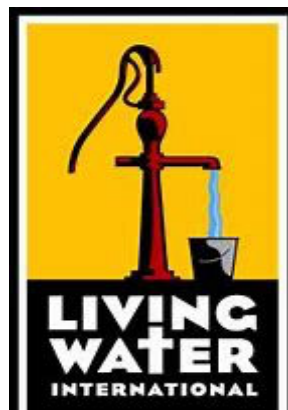


**EVALUATION OF FACTORS CONTRIBUTING TO SUSTAINABILITY OF OPEN  
DEFECATION FREE STATUS OF COMMUNITIES IN BUTERE SUB-COUNTY,  
KAKAMEGA COUNTY, KENYA**

**BY**



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**DECEMBER 2021**

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## **ACKNOWLEDGEMENTS**

The research team would like to thank the various stakeholders including program beneficiaries for their cooperation in participating in this study.

The team is also grateful to Living Water Africa Regional office and Living Water Service Centre country office technical teams whose assistance was paramount in handling all the field logistical support for data collection and overall review of the report.

Lastly, the team is also grateful for the support rendered by the enumerators in data collection.

Remain blessed.

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## EXECUTIVE SUMMARY

Sustainability is a complex concept, which is an integration and interconnection of environmental health, social equity, and economic vitality to create thriving, healthy, diverse, and resilient communities for this generation and generations to come.

Sustainability in villages previously declared open defecation free is demonstrated when the general trend of Open defecation free status is maintained with positive behavior change and scaling up the sanitation ladder. Sustainable sanitation for all is currently one of the key challenges in the wider Water, Sanitation and Hygiene (WASH) programming. The study sought to establish demographic and socio-economic factors, and how behaviour change communication and management structures influence sustainability of open- defecation-free status of communities in Butere Sub County, Kakamega County.

The study provides useful information to address the challenges facing sustainability of open-defecation-free status, inform and enable the government and WaSH stakeholders to understand their contribution to sustainability and achievement of desired goals. The results will be useful in the formulation and implementation of policies, strategies, and guidelines for post ODF interventions.

The study design was a cross-sectional survey, which collected both qualitative and quantitative data. Primary data was collected by observing and interviewing household's members, on sanitation and hygiene practices and sustainability of ODF status in villages. The study was done in three out of five wards namely: Marama Central, Marama West and Marenyo – Shianda with a study population of 8685 households, from 97 ODF declared villages with a sample size of 397 households.

Cluster sampling approach was used for quantitative survey where the population was clustered into villages and sampled households distributed proportionately based on the number of households in the ODF villages. Simple random sampling method was used to identify households and ensure that each household had an equal chance of being selected. Purposive sampling approach was applied for the qualitative survey. Kobo Collect mobile application was used for primary data collection. Quantitative data was collected using household questionnaires and analysed by using SPSS version 25.0 and Microsoft (MS) Excel, while qualitative data was collected using observation checklist, focus group discussions, and key informant interview guides and was transcribed manually and analysed thematically. Findings from quantitative data analysis were presented using tables and charts and final report documented using MS word.

The study found that 97% of the households still had a functioning latrine. If ODF sustainability status was equated to households having a functioning latrine, then the rate of reversion (or 'slippage') was just 3%.

The study used a range of CLTS non-negotiable parameters to award ODF status for a village and each household was expected to have the following indicators.

- A functional sanitation facility with a superstructure and evidence of use (a well-trodden path)
- Absence of human feces in the surrounding of the house
- A sanitation facility that offers privacy
- A functional handwashing facility inside/near the sanitation facility (presence of water and soap, ash, or detergent), and evidence of use – a well-trodden path
- Presence of a drop hole cover.

Out of the 97% of households that had functional sanitation facilities, 95% had no visible signs of open defecation around the household and 2% practiced open defecation. Correspondingly, 78 % of households had sanitation facilities with privacy denoting a reversion rate of 22 %.

With respect to hand washing facilities and the presence of soap or ash and drop hole covers only 13% and 30% of households respectively complied increasing the reversion rate to 87% and 70%, respectively. If all five non-negotiable parameters are applied, the ODF sustainability rate in Butere sub-county stands at 13% depicting an overall reversion/slippage rate of 87%.

The finding shows that CLTS programs have been successful at getting households to build – and retain – latrines and have been less successful at achieving improvements in hygiene behaviors. In particular, the programs have not resulted in households continuing to maintain handwashing facilities supplied with water and soap/ash and drop hole cover.

