DETERMINANTS OF OPEN DEFECATION AMONG COMMUNITY MEMBERS IN MATHIOYA SUB COUNTY, MURANG'A COUNTY, KENYA

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Declaration and approval

I declare that this work is wholly my own and has never been submitted to any educational institution for any academic recognition.

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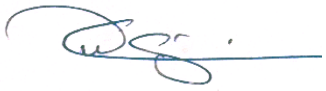
SIGNATURE  **DATE 3/5/2025**

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We hereby confirm that the candidate carried out this thesis under our direct supervision and guidance for the duration of the study.

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Dedication

This work is dedicated to my family, whose unwavering encouragement sustained me, and to my late mother, whose profound devotion to learning continues to inspire me.

Acknowledgement.

I am profoundly grateful to the Almighty for the gracious gift of life, good health, and wisdom during this academic journey. My sincere thanks go to my supervisors, whose steadfast support, guidance, and insightful feedback enriched this project. I am equally grateful to the leadership of the Murang'a County Government for granting me the opportunity to pursue further education. I also appreciate the steady encouragement from my colleagues at work and fellow classmates throughout this journey. My sincere thanks go to the faculty of Mount Kenya University, especially the Dean and the Head of the Community Health Department, for their invaluable support, both materially and morally. May you be richly blessed.

Abstract

Open defecation is still a grave public-health concern in many countries across Africa and the Region. In Kenya, despite the widespread implementation of Community-Led Total Sanitation (CLTS) initiatives aimed at eliminating open defecation, approximately 5.6 million individuals continue to engage in the practice, thereby perpetuating the transmission of faeco-oral diseases. According to the 2019 national census, overall sanitation coverage stood at 65 percent—56 percent in rural regions and 79 percent in urban areas. Nevertheless, inadequate sanitation continues to exact significant economic, health, and social tolls, with the annual cost estimated at KES 27 billion. Poor sanitation elevates morbidity and mortality, threatens water quality, and erodes human dignity.

This study set out to identify factors sustaining open defecation in Mathioya Sub-County, Murang'a County. It specifically examined residents' comprehension of the practice, their use of latrines, and the reach of CLTS interventions. Using a cross-sectional design, the research engaged 185 household members and CLTS implementers selected through random sampling. Data were gathered via structured interviews, questionnaires, observation checklists, and a focus-group discussion guide. Quantitative information was processed with SPSS 23.1 for descriptive statistics. A chi-square test linking sociodemographic traits to open defecation indicated that marital status was significant, $\chi^2(3, N = 185) = 18.63$, $p < 0.001$. Regression analyses showed significant effects for knowledge ($F(2, 358) = 28.02$, $p = 0.002$, $R^2 = 0.32$), latrine cleanliness ($F(3, 184) = 35.80$, $p < 0.001$, $R^2 = 0.91$), and latrine sharing ($F(3, 184) = 24.18$, $p < 0.001$, $R^2 = 0.44$).

Qualitative findings, organized around the study variables, indicated that most participants understood what open defecation entails, learning primarily from Community Health Volunteers. Nonetheless, the practice persisted largely because of limited knowledge depth. Many latrines lacked hand-washing stations with running water, soap, or anal-cleansing materials, and most were simple pit latrines situated some distance from dwellings to minimize odour and flies. Although a sizeable share of households recognized the dangers of open defecation, the behavior still occurred both within homes and across the wider community. The study therefore highlights a significant knowledge gap among household members and confirms that open defecation remains prevalent at multiple levels in Mathioya.

Key words: Open Defecation; Open Defecation Free; Sanitation; access to sanitation; adequate sanitation

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List of Abbreviation and Acronyms

CHPs	**-**	Community Health Promotors
CHEWs	**–**	Community Health Extension Workers
CHVs	**–**	Community Health Volunteers
CLTS	**–**	Community Led-Total Sanitation
FGD	**-**	Focused Group Discussion
GLAAS	**-**	Global Analysis and Assessment of Sanitation
JMP	**-**	Joint Monitoring Program
KESSF	**-**	Kenya Environmental Sanitation and Hygiene Strategy Framework
KHIS	**–**	Kenya Health Information System
KNBS	–	Kenya National Bureau of Statistics
MDG	**-**	Millennial Development Goal
MOH	**–**	Ministry of Health
NACOSTI	**-**	National Commission for Science Technology and Innovation
NOK	**–**	National Open Defecation Free Kenya Framework
OD	**–**	Open Defecation
ODF	**–**	Open Defecation Free
PHO	**–**	Public Health Officer
SC	**–**	Sub County
SDG	**-**	Sustainable Development Goal
US	**–**	United States
WHO	**–**	World Health Organization

Operational definition of terms

Community Led Total Sanitation – This approach is structured to actively engage community members in recognizing and comprehending the serious health hazards, environmental impacts, and social consequences that arise from the practice of open defecation. It aims to foster a deeper awareness of these risks among individuals, while simultaneously instilling a sense of personal responsibility and collective obligation within the community.

Community Led Total Sanitation implementation –the successful delivery, monitoring and evaluation of CLTS activities depending on having adequately trained personnel, sufficient financial resources and robust support systems in place.

Environmental Sanitation - Is the skill and strategies needed to apply technical expertise to improve the environmental health and sanitation, and individual health and welfare

Knowledge on open defecation – awareness of the benefits of safe faecal disposal, faecal-oral related diseases, their transmission routes and barriers.

Pit latrine – an on-site dry conservancy system for human waste final disposal provided at household level

Ordinary pit latrine- It is a simple, low-cost sanitation system that consists of a hole dug in the ground where human wastes(faeces) is deposited.

Improved Vent Pipe Pit Latrine- It refers to a type of pit latrine that incorporates a ventilation system, which consists of a polyvinyl chloride (PVC) vent pipe, typically measuring either 100 millimeters or 150 millimeters in diameter, securely connected to the pit. This vent pipe is designed to facilitate the continuous flow of air through the latrine, thereby reducing unpleasant odors. At the upper outlet of the vent pipe, a mesh or fly screen is installed. This screen serves a dual purpose: firstly, it prevents flies and other insects from entering the pit through the vent, and secondly, it ensures that any flies already present within the latrine are unable to exit.

Clean pit latrine – refers to a latrine with no physical dirt including faecal matter either on latrine slab, around the aperture or the super structure.

Open Defecation – excreting or disposing of feces in the environment either by children or adult persons; practiced by an individual of a group of people

Open Defecation Free – absence/ no evidence of excreta in the environment, village or household using acceptable and appropriate technologies for disposal of human feces.

Sanitation – supplying the infrastructure and services needed to dispose off human excreta, both urine and faeces, safely.

Utilization of sanitary facilities – the provision of on-site human waste disposal system with anal cleansing materials, hand hygiene facilities and effective use of the facilities.

Community Led Total Sanitation – a community-driven strategy that mobilizes residents to eradicate open defecation. By facilitating self-assessment of sanitation habits, it fosters collective commitment to establishing an environment free from open defecation.

Household – one or more persons living in the same dwelling and eating form the same pot (sharing meals).

Homestead- It consists of groups of persons ancestrally related and living/dwelling in an ancestral land but eating from different pots (they do not share meals).

Hand Washing Facility- Is a designated area with a reliable source of water, soap and often a way to dry hands, like towel or a hand dryer.

Health Care Systems- an organized network composed of individuals, institutions, infrastructure, and various resources that are collectively structured to deliver a wide range of health-related services. These systems are designed with the primary objective of addressing, managing, and fulfilling the healthcare needs of specific populations or communities. By coordinating efforts across public and private sectors, health care systems aim to promote, restore, and maintain the overall health and well-being of the target population through preventive, curative, rehabilitative, and palliative services.

CHAPTER ONE: INTRODUCTION

1.0. Introduce chapter contents

This chapter sets the context for the research through provision of an outline of the background, articulating the problem statement, detailing the objectives and corresponding research questions, and discussing the study's significance as well as its limitations and delimitations.

1.1 Background to the Study

Approximately 900 million individuals worldwide still engage in open defecation, while nearly 2.5 billion lack access to adequate sanitation facilities. While global rates of open defecation have generally declined, significant regional disparities remain, posing major public health challenges, particularly in Sub-Saharan Africa and India. Since sanitation-related disorders are thought to be responsible for 842,000 fatalities each year, it continues to be a global health concern (WHO, 2018).

Although some regions recorded significant reductions in open defecation during the Millennium Development Goal (MDG) period, approximately 49 million individuals across 39 Sub-Saharan African countries continued the practice. This challenge persisted despite MDG target 7(c), which aimed to halve the proportion of people without sustainable access to basic sanitation by 2015 (WHO, 2019). Studies reveal that despite long-term governmental efforts to increase latrine coverage, open defecation remains a major issue, especially in rural areas (Adhikari & Ghimire, 2020). Moreover, research has shown that merely installing latrines has not sufficiently decreased faecal-oral disease prevalence among children. Conversely, attaining open defecation-free status correlates with a decline in such illnesses, thereby improving public health, particularly among children. For instance, a comparative study in Uganda demonstrated that villages declared open defecation-free had notably lower incidences of diarrhea (Abebe & Tucho, 2020).

According to the World Health Organization's 2019 report, close to 900 million individuals globally still practice open defecation. While the practice has decreased worldwide, Sub-Saharan Africa has seen an increase of 16 million cases, bringing the total to 220 million. According to studies, rural open defecation rates continue to be high even though governments have worked to expand toilet coverage throughout time. (Adhikari & Ghimire. 2020)

The 2010 Constitution of Kenya acknowledges that maintaining a clean and safe environment is essential for achieving better health outcomes, dignity, and an enhanced quality of life. Sanitation plays a vital role in delivering multiple economic and social advantages, such as increased productivity, improved performance in education and employment, and reduced healthcare costs. Furthermore, access to improved sanitation facilities enhances living standards by promoting safety, dignity, comfort, and social standing among citizens (GOK, 2010).

According to estimates from the Kenya Environmental Sanitation and Hygiene Strategy Framework (KESSF) 2021–2030, over half of Kenya's rural population still lacks access to basic sanitation. Between 1990 and 2013, coverage of improved sanitation facilities saw only a slight increase of 4%, from 25% to 29%. Regional disparities remain pronounced, with sanitation access closely correlated with poverty levels (KESSF, 2021).

The Constitution of Kenya obligates the government to provide all citizens with access to improved sanitation and a safe, healthy environment. This pledge is further supported by Kenya's endorsement of the 2030 Agenda for Sustainable Development in 2015. Within this framework, Sustainable Development Goal (SDG) 3 emphasizes the promotion of health and well-being across all life stages, while SDG 6 underscores the

necessity of universal access to water and sanitation services. Specifically, target 6.2 seeks to ensure equitable sanitation access and eliminate open defecation by 2030 (United Nations, 2021).

The Kenya Environmental Sanitation and Hygiene Policy (KESHP) 2016–2030 aims to achieve universal access to improved sanitation by 2030, in line with international goals. This goal reinforces the constitutional provision under Article 43, which guarantees all residents the right to the highest attainable standards of health and sanitation (KESHP, 2016).

While population growth is a key factor driving the persistence of open defecation, it is crucial to investigate other contributing causes. Abubaka (2018) advocates for more research focused on national-level determinants that influence open defecation, to accelerate progress toward achieving open defecation-free status. According to the 2019 Global Analysis and Assessment of Sanitation (GLAAS) and Drinking Water report, the complete elimination of open defecation by 2030 appears unlikely (WHO, 2019).

1.2 Statement of the problem

Enhancing sanitation coverage in both rural and urban areas is a central strategic goal of the KESSF 2016–2020, which aimed to raise coverage from 32% to 65%. However, the target to eliminate open defecation in Kenya by 2020 was not achieved. The ongoing prevalence of open defecation adversely affects people's well-being—particularly that of children—as well as the country's economy. According to successive Kenya Health Information System (KHIS) reports, faecal-oral diseases have consistently remained among the top ten causes of illness nationwide (KESSF, 2016).

The WHO-UNICEF JMP 2021 reveal of sanitation data for the last two decades indicated 2.1% increase in access to basic sanitation (from 30.6% to 32.7%), 7.3% increase in the population accessing limited sanitation (from 17% to 25.7%) and 1.4% drop in the population using unimproved sanitation from 34.7% in Kenyan from 2000. This represented a comparatively small change recorded for the two decades (UNICEF, 2021).

According to the Murang'a County Development Plan (2018), diarrheal diseases rank among the top five illnesses, accounting for 11.5% of morbidity within the county. The 2021 report by UNICEF and the Centre for Humanitarian Change (CHC) highlights that sanitation remains a critical challenge in Kenya, with approximately 70% of the population lacking access to basic sanitation facilities. Around 10% of Kenyans, roughly 5 million people, continue to practice open defecation, predominantly in rural areas where the prevalence is 15%, compared to 3% in urban centers (County Development Plan, 2018).

In Murang'a County, safe sanitation access remains a pressing public health issue, with 5.8% of households reportedly lacking any sanitation facilities (KNBS, 2019). The 2022 outpatient report indicates a substantial burden of faecal-oral diseases in Mathioya Sub County, documenting 10 cases of typhoid fever, 3,490 cases of diarrhea, 7,843 cases of intestinal worm infections, and 8,262 cases of amoebiasis (KHIS, 2022). The ongoing practice of open defecation is likely contributing to the high incidence of these diseases and may be linked to recent cholera outbreaks in the region.

1.3 Purpose of the Study

The government of Kenya had aimed to achieve open defecation-free status by 2013, a goal that remains unfulfilled to this day. To work towards this objective, the government

developed the first Community-Led Total Sanitation (CLTS) campaign plan for 2011-2013. This plan also sought to accelerate progress towards the then-Millennium Development Goal (MDG) number 7(b), which was largely unmet. As per the Kenya Rural Sanitation and Hygiene Protocol 2022, the country aims to eradicate open defecation and ensure its population live in a clean environment by 2030. Achieving this goal requires county governments and other stakeholders in the hygiene and sanitation sector to develop and implement plans and strategies for monitoring and advancing progress toward open defecation-free status in all rural communities across Kenya (MOH, 2022a).

UNICEF's 2017 report notes that just 13 percent of Kenya's villages—8,738 in total—had attained open-defecation-free certification, up from 8 percent (5,434 villages) in 2016. In Murang'a County, 406 of the 2,479 villages (16 percent) have undergone CLTS triggering; however, only 65 of these (3 percent) have been verified, and a mere 27 villages (1 percent) have achieved official open-defecation-free status (UNICEF, 2017).

1.4 Study objectives

1.4.1 Broad Objective

To assess the factors that influence open-defecation practices among residents of Mathioya Sub-County, Murang'a County, Kenya.

1.4.2 Specific Objectives

1. To ascertain extent of knowledge regarding open defecation among residents of Mathioya Sub County, Murang'a County, Kenya.

2. To assess extent to which sanitary facilities are being utilized by residents of Mathioya Sub County, Murang'a County, Kenya.
3. To evaluate the current status of Community-Led Total Sanitation (CLTS) implementation in Mathioya Sub County, Murang'a County, Kenya.
4. To identify healthcare system deficiencies that impact the implementation of CLTS in Mathioya Sub County, Murang'a County, Kenya.

1.5 Research Questions

1. How well do residents of Mathioya Sub-County in Murang'a County, Kenya understand the issue of open defecation
2. How do household members in Mathioya Sub County, Murang'a County, Kenya utilize sanitary facilities?
3. What is the current implementation status of Community-Led Total Sanitation (CLTS) in Mathioya Sub County, Murang'a County, Kenya?
4. What deficiencies exist in the healthcare system that impact the implementation of CLTS in Mathioya Sub County, Murang'a County, Kenya?

1.6 Significance of the study

The National Open Defecation-Free Kenya (NOK) campaign framework highlights that nearly half of the rural population in Kenya still lacks access to basic sanitation, resulting in a national open defecation rate of approximately 14%, with significant variation across counties. The NOK 2020 initiative had aimed to eliminate open defecation in all rural areas by 2013 through expanded latrine access and regular use, while the Kenya Environmental Sanitation and Hygiene Strategy Framework (KESSF) later revised the national target year to 2020. However, despite the policy efforts and substantial

investment, Kenya has yet to achieve the progress necessary to attain open-defecation-free status.

The national open defecation rate currently stands at 14%, revealing significant regional discrepancies. In certain regions, such as counties within the Northern region, open defecation is a prevalent practice, with rates exceeding 70%, notably 82.2% in Turkana County, 76.7% in Wajir County, and 73.4% in Samburu County. The current national rate of sanitation improvement stands at 0.75%. To realize the target of universal access to improved sanitation, this rate must be accelerated by between 3% to 5% annually (MOH, 2016).

