020).

According to Table 3, According to this investigation, nearly a quarter (28.6%) of study participants who reported that their open defecation-free status was not sustainable were not married, and this could be related to their spouse's lack of social support in maintaining proper hygiene and sanitation practices. More than three-quarters (75.2%) of study respondents who reported that their open defecation-free status was sustainable were

married. When the bivariate analysis was performed, there was no statistically significant relationship between open defecation-free status sustainability and marital status ($X^2=0.441, df=4, p^*=0.979$). The study findings contradicted those of a study done in India where divorced respondents were less likely to sustain open defecation-free status(Sinha & Chaudhry, 2019). This was in contrast to a different Ghanaian study that discovered no correlation between the two indicators(Alhassan & Anyarayor, 2018).

As indicated in Table 3, From this investigation, the majority(85%) of study respondents who reported open defecation-free status sustainability had a household size of 1-4 members, and only a few(15%) of the study partakers who reported open defecation-free status unsustainability had a household size of 1-4 members. The smaller the size of the household size the easier it is to share a pit latrine and hence the reduced probability of open defecation. There was a statistical correlation between household size and open defecation-free status sustainability when the bivariate analysis was done ($X^2=8.005, df=2, p=0.01$).

Table 3:Social Demographic Factors Associated with the Sustainability of Open Defecation-Free Status

Independent Variables	Categories	Dependent Variable (Sustainability of ODFS)		Statistical Significance (Chi-square Test)
		YES (N=298)	NO (N=98)	
Gender	Male	275(75.3%)	90(24.7%)	X^2=0.02
	female	23(74.2%)	8(25.8%)	df=1 p=0.887
Age	25_34	65(89%)	8(11%)	X^2=19.182
	35-44	65(75.6%)	21(24.4%)	df=3
	45-54	151(74.4%)	52(25.6%)	p=<0.001
	54-64	17(50%)	17(50%)	
Marital Status	married	243(75.2%)	80(24.8%)	X^2=0.441
	single	12(80%)	3(20%)	df=4
	window	20(76.9%)	6(23.1%)	p*=0.979
	divorced	3(75%)	1(25%)	
	separated	20(71.4%)	8(28.6%)	
Educational Level	Primary	68(64.2%)	38(35.8%)	X^2=15.521
	secondary	149(82.3%)	32(17.7%)	df=3
	tertiary	30(85.7%)	5(14.3%)	p=0.001
	Noformal education	51(68.9%)	23(31.1%)	
Household Size	1-4	96(85%)	17(15%)	X^2=8.005
	5-8	173(71.5%)	69(28.5%)	df=2
	More than 9	29(70.7%)	12(29.3%)	p=0.01

Source: Primary data

4.3.3 Binary Logistic Regression Analysis on Social Demographic Factors

Table 4 below shows that there was a correlation that was statistically significant (p=0.002) between the degree of education and open defecation-free status sustainability. In addition, study participants who had completed their tertiary education had a fourfold higher chance of maintaining their status as free of open defecation than those who had not received any formal education.

These results aligned with qualitative information, which showed that most focused group participants mentioned that:

"*Level of education is a key factor towards doing away with open defecation. You will find somebody who already understands the importance of not defecating in the environment since they understand the consequences. I would say a higher level of education is of key importance in promoting open defecation status in society..*"

These results were consistent with a Kenyan study (Busienei et al., 2019) that found that a higher education level encouraged a sustainable ODF status. These results contrast with those of two other Ethiopian studies that found no link between education level and the sustainability of an ODF status (Gebremariam & Tsehaye, 2019; Leshargie et al., 2018).

As indicated in Table 4 below, there was a statistical association between Age and the sustainability of ODF status(p=0.009). In addition, those participating in the study between the ages of 35 and 44 were 2.9 times more likely to maintain their status as free of open defecation than participants between the ages of 54 and 64. This may be related to the fact that they are now adults and understand the advantages of being free from open defecation. The outcomes of this investigation aligned with those of a Brazilian investigation that found that the sustainability of open defecation-free living was correlated with young age (Jain et al., 2020b). This was contrary to two other studies done in Vietnam which found no

association between respondent age and open defecation-free status sustainability (Bria et al., 2020).

As indicated in Table 4 below, there was no statistical association between size the household of hand open defecation-free status sustainability (p=0.07). These results were consistent with an investigation done in Liberia(Capps et al., 2017) but contrary to research done in Nepal where the bigger the household size the poorer the sustainability of open defection-free status(Raj Pokhrel, 2020).

Table 4:Binary Logistic Analysis on Social Demographic Factors Associated with the Sustainability of Open Defecation-Free Status

Step 1a	Variables	B	S.E	Wald	Df	Sig	Exp(B)	95% C.I for EXP(B)	
								Lower	Upper
	age			11.684	3	0.009			
	25-34	-1.86	.55	11.28	1	.11	.15	.05	.46
	35-44	-1.04	.48	4.76	1	.03	2.9	.14	.89
	45-54	-.82	.43	3.72	1	.06	.44	.19	1.01
							ref		
	Education level			14.81	3	0.002			
	primary	.09	.37	.07	1	.789	1.10	.54	2.27
	secondary	-.87	.36	5.72	1	.03	.42	.21	.86
	tertiary	-.78	.61	5.34	1	.02	4	.07	.81
							ref		
	Household size			5.07	2	0.07			
	1-4	-.74	.49	2.20	1	.14	.49	.19	1.22
	5-8	.02	.42	0.00	1	.96	1.02	.44	2.34
							ref		
	Constant	-.144	.632	.05	1	0.82	.866		

Source: Primary data

4.4 Socio-economic Factors Influencing the Sustainability of Open Defecation-Free Status

4.4.1 Social-Economic Characteristics of the Study Respondents.

Table 5 below shows the occupation type of study partakers: nearly half (42.7%) reported being employed, while over 25% (38.1%) were self-employed. Just a small percentage of study participants were peasants (11.1%) and farmers (8.1%). Regarding the study participants' income status, 81.6% of the participants earned more than the poverty line, compared to 18.4% of the participants who earned less. Concerning financial options needed to construct a latrine, close to three quarter(73.2%) of the study partakers reported income being the source of capital to aid in building a latrine, only a few of the study partakers reported borrowing(8.3%), and well-wishers support(18.4%) as the source of financial support in constructing a latrine. Concerning obstacles to latrine ownership, the majority(80.1%) of the study respondents cited finance as being an obstacle to latrine ownership, and a minute portion of the study partakers cited culture(1.5%) as a barrier to land ownership. A section(8.3%) of study partakers cited a lack of skills as an obstacle to latrine ownership. Concerning the provision of incentives when constructing a new pit latrine, close to a quarter(27.3%) of the study participants reported the provision of incentives while close to three-quarters (72.7%) of the study partakers reported the absence of incentives when constructing a new pit latrine. Regarding the type of incentive provided when building a pit latrine, more than half(59.3%) of the study partakers cited the provision of labor while only a few of the study partakers cited the provision of materials(22.2%) and funds(18.5%). Concerning non-financial resources needed in the construction of a latrine, the majority of the study respondents reported using non-financial resources in the construction of a pit latrine while only a few of the study partakers reported not using non-financial resources in the construction of a pit latrine.