The main motivating factors for maintaining the ODF status included comfort convenience, and health. The major enabling factors were availability of locally available material, land, and low-cost labour.

The study established a significant relationship between ODF sustainability and demographic factors (age, and level of education). However, gender, marital status, family size and number of children aged below five years in the household did not influence sustainability of ODF status. Socio-economic factors such as employment, income and social status positively influenced sustainability of ODF status. It was determined that behaviour change communication influenced sustainability of ODF status when the sanitation messages come from local churches, health officials, community dialogues and community involvement in CLTS triggering. The study established that law governing sanitation and hygiene practices positively influenced sustainability of ODF status.

Sanitation and hygiene programming in Butere sub county proved effective as ascertained by the post ODF follow-ups in the communities by county government officials together with community health volunteers which resulted to households retaining sanitation coverage, along with



sanitation facilities that offered privacy, and households free from human excreta in the compound. Despite the frequent Post ODF follow-up, the study observed low coverage sanitation facilities fitted with drop hole covers and hand washing facilities lacking soap and flowing water at the point of the study. Therefore, the study concludes that there is significant reversion rate from 100% ODF status compliance to 13%, based on the two non-negotiable parameters that were not sustained by the communities. It further concludes that the more demanding the parameters / criteria the more slippage communities can potentially experience.

Based on the findings and conclusions the study made the following recommendation:- Government, LWI and partners to capitalize on age and level of education during awareness creation to promote sustainability of ODF status, by targeting the less educated and illiterate individuals with right S&H promotion messages in communities. Sustainable sanitation is positively linked to education, employment and social status, governments should increase investment in education, creating jobs as these are long-term and sustainable measures to manage the sanitation crisis. Increase awareness campaigns on simple-to-use hand washing points and drop hole covers to enhance proper hygiene and sustainability of ODF status. Explore positive sanitation messaging channels for behaviour change communication through churches, mosques, health facilities and community meetings. Increase awareness of law governing sanitation and hygiene practices to positively influence sustainability of ODF status. Enforce adherence to laws, regulations and policies governing safe sanitation and hygiene practices to sustain ODF status. Further studies need to be conducted to evaluate the prompts of handwashing and use of drop hole covers.

## **ACRONYMS AND ABBREVIATIONS**

|   |  |
|---|--|
| BCC                                     | Behaviour change communication                     |
| CLTS                                    | Community led total sanitation                     |
| CHAs                                    | Community Health Assistants                        |
| CHVS                                    | Community Health Volunteers                        |
| FBO (Faith Based Organizations)         |  |
| FGD                                     | Focus group discussion                             |
| KES                                     | Kenyan shillings                                   |
| KII (Key Informant Interviews)          |  |
| KIWASH                                  | Kenya integrated water sanitation and hygiene      |
| LWAR                                    | Living Water Africa Region                         |
| LWI (Living Water International)        |  |
| LWSC (Living Water Service Centre)      |  |
| MS                                      | Microsoft  |
| NGO (Non-Governmental Organizations)    |  |
| OD (Open Defecation)                    |  |
| ODF                                     | Open defecation free                               |
| PHOs                                    | Public health officers                             |
| SCT                                     | Social cognitive theory                            |
| SDG (Sustainable Development Goals)     |  |
| SLT                                     | Social learning theory                             |
| S&H                                     | Sanitation and Hygiene                             |
| SPSS                                    | Statistical package for social scientists          |
| TPB                                     | Theory of planned behaviour                        |
| UNICEF (United Nations children's Fund) |  |
| USAID                                   | United states agency for international development |
| WASH                                    | Water sanitation and hygiene                       |
| WHO                                     | World Health Organisation                          |
| WSP                                     | Water and sanitation program                       |
| WPA                                     | WASH Programme Area                                |

## **DEFINITION OF TERMS.**

**Open Defecation Free** – This refers to when no faeces are openly exposed to the environment. Achieving ODF might involve the use of any form of latrines that prevent exposure of faeces to the environment with provision for moving up the sanitation ladder.

**Open defecation** refers to the practice of defecating in fields, forests, bushes, bodies of water, or other open spaces. (JMP WASH data 2020)

**ODF sustainability** sustainability of ODF villages is indicated when the general trend in a community is to go up the sanitation ladder. (Kar & Chamber, 2008),

**Slippage:** The return to previous unhygienic behaviors or the inability of some or all community members to continue to meet all ODF criteria”. (Jerneck et al. 2016).