1.7 Justification of the study

According to the 2019 census report, 5.2% of the population utilizes uncovered pit latrines, 0.1% uses bucket latrines, and 0.2% practices open or bush defecation. This equates to 5.8% (61,286 individuals) of the population using unsafe sanitation facilities, exposing them to sanitation-related illnesses and deaths.

Open defection may be connected with different factors which may consist of poverty, education, lack of sanitary facilities, lack of knowledge on its effects to individual (especially children) and the community at large. Existing records provide no clear data on the prevalence of open defecation in Murang'a County. To address this gap, the present study examined the factors driving open-defecation practices in Mathioya Sub-County, Murang'a County, Kenya (KNBS, 2019).

Scope of the study

The research took place in Mathioya Sub-County, one of the seven sub-counties within Murang'a County, Kenya. Spanning 220.8 km², Mathioya is largely rural, and its literacy rate is somewhat lower than that of the county's urban centres. Specifically, the research was conducted in households within the Kamacharia, Gitugi, and Kiru Wards of Mathioya Sub County. The study centered on specific variables to assess the determinants of open defecation in the study area.

1.8 Study limitation and delimitation

The residents of the study area are predominantly vernacular speaking which could introduced a language barrier between the respondent and the interviewer. This was addressed by recruiting research assistants from the study area who had attained at least form four educations and were conversant with the local dialect to effectively conduct the interview with the respondents. The FGDs were also conducted in the local vernacular language.

Households without latrines, those with dilapidated and filled up were unwilling to respond to the questions. This limitation was addressed by reassuring the respondents of confidentiality of the data, the objective of the study and anonymity of the respondent would be ensured throughout the study period and beyond.

CHAPTER TWO: LITERATURE

1.1 Introduction

The chapter provides summarized and synthesized literature from published studies on CLTS. The chapter contain empirical literature reviewed on various determinants and how they influencing open defecation practices particularly in line with the variable under study. This chapter also explores the theoretical models and conceptual framework that underpin the study.

Open defecation is the practice of disposing of human waste in open environments such as bushes, roadsides, rivers, farms, or any place that is not a designated sanitation facility like a latrine or toilet. This behavior contributes to the transmission of disease-causing pathogens, particularly those responsible for diarrheal illnesses, which are the second leading cause of global disease burden. The practice is predominantly observed in Sub-Saharan Africa, with prevalence rates ranging from as low as 0.81% in Comoros to as high as 72.75% in Nigeria (Gasheneh et al., 2022). According to the WHO and UNICEF Joint Monitoring Programme (2021), an estimated 494 million people globally still engage in open defecation, with 92% of them living in rural settings. Nearly half of this population is concentrated in Sub-Saharan Africa. While Central and Southern Asia achieved a substantial reduction in open defecation—from 23% to 12%—between 2015 and 2020, Sub-Saharan Africa recorded a more modest decline, decreasing from 22% to 18% during the same period (Abebe & Tucho, 2020).

The Joint Monitoring Program (JMP) 2015 report indicated that over eight million Kenyans practices open defecation resulting to faecal-oral related diseases including diarrheal diseases, amoeba and cholera. Poor sanitation leads to economic loss of Ksh 27

billion annually. Open Defecation contribute to high disease burden and mortality, as well as contamination of water sources thus undermining human dignity. It is also estimated to cost the government of Kenya US$ 88 million thus becoming one of the most expensive unimproved sanitation practices estimated to cost over US$ 17 per person per year. Kenya launched a nationwide Community-Led Total Sanitation (CLTS) initiative aimed at mobilizing communities to achieve open defecation-free status (MOH, 2020).

2.1 Empirical literature review

2.1.1 Level of knowledge on Open Defecation

The NOK 2020 (2016/17 – 2019/20 campaign framework) recognizes the fact that, households and communities have diverse needs, understanding, attitudes and opinions that inform the choices they make to either provide or not to provide a sanitary facility at their households. To promote sustainable access to improved sanitation in rural areas, the KESSF 2016–2020 recommended fostering appropriate community knowledge, attitudes, and practices regarding sanitation and hygiene. Promotion of public health education on sanitation is one of the main strategies identified to intensify access to improved sanitation. The framework further recommended for the development and promotion of peer-to-peer education simulations to enable learners acquire crucial appropriate knowledge, practices, skills, and attitudes for good proper hygiene practices in the communities (NOK 2020).

Ntaro et, al., (2020) study revealed limited public knowledge on hygiene related disease transmission routes. The study further identified lack of knowledge on importance of maintaining open defecation free environment as a cause of open defecation practice

among community members. This implied the community knowledge on faecal oral disease transmission route was low.

Njuguna and Muruka (2017) highlight open defecation as a major contributor to the spread of fecal-borne diseases. Their findings indicate that this unsanitary practice plays a significant role in the transmission of diarrheal diseases and parasitic infections, including roundworms, hookworms, and whipworms, all of which pose serious public health risks. Children are most vulnerable to these conditions due to their hygiene practices and habits of putting contaminated item in their mouth coupled with their weak immunity.

2.1.2 Utilization of sanitary facilities

According to Fry E. report, despite adequate sanitation being a Human Right both in developed and developing world, in the US, homeless people are known to practice open defecation. Factors contributing to open defecation include the absence of public sanitary facilities, negative perceptions about existing public toilets, safety concerns, and issues related to alcohol, drug, and substance abuse and addiction. The report further indicated that, public sanitary facilities are important to control open defecation together with other more permanent initiatives such as settlement of homeless persons in housing with required sanitation facilities (Fry E. at al. 2019).

The 2009 census, reported a national latrine coverage of 65% with rural and urban coverage of 56% and 79% respectively. The 2019 census recorded 17.3% increase latrine coverage in the Nation with almost equal proportion (17.7%) using unsafe sanitation methods (KNBS, 2019). Further, the JMP 2015 updates which combined households with shared facilities as lacking adequate access to sanitation, reported an overall access

to improved sanitation at 31% with urban and rural coverage of 36% 18% respectively. The WHO report contends that, in consideration to the existing open defecation reduction rate, the universal agenda of elimination of global open defecation practices by 2030 remains ambitious goal (WHO 2019).

Kenya's Vision 2030 outlines an ambitious national development blueprint that includes, among its key objectives, the achievement of universal access to both safe drinking water and improved sanitation facilities for every citizen by the year 2030. This vision underscores the government's commitment to ensuring that clean water sources and adequate sanitation services are not only provided but are also equitably distributed and readily accessible to populations across all regions of the country. In the shorter term, the initiative sets specific targets aimed at expanding the reach of safe sanitation coverage, with the goal of achieving at least 65% coverage in rural areas and 70% in urban areas. To accomplish these goals, the strategy prioritizes the promotion and adoption of hygienic sanitation technologies. These include, but are not limited to, the installation and use of Ventilated Improved Pit (VIP) latrines, as well as the expansion of waterborne sanitation systems. Such interventions are particularly emphasized within underserved rural communities and learning institutions, where the lack of proper sanitation infrastructure poses significant public health risks (KESSF, 2016).

2.1.3 Community Led Total Sanitation Implementation

The Kenya Open Defecation-Free 2020 Campaign Framework was designed to achieve nationwide elimination of open defecation by the year 2020. The initiative sought to fast-track progress toward this goal by enhancing the capacity of sanitation stakeholders, establishing robust monitoring and evaluation mechanisms, mobilizing resources, and

supporting County Governments in implementing their open defecation-free (ODF) strategies. Since sanitation is a devolved function under Kenya's 2010 Constitution, County Governments are expected to collaborate with partners and other stakeholders to secure the necessary support and resources for achieving ODF status. Despite these efforts, the vision of a fully open defecation-free Kenya remains unfulfilled (NOK, 2020).

In Kenya's devolved governance framework, Community-Led Total Sanitation (CLTS) interventions are primarily implemented through a multi-tiered approach involving Public Health Officers (PHOs), Community Health Volunteers (CHVs), and influential Opinion Leaders at the grassroots level. These actors serve as the backbone of local sanitation initiatives, facilitating behavioral change, mobilizing communities, and monitoring hygiene practices. However, the success of CLTS is significantly hampered by persistent human resource challenges within the health sector. According to the Kenya Sanitation and Sanitation Framework (KSSF) 2016–2020, the sector suffers from a notable deficit in qualified personnel across all operational tiers, ranging from community units to county and national levels.

This shortage is further complicated by several structural and systemic inefficiencies. Among these are the uneven distribution of health personnel across regions—leaving remote and marginalized areas under-served—along with high staff turnover rates, poor working conditions, and weak systems for performance appraisal and staff motivation. The absence of a clear linkage between academic training institutions and the actual needs of the sanitation sector further widens the skills gap, as many graduates lack practical, market-relevant competencies. Moreover, the dearth of policy direction on required

qualifications, technical capacities, and competency benchmarks continues to impede the development of a robust sanitation workforce.

One of the critical concerns lies in the scarcity of personnel who are both technically skilled and contextually knowledgeable along the entire sanitation service delivery chain. This includes not just field officers, but also sanitation engineers, program managers, data specialists, and artisans with the capacity to design, manage, and maintain sanitation infrastructure sustainably. The lack of accredited training institutions further aggravates the problem, as very few offer specialized courses tailored to CLTS principles or environmental sanitation.

In addition, coordination among key stakeholders—including county governments, NGOs, private sector actors, and development partners—often remains fragmented. This fragmentation undermines efforts to establish coherent capacity-building initiatives and results in duplication of efforts or misalignment of priorities. Without a centralized mechanism to oversee training, accreditation, and deployment, the development of a well-trained sanitation workforce remains disjointed.

The National Open Defecation Free (ODF) Kenya Strategy (2020) acknowledges these challenges and proposes a comprehensive, multi-level response. It advocates for the institutionalization of structured training programs to build the capacity of frontline sanitation workers and support staff. Emphasis is placed on enhancing performance management systems, introducing non-monetary incentives, and aligning rewards with demonstrated outcomes. By doing so, the strategy seeks to improve not only workforce retention but also the efficiency and effectiveness of CLTS interventions.

Moreover, the strategy underscores the importance of integrating sanitation workforce planning into broader county and national development agendas. It proposes the development of a national skills inventory and the mapping of current and projected human resource needs within the sanitation sector. These efforts are intended to facilitate better planning, equitable deployment, and career development pathways for sanitation professionals. Long-term, these measures aim to transition Kenya toward a more resilient and professionally managed sanitation ecosystem—one that is capable of achieving and sustaining open defecation-free status across all counties.

Ultimately, addressing the human resource and institutional capacity gaps is not just a technical necessity but a moral imperative. Access to adequate sanitation is a fundamental human right, and the ability of the state to uphold this right is closely tied to the strength and competence of the sanitation workforce.

The Kenyan Constitution 2010 mandated Counties with the obligation of delivering hygiene and sanitation activities. The framework recognizes the importance of training and capacity building of the officers in order for them to effectively implement the CLTS activities, monitor and evaluate the progress. The framework proposes a 5 days training for PHOs and PHTs on CLTS methodology, training of natural leader and orientation of Community Health Volunteers (CHVs) at the Sub Location level (National open defecation free Kenya [NOK] framework, 2020). The KESSF 2016-2020 recommended the creation and rollout of training modules and Information, Education, and Communication (IEC) materials focused on Behavior Change Communication (BCC) related to improved hygiene, sanitation, and proper waste management to strengthen both county and national initiatives (MOH, 2017).

Health system gaps affecting CLTS implementation

The new constitution of Kenya 2020 devolved the implementation of health services thus the Counties are in charge of all prevention services including sanitation services. The National open defecation free 2020 Campaign Framework came at a time recognizes the paradigm shift in sanitation programs. The framework advocates for partnership with stakeholders to create and respond demand for improved sanitation in the Counties. The Framework is instrumental in fast tracking the achievement of open defecation free status within the Counties. This can be achieved by developing the capacities of the sanitation stakeholders, putting in place an active monitoring and evaluation system and mobilization of development partners and media for support and advocacy for achievement of sustainable open defecation free status in the Counties. Nevertheless, the Counties are still struggle to achieve their open defecation free targets which had been envisioned to be achieved by 2020. The need for health system support is therefore critical in order to ensure there is adequate capacity in terms of staff numbers and knowledge on CLTS processes across the different levels of CLTS implementation. Since the emergency of Community-Led Total Sanitation in 1999-2000, the initiative has exponentially grown. However, studies have demonstrated great discrepancy in the scale and quality of CLTS implementation (National open defecation free Kenya [NOK] framework, 2020).

According to Abubakar, 2018 report, sanitation targets proposed in the Sustainable Development Goals will remain a dream if the poor will not be helped to provide acceptable system of human waste disposal thus eradicate open defecation practices.

2.1.4 Recap of literature review

Adequate knowledge on the risk of open defecation coupled by the knowledge on faecal oral disease transmission among community members is critical in behaviour. Provision of sanitary facilities without awareness on how to break faecal disease transmission may not translate to the ultimate goal of attaining open defecation free villages. Additionally, provision of sanitary facilities without the hand washing facilities and anal cleansing materials will not offer the desired disease transmission barrier needed. Various studies have revealed awareness and practices gap in endeavor to deliver open defecation free communities. It is therefore critical to ensure both the prerequisite hardware and software components of any sanitation program are put in place for the communities to reap the maximum benefits of any hygiene and sanitation program.

2.2 Theoretical Framework

he study was guided by two theoretical frameworks: the Health Belief Model (HBM) and the Theory of Planned Behaviour (TPB). These theories are particularly relevant as they address the relationship between individual behavior and its consequences. Given that open defecation is largely a behavioral issue, both HBM and TPB provide a suitable lens for understanding the factors influencing sanitation practices and the likelihood of individuals adopting improved sanitation behaviors.

The Health Belief Model (HBM) was developed in the 1950s by social psychologists working with the United States Public Health Service. It was designed to explain why individuals frequently fail to participate in disease prevention, detection, and control programs, despite the availability of such initiatives (Hochbaum, 1958; Rosenstock, 1974). Over time, the theory was expanded to explore individuals' responses to symptoms

and their behavior concerning diagnosed illnesses. It has since been widely applied to assess the association between health beliefs and behaviors (Champion, 1999).

2.2.1 Health Belief Model (HBM)

The Health Belief Model (HBM) serves as a foundational and widely recognized theoretical framework that informs the development and implementation of health education, health promotion, and disease prevention strategies. It is one of the most extensively applied models within the field of behavioral and public health research, particularly in efforts to understand, explain, and anticipate how individuals engage with and respond to health-related issues. The HBM is premised on the notion that an individual's health behavior is predominantly influenced by their subjective perceptions and beliefs regarding specific health conditions. These beliefs shape how people assess their vulnerability to illness, the seriousness of the potential health outcome, and the benefits or challenges associated with taking preventive or remedial action.

The model is constructed around several key components, often referred to as constructs, which work collectively to influence behavior change. These constructs include perceived susceptibility—how much an individual believes they are at risk of contracting a particular illness or disease; perceived severity—how serious they consider the consequences of the illness to be; perceived benefits—an individual's belief in the efficacy of the recommended preventive behavior or action; and perceived barriers—the perceived obstacles, whether physical, emotional, financial, or social, that might prevent one from engaging in that behavior. Additionally, the model incorporates cues to action—external or internal prompts that trigger the decision-making process—and self-efficacy,

which refers to the individual's confidence in their ability to successfully perform the desired behavior.

The core assumption of the Health Belief Model is that individuals are more likely to take action toward preventing illness or engaging in health-promoting behaviors when they perceive themselves to be personally susceptible to a condition, believe that the condition has potentially serious consequences, recognize that a particular course of action would reduce their susceptibility or severity, and feel confident in their ability to successfully execute that action despite any barriers. This model has been instrumental in shaping interventions aimed at encouraging behavior change in diverse health domains, ranging from vaccination and sanitation practices to nutrition and chronic disease management. The model posits that individuals are more likely to adopt health-promoting behaviors if they believe they are at risk of a condition, recognize the condition as having serious health consequences, view the recommended preventive measures as beneficial, and believe that the benefits of action outweigh the potential barriers, such as cost or inconvenience (Becker, 1974).