Table 5: Social Economic Characteristics of the Study Respondents

Independent Variables	Categories	Frequency	Valid Percentage%
Occupation Type	farmer	32	8.1%
	peasant	44	11.1%
	employed	169	42.7%
	Self-employed	151	38.1%
Income level	Below poverty line	73	18.4%
	Above poverty line	323	81.6%
Financial Option	Borrowing	33	8.3%
	From income	290	73.2%
	Well-wishers support	73	18.4%
	finance	317	80.1%
Obstacles to L.Ownership	culture	6	1.5%
	Lack of skills	33	8.3%
	Lack of land or space	40	10.1%
Non-financial Resources	yes	354	89.4%
	no	42	10.6%
Presence of Incentives	yes	108	27.3%
	No	288	72.7%
Type of Incentive	materials	24	22.2%
	Funds	20	18.5%
	labor	64	59.3%

Source: Primary data

4.4.2 Association between Social Economic Factors and Sustainability of Open Defecation-Free Status

As indicated in Table 6 below, From this research, the majority(79.6%) of study partakers who reported ODF status sustainability were earning above the poverty line. Better income is often linked to better sustenance of sanitation and hygienic practices which discourage defecation in the open. Close to half(43.8%) of the study partakers who ODF status unsustainability were earning below the poverty line. There was a statistical correlation between income status and open defecation-free status sustainability when the chi-square test for independence was done($X^2=17.510, df=1, p=<.001$).

As indicated in Table 6 below, From this research, the majority(84.3%) of study partakers who reported open defecation-free status sustainability reported the provision of an incentive when building a pit latrine. Only a few(15.7%) of the study partakers who reported unsustainability of open defecation-free status had incentives provided to them when building a pit latrine. There was a statistical correlation between the provision of incentives and open defecation-free status sustainability when the chi-square test for independence was done($X^2=6.469, df=1, p=0.01$).

As indicated in Table 6, From this research, more than three-quarters (75.8%) of study partakers who reported sustainability of open defecation-free status reported finance as a major obstacle for latrine ownership. The majority (75%) of the study partakers who reported the unsustainability of open defecation-free status cited culture as an obstacle to latrine ownership. There was no statistical relationship between obstacles to latrine ownership and open defecation-free status sustainability when the bivariate investigation was done ($X^2=6.781, df=3, p=0.07$).

These results ran counter to the findings from qualitative research, which showed that most focused group participants mentioned the following:

"*Obstacles to latrine ownership such as lack of finance, harmful cultural practices, and lack of skills in building a toilet have a crucial role in the sustainability of open defecation-free status. Efforts should be geared upon to overcome these obstacles which will aid in overcoming open defecation-free status*"

Findings from this research disagreed with those of a study done in Ghana but were contrary to those of research done in Ethiopia(Crocker et al., 2017; Temesgen et al., 2021).

As indicated in Table 6, From this research, the majority (81.5%) of study partakers who reported sustainability of open defecation-free status were self-employed. While close(45.5%) to half of the study respondents who were peasants reported unsustainability of open defecation-free status. After doing a bivariate analysis, The sustainability of the study those who participated status as open defecation-free individuals was correlated statistically significantly with their employment status ($X^2=16.511$, $df=3$,$p=0.001$).

As indicated in Table 6, In this study, close to three quarter(74.9%) of study partakers who reported sustainability of open defecation-free status reported using non-financial resources in the construction of latrine facilities while the majority(78.6%) of the study partakers who reported sustainability of open defecation-free status reported not using non-financial resources in the construction of latrine facility. Following the bivariate analysis, there was a statistically significant correlation between investigation participants' use of non-financial resources and their sustainability as open defecation-free individuals ($X^2=0.278$,$df=1$, $p=0.598$). This was in harmony with a study done in Ghana which reported similar findings(Harter et al., 2019). A second study carried out in Ghana discovered a correlation

between non-financial resources and the absence of defecation in the open (Nunbogu et al., 2019).

As indicated in Table 6, In this study, more than half(63.8%) of study partakers who reported sustainability of open defecation-free status reported well-wishers' support as their financing option for the construction of latrine facilities. This was closely followed by the majority(77.6%) of the study partakers who reported sustainability of open defecation-free status reported income as their financing option for the construction of latrine facilities. After doing a bivariate analysis, there was no statistically significant correlation found between investigation participants' financing options and their ODF status sustainability ($X2=4.803$, $df=2$, $p=0.09$). These results corroborated those of an Indonesian investigation that produced comparable results (Azizah et al., 2022).

Table 6:Social Economic Factors Associated with the Sustainability of Open Defecation-Free Status

Independent Variables	Categories	Dependent Variable (Sustainability of ODFS)		Statistical Significance (Chi-square Test)
		YES (N=298)	NO (N=98)	
Income	Below poverty line	41(56.2%)	32(43.8%)	X^2=17.510 df=1 p=<.001
	Above poverty line	257(79.6%)	66(20.4%)	
Financial Option	Borrowing	26(76.5%)	8(23.5%)	X^2=4.803 df=2 p=0.09
	From income	235(77.3%)	69(22.7%)	
	Well-wishers support	37(63.8%)	21(36.2%)	
Occupation Type	farmer	20(62.5%)	12(37.5%)	X^2=16.511 df=3 p=0.001
	peasant	24(54.5%)	20(45.5%)	
	employed	131(77.5%)	38(22.5%)	
	self-employed	128(81.5%)	28(18.5%)	
Obstacles to L.Ownership	Finance	247(75.8%)	79(24.2%)	X^2=6.781 df=3 p=0.07
	culture	1(25%)	3(75%)	
	Lack f skills	23(69.7%)	10(30.3%)	
	Lack of land or space	27(81.8%)	6(18.2%)	
Non-financial Resources	Yes	265(74.9%)	89(25.1%)	X^2=0.278 df=1 p=0.598
	No	33(78.6%)	9(21.4%)	
Presence of Incentives	Yes	91(84.3%)	17(15.7%)	X^2=6.469 df=1 p=0.01
	No	207(71.9%)	81(28.1%)	

Source: Primary data

4.4.3 Binary Logistic Regression Analysis of Social Economic Factors

As indicated in Table 7 below, there was a statistical association between income and open defecation-free status sustainability(p=0.001). Additionally, participants in the study with incomes below the poverty line were 2.7 times less inclined to maintain their status as free of open defecation; this finding may be explained by a lack of funding for the construction of a long-lasting pit latrine.