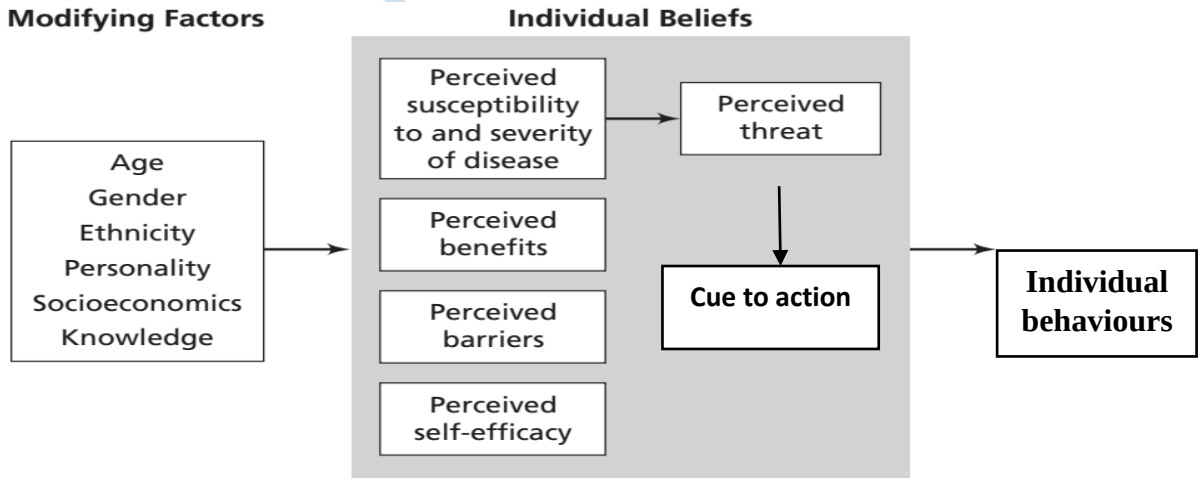


Figure 2.1 Health Belief Model

2.2.2 Key Concepts and Definition of the HBM

Table 2.1 Key concept and definition of Health Belief Model

	Concept	Definition	Application
	Vulnerability	Belief about the likelihood or risk of contracting a disease or becoming ill	Definition of persons at hazard and the level of risk they face Individual risk based on behaviour/ individual characteristics Perceived susceptibility reflects how individuals assess their actual risk.
	Severity	Individual conviction of the seriousness of the condition	Impact/ effects of risks of the condition
	Benefits	Efficiency of the desired action in risk and impact reduction	Action clarity in terms of time, method, place and gains to be accrued
	Barriers	Rear and/ or perceived difficulties in action actualization	Recognition of perceived obstacles by encouragement, information sharing, motivation and support
	Signals to action	Approaches to stimulate readiness	Provide action processes, promote awareness, appropriate feedback mechanism
	Self-efficacy	Confidence on individual ability to act	Capacity building and support in action implementation Setting of incremental goals Communication for strengthening Demonstration of desired conduct Minimize anxiety

2.2.3 Theory of Planned Behaviour (TPB)

Since the introduction of Theory of Planned Behaviour (TPB) more than 50 years ago, it is one of the models most commonly used to explore human social behaviour. The fundamental, principle of TPB revolve around prediction of intentions. Behavioral

intentions are influenced by factors like behavior, beliefs, attitudes, social norms, and perceptions (Icek, A., 2011). However, intentions do not always translate to behaviour particularly if it is physically impossible to execute the behaviour or if unpredicted obstacles occur in the process. According to Ajzen (1988), there are three elements that explains behavioral intention namely Attitude which refers to personal opinion on the intended behaviour, subjective norms encompassing other peoples' opinion regarding the intended behaviour and perceived behavior control concerned with the self-efficacy concerning the behavior (Ajzen, 1988).

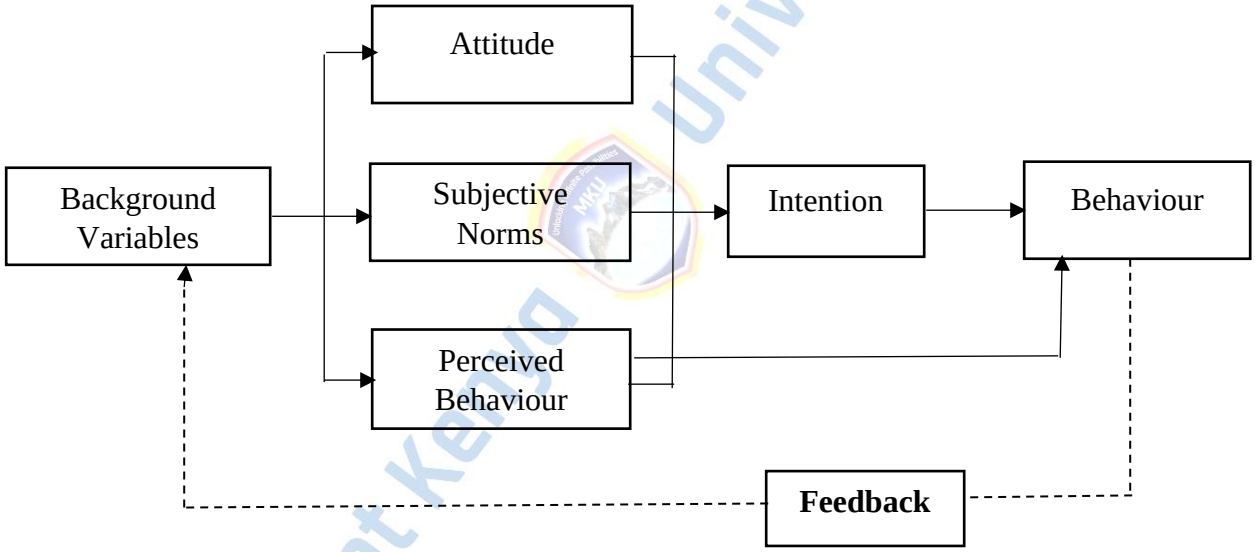


Figure 2.2 Theory of planned behaviour

The Theory of Planned Behaviour (TPB) posits that an individual's intention to perform a behavior is the most immediate determinant of that behavior, and this intention is influenced by three key constructs: attitude toward the behavior, subjective norms, and perceived behavioral control. Factors such as demographic characteristics typically influence behavior through these three factors and intention. These three determinants delineate behavioral intention prior to its occurrence, with intention serving as a reliable

precursor of actual behavior. Moreover, the theory suggests that perceived behavior control gauges the necessary skills for behavior expression and the likelihood of overcoming potential barriers. Ultimately, the exhibited behavior yields feedback on the prospects of the behavior (Ajzen, 1988).

2.2.4 Assumptions of Theory of Planned Behaviour

Ajzen (1985) conceptualizes the Theory of Planned Behaviour (TPB) as a decision-making framework in which individuals evaluate the potential costs and benefits of various actions and are more likely to engage in a behavior that they believe will yield the most favorable outcome. This theory falls under the "rational choice model" group, positing that rational behavior stems from cognitive deliberation and personal self-interest, alongside individual characteristics. This perspective underscores the importance of personal traits in shaping behavior. From a policy standpoint, it's essential to make sure consumers have access to sufficient information to make informed decisions. However, rational choice models have faced criticism. Firstly, human behavior is multifaceted, encompassing social, moral, and altruistic elements alongside self-interest. Moreover, behavior is often influenced by collective and social contexts, as well as habits and routines, which may override cognitive processes. Emotional responses also play a significant role, confounding rational deliberation. For instance, in marketing, consumers often form emotional connections with products, complicating purely rational decision-making processes (Ajzen, 1985).

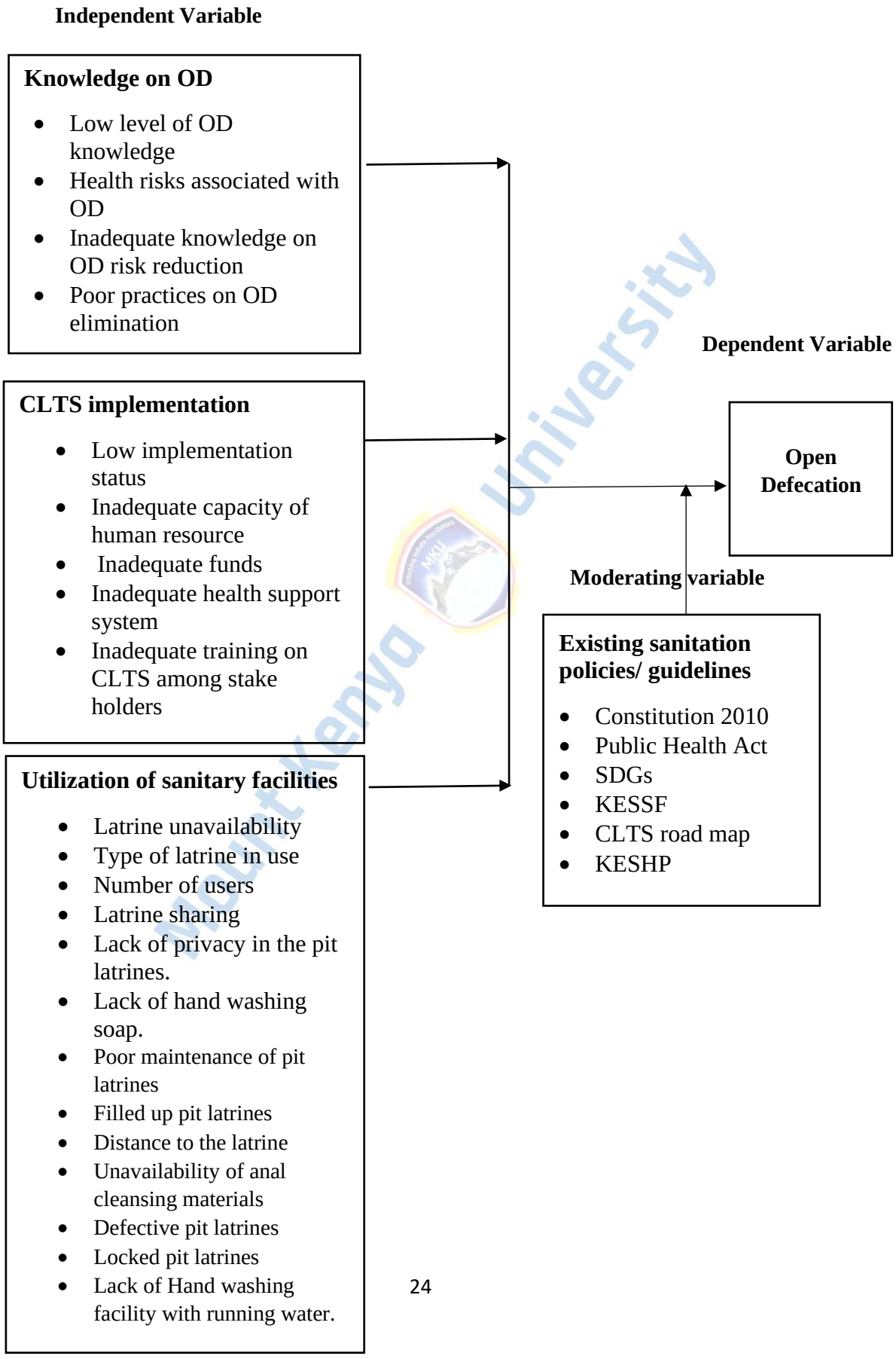
2.2.5 Summary of theoretical framework and conceptual framework

The Health Belief Model (HBM) explains why individuals might avoid participating in disease prevention and detection programs. It suggests that individual's beliefs about their vulnerability to an ailment, the seriousness of the disease, the benefits of controlling the risk, the ease of implementing preventive measures, the necessary actions, and their ability to act will either hinder or facilitate the adoption of preventive measures by individuals and communities. Therefore, in the case of open defecation, whether the practice continues or is reduced depends on individuals' perceived vulnerability. Similarly, the Theory of Planned Behavior suggests that attitudes and subjective norms shape intentions, while perceived behavioral control determines whether individuals act in a certain way, either positively or negatively.

Conceptual Frame work

A conceptual framework is an outline presenting key interconnected ideas arranged logically. It represents a broad concept that highlights specific relationships, helping to shape understanding within a particular field or discipline. (Jarosova, 2018). Figure 2.2 present the adopted conceptual framework by the study.

Table 2.2 Conceptual Framework



CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology employed to investigate the factors contributing to open defecation among residents of Mathioya Sub County, Murang'a County, Kenya. It offers a comprehensive overview of the study design, research setting, target population, sampling techniques, key variables, measures for ensuring validity and reliability, procedures for data collection and management, analytical methods, and the ethical considerations undertaken.

3.2 Research method

The study employed a mixed-methods approach, combining both quantitative and qualitative data collection techniques. Quantitative data were gathered through interviews, observational checklists, and questionnaires administered to public health officers. Meanwhile, qualitative insights were obtained using a Focus Group Discussion (FGD) guide. These instruments were designed to assess how key independent variables, knowledge, latrine usage, and the implementation of Community-Led Total Sanitation (CLTS), influence the practice of open defecation in Mathioya Sub County, Murang'a County, Kenya.

3.3 Research Design

Study design is a fundamental component of research methodology as it guides the process of data collection and analysis. In this study, a cross-sectional design was adopted to examine the factors influencing open defecation among household members. This approach allowed for the assessment of various determinants within the community and provided a snapshot of the prevailing conditions at a specific point in time (Mugenda &

Mugenda, 2008). By sampling within a set timeframe, the cross-sectional design facilitated the generalization of findings to the broader population.

Study Area

The research was carried out in Mathioya Sub-County, located in Murang'a County, Kenya. Covering an area of approximately 220.8 km² on the northern edge of Murang'a town, Mathioya is one of the county's seven sub-counties, bordered by Kangema Sub-County to the west and Nyeri County to the east. The area has a population of 92,814, with projections estimating an increase to about 106,400. Mathioya consists of 337 villages and is divided into three wards: Kiru Ward, housing 8,393 households; Gitugi Ward, with 7,136 households; and Kamacharia Ward, comprising 6,891 households. According to Njuguna (2019), latrine provision plays a vital role in sanitation interventions by safely containing human waste and thereby preventing diarrheal diseases (KNBS, 2019).

Additionally, a comparative analysis of outpatient records for hygiene- and sanitation-related infections over the year prior to the study showed that Mathioya Sub-County experienced higher case numbers than Kiharu and Kangema Sub-Counties, as detailed in Table 3.2 (KHIS, 2022).

Table 3.1 Comparative review of hygiene and sanitation related infections

Sub County	Diarrhea cases	Intestinal worms	Total cases
Kiharu	2592	7107	**9699**
Mathioya	3490	7843	**11333**
Kangema	2903	6860	**9763**

3.1 Target Population

The target population comprised adults who had lived in Mathioya Sub-County's three wards for at least one year before the study. Respondents were household heads or, if absent, another adult resident present during data collection because heads of households are centrally involved in decision-making and financing domestic infrastructure. Further due to their length of stay in the study area they are able to give accurate and credible information on the study topic during the data collection. The household was the unit of measure for open defecation.

3.1.1 Sample Size Determination

To calculate the sample size (n) from a population exceeding 10,000, Fisher's formula shown below was applied (Kasiu et al., 2006). The number of households in the study area was 22,406, justifying the use of this formula. The sampling unit was the household, and the respondents were household heads or any other eligible household member present during data collection.

Equation 3.1 Fisher's Sampling formula

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

Where; n = Minimum required sample size

Z = the standard normal deviation (set at 1.96 and corresponds to 95% Confidence Interval (CI).

p = the percentage of the target population with condition of interest – (since there is no recorded County specific open defecation prevalence, the study will use the national open defecation prevalence = 14%)

q = 1- p = (1 – 0.14 = 0.86)

d = Minimum error (0.05)

p = 0.14

q = 0.86

$n = \frac{1.96^2 \times 0.14 \times 0.86}{0.05^2} = 184.2$ Therefore, the desired sample size was 185 respondents

3.5.2 Allocation of sample size

To obtain a representative sample from the three Wards (Gitugi, Kiru, and Kamacharia) in Mathioya Sub County, a proportionate sample was calculated based on the 22,406 households recorded in the 2019 Census for the study area. Table 3.3 below indicates the proportionate sample for the study sample.

The study area was stratified in to the three Wards and Community Health Units (CHUs). The household registers were used as the sampling frame for the 185 households. Three FGD were held with household members from additionally twelve households which were randomly sampled from the household registers per Ward. A census sampling method was used for the public health officers working in the study area.

Table 3.2 Proportionate Sample size per Ward

Name of Ward	Total number of households	Proportionate sample	Desired sample per Ward
Gitugi Ward	7,136	7136/22406x185	59
Kiru Ward	8,393	8393/22406x185	69
Kamacharia Ward	6,877	6877/22406x185	57
Total	**22,406**		**185**

In the study area, a total number of eleven villages were sampled in the three wards, namely; in Gitugi Ward the researcher sampled Kiuu village, Ngechu village, Nyakianga village and Ngoe village. In Kamacharia Ward, the researcher also sampled Kiriaini village, Gatima village and Iruri village. Last but not least, in Kiru Ward the researcher sampled Ngarange village, Ngoe village, Kiriaini village and Mutarato village.

3.2 Study Variables

Table 3.3 Study variable

Variable	Variable definition	Scale of measurement
Social Demographic		
Gender	The being male of female	Nominal
Education	Level of education attained	Ordinal
Marital status	In a relationship with an opposite gender	Nominal
Age	Years lived	Ratio
Religion	Affiliation to faith	Nominal
Occupation	Daily financial engagement	Nominal
Average income	Amount earned monthly	Ratio
Family size	The number of family members	Categorical
Knowledge on OD		
OD knowledge	Awareness on OD	Nominal

Variable	Variable definition	Scale of measurement
Risks associated with OD	Awareness on health risks associated with OD	Categorical
OD risk reduction	Awareness on measures to prevent/ eliminate OD health risks	Categorical
CLTS implementation		
CLTS status	Level of CLTS implementation	Categorical
Human resource	Health officers implementing CLTS	Categorical
Support system	Availability of facilities and equipment for CLTS activities	Nominal
Financial resources	Availability of CLTS budget & funding of CLTS activities	Nominal
CLTS Monitoring and evaluation	Presence of evidence-based system to track and review CLTS progress	Nominal
Utilization		
Availability	Presence of latrines	Nominal
Type	The operation system of the latrine	Ordinal
Safety & privacy	Ability of the super structure to offer required security and protection	Nominal
Water & soap	Availability for hand washing facilities	Nominal
Cleansing/ maintenance	State of cleanliness, maintained and availability of anal cleaning materials	Categorical
Pit depth/ filled up	Remaining safe pit depth	Nominal
Distance to the latrine	Location of the latrine from dwellings	Ordinal

3.3 Sampling Techniques

The study area was selected because of the high incidence of fecal-oral related diseases. Households were randomly sampled using household registers and a computer-generated random number table. When more than one eligible respondent was present in a selected household, a simple random sampling method was used to choose the participant by drawing numbered pieces of paper. The individual who picked a piece of paper bearing number one was designated as the study respondent. For households selected to participate in Focus Group Discussions (FGDs), respondents were invited to a central place where the FGDs, were held. Data was collected through interview using FGD guide

Eligibility criteria

3.3.1 Inclusion criteria

Eligible respondents were anybody who met the following criteria; - was a resident who had resided for a period of one year (twelve months) prior to the study, a member of the sampled household, above the age of 18 years, willing to be interviewed and of a sound mind. The length of stay in the study area was confirmed by the respondents before the commence of the interviews

3.3.2 Exclusion criteria

Respondent with the following criteria were excluded from the study; - those who consented to be non-household member/ visitors, persons below 18 years, those who reported they had resided in the area or a household for less than one year prior to the study, persons of unsound mind, those found under influence of alcohol at the time of study and those who decline to be interviewed.

3.7 Data collection tools

Data collection employed multiple methods, including a structured interview schedule with both open- and closed-ended questions, a self-administered questionnaire, and an observation checklist. The interview schedule facilitated face-to-face interactions, enabling the researcher to gather primary data from household respondents by asking a consistent set of questions focused on the study variables. Concurrently, direct observations were made using a checklist to document the presence or absence of sanitation facilities, types of facilities, visible fecal matter, availability of handwashing stations, latrine remaining depth, anal cleansing materials, and access to running water and soap. Furthermore, health officers involved in implementing the Community-Led Total Sanitation program completed self-administered questionnaires independently; these instruments contained structured open- and closed-ended questions to capture relevant information.

Qualitative data were collected using a Focus Group Discussion (FGD) guide. The researcher, assisted by research assistants, conducted three FGDs. The Kamachari Ward FGD included 8 participants (3 males and 5 females), the Gitugi Ward FGD had 10 participants (4 males and 6 females), and the Kiiru Ward FGD involved 12 participants (5 males and 7 females). In total, 30 adult residents from the study area, who had not previously participated in interviews, took part in the FGDs.

The interview schedule was organized into four parts. Part one gathered sociodemographic information such as gender, age, average income, education level, and occupation. Part two focused on knowledge about open defecation, including awareness, associated risks, prevention methods, sources of information, and strategies to eliminate

the practice. Part three collected data on latrine utilization, covering aspects like availability, type, sharing, cleanliness, handwashing facilities, proximity to the main house, and remaining pit depth. The final part assessed the implementation status of the Community-Led Total Sanitation program.

3.4 Validity and Reliability

3.4.1 Validity

Validity is a measure of extent to which a data collection tool precisely measures what the study aims to assess. To ensure content validity, the researcher collaborated closely with healthcare providers, who are experts in community sanitation, to ascertain the suitability of the study tools. By involving these experts in the assessment of the study tools, the researcher sought to ensure that the tools adequately captured the relevant aspects of community sanitation and open defecation that the study intended to investigate. Further the data tools were assessed for conformity between the speculative concept of the study and the specific variable measuring procedure or method. The data collection tools were combined and reviewed to eliminate any inconsistencies and ambiguities identified during the pre-test conducted in Nyeri South Sub County, Kenya. The pre-test involved 19 respondents, representing 10% of the intended sample size. This process also helped research assistants gain a clear understanding of the questions before the actual data collection commenced.

Reliability

Reliability refers to the consistency and repeatability of study results when using the same data collection tools. To ensure reliability in this study, Cronbach's alpha (α) was

calculated for items under each study variable. This measure assesses the reliability and internal consistency of the data collection items (Keith, 2018). The Cronbach's alpha scores indicated good consistency across variables: knowledge ($\alpha = 0.809$), latrine utilization ($\alpha = 0.812$), community-led total sanitation implementation ($\alpha = 0.871$), and health system factors ($\alpha = 0.832$).

3.5 Data Collection Techniques

Quantitative data were obtained through an interviewer-administered schedule. The principal investigator, together with three trained research assistants drawn from the locality, carried out face-to-face interviews. After the study's purpose had been explained, responses were noted down in real time. Each participant signed an informed-consent form to signal voluntary participation.

Qualitative information was collected in three Focus Group Discussions (FGDs). The Gitugi group comprised ten participants (four men and six women); the Kiru Ward group had twelve participants (five men and seven women); and the Kamacharia Ward group included eight participants (four men and four women).

3.6 Data collection methods and procedures

Household data collection was done through face to face interview using interview schedule. The respondents' responses were recorded in the structured interview schedule during the interview. A checklist was used to record observational data as per the observable study variables items. The items which were observed included presence of sanitary facility and type, presence of faecal matter (indicator for open defecation), presence hand washing facilities, filled up latrine, anal cleansing material, availability of

running water and soap were observed by the researcher and recorded during the data collection period. The data analyzed in frequencies and proportion and presented in tables and charts.

A questionnaire containing open-ended questions was used to collect data on Community Led Total Sanitation implementation from health officers. Qualitative data was gathered from members of three FGDs using an FGD guide; these participants had not taken part in the interviews. Responses from participants were recorded with a tape recorder for later retrieval and transcription.

3.7 Data analysis techniques and presentation

Completed interview schedules were carefully reviewed for consistency, assigned unique identification numbers, and filed in folders labeled by Ward. This system helped the researcher track progress and ensure that the desired sample size was achieved. Quantitative data were coded and entered into Excel, then analyzed using SPSS version 23.1. Descriptive statistics were presented as frequencies and proportions, illustrated through pie charts, tables, and graphs. Qualitative data from tape recordings and notes taken during the Focus Group Discussions (FGDs) were transcribed, organized, and thematically arranged according to the study variables.

Ethical Considerations and Approval

Ethical clearance for this study was obtained from the Mount Kenya University Ethics and Research Committee (License No. 2012) and the National Commission for Science, Technology and Innovation (NACOSTI) (License No. NACOSTI/P/23/28369). Further authorization to conduct data collection was granted by the Murang'a County Department

of Health Services. Local administrators were informed, and community health volunteers assisted in locating the selected households. All interviews and observations were conducted at times convenient and preferred by the participants.

Participant confidentiality and anonymity were rigorously protected: no personal identifiers were recorded. After the study aims were fully explained, informed-consent forms were signed only by those who agreed to take part. Respondents were reminded that participation was entirely voluntary and that they could withdraw at any stage without penalty.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter presents the findings, analysis, and discussion of the study based on the study variables. It covers the response rate, sociodemographic characteristics of respondents, knowledge of open defecation and related risk factors, latrine use, and the implementation of community-led total sanitation in Mathioya Sub County. Data collection occurred in August and September 2023, with findings analyzed and organized according to the study variables.

4.1 Response rate

The study aimed to assess the determinants of open defecation in the three Wards of Mathioya Sub County, Murang'a County, Kenya. Respondents were interviewed at their households using an interviewer-administered schedule, achieving a 100% response rate from the targeted sample size of 185 households. Majority 95.7% of the interviews were complete, however, some items in the interview questions were not responded to particularly in the sociodemographic questions as indicated in Figure 4.1 below.

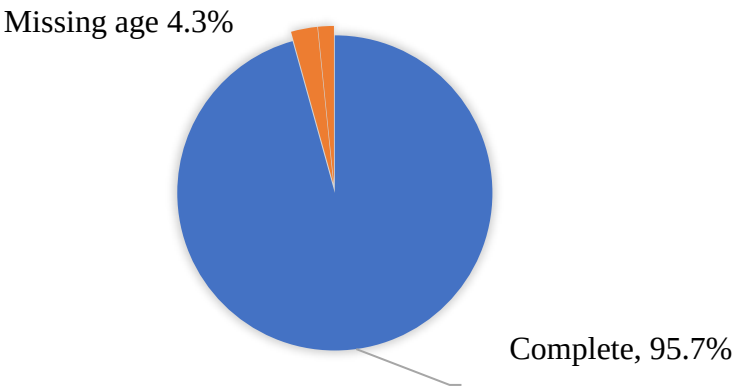


Figure 4.1 Response rate

4.2 Socio-demographic characteristics of respondents

The researcher assessed sociodemographic characteristics of the respondent distribution of the sociodemographic characteristic of the respondents are indicated in the Table 4.1 below.

Table 4.1: Socio-demographic characteristics of the respondents

Gender of the respondent	**Frequency (n=185)**	**Percentage (100%)**
Male	62	33.5
Female	123	66.5
Total	**185**	**100.0**
Age distribution	**Frequency (n=180)**	**Percentage (100%)**
18 to 30 years	12	6.4
31 to 40 years	43	23.2
41 to 50 years	43	23.2
51 to 60 years	34	18.6
61 years and above	48	25.9
Total	**180**	**100**
Education level	**Frequency (n=185)**	**Percentage (100%)**
No formal education	11	5.9
Primary	101	54.6
Secondary	54	29.2
Tertiary level and above	19	10.3
Total	**185**	**100.0**
Marital status	**Frequency (n=185)**	**Percentage (100%)**
Widowed	20	10.8
Single/ Separated/Divorced	33	17.9
Married	132	71.4
Total	**185**	**100.0**
Main occupation	**Frequency (n=185)**	**Percentage (100%)**
Farming	143	76.8
Self-employed/ business	24	13.0
Casual/ manual jobs	13	7.0
Employed	5	3.2
Total	**185**	**100**
Average monthly income	**182**	
Up to Ksh 15,000	123	66.5
Ksh 15,001 – 30,000	28	15.1
Ksh 30,001- 45,000	11	5.9
Above Ksh 45,000	20	10.8
Total	**182**	**100**

The majority of respondents were female, accounting for 123 individuals (66.5%). This pattern likely reflects traditional gender roles, where men, as primary breadwinners, are

often away from home seeking livelihood opportunities. Regarding age distribution, a substantial proportion of respondents—46.4%—were between 31 and 50 years old (M = 34, SD = 2.29). Additionally, 25.9% of respondents were over sixty years of age. This demographic trend may be attributed to the tendency of older individuals to remain at home, as they are generally less involved in activities outside the household.

Most respondents (54.6%) had completed primary education, while 10.3% had attained tertiary education or higher, and 5.9% had no formal education. The majority were females, with many being elderly over 60 years old. Additionally, 69.2% of respondents were above 40 years, indicating that most were either household heads or their spouses.

In regard to main occupation, majority (76.8%) of the respondents indicated they were involved in farming. Only a small proportion of 3.2% indicated they were salaried. Most (66.5%) of the respondents indicated they earn up to Ksh 15,000 with only a small proportion (2.7%) reporting a higher average income of between Ksh 75.000 to Ksh 90,000.

Most respondents (71.4%) were married, while the remainder were either widowed (10.8%) or single (17.9%). Chi square test on sociodemographic characteristics and open defecation revealed significant association between that, marital status and occupation were statistically significant χ^2 (3, N=185) = 18.63 P = <0.001 and χ^2 (4, N=185) = 4.66 P = 0.004.

This finding aligns with Orienje's (2018) study, which also reported a majority of female respondents. However, the Rural Sanitation Guide (MOH, 2022) highlights that women in many rural areas often lack decision-making power despite shouldering a greater

burden of sanitation and hygiene responsibilities. Furthermore, the results are consistent with the Kenya National Bureau of Statistics (KNBS) census report, which indicated that 7.3% of the population had never attended school.

This finding supports Sustainable Development Goal (SDG) target 6.2, which calls for universal access to adequate hygiene and sanitation and the eradication of open defecation, with particular attention to the needs of women and vulnerable populations. Economic status emerges as a critical factor contributing to open defecation (Buseinei, 2019). In line with Orienje's (2018) study, over half of the respondents earned less than Ksh 10,000 monthly. That study further established that a household's economic status significantly influences sanitation conditions, including the type and quality of facilities, maintenance, and provision of hand hygiene amenities. According to Njuguna's (2019) report, income, education level, and place of residence (rural or urban) are strong predictors of open defecation practices.

4.3 Knowledge on open defecation

The first objective of the study assessed the level of knowledge among household members through a series of knowledge-based questions. The descriptive results are presented in Table 4.2 below..

Table 4.2 Knowledge on Open Defecation

Ever sensitized on open defecation	**Frequency (n=185)**	**Percentage (100%)**
Yes	89	48.1
No	96	51.9
Total	**185**	**100.0**
Source of information	**Frequency (n=89)**	**Percentage (100%)**
CHVs	55	68.5
Public health staff	15	31.5
Total	**89**	**100.0**
Known risk to open defecation	**Frequency (n=185)**	**Percentage (100%)**
Yes	173	93.5
No	12	6.5
Total	**185**	**100.0**
Risks associated to open defecation (multiple responses)		
Diarrheal diseases	147	85.02%
Intestinal worms	78	45.1%
Unsightliness	63	36.4%
Insect/ rodent breeding	44	25.4%
Typhoid	43	25.9%
Total	**375**	**216.0**
Open defecation risk prevention		
Provision & effective latrine use	147	79.8%
Community sensitization	78	37.6%
Hand washing	63	28.1%
Sanitation dialogue	44	26.4%
Provide latrine at market centres	43	9.6%
Total	**375**	**181.5%**
How to stop open defecation		
Health Education	140	79.1%
Community involvement	59	33.3%
Law enforcement	54	30.5%
Household visit	47	26.6%
Government support to construct latrine	21	11.9%
Total	**321**	**181.4%**

In regard to respondents' knowledge on open defecation, slightly over half (51.9%) of the respondents had not heard about open defecation. Most (68.5%) of the respondent who were aware of open defecation, heard it from the community health volunteer. Majority

(93.5%) of the respondents were aware of at least one risk associated with open defecation. However, only 21.2% of the reported more than one risk associated with open defecation.

A multiple response question was asked to assess knowledge on open defecation related risks and how to prevent these risks. Diarrheal diseases were the mostly reported risk with 85.2% while typhoid was the least reported (25.9%). In respect to open defecation risk reduction, provision and effective use of latrine was suggested by majority 79.8% of the respondents followed by community sensitization which accounted for 37.6% of the respondents. The least reported risk prevention method was provision of public latrine in market centres (9.6%) In regards to ways of stopping open defecation, health education was reported by 79.1% of the respondents. Government support to construct latrine was the least suggested way of stopping open defecation. Reported by 11.9% of the respondent as indicated in table above.