One of the key informants combined these results with the findings from the qualitative data and observed that:

"*Issues to do with income have a critical role on the sustainability of open defecation-free status. Building a pit latrine is not easy as a lot of capital, labor is needed to have one which means households with poor income cannot sustain building a toilet that is friendly to use. Nevertheless, there should be a program supporting such households and this will aid in eradicating open defecation which is a public health concern*.."

Findings from this study were supported by two other investigations done in Ghana where better income was linked to open defecation-free status sustainability(Immurana et al., 2022b).

As indicated in Table 7 below, there was a statistical association between the provision of incentives and open defecation-free status sustainability(p=0.01). Furthermore, the provision of incentives increased the odds of sustaining open defecation-free status by 2.1. The provision of incentives such as labor, building materials, and funds ensures the easy provision of pit latrines which is a key component in eradicating open defecation in the community.

One of the primary informants made the following observation in conjunction with the results from the qualitative data:

"*Not everybody is in a capacity to afford to build a pit larine when these incentives are provided, they play a critical role in preventing open defecation which has a bad effect on the surrounding. I would say incentives such as labor, funds, and provision of building material is a critical component for sustaining open defecation-free status..*"

The results of two additional studies conducted in Cote Divoire and Nepal, where offering incentives raised the likelihood of ODF status sustainability, corroborated the results of the present investigation (Angoua et al., 2018b; Bhatt, 2019).

As indicated in Table 7 below, there was a statistical association between the type of occupation of the study partaker and open defecation-free status sustainability (p=0.01). From this research, peasant study respondents were 5.5 less likely to sustain open defecation-free status as compared to the self-employed study respondents. Better income promotes good hygiene and sanitation practices which enhance the maintenance of open defecation-free status.

The results of this inquiry aligned with an Indonesian study that found a relationship between ODF status sustainability and occupation status (Ibnusantosa et al., 2021). This was not in harmony with a study done in Indonesia(Soedjono et al., 2017).

Table 7:Binary Logistic Regression Analysis of Social Economic Factors Associated with the Sustainability of Open Defecation-Free Status

Step 1a	Variables	B	S.E	Wald	Df	Sig	Exp(B)	95% C.I for EXP(B)	
								Lower	Upper
	incentives	-.77	.33	5.56	1	0.01	2.1	.24	.88
							ref		
	occupation			17.58	3	0.01			
	farmer	1.00	.48	4.39	1	.03	2.72	1.07	6.92
	peasant	1.69	-42	16.12	1	.00	5.46	2.38	12.50
	employed	.48	.31	2.39	1	.12	1.61	0.88	2.94
							ref		
	income	1.001	0.308	10.54	1	.001	2.72	1.49	4.98
							ref		
	Constant	-.173	.542	.05	1	0.72	.796		

Source: Primary Data

4.5 Socio-cultural Factors Influencing the Sustainability of Open Defecation-Free Status

4.5.1 Descriptive Statistics on Social-cultural Factors

As shown in Table 8 below, which offers descriptive statistics on cultural and social factors related to the sustainable development of the status of not using public restrooms. About using the same pit latrine for defecation, more than a quarter (80.1%) of study participants reported doing so, whereas only a small percentage (19.9%) of study respondents said they did not share the pit latrine, which may be related to deeply held cultural beliefs in this area. In regards to harassment or attacks on women who use pit latrines for personal hygiene, nearly 25% of study participants said they had experienced harassment only infrequently, and nearly 25% said they had never encountered harassment at all (20.5%). Just 7.3% of study participants said they had occasionally experienced harassment. Regarding the characteristics of defecation in public, only a small percentage of study participants (21.5%) linked open defecation to superstitions, whereas over three quarters (78.5%) of study respondents linked it to cultural beliefs.

. Concerning the presence of a sanction to members who practice open defecation in the community, a majority(83.6%) of the study respondents confirmed the presence of a sanction to community members who practice open defecation in the community while only a few(16.4%) of the study respondents confirmed the absence of sanction to community members who practice open defecation. In conclusion, regarding the existence of a household member who has ever attended a sanitation meeting, nearly half (40.7%) of study participants reported a CHV visit or a household member having attended a sanitation meeting, whereas over half (59.3%) of study respondents reported never attending any sanitation meetings or experiencing a CHV visit.

Table 8: Descriptive Statistics on Social-cultural Factors

Variable	Categories	Frequency	Valid Percentage%
Sharing of pit latrines	yes	317	80.1
	no	79	19.9
Harassment of women	never	81	20.5
	rarely	286	72.2
	sometimes	29	7.3
Attributes of OD	Cultural belief	311	78.5
	superstitions	85	21.5
Presence of sanction	yes	331	83.6
	no	65	16.4
Presence of a sanitation	yes	161	40.7
program by CHV	no	235	59.3

Source: Primary data

4.5.2: Association between Social Cultural Factors and Sustainability of Open Defecation-free Status

Ample pit latrine use has been considered one of the best strategies for ending defecation in the open, as shown in Table 9 below, where nearly three-quarters (73.8%) of the study participants who reported sustainability of ODF status reported sharing the pit latrine. Only 19% of the study respondents who reported unsustainable development of ODF status reported not sharing the pit latrine. After doing a bivariate analysis, there was no statistically significant relationship found between sharing pit latrines and their long-term open defecation-free status (X2=1.758,df=1,p=0.185). The majority of study participants may have maintained their open defecation-free status by sharing pit latrines, which could account for the decline in statistical power of association.

The results of the investigation aligned with those of two additional investigations conducted in Tanzania and Kenya, wherein sharing pit latrines was not linked to a sustained state of not defecating in public (Njuguna, 2019; Sara & Graham, 2014). This was in contrast to a different Burkina Faso investigation that found that sharing pit latrines decreased the likelihood that open defecation-free status would last (Kouassi et al., 2023).

As indicated in Table 9 below, From this investigation, close to three-quarters(72.5%) of the investigation partakers who confirmed the open defecation-free status sustainability reported the presence of sanction to community members who were observed practicing open defection in the open, only a few(10.8%) of the study partakers who confirmed open defecation-free status unsustainability reported absence of sanction a factor that propelled open defecation. When the bivariate analysis was performed, there was a statistically

significant correlation (X2=8.159,df=1,p=0.004) between the long-term sustainability of open defecation-free status and the existence of sanctions.

As demonstrated in Table 9 below, Approximately three-quarters (72.5%) of those who participated who confirmed that the ODF status was viable linked it to cultural beliefs, while a quarter (20%) of participants who confirmed that the status was not sustainable assigned this to superstitions. Upon conducting a bivariate analysis, there was no statistically significant association was observed between the attributes and the sustainability of open defecation (X2=1.3, df=1, p=0.252). These results were consistent with those of two additional investigations that were carried out in Ethiopia and Uganda and produced similar findings (Abebe & Tucho, 2020b; Ntaro et al., 2022).

As indicated in Table 10 below, From this investigation, More than three-quarters(76.5%) of the study partakers who confirmed the sustainability of open defecation-free status reported women being never harassed when going to a pit latrine to defecate, this could be linked to the improved security system in the study area. Only a few(20.7%) of the study partakers who confirmed the unsustainability of open defecation-free status reported women being harassed sometimes when going to a place to defecate. When the bivariate analysis was performed, there was no statistically significant relationship found between the harassment of women and the sustainability of ODF status (X2=0.422,df=2, p=0.81). These results disagreed with two Ethiopian studies (Azage & Haile, 2015; Soboksa et al., 2021) that found the likelihood of ODF status becoming untenable increased when harassed women were present. However, the results of the investigation aligned with a Ugandan study that discovered no connection between harassment of women and continuing to be defecation-free (Cagnet, 2022).

As indicated in Table 9, From this investigation, the majority(83.2%) of the study partakers who confirmed the open defecation-free status sustainability reported the presence of a sanitation program. This could be linked to awareness gained on the benefits of not defecating in the open and hence the observed need to sustain open defecation-free status. The lack of a sanitation program was cited by nearly a quarter (30.2%) of the respondents who felt that the ODF status was unsustainable. This finding may be related to a lack of knowledge about the advantages of proper sanitation practices for overall wellbeing. When the bivariate analysis was performed, there was a statistically significant correlation ($X2=8.159, df=1, p=0.004$) between the long-term sustainability of ODF status and the presence of a sanitation program.

Table 9:Social Cultural Factors Associated with the Sustainability of Open Defecation-free Status

Independent Variables	Categories	Dependent Variable (Sustainability of ODFS)		Statistical Significance (Chi-square Test)
		YES (N=298)	NO (N=98)	
Sharing of pit latrines	Yes	234(73.8%)	83(26.2%)	X^2=1.758
	No	64(81%)	15(19%)	df=1
				p=0.185
Harassment of women	never	62(76.5%)	19(23.5%)	X^2=0.422
	rarely	213(74.5%)	73(25.5%)	df=2
	sometimes	23(79.3%)	6(20.7%)	p=0.81
Attributes of OD	Cultural belief	230(74%)	81(26%)	X^2=1.31
	Superstitions	68(80%)	17(20%)	df=1
				p=0.252
Presence of sanction	Yes	240(72.5%)	91(27.5%)	X^2=8.159
	No	58(89.2%)	7(10.8%)	df=1
				p=0.004
Presence of a sanitation program by CHV	Yes	134(83.2%)	27(16.8%)	X^2=9.271
	No	164(69.8%)	71(30.2%)	df=1
				p=0.002

Source: Primary data

4.5.3 Binary Logistic Regression on Social-Cultural Factors

As indicated in Table 10, there was a statistical association between the presence of sanctions and the open defecation-free status sustainability (p=0.005). Furthermore, the Absence of a sanction program in the community reduced the odds of sustaining ODF status by 3.3.

These results were consistent with the qualitative data, which showed that most focused group participants mentioned the following:

"I would say the presence of punishment for the members of the community who practice open defecation has really helped in preventing open defection in the community and this has played a key role in sustaining open defection-free status, for instance in my village you commanded to dispose of the fecal matter accordingly as well as pay a fine to the village elder if the action is repeated again…"

The results of The inquiry conducted aligned with a study conducted in Ghana (Osumanu et al., 2019), which found that the existence of sanction programs raised the likelihood that ODF status would last. This result was in contrast to a study conducted in Zimbabwe that found no correlation between the two variables (Nyoni & Nyoni, 2020).

Table 10 below shows that there was a statistically significant correlation (p=0.002) between the ongoing viability of the ODF status and the existence of a sanitation program. Additionally, the likelihood of maintaining an ODF status was raised by 2.2 in the presence of a sanitation program. This could be focused on the advantages of sanitation initiatives that support adequate personal hygiene practices and the appropriate disposal of waste.

These results were consistent with the qualitative information provided by one of the key informants, who stated that:

"I would say the presence of sanitation programs in this area has helped in dealing with the problem of open defection because it has been an issue in this area. You will find through this program some members have benefitted through the provision of incentives in ensuring they have a pit latrine which is a key factor in promoting open defecation-free status in society, I would say the provision of this program has a lot of benefits…….."

According to two additional investigations conducted in Rwanda and Ethiopia (Belay, Chilot, et al., 2022; Ebenezer Fagunwa et al., 2023), the presence of sanitation programs increased the odds of ODF sustainability. These findings were corroborated with the findings of the present investigation. This was in contrast to a Kenyan study (Aluoch et al., 2022) that discovered no correlation between the two variables.

Table 10:Multivariate Analysis of Social-Cultural Factors

Step 1a	Variables	B	S.E	Wald	Df	Sig	Exp(B)	95% C.I for EXP(B)	
								Lower	Upper
	Presence of sanction	1.187	.422	7.912	1	0.005	3.3	1.433	7.488
							ref		
	Presence of a sanitation program by CHV	-.794	.257	9.560	1	0..002	2.2	.273	.748
							ref		
	Constant	-1.865	.407	20.951	1	0.000	.155		

Source: Primary data

4.6 Environmental Factors Influencing the Sustainability of Open Defecation-Free Status

4.6.1 Descriptive Statistics on Environmental Factors

As indicated in Table 11 below which provides descriptive statistics on environmental factors associated with open-defecation-free status sustainability. With regard to the safety of family members when using the latrines both during the day and at night, over half of the investigation participants (65.7%) reported that safety existed, while over a quarter (34.3%) reported that there was no safety when using the latrines either way with regards to the distance to the pit latrine, over 25% of the study participants estimated it to be less than 100 meters, while over 50% (61.6%) estimated it to be more than 100 meters from their property. When it comes to the availability of light when using the pit latrine at night, over 25% of study participants reported that lighting was present, while over 50% of study respondents reported that lighting was absent. This difference in response may be related to inadequate electricity connectivity in Kitui County's rural areas. Regarding the availability of water for use following defecation, nearly 25% of study participants reported that water was available for use following defecation, whereas over half (68.4%) of study participants reported that water was not available following defecation. When it came to the existence of a collapsed pit latrine in the home, nearly a quarter (32.1%) of study participants reported that one existed, while over half (67.9%) reported that there was not a collapsed toilet in the household. Lastly concerning the attributed reason for the collapse of pit latrines in various households, more than of the study partakers attributed the collapse of the toilet to heavy rains, while only a few of the study partakers attributed the collapse of the pit latrines to poor soil profile(17.3%), poor workmanship(18.9%)and use of weak materials(7.9%).