Linear regression was performed to test if knowledge significantly predicted open defecation. The result was statistically significant F (1, 41.25) = 28.41, P = <0.001 R^2 = 0.42)

The FGDs acknowledged the existence of the open defecation site in the community, which they attributed to a number of reasons, including the absence of public latrine, the distance to the latrine, the locking of latrine to avoid misuse, alcoholism, ignorance, and diarrheal diseases. However, they claimed that when they could not get the key, locking of the latrine led some family members to engage in open defecation. One respondent at Kiru FGD said,

……. *"I was surprised when my children told me they saw a drunkard person defaecating in tall vegetations along the road reserve and was not minding about the road users passing by. The issue of open defecation mostly happens along the road side at night and not during the day and is alarming since unless sensitization happens at Chief's Barazas, social groups and Churches, it is difficult for such a person to stop defecating along the roadsides. Most of them are drunkards thus there is need for regular community sensitization meetings to highlight the dangers associated with open defecation along the roadsides".*

Diarrheal diseases linked to open defecation were frequently mentioned across the three FGDs. Specific risks identified included cholera, typhoid, foul odors, intestinal worms, and breeding of flies and insects. During the Kamacharia FGD, one respondent noted that,

……. *"open defecation is a source of diseases, contributed to water contamination, people eating faeces through contaminated hands and flies. Open defecation is also done in the tea bushes, sometimes it is so unsightly when picking tea leaves in some shambas that do not have pit latrines. Health authority and chiefs need to educate and enforce regulations to ensure owners of these shambas construct ordinally simple pit latrine and also provide hand washing facilities with running water and soap. Some people after picking tea leaves use their bare hands when taking food. Open defecation is also a source of intestinal worms and breeding sites for flies hence contributing to risk of faecal related illnesses" I witnessed case where fresh faeces on a roadside had live worms moving about and contaminating the soil".*

A respondent at Kiru group said,

…." Some community members believe that defecating in the shamba and burying the faeces has no problem, since human faeces turns into manure and also sewage is used as manure".

The FGDs further revealed that, one of the major reasons for open defecation is diarrhea especially if it affects someone at night. The respondents in the three FGDs were in concurrence that provision of latrine in public places such as market centers, washing of hands with soap and running water, assisting the very poor households to provide latrines, follow up of households without or with filled up latrines to provide was critical to both prevent and control the open defecation and associated health risks in the community. At Kamacharia FGD, a participant said,

……. "*Open defecation is a source of diseases in the community since those defecating in the open expose for instance the school going children to diseases when they play in such contaminated areas. Some children do not go to school because of complains of stomach upset and diarrhea, when their parents take them to the hospital they are diagnosed with intestinal worms as a result of ingestion of food using dirty bare hands. Sometimes Children may buy cakes on their way home and eat with their contaminated hands thus transmitting faecal related diseases from one person to another".* A respondent at Gitugi FGD further said,

……. *"Low economic status is a key factor contributing to lack of pit latrine resulting to open defecation by such families. In some household's pit latrines are filled up, they have no resources to put up new ones. Therefore, most children defecate in the shambas*

or within the periphery of the pit latrines for fear of these filled up pit latrines. Flies usually access faeces from those open defecation sites and also from those filled up latrines hence contaminating food stuffs. There is also high chances of these faeces getting into rivers and wells. The family may be having local material that can be used to construct a latrine but they may lack adequate resources to buy items such as nails, iron sheets, timber among other requirements which are required for latrine construction".

They however said the only way such a family can construct a latrine is by mobilizing well-wishers to assist in the construction. They further said siting of latrines far distance from the main house also contribute to open defecation especially at night thus they proposed latrines to be sited at distance of not more than ten meters to facilitate ease of access even if a person may be suffering from diarrhea.

Another respondent from Kiru FGD said

……. *"let me tell you where open defecation is practiced is near the scrap metal area near the road. The dealers just go down near the Church and defecate not one not two but many. However, they defecate in the open because the scrap metal yard owner has not provided any latrine. Another place where you cannot miss to see faeces along the road is along the bushy road near the center".*

The FGD also highlighted that raising awareness is crucial to ending open defecation. Participants in the Kamacharia FGD emphasized that simply providing latrines is insufficient without ensuring their proper use; therefore, knowledge creation is vital to prevent open defecation and improper latrine usage. Additionally, respondents noted the risk of disease transmission through flies and contaminated hands.

The 2019 JMP report, Kenya is categorized among the 17 countries where progress to eliminating open defecation by 2030 is too slow, while Ethiopia is one of five countries that are on track (WHO, 2021). This finding concurs with Busienei, J. 2019 report which indicated road sides were the key site for open defecation in Lodwar.

Despite the government efforts to implement community led total sanitation program across the country with the aim to achieve 100% open defecation free status, some respondents were unaware of open defection. The finding contradicts the Murang'a County open defecation plan annexed in the National open defecation free Kenya 2020 campaign framework. The plan had envisaged to increase the County proportion of open defecation free villages from 3% (66 villages out of 1,889 villages) to 25% by 2018. This was to be achieved through various objectives one of them being community sensitization on open defecation through Barazas, school health program, Churches, road shows and radio talks. The four years' plan had envisioned to trigger 257 villages in Mathioya Sub County (MOH, 2017).

The finding that community health volunteers are the main source of sanitation information aligns with the WHO-UNICEF Joint Monitoring Programme (JMP) 2021 report, which credits these volunteers with contributing to a 9.3% reduction in open defecation in Kenya—from 17.8% in 2000. This progress supports Kenya's commitment to Sustainable Development Goal (SDG) 6, which targets the elimination of open defecation by 2030. However, it also underscores a shortfall in meeting the Kenya Environmental Sanitation and Hygiene Policy (KESHP) 2016–2030, which emphasizes the need to scale up access to improved sanitation through enhanced community knowledge and behavior change (MOH, 2017). The WHO-UNICEF JMP report further

notes that nearly half the global population lacks access to safe sanitation, resulting in the daily deaths of approximately 1,000 children under five from diarrheal diseases linked to fecal-oral contamination. These findings reinforce the importance of knowledge creation and community engagement in eliminating open defecation. This conclusion contrasts with a study in Lodwar, which attributed persistent open defecation primarily to poor latrine design and structural deficiencies. KESHP (2016/27) similarly recognizes that infrastructure alone is insufficient; without proper latrine use, maintenance, and hygienic behavior, improved health outcomes cannot be realized. Supporting this, a meta-analysis by Gain et al. (2017) found that sanitation interventions incorporating education increased latrine coverage and use by 17%, compared to a 12% increase through Community-Led Total Sanitation (CLTS) alone—underscoring the central role of education and awareness in improving sanitation practices.

The Kenya Environmental Sanitation and Hygiene Policy 2016–2030 underscores the severe health risks associated with inadequate sanitation and hygiene, noting that over half of the population remains vulnerable to disease and mortality. Notably, more than 75% of the national disease burden is attributed to poor sanitation practices, inadequate personal hygiene, and unsafe drinking water. While the present study confirms a general awareness of the health risks linked to open defecation, it also reveals that this knowledge does not necessarily translate into the consistent provision or proper use of latrines. As a result, open defecation remains prevalent, sustaining high levels of morbidity.

To address these challenges, the Policy advocates for intensified public sensitization and awareness campaigns targeting individuals, households, and communities. It emphasizes the critical role of behavior change in fostering improved sanitation and hygiene practices

by educating the population on the adverse effects of environmental neglect and the health benefits of proper sanitation (MOH, 2017). This behavioral focus is vital for achieving long-term public health gains and reducing the burden of preventable diseases.

Furthermore, the respondents' recommendation to strengthen health education initiatives to combat open defecation is consistent with the Kenya Open Defecation Free Campaign Framework (2016/17–2019/20), which calls for raising awareness about community sanitation status and the risks of poor hygiene. The framework promotes the use of emotionally resonant messaging—such as evoking disgust—to encourage behavioral shifts and collective action toward improved sanitation (MOH, 2017). This approach also aligns with the 2012 revision of Kenya's Vision 2030, which prioritizes community health education on sanitation as a national development goal. However, as highlighted in Kosugi's 2023 report, community sensitization alone may not suffice to achieve open defecation-free status. Nevertheless, sustained behavior change communication remains indispensable in promoting and maintaining hygienic practices across households and communities.

4.4 Latrine utilization

The second objective of the study was to determine latrine utilization among household members in Mathioya Sub County, Murang'a County. To assess latrine utilization, various items from the interview schedule and observation checklist were employed. The findings of the study under latrine utilization variable are presented in Table 4.3 and Table 4.4 below.

Table 4.2: latrine utilization

Latrine users	**Frequency (n=185)**	**Percentage (100%)**
1 to5	130	70.3
6 to 10	52	28.1
11 and above	3	1.6
Total	**185**	**100.0**
Latrine sharing		
Yes	54	29.2
No	131	70.8
Total	**185**	**100.0**
Number of household sharing latrine	**Frequency (n=54)**	**Percentage (100%)**
One house hold	24	44.4
Two households	22	40.7
Three households	6	11.1
More than four households	2	3.7
Total	**54**	**100.0**

The study further revealed more than a quarter (29.2%) of the household were sharing their latrine with another household. Most (44.4%) of the households were sharing latrine with one household while those sharing with two households were at 40.7% while 3.7% were sharing with more than four households.

The study revealed most (70.1%) of the households had between 1 to 5 latrine users while 1.6% of the respondents reported more than ten users of the household latrine. The FGDs revealed that, most of the households have provided latrine for individual families and only few families share latrine. The study further revealed that a large proportion of latrine were being used by one to five persons. Approximate 30% of the households reported they share latrine with the bigger proportion sharing with one household.

Regression test on latrine provision and utilization revealed statistical significance result $F(1, 40.29) = 5.12$, $P = 0.025$, $R^2 = 0.26$).

The FGD finding further revealed some of the households had not provided latrine highlighting financial constraints as one of the main reasons. This concurs with Suri T. at el 2018 study which indicated that low income status has been associated with open defecation since such households only construct simple latrines which lack privacy, fill up quickly and are prone to collapse.

The study findings on latrine utilization were further confirmed by the FGD where the respondents indicated some household share latrines. A respondent at Kamachari FGD said,

…….. "*Not many homesteads you will find without a pit latrine, however, there is pit latrine sharing whereby due to some people defecating on the slab and anyone visiting the pit latrine after finds it difficult to use such soiled pit latrine and opt to defecate in the open. Such latrine is difficult to keep clean as no one want to take the responsibility of cleaning unlike where there is no pit latrine sharing. Secondly, repair and maintenance of such pit latrines is usually neglected thus mostly they do not offer the required privacy which may contribute to open defecation by members who are not comfortable using the pit latrine especially during the day time when other family members are outside. Pit latrine sharing mostly in homesteads is contributing to Open Defecation especially when someone is having diarrhea and finds the pit latrine is either locked or being used by another member of a household. Some of those pit latrines are constructed very far from households, some family members have fear to use them at night or when it is raining and usually defecates in the shamba and mostly children defecate behind the households"*.

Research conducted in Kenya, Ghana and Uganda has highlighted factors such as distance, cleanliness issues often stemming from latrine sharing, and long queues as

drivers for practicing open defecation or resorting to using plastic bags at home instead of shared latrines. Conversely, studies conducted in Dar es Salaam, Tanzania, have shown that latrine sharing was positively correlated with hygienically safe and functionally sustainable sanitation facilities. This could be attributed to the potential for mobilizing higher investments for such facilities in shared settings. However, according to WHO/UNICEF, shared sanitary facilities are excluded from basic safely managed sanitation facilities sighting proper use and maintenance as a major issue facing shared facilities (WHO-UNICEF, 2018).

Table 4.3: Latrines usage without accompany

Latrine usage at night	**Frequency (n=185)**	**Percentage (100%)**
Yes	87	47.0
No	98	53.0
Total	**185**	**100.0**
When latrine use is impossible		
When it is raining	68	73.9%
During the night	64	69.6 %
When sick	60	65.2%
Total	**192**	**208.7%**

The study revealed over half (53.0%) of the respondents reported that it was not possible for everyone in the family to always use the latrine at night. This was mostly during the rainy season as reported by 73.9% of the respondents and at by night time (69.6%). The occasions when it was not possible to use latrine were when it was raining and at night reported by 73.9% and 69.6% of the respondents respectively. The FGDs concurred with the finding as the respondents reported distance to the latrine and insecurity at night as the major reasons why latrine use at night was not always possible. Linear regression test revealed significant results on latrine use at night $F(1, 19.83) = 18.1$, $P = 0.025$, $R^2 = 0.27$).

The three FGDs revealed mixed responses as there were those who reported that not everybody was able to use latrine especially the children. They further reported there are times one may need to be accompanied to the latrine especially at night. A respondent at Kiru FGD mentioned insecurity prevent using latrine at night whereby some use small containers at night.

One respondent at Kamacharia FGD said,

…… *"persons fail to use the latrine sometimes due to ignorance and due to the distance from the house. In others times is due to darkness at night and also if the latrine is sited at a far distance from the house, a person may decide to defecate in the open since it is dark and no one is seeing him or her. Others do it if they have stomach upset and they are unable to reach the latrine thus they opt to defecate in the open rather than soiling themselves. Some people even practice Open Defecation near the rivers, some women saw human faeces in the river while they were fetching water for domestic use."*

Another respondent adjoined and reported that,

……. *"I visited some households and children said pit latrines were for grown-ups and hence they were defecating behind the pit latrines and houses. There are families who do not train their children how to use the latrine early enough. Such children will in most cases be defecation behind the sanitary facility purporting they are fearing falling in to the pit. There is also the mentality some community members hold, that children's faeces are not infections thus they do not take much effort for its safe disposal".*

Table 4.4: Provision of latrines, type, distance to the households and cleanliness

Latrine was provided	**Frequency (n=185)**	**Percentage (100%)**
Yes	177	95.7
No	8	4.3
Total	**185**	**100.0**
Type of latrine provided		
Ordinary pit latrine	155	83.8
VIP latrine	30	16.2
Total	**185**	**100.0**
Cleanliness of latrine		
Yes	63	34.1
No	122	65.9
Total	**185**	**100.0**
Latrine distance to the house	Frequency (n=177)	Percentage (100%)
1 to 5 metres	54	30.7
6 to 10 metres	72	40.9
11 to 15 metres	46	26.1
16 metres and above	5	2.3
Total	**177**	**100.0**

Observations made during the time of data collection revealed that, 4.3% of the visited households had no latrine. Majority (83.8%) of the provided latrines being ordinary pit latrine of which 30.7% (54) were within 1 to 5 metres, 40.9% (72) were within 6 to 10 metres and 2.3% (5) of the latrine were located 16 metres and above away from the house. The small proportion of households that had not provided latrine may contribute to significant health challenges as a result of practicing open defecation. Most 40.9% of the latrine were sited between 6 to 10 metres from the house while 2.3% were sited more than fifteen metres form the house.

In respect to distance to the latrine from the households there are those sited 30 to 40 metres especially those with ordinary latrine to avoid smell and flies from the latrine. But majority are sited 10 to 15 metres which concurs with the above finding. There are those who due to the size of the land have provided the latrine close to the household. There are few households with water borne facility whose effluent is discharged in a pit dug some distance from the household. It was further revealed open defecation is also contributed by dirty latrine as some household and public latrine are not regularly cleaned. Multilinear regression revealed significant results on distance from the house to the latrine F (2, 15.65) = 18.1, P = 0.001, R^2 = 0.055) and latrine cleanliness F (2, 184) = 35.8, P = 0.000, R^2 = 0.91)

The three FGDs concurred with most of the above findings as they reported almost all household have a latrine which are ordinary pit latrines. However, the FGD findings also revealed that there are some households without latrines. One participant reported that,

…… "most *of the households had provided ordinary pit latrines which are prone to smell and fly nuisance"*

Another respondents at Gitugi FGD reported all the households within the Ward have latrine. The discussion also reveal that anal cleansing materials were also not provided in majority of the latrines. Family conflict (were the father deny his sons to dig latrines), old age and abject poverty as reported by one respondent at Kiru FGD said

……. *"Currently digging and constructing of a latrine cannot cost less than Ksh 20,000 which most families cannot afford. There is also ignorance and lack of prioritization of pit latrines as a critical infrastructure within a household due to the attitude that is only faecal disposal. Sometimes one would like to dig and construct his or her own pit latrine*

but parents refuse to allow an area to do it and the only available pit latrine is usually locked due to family issues hence children mostly defecate in the open and behind houses".

These were mentioned as some of the reasons contributing to lack of latrines in households. Lack of prioritization for provision of a sanitary facilities coupled with ignorance may even contribute to poorly constructed latrines even by families with stable economic status.