Table 11:Descriptive Statistics on Environmental Factors

Variable	Categories	Frequency	Valid Percentage%
Safety of using latrines	Yes	260	65.7
	No	136	34.3
Distance to the toilet	< 100m	152	38.4
	>100m	244	61.6
Provision of lighting at night	Yes	158	39.9
	No	238	60.1
Water availability	Yes	125	31.6
	No	271	68.4
Presence of a collapsed toilet	Yes	127	32.1
	No	269	67.9
Reason for the collapse	Heavy rains	71	55.9
	Poor soil profile	22	17.3
	Poor workmanship	24	18.9
	Weak materials	10	7.9

Source : Primary Data

4.6.2 Association between Environmental Factors and Open defecation-free Status Sustainability

As indicated in Table 12 below, From this investigation, the majority(79.6%) of the study partakers who confirmed open defecation-free status sustainability reported the presence of safety when using pit latrines during the day and night times. When it came to the unsustainability of ODF status, nearly a quarter (33.1%) of the investigation's participants stated that there was no safety when using underground toilets during the day. When the bivariate analysis was performed, there was a statistically significant correlation (X2=7.738,df=1,p=0.005) between the sustainability open defecation-free status and the presence of protection when using pit latrines.

As seen below in Table 12, The majority of the study's participants (79.6%) who confirmed the sustainability of their ODF status reported traveling less than 100 meters to use pit latrines, according to the results of this investigation. When it came to the study, nearly a quarter (28.7%) of the participants who said that the ODF status was not sustainable mentioned that they had to travel more than 100 meters to use the pit latrine. Upon conducting a bivariate analysis, a statistical correlation was observed between the distance required to reach a pit latrine and the sustainability of open defecation-free status (X2=5.302,df=1,p=0.02). These findings were not consistent with multivariate analysis since there was no statistical association between the distance used to access the pit latrines and open defecation-free status sustainability (p=0.132) translating that distance used to access the pit latrine was not an independent predictor of sustainable open defecation free status.

The majority of those who participated reported the following qualitative findings, which were at odds with these results:

"*Distance to the pit latrine is a key reason for open defecation in this region. Look at night, everybody is cautious for safety reasons, furthermore, children are not like adults where you can hold your fecal matter till you manage to access the pit latrine, I feel the closer the toilet is near to the homestade the better we can control open defecation...*"

This finding was consistent with research conducted in Ghana and Ethiopia (Delaire et al., 2022; Getahun et al., 2022). Nevertheless, a different Burundian study found that the likelihood of defecation in the open increased when a pit latrine was farther away (Belay, Asratie, et al., 2022).

As indicated in Table 12 below, From this investigation, the majority(83.5%) of the study partakers who confirmed open defecation-free status sustainability reported the presence of lighting at night when accessing pit latrines. Only a few(16.5%) of the study partakers who reported the unsustainability of the ODF status reported the presence of lighting at night when accessing pit latrines. There was a statistical correlation between the presence of lighting at night when accessing pit latrines and sustainability open defecation-free status when the bivariate analysis was done (X^2=9.706,df=1,p=0.002).

As indicated in Table 12 below, From this study, more than three-quarters (76.8%) of the study partakers who confirmed open defecation-free status sustainability reported the availability of water for washing hands after defecating. As part of a community-led comprehensive sanitation program that promotes open defecation-free status, washing hands after urinating is encouraged. The unsustainability of the open defecation-free status was

only mentioned by a small percentage of study participants (23.2%), who reported that water was available for hand washing after defecating. The results of the bivariate analysis showed that there was no statistically significant correlation between the availability of water for washing one's hands after defecating and the long-term viability of ODF status (X2=0.235,df=1,p=0.628).

These results were in line with those of another Ethiopian investigation (Woyessa et al., 2022). These verdicts were not in harmony with two other studies done in India(Exum et al., 2020; VerKuilen et al., 2023).

As presented in Table 12 below, 78.4% of study participants who confirmed the sustainability of their ODF status also reported not having a collapsed toilet. It has been suggested that the existence of a collapsed toilet encourages urination. Just 31.5% of study participants who reported seeing a collapsed toilet said that the open defecation-free state could not be sustained. When the bivariate analysis was performed, there was a statistically significant correlation (X2=4.572,df=1,p=0.03) between the existence of a collapsed toilet and sustainability ODF status.

Table 12: Environmental Factors Associated with Sustainability Open defecation-free Status

Independent Variables	Categories	Dependent Variable (Sustainability of ODFS)		Statistical Significance (Chi-square Test)
		YES (N=298)	NO (N=98)	
Safety of using latrines	Yes	207(79.6%)	53(20.4%)	X^2=7.738 df=1 p=0.005
	No	91(66.9%)	45(33.1%)	
Distance to the toilet	< 100m	124(81.6%)	28(18.4%)	X^2=5.302 df=1 p=0.02
	>100m	174(71.3%)	70(28.7%)	
Provision of lighting at night	Yes	132(83.5%)	26(16.5%)	X^2=9.706 df=1 p=0.002
	No	166(69.7%)	72(30.3%)	
Water availability	Yes	96(76.8%)	29(23.2%)	X^2=0.235 df=1 p=0.628
	No	202(74.5%)	69(25.5%)	
The presence of a collapsed toilet	Yes	87(68.5%)	40(31.5%)	X^2=4.572 df=1 p=0.03
	No	211(78.4%)	58(21.6%)	

Source: Primary data

4.6.3 Binary Logistic Regression on Environmental Factors

As indicated in Table 13 below, there was a statistical association between the presence of safety when using pit latrines and open defecation-free status sustainability (p=0.004). Furthermore, study respondents who reported the presence of safety when using pit latrines during the day and night times were 2 times more likely to sustain ODF status as compared to their counterparts. These results were consistent with another investigation done in Tanzania(González-rodrigo et al., 2022). The presence of safety when using pit latrines promotes the safe disposal of fecal matter. These findings disagreed with two other studies done in Indonesia and India which found no association between the safety of using pit latrines and the sustainability of ODF status(Bauza et al., 2020; Kurniatillah et al., 2023)

The presence of lighting when using pit latrines at night was statistically associated with open defecation-free status sustainability (p=0.02), as Table 13 below shows. Additionally, study participants who reported having access to lighting at night when using pit latrines were 2.2 times more probable to maintain a sustainable state free from defecation in the open. This finding may be related to safety and having enough lighting when using pit latrines, both of which are factors in the prevention of defecation in the open.