The FGDs further revealed that, siting of latrine far from the house hindered the use of the latrine at night and when it was raining. A respondent at Kamacharia supported this finding by reporting that,

……."economic factor whereby you may find a home with abject poverty hinder provision of latrine by the families. Such a household is unable to construct a latrine even if they are told to provide as a result of the level of poverty and to provide a latrine is currently a costly affair. In one of such household I was involved in resource mobilization from well-wishers among community members to provide a sanitary facility for a poor household. There is also the issue of neglecting elderly persons by their families, and who cannot be able to construct a new facility once the one they are using is filled up. Some households have provided pit latrines but due to physical challenges, they are not properly used or not utilized at all especially when these special groups of persons are left alone in the households without anyone to assist them. Some proper designs of the pit latrine need to be done so that these special group of persons can be able to utilize them".

The study finding on the most common type of latrine in the area concurs with Njuguna, 2019 report which indicated the most common sanitary facility in Kenya are pit latrines.

However, on the siting distance of the latrine from the house, the study finding contradicted with Businei, J. 2019 study which revealed 47% of the latrines sited between 20 to 39 metres from the house.

This finding concurs with Novotný et al. 2018 study which indicated that open defecation is mainly practiced by community members with low economic status due to cost incurred to provide a latrine.

Table 4.5 Latrine cleanliness, anal cleansing and hand washing

Presence of faecal matter in latrine	**Frequency (n=185)**	**Percentage (100%)**
Yes	122	65.9
No	63	34.1
Total	**185**	**100.0**
Presence of anal cleansing materials		
Yes	83	44.9
No	102	55.1
Total	**185**	**100.0**
Presence of running water		
Yes	12	44.4
No	15	55.6
Total	**27**	**100.0**
Presence of soap		
Yes	4	33.3
No	8	66.7
Total	**12**	**100.0**
Type of soap		
Liquid soap	1	25.0
Bar soap	3	75.0
Total	**4**	**100.0**
Presence of hand washing facilities	**Frequency (n=185)**	**Percentage (100%)**
Yes	27	14.6
No	158	85.4
Total	**185**	**100.0**

Evidence of open defecation was assessed by presence of faecal matter where faecal matter was present in 65.9% of the latrine at the time of household visit. Over half

(55.1%) of the latrine lacked anal cleansing material. Majority (85.4%) of the latrines lacked hand washing facilities while most (55.6%) of the latrines with hand washing facility had no water for hand washing at the time of data collection.

Two thirds (66.7%) of the latrines provided with running water lacked soap while bar soap was the main type of soap provided for hand washing as observed in three quarters (75.0%) of the latrines.

Hierarchical linear regression revealed significant results on lack of anal cleansing material as a predictor to open defecation F (1, 41.7) = 43.1, P = 0.023, R^2 = 0.028)

The FGD respondents largely concurred with the above finding since respondents reported most of the latrines are not provided with handwashing facilities. A respondent at Gitugi FGD reported

……. *"most households have provided handwashing facilities and soap during the COVID-19 both at the latrine and the household entrance. But they had removed the hand washing facilities due to theft of the containers. Others have removed hand washing facilities due to ignorance siting waste of water and also due to lack of adequate water in their households".*

Another respondent at Kiru group support this by reporting that,

…… *"It seems people are only careful with their health when there is a real threat of death and when we experience outbreaks of cholera in our county which likely happens as a result of human faeces contaminating our rivers and environment. This is because, even with the information that COVID-19 is with us and cholera has fatal consequences, we are no longer taking the issue of hand washing seriously despite the benefits that comes with it. This is not only at home but in all settings including the public places which*

initially used to provide hand washing facilities and at time even allocated someone to ensure people wash their hands before they can be served. This is no longer happening and may be it is a high time the ministry starts to enforce such measures in all public places"

This finding aligns with the sanitation guidelines issued by the Ministry of Health (MOH), which note that handwashing facilities in rural settings are frequently temporary and easily movable, potentially undermining consistent hand hygiene practices (MOH, 2022c). However, the current study's findings appear to contrast with those of Soboksa et al. (2021), whose research demonstrated that promoting hand hygiene is a highly effective preventive measure against several health conditions, including diarrheal diseases, undernutrition, and neglected tropical diseases. In a case-control study conducted in Ethiopia's Kersa and Omo Nada districts, Soboksa et al. found that handwashing at critical times—particularly after defecation—was a significant predictor of childhood nutritional outcomes. Specifically, mothers who did not engage in proper hand hygiene at these key moments were 2.58 times more likely to have a malnourished child than those who practiced handwashing regularly.

Further evidence from a community-based cluster randomized trial in Ethiopia reinforced these findings. Households that received soap and targeted handwashing promotion materials experienced a 41% reduction in the incidence of diarrhea, compared to control households that continued existing practices without intervention (Soboksa et al., 2021). These findings emphasize the essential role of hand hygiene, particularly post-defecation, in safeguarding community health and preventing a range of illnesses.

Therefore, although the study participants may exhibit a relatively high level of knowledge regarding the health risks associated with open defecation, this awareness does not necessarily translate into the consistent adoption of effective handwashing behaviors. The findings thus highlight a gap between knowledge and practice, suggesting the need for strengthened behavior change interventions to promote sustainable hand hygiene habits.

The WHO-UNICE 2021 report indicates that lack of handwashing facilities is a risk factor to WASH related diseases thus stakeholders need to strengthen handwashing component in hygiene and sanitation programmes. The report underpinned the critical role played by supporting local sanitation and hygiene innovations to facilitate the accessibility and sustainability of handwashing practices in the community.

The study finding revealed a relatively higher proportion of latrine were not cleaned as compared to Busienei 2019 study which indicated only a 10% of the latrine were unclean. Additionally, study identified rampant cases of latrine sharing lead to unhygienic latrine conditions, which ultimately contribute to the encouragement of open defecation practices (Njuguna, 2019).

Beyond health-related outcomes, research has increasingly demonstrated the economic benefits of promoting hand hygiene, underscoring its cost-effectiveness as a public health intervention. An observational study conducted in Quebec, Canada, found that investing in hand hygiene resources represents a low-cost and highly effective strategy for reducing healthcare-associated infections (Tchouaket N. et al., 2021). This supports the growing body of evidence that preventive hygiene practices not only improve health outcomes but also reduce healthcare expenditures.

Further, the cost-effectiveness of hand hygiene extends to broader public health goals, particularly in low-income settings. A recent study addressing the economic costs of achieving universal access to basic hand hygiene—an often-overlooked component in sanitation planning—developed a model estimating the required investment across 46 least developed countries. The model indicated that promoting behavior change for hand hygiene would cost approximately US$0.47 per person, equivalent to just 4.7% of median government health expenditure and about 1% of annual aid receipts in those countries (Ross et al., 2021). These findings highlight that scaling up hand hygiene practices is not only crucial for improving health but also financially viable and sustainable for governments and development partners.

Additionally, a study highlighted significant disparities among marginalized populations. A cross-sectional study conducted across 23 low and middle-income countries revealed that nearly one in four households lacked access to adequate hand hygiene facilities, making consistent handwashing difficult (Stoler et al., 2021).

Table 4.6: Latrine construction materials and privacy

Floor type	**Frequency (n=185)**	**Percentage (100%)**
Earthen floor	5	2.7
Timber/ wooden floor	60	32.4
Rough concrete floor	50	27.0
Smooth concrete floor	70	37.8
Total	**185**	**100.0**
Superstructure	**Frequency (n=185)**	**Percentage (100%)**
Sacks/ nylon papers	10	5.4
Timber	52	28.1
Iron sheet	116	62.7
Masonry wall	7	3.8
Total	**185**	**100.0**
Roof	**Frequency (n=185)**	**Percentage (100%)**
Open roof	32	17.3
Thatched roof	3	1.6
Iron sheet roof	150	81.1
Total	**185**	**100.0**
Privacy offered by superstructure	**Frequency (n=185)**	**Percentage (100%)**
Yes	158	85.4
No	27	14.6
Total	**185**	**100.0**
Latrine filled up	**Frequency (n=185)**	**Percentage (100%)**
Yes	52	28.1
No	133	71.9
Total	**185**	**100.0**

Slightly over a third (37.8%) of the latrine had a smooth concrete floor while 2.7% of the latrine had an earthen floor. Most (62.7%) of the latrine had iron sheet super structure while 5.4% had sacks/ nylon papers for superstructure. Majority (81.1%) of the latrines

had iron sheet roofing while 17.3% of the latrine had no roof covering. Majority (85.4%) of the superstructure were reported to offer required privacy. More than a quarter 28.1% of the latrine were within the filing depth at the time of household visit for data collection. Linear regression performed on latrine utilization further revealed significant results in respect to floor type F (1, 41.7) = 11.3, P = 0. 003, R^2 = 0.216), and super structure privacy F (1, 21.7) = 10.7, P = 0. 022, R^2 = 0.58),

The FGD concurred to the fact that filled up latrine also contribute to open defecation as some household members and especially the children do not use filled up latrine. a respondent at Kiru group reported that,

……. *"Children as well as some adults cannot stand the sight of faeces in a filled-up latrine. they are usually disgusted by the sight. I once witnessed a conservation where someone said she dreads defecating in a filled latrine due to the fear of the faeces splashing back to her. Such latrines also despite being a smell nuisance and fly nuisance, they are a source of food contamination by the flies".*

The FGDs revealed that, most of the latrine superstructure (wall and roof) are constructed of iron sheet with concrete floor which concur with the above findings. The respondents further reported that there are some latrines with wooden walls and floors some of which are insecure to use as they are not stable.

Generally, the FDGs revealed most of the latrines are providing privacy. At Kamacharia, one respondent reported that, "80% of the latrines offers the intended privacy to the user". a respondent at Gitugi FGD said,

…… "*we have seen some latrine constructed with sacks and nylon papers and another one with logs for slab which even my colleague tried to check on the firmness of those*

*logs by shaking if they can securely support a person while using the pit latrin*e. *Some pit latrine have earthen floor slabs which had urine and faeces on the surface. Someone may not use it for fear of stepping on urine and faeces prompting him/her to defecate in the shamba especially at night.* S*uch types of pit latrines are usually unsafe and they are a risk due to fly and smell nuisance which discourage their use. Flies are also known to contaminate food if they are freely accessing the faeces and flying back to the house. Children from such households hardly uses the latrine due to fear of falling into the pit*". The finding concurs with the rural sanitation protocol 2022 which indicates that some household latrines are in Kenya are constructed of poor-quality materials hence limited life span. The rural sanitation and hygiene monitoring framework 2022 further provide that individuals should use durable latrine construction materials in safe environment and provided with handwashing facilities with soap (MOH 2022 a & b).

Studies have shown that simple pit latrine constructed using non-durable local materials are not sustainable and may result to open defecation. The WHO sanitation guidelines further recognize the risk associated with floor slabs that are made materials that are either non-durable or difficult to clean for they discourage sustained use of latrine (MOH 2022a & WHO_UNICEF JMP 2019).

The findings were consistent with the results of the Focus Group Discussions (FGDs), which revealed that the majority of households used ordinary pit latrines. The study further established that a significant proportion of these latrines were located at a distance of 6 to 15 meters from the main house. However, this contrasts with findings from a study conducted in Lodwar, which reported that 45% of households had their latrines situated between 20 and 39 meters away from their dwellings. In the Lodwar study, respondents

explained that the greater distance was intended to minimize unpleasant odors and reduce fly nuisance near the living areas..

The quantitative data supported the distance siting of the latrine as one respondent reported that,

……. "*due to smell and fly avoidance there is no way household will be able to site their latrines near the households. However, we need to be trained on how to construct the piped latrine which are said to control flies and smell".*

This indicated a gap in knowledge for ventilated improved latrine construction since the discussions further revealed that most of the latrines with those pipes are not better than the ordinary latrines since they harbor flies and smell nuisances.

4.5 Community led-total sanitation implementation status

The third objective of the study was to assess the implementation status of the Community-Led Total Sanitation (CLTS) program in Mathioya Sub-County, Murang'a County. The findings related to the implementation of the CLTS initiative are presented in the tables and figures provided below.

Table 4.7: Open defecation free program by County government

Open defecation free program by MOH	**Frequency (n=185)**	**Percentage (100%)**
Yes	69	37.3
No	106	62.7
Total	**185**	**100.0**
Open defecation program in the village	**Frequency (n=185)**	**Percentage (100%)**
Yes	11	15.9
No	58	84.1
Total	**69**	**100.0**
Involvement in ODF implementation	**Frequency (n=185)**	**Percentage (100%)**
Yes	29	42.0
No	40	58.0
Total	**69**	**100.0**

Almost two thirds (62.7%) of the respondents did not know of open defecation free program implemented by the ministry of health. Majority (84.1%) of the respondents reported open defecation free program had not been implemented in their village. More than half (58.0%) of the respondents were not involved in open defecation free program implementation.

Linear regression test revealed significant results F (1, 23.3) = 15.3, P = 0. 043, R^2 = 0.116)

In respect to the FGD, the participants were generally unaware of community led total sanitation program implemented in their villages. However, a number of participants in the Gitugi Ward claimed to have helped or supported a number of needy households to provide pit latrines. They further mentioned of an instance where a few young men from Kiaguthu village were summoned to the Chief camp and instructed to construct latrines for their families, which they did.

A respondent from Gitugi group reported that,

…… *"we are not involved in the latrine construction since that is the work of the government officers to make sure households provides sanitary facilities. The government should also donate resources and materials to construct pit latrines and also provide adequate water in our villages and households since without water it's difficult to improve hygiene".*

Another respondent in Kamacharia group had a contrary response by saying,

…… *"Here, many people are busy and the usually do not take much interest in what the government officers are doing. They usually ignore most government fora where the*

government initiatives are communicated to community members; thus, we might think such programme do not exist where they could be happening without the knowledge on most of us; most pretend to be very busy thus they cannot find time to attend and public meeting. Others feel it's not good to share and attend meetings and discuss on pit latrines, human faeces disposal especially together with different age groups for instance children youth and elderly".

However, the member noted that such initiatives need to be communicated through all the available channels including the churches, the schools, the local stations, organized groups and through public address system.

This finding revealed critical gaps in rolling out and involving the community members in Community Led-Total Sanitation program. In order for the community to own up and sustain any programme including CLTS programme, their understanding of the benefits of the interventions, their active involvement and participation are key. No community programme can succeeded if the community who are the main beneficiaries are left out.

The study finding contradict the rural sanitation and hygiene monitoring framework whose goal is to ensure counties have a systematic and timely community led total sanitation program with a monitoring and reporting system. The framework further recommends that at every stage of reporting, data have to be transmitted to the next higher office along the reporting chain for checking and approval. In order to effectively report and monitor the hygiene and sanitation activities in rural setting, the frontline team for which includes the Community Health Extension Workers (CHEWs), the Community Health Assistants (CHAs) and the area PHOs must well capacity built to execute this mandate (MOH, 2022b).

The rural sanitation implementation guidelines indicate that, financing rural hygiene and sanitation is a major challenge. Currently, many counties rely on donor funds to finance rural sanitation and hygiene activities in spite of the fact that counties are incurring significant cost attributable to inadequate hygiene and sanitation in terms of increased cost of health care, reduced education performance as well as reduction in productivity. These factors affect the long-term development agenda of the counties and the community at large.

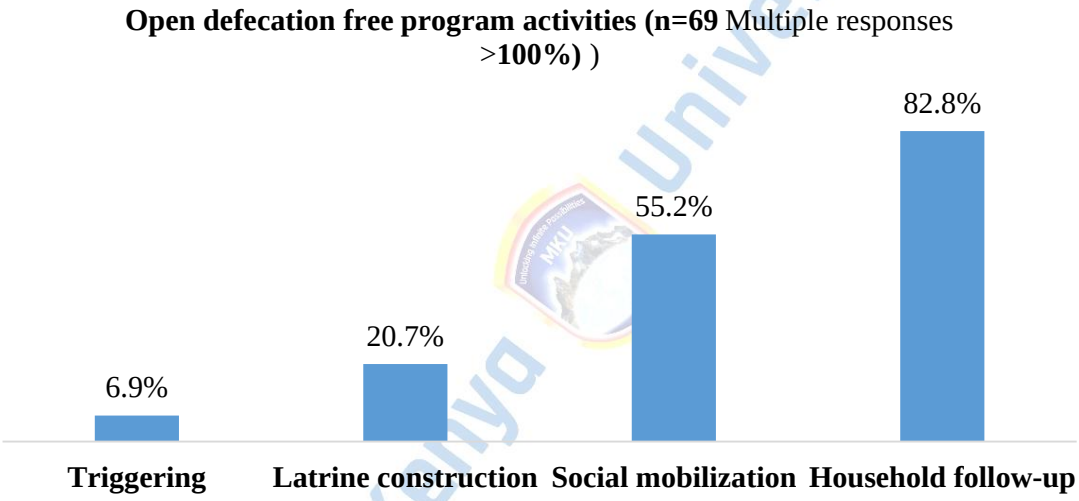


Figure 4.2: Community involvement in CLTS program implementation

Majority 82.8% had been involved in household follow up to provide latrine while 6.9% had been involved in village triggering. Other open defecation free program activities undertake are latrine construction and social mobilization reported by 20.7% and 52.4% respectively. The study revealed only 18.2% (2) Health Officer had been involved in village triggering while

majority 54.5%had been involved in community sensitization.