These results aligned with qualitative data, which showed that most focused group discussants mentioned the following:

"*I would say the absence of sufficient lighting when accessing the pit latrine at night is a major factor for open defecation. Girls and women are more likely to engage in open defecation due to fear they experience during at night a factor that is likely to lead to open defecation. I feel provision of lighting is of key importance…….*"

These findings were consistent with those of an additional investigation carried out in Haiti and Ethiopia that also produced findings along these lines (Murad et al., 2022b; Paul et al., 2022b). Nevertheless, a different Nigerian study (Abdullahi et al., 2023) disagreed with these conclusions.

A statistically significant correlation ($p=0.01$) was found between the open defecation-free status sustainability and the existence of a collapsed toilet, as presented in Table 13. Additionally, the odds of maintaining the open defecation-free status were lowered by 1.9 in the presence of a collapsed toilet. This finding may be related to people's fear of using collapsed pit latrines, which encourages open defecation in public spaces. These results corroborated the outcomes of an Ethiopian study (Gebremariam et al., 2018). However, another Ethiopian study (Osumanu et al., 2019) found no correlation between the two variables.

Table 13: Multivariate Analysis on Environmental Factors

Step 1a	Variables	B	S.E	Wald	Df	Sig	Exp(B)	95% C.I for EXP(B)	
								Lower	Upper
	Safety of using latrines	-.712	.252	7.95	1	0.004	2	.299	.805
							ref		
	Distance to the toilet	-.396	.263	2.267	1	.132	.673	.402	1.127
							ref		
	Provision of lighting at night	-.798	.263	9.208	1	0.02	2.2	.269	.754
							ref		
	The presence of a collapsed toilet	0.646	.254	6.458	1	0.011	1.908	1.159	3.141
							ref		
	Constant	-.48	.223	4.610	1	0.032	.619		

Source: Primary Data

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Preamble

The study's summary, conclusion, and recommendations are all included in this section.

5.1 Summary

Objective 1: Sustainability of open defecation-free status

From this research, more than three-quarters(75.3%) of the study partakers confirmed the open defecation-free status sustainability which was confirmed by sustained use of toilets instead of open defecation.

Objective 2: Social demographic factors associated with open defecation-free status sustainability

The age of the study respondents, size of the household, and education level were found to be statistically associated with ODF status sustainability, which is why they were imported for multivariate analysis. These findings stemmed from the study's second objective, which focused on social demographic factors related to the sustainability of open defecation-free status. ODF status sustainability was not statistically correlated with the study participant's gender or marital status.

Objective 3: Social economic factors associated with open defecation-free status sustainability

The study's third objective, which examined social and economic factors, revealed the following variables to be scientifically associated with ODF status sustainability; consequently, they were imported for multivariate analysis. The study participants' income,

occupation, and availability of incentives were among the variables. Financial alternatives, non-financial resources needed to build latrines, and ownership barriers did not show any statistically significant correlation with maintaining an open defecation-free state.

Objective 4: Social-cultural factors associated with open-defecation-free status sustainability

The following variables were found to be statistically associated with open-defecation-free status sustainability from the study's fourth objective, which focused on social-cultural factors; as a result, they were imported for multivariate analysis. These variables were the presence of a sanitation program and a sanction. Pit latrine sharing, harassing women to use a pit latrine, and open defecation were not statistically linked to the sustainability of the open defecation-free status.

Objective 5: Environmental factors associated with open-defecation-free status sustainability

From the fifth objective; concerning environmental factors associated with open-defecation-free status sustainability, the following variables were found to be statistically linked with open-defecation-free status sustainability, presence of a collapsed toilet, presence of lighting at night, distance to the pit latrine, and safety when using pit latrines hence they were imported for multivariate analysis. Water availability for handwashing purposes after using the latrines was not statistically associated with ODF status sustainability.

5.2 Conclusion

Objective 1: Open defecation-free status sustainability of Mwingi West, Kitui County.

In Kitui County's Mwingi West Sub-County, 75.3% of adult residents were able to maintain their status as defecation-free adults. The national target of Kenya to achieve 100% defecation-free status by 2030, in accordance with Sustainable Development Goal number six, was substantially higher than this.

Objective 2: Social demographic factors associated with open defecation-free status sustainability

The second objective of the investigation looked at social demographic factors associated with the long-term sustainability of ODF status. Participants in the study, aged 35 to 44, who had finished their tertiary education had a higher likelihood of maintaining their status, whereas those who made less than the poverty line had a lower likelihood.

Objective 3: Social economic factors associated with open defecation-free status sustainability

According to the investigation's third objective, which examined social and economic factors linked to the sustainability of open defecation-free status, the likelihood of maintaining open defecation-free status increased in the presence of incentives, but the likelihood of ODF status sustainability decreased in the case of peasant occupation.

Objective 4: Social-cultural factors associated with open-defecation-free status sustainability

According to the study's fourth objective, which examined social and cultural factors linked to the sustainability of open-defecation-free status, the likelihood of maintaining open-defecation-free status in a community was found to be lower in the absence of a sanction program and to be higher in the presence of a sanitation program.

Objective 5: Environmental factors associated with open-defecation-free status sustainability

According to the fifth objective, which deals with environmental factors that are linked to the sustainability of ODF status, the likelihood of ODF status sustainability was found to be higher in areas where pit latrines are safe to use and where there is nighttime lighting, whereas the likelihood was lower in areas where toilets have collapsed.

5.3 Recommendations

1. Both national and county governments should enhance supporting free primary and secondary education to improve literacy level and promote community income-generating activities to overcome the burden of poverty which has been a hindrance in the sustainability of ODF.
2. The county government of Kitui and WASH stakeholders should aim at providing incentives for building pit latrines and support Health education campaigns which will aid in the sustainability of ODF status.
3. The county government of Kitui should empower communities on the importance of adhering to social norms related to the sustainability of ODF status by enforcing existing Sanction programs.
4. Kitui County government and WASH partners should introduce sanitation skills upgrading artisanal training and facilitate provision of model latrines to community members to avoid collapsing of constructed latrines.

5. Both national and county government of Kitui should ensure there is adequate electricity connectivity in households for provision of security and lighting to latrine users at night.

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APPENDICES

APPENDIX 1: INFORMED CONSENT

Hi, I'm Daniel Kyalo-Munyongi, an MPH student at Mount Kenya University. I'm here to carry out investigation into determinants of ODF status sustainability among adult residents in Mwingi West Sub-County.

My academic requirement is partially fulfilled by my research. By taking part in the research, you will contribute important data that could assist the Ministry of Health personnel, WASH partners, and the local community in implementing WASH programs that will support the variables impacting sustainability of ODF status and related factors.

Because of this, I humbly ask that you participate in the inquiry by answering a few questions. It could take you up to 20 minutes to complete this. If you choose to participate, your identity and name will remain hidden from others. Additionally, you are free to decline to respond to any of the investigations questions, and your participation will be completely voluntary and unpaid. We promise that the data you submit will only be used for this scholarly investigation.

Signature…….

I have read the consent statement above and I understand that it is entirely up to me to decide to or not to take part in the study and that there will be no financial gain.

Please complete the next section. (If yes, go to Question 1. If the answer is no, end the session).

Yes, I've committed to take part. Signature or right thumb impression _____ Date_____

No, I've declined to take part. Signature or the Person Granting Consent ____ Date _____

APPENDIX 2: HOUSEHOLD QUESTIONNAIRE

Interviewer Initials ---------- Date ----------

Household Number ---------- Questionnaire code No ---------

Ward ---------- Village ----------

If you are able, please check the relevant boxes and complete the blank spaces stipulated the questions that require narrative responses.

SECTION A

Demographic information

1. Gender of household head
   a. Male ☐
   b. Female ☐
2. Number of household members:

……

3. Age of household head:

……..

4. Highest level of education:
   a. Primary ☐
   b. Secondary ☐
   c. Tertiary ☐
   d. No formal education ☐
5. Marital status
   a. Married ☐
   b. Single ☐
   c. Window ☐
   d. Divorced ☐

e. Separated ☐

Section B: Open Defecation-Free Status Sustainability

6. Does the household practice open defecation

a. Yes ☐

b. No ☐

7. If no for question 6,is there a presence of a pit latrine

a. Yes ☐

b. No ☐

Social-economic Factors

8. What is the family income level?

……..

9. Which financing option did you use for the construction of your latrine?

a. Borrowing ☐

b. From earnings /income ☐

c. Well-wishers support ☐

10. Are there non-financial resources used in the construction of the latrine facility?

a. Yes ☐

b. None ☐

11. What are the main barriers to owning and using a latrine in your home?

a. Finance ☐

b. Culture ☐

c. Lack of skill ☐

d. Lack of land or space ☐

12. Did you receive incentives were constructing a new latrine?

a. Yes ☐
b. No ☐

13. If yes for question 12 , What types of incentives

a. Materials ☐
b. Funds ☐
c. Labor ☐

14. Occupation of household head

a. Farmer ☐
b. Peasant ☐
c. Employed ☐
d. Self-employed ☐

Section C: Social-cultural Factors

15. Do males and females use the same pit latrine for defecation during the day?

a. Yes ☐
b. No ☐

16. Are women harassed or attacked when going to a place for defecation or bathing?

a. Never ☐
b. Rarely ☐
c. Sometimes ☐
d. Often ☐
e. Don't know ☐

17. What are the main reasons that household members in your household practice open defecation?

a. Privacy ☐
b. Safety ☐
c. Habit/routine ☐
d. Toilet not available at work ☐
e. Chose not to share lavatories with in-laws/ extended family ☐

18. In your opinion, what attributes to open defecation in your household or community?

a. Cultural beliefs ☐
b. Superstitions ☐

19. Would someone in your village face any consequences if they were caught publicly defecating?

a. Yes ☐
b. No ☐

20. Has anyone in the household attended a meeting on sanitation? Have any government employees or Community Health Promoter (CHP) visited your home to discuss sanitation?

a. Yes ☐
b. No ☐

Section D: Environmental Factors.

21.Is it safe and secure for all family members to use latrines during the day and night?

a. Yes ☐
b. No ☐

22. What is the approximate distance from the sleeping house to the toilet?

a. Less than 100 m ☐
b. 100 m ☐
c. More than 100m ☐

23. Is there provision of light at night?

a. Yes ☐

b. No ☐

24. Is water available to use after defecating (to flash faces or wash hands after use)?

a. Yes ☐

b. No ☐

25. Is the soil profile stable to avoid collapsing the latrine?

a. Yes ☐

b. No. ☐

26. Has there been any collapse of the latrine in your household?

a. Yes ☐

b. No ☐

26. If yes in question 26 above. Why?

a. Heavy rains ☐

b. Poor soil profile ☐

c. Poor workmanship ☐

d. Weak materials ☐

THANK YOU FOR YOUR RESPONSES

APPENDIX 3: INTERVIEW GUIDE FOR FOCUSED GROUP DISCUSSION

Number of participants ----------

Male ---------- Female ----------

1. In Mwingi West Sub County, what socioeconomic variables are linked to the decline in the status of open defecation.	
2. What financial issues are impeding Mwingi West Sub County's Open Defecation Free status from being sustained?	
3. What cultural elements are impeding the Open Defecation Free status's sustainability?	
4. How have campaigns to promote behavior change impacted the long-term viability of the open defecation-free status?	

THANK YOU FOR YOUR RESPONSES

APPENDIX 4: INTERVIEW GUIDE FOR KEY INFORMANTS.

a) Designation

b. PHO

c. CHV

b) What social factors, in your opinion, are connected to the ward's Open Defecation status slipping?

c) In your opinion, what financial issues are impeding this ward's ability to maintain its Open Defecation Free status?

d) What are your thoughts on the community's preparedness for the adoption and ongoing application of sanitation innovation?