The MOH 2022c rural sanitation implementation guidelines provides an elaborate and concise rural hygiene and sanitation promotion process from triggering to village verification and certification for open defecation free status. In order to for the implementers to achieve this goal, they need to have the perquisite training in CLTS process. The study finding contradicted this critical requirement for a successful implementation of the CLTS program in the study area. According to Kenya Water and Sanitation Network (KEWASNET) 2020 report, categorized CLTS challenges into funding, institutional, technical, environmental and social. These together with programme monitoring and evaluation must be addressed in order to effectively implement CLTS program in a sustainable manner.

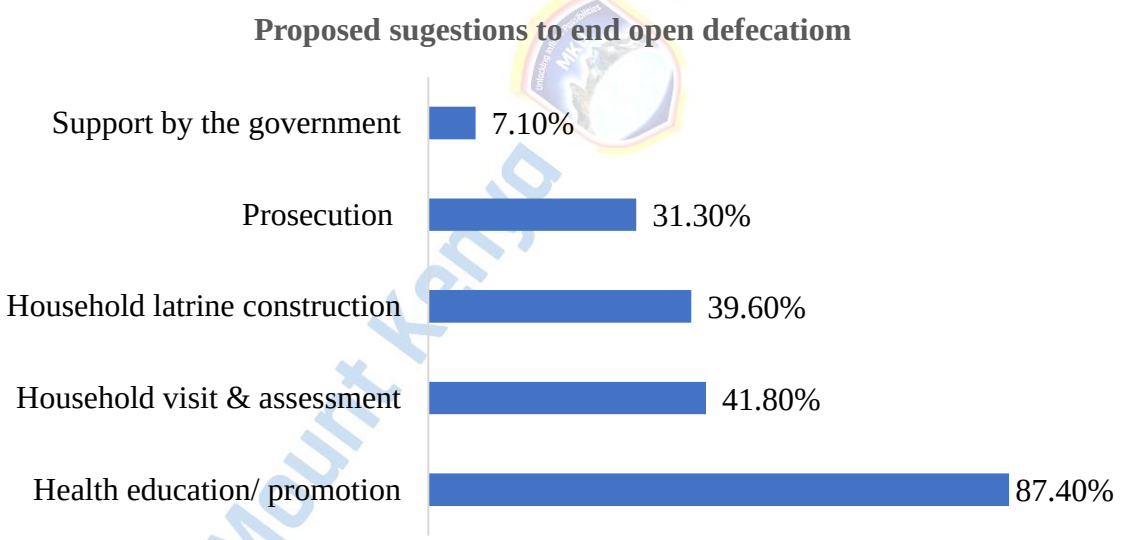


Figure 4.3: Proposed suggestion to end Open Defecation

Majority 159 (87.4%) of the respondents proposed community health education promotion as a way of ending open defecation while 7.1% (13) were of the opinion that the government should support community member to provide latrine at household level.

The FGD findings concurred with the above findings as they reported community sensitization and follow up are critical in ending open defecation within their areas.

A respondent at Gitugi group reported that,

……. *"there is a lot of health education and promotion needed to community members on how diseases are transmitted and prevented. Most community member are ignorant to disease transmission routes and usually do not care much about how they disease affected them or their children. Furthermore, they never consider the economic loss they incur from suffering from a condition they could have easily prevented by for example hand washing or drinking safe water".*

A respondent at Kiru group concurred**,**

…." *household members need to be sensitized that provision and usage of pit latrines is not enough to prevent diseases and eliminate Open Defecation but other factors need to be put in place for instance, provision and usage of anal cleansing materials, provision and usage of handwashing facilities with adequate running water and soap and also proper utilization of pit latrines helps to promote hygiene, health and prevent occurrence of diseases*".

A respondent at Kamacharia group reported,

….. *"Hygiene at any household starts by provision of either ordinally pit latrine or an improved vent-pipe pit latrine and therefore legal measures should be taken to those without any form of pit latrines and also scrap metal dealers without pit latrines since they are giving other people faeces".*

4.6 Health deficiencies factors

The fourth objective was to find out health system gaps affecting the implementation of community led-total sanitation in Mathioya Sub County Murang'a County. This was assessed by a self-administered questionnaire filled by the public health staff. The study findings were as indicated in Table 4.9 below

Table 4.8: Staff training/ sensitization

Staff training	**Frequency (n=11)**	**Percentage**
Number of PHOs	7	63.6%
Number of PHTs	4	36.4%
Total	**11**	**100.0%**
Duration in the station	**Frequency (n=11)**	**Percentage**
1 to 3	1	9.0%
4 to 7 years	6	54.6%
Over 7 years	4	36.4%
Total	**11**	**100.0%**
Ever trained/ sensitized	**Frequency (n=11)**	**Percentage**
Yes	3	27.3%
No	8	72.7%
Total	**11**	**100.0%**
Involved in CLTS implementation	**Frequency (n=11)**	**Percentage**
Yes	6	54.5%
No	5	45.5%
Total	**11**	**100.0%**
Presence of reporting tools	**Frequency (n=11)**	**Percentage**
Not available	11	100.0%
Total	**11**	**100.0%**
Presence of reporting system		
Not available	11	100.0%
Total	**11**	**100.0%**

The study revealed only 27.3% of the Public Health Officer in the Sub County had ever been trained or sensitized on Community Led-Total Sanitation. Over half 54.5% of the officers have ever been involved in CLTS implementation. Most (54.6%) of the staff had stayed in the study area for between 4 to 7 years while 36.4% had worked in the study

area for more than 7 years. The study further revealed lack of reporting system for CLTS activities. The study finding contradicts the rural sanitation implementation guidelines which provides that institutional triggering as a key component to the success of hygiene and sanitation activities. This entails the sensitization and training of leaders, decision makers and key stakeholders on community led-total sanitation approach in order to effectively participate and support hygiene and sanitation improvement activities in the county (MOH, 2022c).

Table 4.9: Hierarchical regression analysis

Model Summary

					Change Statistics				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**R Square Change**	**F Change**	**df1**	**df2**	**Sig. F Change**
1	.066[a]	.194	.001	.476	.004	14.791	1	182	.028
2	.036[b]	.112	.010	.489	.001	26.113	1	186	.037
3	.098[c]	.076	.004	.475	.010	31.758	1	172	.011

Predictors: (Constant), Knowledge on open defecation

Predictors: (Constant), Latrine utilization

Predictors: (Constant), Implementation of community led total sanitation

The results of a hierarchical regression show that the inclusion of knowledge accounted for 19.4% variance in open defecation ($R^{2\Delta}$ 0.194 R^2 0.194, *F* (1, 182) = 14.79), P = 0.028, and the results show evidence of effect of knowledge on open defecation (β = 0.084, CI 0.023, 0.64, P = 0.028). inclusion of latrine utilization added additional 11.2%

R^2 F (1, 186) = 26.11), P = 0.037 which significantly predicted open defecation (β = 0.177, CI 0.029, 0.308, P = 0.037). the analysis further shows addition of community led total sanitation implementation program added 7.6 % variance to open defecation R^2 F (1, 172) = 31.75), P = 0.011 which also significantly predicted open defecation (β = 0.046, CI 0.062, 0.75, P = 0.011).

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter encapsulates the summary, conclusions, and recommendations drawn from the findings of the study variables.

5.1 Summary

The respondents' demographic characteristics revealed that the majority were female, with most aged over sixty years. Most respondents had attained primary level education, and the majority were married. The average family size in most households ranged from four to six members. Regarding occupation, the majority were farmers earning up to Ksh 15,000 monthly, while only a small proportion reported an average monthly income exceeding Ksh 60,000.

The study revealed a relatively high level of knowledge about open defecation and its associated risks. However, despite this awareness, evidence of open defecation persisted in the study area, mainly attributable to ignorance among community members, financial constraints, alcoholism, and lack of latrines in public places such as market centres. There was a notable gap in knowledge on the risks of open defecation, as only a small proportion of respondents could mention more than one associated risk. To mitigate these risks, the majority of respondents recommended the promotion of health education, followed by increased community involvement in hygiene and sanitation activities.

The study further revealed majority of the households were not sharing latrine which is commendable as it is recommended by the WHO. Majority of the household have a maximum of six latrine users. Despite the high proportion of household not sharing the latrine and the few numbers of users, this did not reflect the required status of latrine

cleanliness since about two thirds of the latrines were dirty with of faecal matter was observed at the time of the study. The study further revealed low hygiene practices since majority of latrines lacked handwashing, running water and soap for handwashing after latrine use.

The study uncovered a concerning lack of understanding regarding the implementation of the Community Led Total Sanitation program by the Ministry of Health, as the majority of respondents were unaware of its existence in the study area. Additionally, among those who were aware of the program, only a few reported any involvement in its activities. Merely a small proportion of respondents had participated in community triggering, which is fundamental for instigating behavioral change towards sanitation and ensuring sustainable hygienic practices within the community. Majority of respondents suggested health education promotion as a crucial approach to eradicating open defecation in the community.

The study uncovered a deficiency in the training of CLTS implementers, indicating a lack of necessary skills to carry out hygiene and sanitation activities in accordance with the Kenya open defecation roadmap and rural hygiene and sanitation implementation guidelines. Furthermore, there was an absence of a support system for community-led total sanitation implementation, reporting, monitoring, and evaluation in the study area.

5.2 Conclusion

i. Regarding knowledge of open defecation, the study revealed that fewer than half of the respondents had received sensitization on the issue. Additionally, knowledge about the risks associated with open defecation was found to be low, as only a small proportion of respondents were able to identify more than one related risk. This indicates a knowledge gap in open defecation and associated risks. Community Health Volunteers were identified a major source of information to household members.

ii. In regard to latrine utilization the study revealed a poor latrine usage and practices among the household members as evidenced in presence of faecal matter in the latrine slab. Further the study revealed lack of handwashing facilities, absence of running water and soap as well as anal cleansing materials. The study also found some households which either had no latrines or they had filled up latrines. Further the study revealed that some latrines were cited a far distance from the house thus rendering them unusable particularly during the night and when it was raining.

iii. Regarding the implementation of the Community Led Total Sanitation program in the county, the study indicated that community members had a poor understanding of the program.

iv. Regarding health system support, the study revealed critical gaps in skills and necessary support systems required to effectively implement the Community Led Total Sanitation program in the study area. Public health officers demonstrated inadequate capacity to plan, implement, monitor, and evaluate the program.

5.3 Recommendation

i. The study recommends that the Mathioya Sub County Health Management Team (SCHMT), in collaboration with the County Health Management Team (CHMT), develop strategies to build community capacity on open defecation elimination to eradicate the practice in the area. Furthermore, the SCHMT, together with the Community Health Services Coordinator (CHSC), should enhance the capacity and engagement of Community Health Volunteers (CHVs) to effectively promote sanitation and hygiene behavior change messages at the household level.

ii. In relation to latrine utilization the study recommends that, the Sub County Public Health Officer together with his field officers to follow up households without, and those with filled up latrines to provide new ones.

They also need to ensure that household members provide handwashing facilities equipped with running water and soap, maintain latrine cleanliness, and supply appropriate anal cleansing materials to promote hygiene and effectively eliminate open defecation in the area.

In order to avoid latrine siting very far from the house it is critical for the Sub County Public Health personnel to promote appropriate sanitation technologies such as Ventilated Pit Latrines (VIPs) which can be cited near the house due to its ability to control odor and flies' nuisances.

iii. In regard to community led total sanitation implementation, the SCHMT and the CHMT must ensure community involvement and participation for ownership and provision of latrines to render the area open defecation free

iv. The study recommends that the County Government strengthens the capacity of all implementers involved in the Community-Led Total Sanitation (CLTS) program by providing comprehensive training, adequate resources, and continuous technical support to enhance program effectiveness within the study area. Furthermore, it is imperative to establish a robust and sustainable monitoring and evaluation framework to regularly assess the status of open defecation, both within the study area and across Murang'a County. This will facilitate timely interventions and inform data-driven policy and resource allocation decisions.

5.4 Areas of further study

The study acknowledges a limitation in its inability to identify other potential confounding factors that may influence open defecation practices in Murang'a County. As such, further research is recommended to explore and analyze additional socio-cultural, environmental, and structural determinants that may contribute to the persistence of open defecation. Understanding the full range of influencing factors is essential for developing comprehensive and context-specific interventions aimed at achieving sustainable sanitation outcomes in the region.

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Appendices

Appendix 1 Consent Form

My name is **Charles Wanjohi Mwangi**, a Master's student in Community Health and Development at the Mount Kenya University. 1 am conducting entitled **"Determinants of Open Defecation among Community Members in Mathioya Sub County, Murang'a County, Kenya".**

You have been randomly selected to take part in this study. Participation is entirely voluntary. If you agree, I will ask you several questions about open defecation in this area. You may decline to participate or withdraw at any time

Your identity will not be requested or recorded and all responses will remain anonymous.

Study results will be shared through feedback meetings, conference presentations and publication.

There is no personal reward for taking part, but your honest answers will help us better understand and ultimately address the factors that sustain open defecation in this community.

The interview will take twenty to 20-25 minutes. Thank you for considering this request.

Respondent's declaration (*kindly tick appropriately – to participate in the study, the respondent must consent to the five declaration points listed below*)

Respondent's declaration (*kindly tick appropriately – to participate in the study, the respondent must consent to the five declaration points listed below*)

i. I acknowledge that the researcher has explained purpose of the study and has satisfactory all my questions and concerns [ ]
ii. I understand that my participation is voluntary and that I may withdraw from the study at any time [ ]
iii. I have also been assured that, my answers will stay anonymous and will be used solely for this research [ ]
iv. I have given the research authority to professionally disseminate the study findings through the available academic channel including publication [ ]
v. I hereby volunteer to participate in the study [ ]

Participant signature …… Date ……

Researcher signature …… Date ……

Appendix 2: Interview schedule

1.0 Demographic data

1. Gender of the respondent

(i) Male [ ]

(ii) Female [ ]

iii) Others (specify) …...

2. Religion affiliation

(i) Christian [ ]

(ii) Muslim [ ]

(iii) Others (specify) …….

3. Age of the respondent

i. 18 to 20 years [ ]
ii. 21 to 30 years [ ]
iii. 31 to 40 years [ ]
iv. 41 to 50 years
v. 51 to 60 years
vi. Over 60 years [ ]

4. What is you highest level of education attained

(i) No formal education [ ]
(ii) Primary [ ]
(iii) Secondary [ ]
(iv) Tertiary/ college [ ]
(v) University [ ]

5. What is your main occupation/ or source of income?

(i) Self-employed/ business [ ]
(ii) Salaried/ employed [ ]
(iii) Casual worker [ ]
(iv) Farming [ ]
(vi) Others (specify) ……..…

6. What is your marital status?

(i) Single [ ]
(ii) Married [ ]
(iii) Separated/ divorced [ ]
(iv) Others (specify) ……

7. What is your average monthly income in Ksh?

(i) Up to 15,000 [ ]
(ii) Ksh 15,001 – 30,000 [ ]
(iii) Ksh 30,001 - 45,000 [ ]
(iv) Ksh 45,001 – 60,000 [ ]
(v) Ksh 60,001 to 75,000 [ ]
(vi) Ksh 75,001 to 90,000 [ ]
(vii) Over Ksh 90,000

8. How many family members are in your household?

(i) 1 to 3 members [ ] (ii) 3 to 6 members [ ] (iii) 6 to 9 members [ ]

(iv) 9 to 12 members [ ] (v) Over 12 members [ ]

2.0 Knowledge on **Open Defecation**

8. Have you ever heard about open defecation (i) Yes [ ] (ii) No [ ] ***(if No skip to 11)***

9. If Yes; what was the source of information **(*Do not read the options*)**

(i) Radio [ ]

(ii) Television [ ] (iii) CHVs [ ] (iv) Health Officer [ ]

(v) Others (specify) ….....

10. Do you know any health risks associated with open defecation?

(i) Yes [ ] (ii) No [ ] ***(if No skip to 13)***

11. If Yes; what are the dangers associated with open defecation? **(*multiple response* - do not read the answers)**

(i) Diarrheal diseases [ ]

(ii) Intestinal worms [ ]

(iii) Breeding of insect and rodents [ ]

(iv) Unsightliness [ ]

(v) Others (specify) …….

12. How can you prevent yourself from the above risks? **(*multiple response - do not read the answers)***

(i) Provision and effective use of latrine at household level [ ]

(ii) Community sensitization on disease prevention and control [ ]

(iii) Regular sanitation dialogue [ ]

(iv) Provision of latrines at markets and shopping centres [ ]

(vi) Others (specify) …….

13. In your opinion, what do you think should be done to stop open defecation?

(i) Health education [ ] (ii) Law enforcement [ ] (iii) Community participation [ ]

(v) Regular household visits [ ] (vii) Others (specify) ……

3.0 Latrine utilization

14. How many persons use your household latrine *(if provided)*? ..... persons.

15. Do you share your latrine with other households? (i) Yes [ ] (ii) No [ ] **(*if No skip to Question 18)***

16. If Yes; how many households?

i. One household

ii. Two households

iii. Three households

iv. More than three households

17. Is it possible for every household member to use the latrine at night without being accompanied by other household member? i) Yes [ ] (ii) No [ ] (iii) Others ……...

18. Are there instances when any of your household member is not able to use the provided latrine? (i) Yes [ ] (ii) No [ ]

19. If yes, which are some of these instances?

i. When they are sick [ ]

ii. At night [ ]

iii. When it is raining [ ]

iv. Others (specify) ……..

4.0 CLTS implementation status

20. Is the ministry of health implementing any strategy/ program to stop OD? i) Yes [ ] (ii) No [ ] (iii) Don't know [ ] (iv) Others (specify) ……..

21. If Yes, is it being implemented in your village? i) Yes [ ] (ii) No [ ]

22. Have you ever been involved in its implementation? i) Yes [ ] (ii) No [ ]

23. If Yes, what are the main activities that you participated in in the program? ***(multiple responses)***

i. Village triggering [ ]

ii. Follow up of households to provide latrine [ ]

iii. Latrine construction [ ]

iv. Community mobilization to provide latrine [ ]

v. Others (Specify) ……

24. What would you propose to be done in order to stop OD practice? ***(multiple responses)***

i. Community health promotion/ education [ ]

ii. Continuous household visit and assessment [ ]

iii. Support for households to provide latrine [ ]

iv.Prosecution of households without latrine [ ]

v.Others (Specify) ……..

Appendix 3; Questionnaire guide

	General questions	**Response**
	What is your current designation?	
	For how long have you worked in the current station (in years)?	
	CLTS implementation capacity	**Response**
	Have you ever been trained on CLTS? For how many days? and When was the training?	
	Have you ever taken part in CLTS implementation and how have you participated?	
	CLTS implementation support	**Response**
	Availability of reporting tools	
	Availability of support system	

Appendix 4; Observation Check list

	Item to check	**Tick appropriately**	
	Presence of a latrine for the household	Yes ☐ No ☐	
	Type of latrine in use (give the description of the latrine	Ordinary pit VIP latrine Water borne	
	Approximate distance from the house to the latrine in metres	_____ metres	
	Floor type – describe using the material used for the slab floor	Earthen floor Wooden floor Concrete (rough) Concrete (smooth)	
	Material used for superstructure – give the description of the materials used for super structure and the roof	**WALLING** Sacks Mud Timber Iron sheet Masonry wall	**ROOFING** Open roof Thatched Iron sheet
	Latrine was clean at time of visit	**Yes**	**No**
	Latrine is able to offer required privacy	**Yes**	**No**
	Presence of fecal matters on floor/ at the aperture	**Yes**	**No**
	Presence of anal cleansing material	**Yes**	**No**
	Presence of a hand washing facility	**Yes**	**No**
	Distance from the latrine to the hand washing facility (in metre)	_____ metres	
	Presence of running water in the hand washing facility at the time of visit	**Yes**	**No**

.	Presence of soap at the hand washing facility at the time of visit	**Yes** **No**
.	Type of soap present	Liquid Bar soap
.	Was the latrine filled up at time of visit	**Yes** **No**

Appendix 5: Focused Group Discussion Guide

1. **What is the level of knowledge on open defecation?**

- Health risks associated with Open Defecation
- Knowledge on Open Defecation risk reduction

2. **Which are the common types of latrine used by the community?**

- Privacy
- Security
- Distance to the house
- Construction materials

3. **How has the community participated in CLTS?**

- Natural leaders
- Latrine construction
- Provision of hand washing facilities
- Provision of soap

4. **What are the factors contributing to open defecation in the community?**

Appendix 6: Mt Kenya ERC clearance letter

Mount Kenya University

REF: **MKU/ISERC/2968**
TO: **CHARLES WANJOHI MWANGI**

Date: 27 July 2023

REG: **MCHD/2022/49948**

Dear Sir/Madam,

RE: DETERMINANTS OF OPEN DEFECATION AMONG COMMUNITY MEMBERS IN MATHIOYA SUB COUNTY, MURANG'A COUNTY, KENYA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **2012.** The approval period is **27/07/2023 - 26/07/2024.**

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**

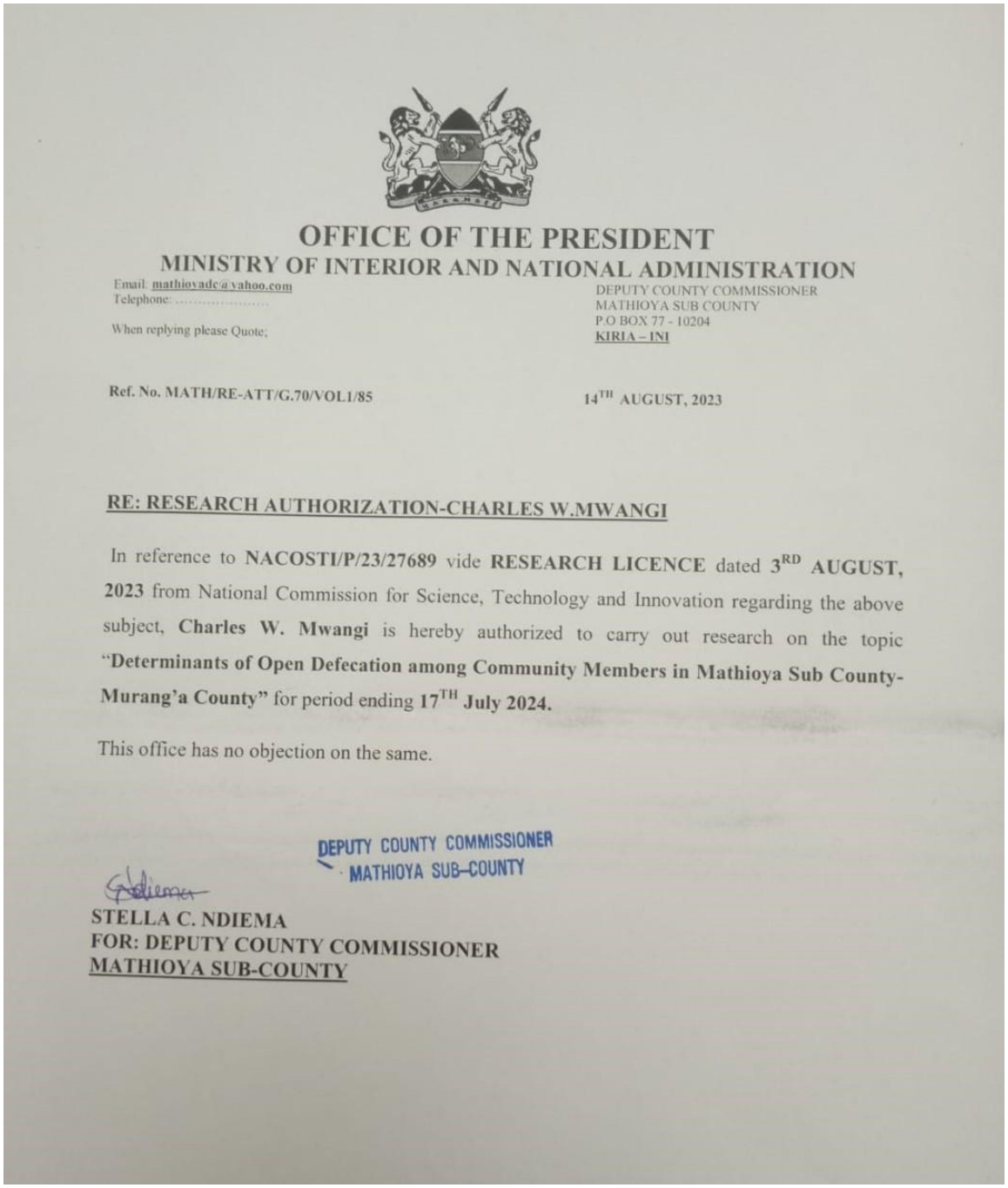
Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

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

Yours sincerely,

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

Appendix 7: Murang'a County clearance letter



OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND NATIONAL ADMINISTRATION

Email: mathioyadc@yahoo.com
Telephone: .....

When replying please Quote;

DEPUTY COUNTY COMMISSIONER
MATHIOYA SUB COUNTY
P.O BOX 77 - 10204
KIRIA – INI

Ref. No. MATH/RE-ATT/G.70/VOL1/85

14TH AUGUST, 2023

RE: RESEARCH AUTHORIZATION-CHARLES W.MWANGI

In reference to **NACOSTI/P/23/27689** vide **RESEARCH LICENCE** dated **3RD AUGUST, 2023** from National Commission for Science, Technology and Innovation regarding the above subject, **Charles W. Mwangi** is hereby authorized to carry out research on the topic "**Determinants of Open Defecation among Community Members in Mathioya Sub County-Murang'a County"** for period ending **17TH July 2024.**

This office has no objection on the same.

DEPUTY COUNTY COMMISSIONER
MATHIOYA SUB-COUNTY

STELLA C. NDIEMA
FOR: DEPUTY COUNTY COMMISSIONER
MATHIOYA SUB-COUNTY

Appendix 8: Murang'a County Health Department clearance letter

MURANG'A COUNTY GOVERNMENT

Telephone: (060) 30244,
Fax: (060) 30244,
When replying please quote,

REF: MRG/CDH/GEN./Vol.1

DEPARTMENT OF HEALTH

COUNTY DIRECTOR OF HEALTH,
MURANG'A COUNTY,
P. O. BOX 69,
MURANG'A

DATE: 15TH AUGUST 2023

TO WHOM IT MAY CONCERN

RE: AUTHORIZATION TO COLLECT RESEARCH DATA
CHARLES MWANGI

The above mentioned officer has been permitted to collect data for his academic research titled 'Determinants of Open Defecation among Community Members in Mathioya Sub County, Murang'a County.'

Please accord him any necessary support.

COUNTY HEALTH DIRECTOR/CO-ORDINATOR
MURANG'A COUNTY
DATE:.....
P. O. BOX 69-10200 MURANG'A.

DR. KAIRO KIMENDE
DEPUTY COUNTY DIRECTOR OF HEALTH
MURANG'A COUNTY

Appendix 9: NACOSTI introduction letter

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MCHD/2022/49948

27th July, 2023

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

Dear Sir/Madam,

RE: CHARLES WANJOHI MWANGI- REGISTRATION NO. MCHD/2022/49948

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

The title of the research is **"Determinants of Open Defecation among Community Members in Mathioya Sub County, Murang'a 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 **August, 2023 and October, 2023.**

Any assistance accorded to the student will be highly appreciated.

Thank you.

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

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: 020-2878 000, Cell: +254 709 153 000
Email: info@mku.ac.ke, Web: www.mku.ac.ke
Chartered and ISO 9001 : 2015 Certified Institution.

Appendix 10: NACOSTI License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **918783**

Date of Issue: **03/August/2023**

RESEARCH LICENSE

This is to Certify that Mr.. Charles Wanjohi Mwangi 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 Muranga on the topic: DETERMINANTS OF OPEN DEFECATION AMONG COMMUNITY MEMBERS IN MATHIOYA SUB COUNTY; MURANG\'A COUNTY for the period ending : 03/August/2024.

License No: **NACOSTI/P/23/28369**

918783

Applicant Identification Number

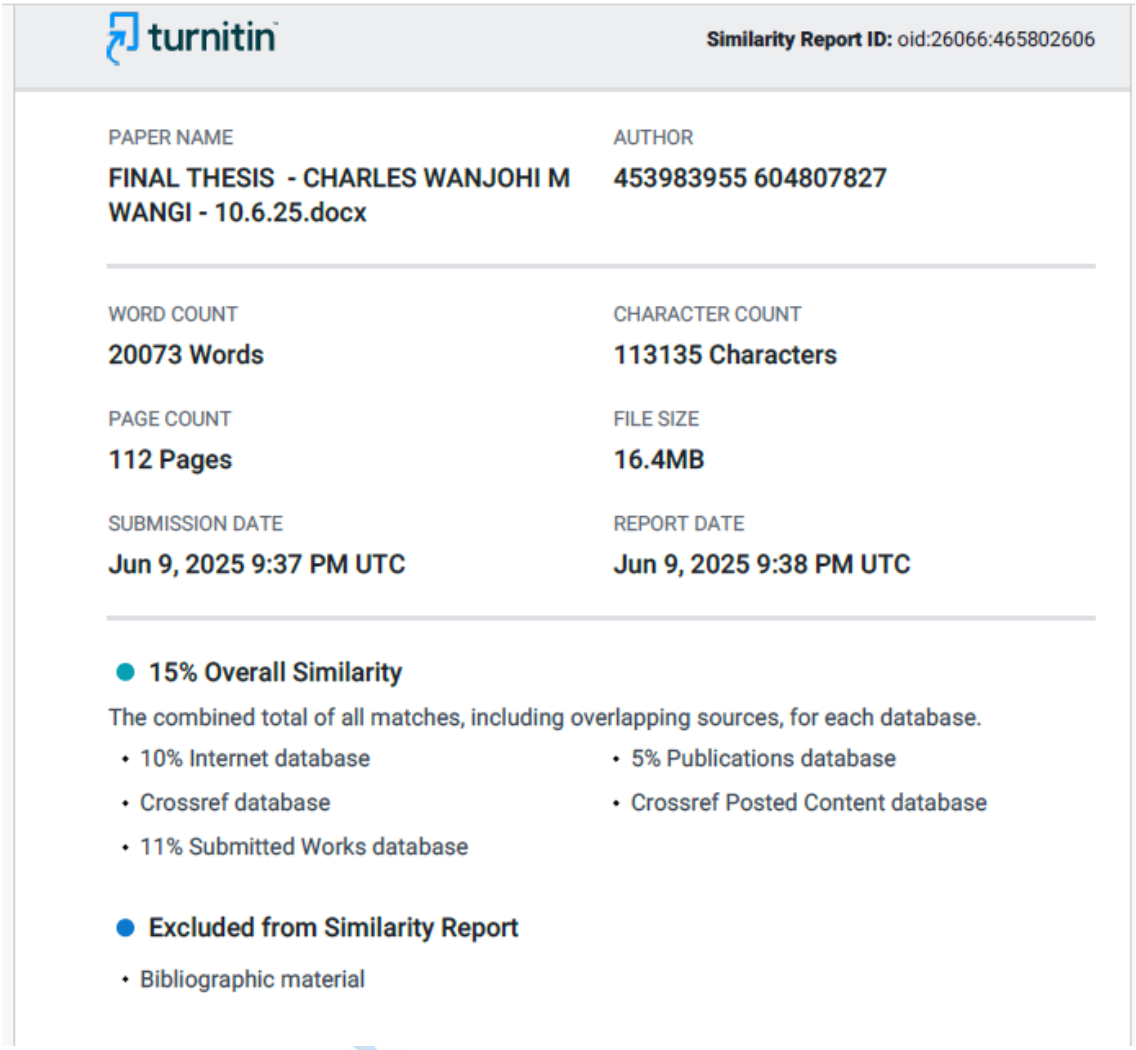
Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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

See overleaf for conditions

Appendix 11: Turnitin summary report



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1ppendix 12: Map of Murang'a County indicating the study area