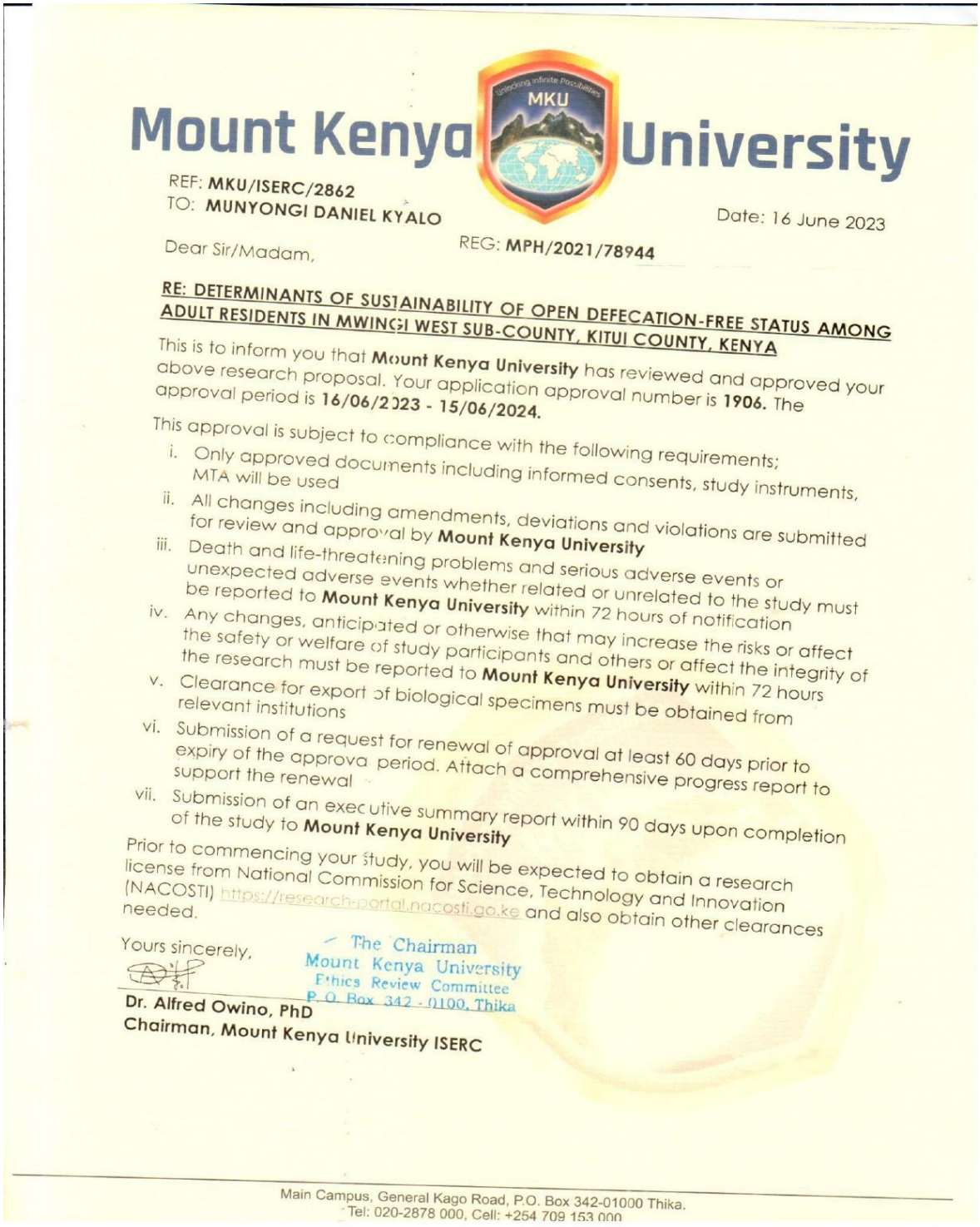
e) How have campaigns to promote behavior change in communication affected the sustainability of the open defecation-free status?

f) In the previous six months, have you participated in any ODF sustainability training?

g) In your opinion, what can be done better to prevent the community from going back to Open Defecation once they have obtained ODF certification?

THANK YOU FOR YOUR RESPONSES

APPENDIX 5. ERC CERTIFICATE



Mount Kenya University

REF: **MKU/ISERC/2862**
TO: **MUNYONGI DANIEL KYALO**

Date: 16 June 2023

Dear Sir/Madam,

REG: **MPH/2021/78944**

RE: DETERMINANTS OF SUSTAINABILITY OF OPEN DEFECATION-FREE STATUS AMONG ADULT RESIDENTS IN MWINGI WEST SUB-COUNTY, KITUI COUNTY, KENYA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **1906.** The approval period is **16/06/2023 - 15/06/2024.**

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 **Mount Kenya University**
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 **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** 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 **Mount Kenya University**

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.

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Dr. Alfred Owino, PhD
Chairman, Mount Kenya University ISERC

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: 020-2878 000, Cell: +254 709 153 000

APPENDIX 6. INTRODUCTORY LETTER

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2021/78944

16th June, 2023

National Commission for Science Technology & Innovation (NACOSTI)
Off Waiyaki Way, Upper Kabete,
P.O Box 30623- 00100
NAIROBI, KENYA

Dear Sir/Madam,

RE: MUNYONGI DANIEL KYALO – REGISTRATION NO. MPH/2021/78944

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health** in the department of **Epidemiology and Biostatistics** in the school of **Public Health.**

The title of the research is **"Determinants of Sustainability of Open Defecation-Free Status among Adults Residents in Mwingi West Sub-County, Kitui County, Kenya."**

It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **June, 2023 and August, 2023.**

Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University
P. O. Box 342 - 01000, THIKA
Office of the Director
Graduate Studies

Dr. Samuel M. Karenga, Ph.D
Director, Graduate Studies
Enc.

APPENDIX 7. NACOSTI LICENSE

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **793591**

Date of Issue: **14/July/2023**

RESEARCH LICENSE

This is to Certify that Mr.. DANIEL Munyogi KYALO of Mount Kenya University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kitui on the topic: DETERMINANTS OF SUSTAINABILITY OF OPEN DEFECATION-FREE STATUS AMONG ADULT RESIDENTS IN MWINGI WEST SUB-COUNTY, KITUI COUNTY, KENYA for the period ending : 14/July/2024.

License No: **NACOSTI/P/23/27346**

793591

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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See overleaf for conditions

APPENDIX 8. COUNTY COMMISSIONER CLEARANCE

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND NATIONAL ADMINISTRATION

Telegrams.....
E-mail: *cckitui@gmail.com*
When replying please quote Ref. and date

OFFICE OF THE
COUNTY COMMISSIONER
P.O.BOX 1-90200
KITUI.

K.C. 603/IV/92

25th July, 2023

Mr. Daniel Munyogi Kyalo
Mount Kenya University
P.O BOX 342 - 0100
THIKA.

RE: RESEARCH AUTHORIZATION

Reference is made to a letter from the National Commission for Science, Technology & Innovation Ref. **No. 793591** dated 14th July, 2023 on the above subject matter.

You are hereby authorized to carry out research on the topic "**Determinants of Sustainability of Open Defecation-Free Status Among Adult Residents**" for the period ending 14th July, 2024.

pp
E.M. MBUI
COUNTY COMMISSIONER
KITUI COUNTY

Copy to:
Deputy County Commissioner
Mwingi West Sub County

APPENDIX 9:SIMILARITY INDEX REPORT

Kyalo Munyongi

DETERMINANTS OF SUSTAINABILITY OF OPEN DEFECATION-FREE STATUS AMONG ADULT RESIDENTS IN M...

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STUDENT THESIS
Mount Kenya University

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APPENDIX 10. MAP OF MWINGI WEST SHOWING FOUR WARDS