**Certification** – This is the official confirmation and recognition of Open defecation free status. For quality control and to ensure strict compliance to the guidelines for certification, official confirmation should be done at State level.

**Verification** – This is inspection carried out to assess whether a community is ODF.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background of the Study

Globally, two (2) billion people lack basic sanitation such as toilets, of which 673 million still practice open defecation in water bodies, bushes, fields, beaches, and street drains (UNICEF/WHO, 2019). Poor sanitation is associated with infectious diseases including trachoma, schistosomiasis, soil-transmitted helminths, typhoid, polio, cholera, dysentery, and diarrhea (Boisson et al., 2016). Diarrheal diseases are leading causes of child mortality and remain a significant killer in low and middle-income countries, but is preventable through improved water, sanitation, and hygiene practices. Studies have also shown that poor sanitation linked to environmental enteropathy and stunting, which results in low productivity in adulthood, lower cognitive development, and increased risk of infectious diseases (Mbuya & Humphrey, 2016).

Recent reports have shown a drop in the number of individuals who practice open defecation in many parts of the world. However, for Sub Saharan countries, the number of people defecating in the open has increased from 214 million to 220 million (World Health Organization, 2017). While JMP 2020 showed that more than 5% of the population still practiced open defecation in 55 countries. Nine out of ten people practicing open defecation lived in two regions: Central and Southern Asia (233 million) and Sub-Saharan Africa (197 million). This is due to high population growth rate in Sub-Saharan Africa and the unsustainability of ODF-certified communities.

The ODF slippage rate in Africa is 10-13% per year, based on sub-optimal latrine utilization and open field defecation (Tyndale-Biscoe et al 2013). These studies show that ODF villages are not sustainable, and that Africa is far from attaining SDG (Sustainable Development Goals) 6 target 6.2 which calls for *an end to open defecation urging for universal access to sanitation services, and emphasizes dignity, equity, gender, and sustainability* by 2030 (United Nations Development Programme, 2019).

In Kenya, poor sanitation costs the economy Kenya shillings (KES) twenty-seven (27) billion every year (WSP, 2014). The Kenyan population that uses proper sanitation stands at 30% (Singh, & Balfour, 2015). The rate of open defecation in Kenya, stands at 10.34%, while in Kakamega County, the rate of open defecation is 15 % (USAID, 2019). The Kenyan government has made efforts to accelerate the open-defecation free (ODF) campaign, through the rural Kenya ODF campaign towards achieving universal sanitation coverage, which saw the government in partnership with development partners implement sanitation improvement programs at the community through Community-Led Total Sanitation. These concerted efforts have yield achievement of ODF villages and others working towards the declaration.

A study by Singh & Balfour (2015) showed that Community Led total sanitation (CLTS) has resulted in sustained ODF practice in more than 95% of households in Kenya but due to continued open defecation by few households in each community, more than 70% of the villages have partially or fully collapsed from the ODF status. The main reasons for some households reverting

to OD are lack of access to their own, safe, and functioning toilet and the defecation practice by young children.

Kakamega County in partnership with Kenya integrated water sanitation and hygiene project (KIWASH) funded by United States agency for international development (USAID) employed a multi-faceted integrated approach for effective delivery of improved access to integrated WASH and nutrition services. The approach involved a demand driven mentorship program for community mobilization, awareness creation as well as ensuring easy access to sanitation technologies and products to maintain ODF status. However, Open defecation is still rampant in Kakamega County (USAID, 2019). Even though studies have been conducted on the effects, social and behavioural factors affecting CLTS and the sustainability of ODF, of the few done in Kenya, none has been done in Butere sub county, Kakamega County.

Sustainability is a complex concept, which is an integration and interconnection of environmental health, social equity, and economic vitality to create thriving, healthy, diverse, and resilient communities for this generation and generations to come. (ULCA, 2021). WaterAid in their sustainability framework define sustainability as beneficial change in access to services leading to corresponding lasting outcomes and impacts in people's lives. The time dimension implied in the idea of sustainability is not finite. Once change for the better has been brought about, that trajectory of change must be maintained and enhanced.

ODF sustainability is evidence of continual use of sanitation facilities and practice of hygienic behaviours after attaining ODF status (UN Habitat, 2017). While the demonstrated health benefits are the main motivating factors for such households, sustaining latrine use and sustaining ODF status is yet to be achieved (Tyndale-Biscoe et al 2013).

Sustaining the ODF status is important to consolidate the initial success and guide the community to move up the sanitation ladder. Wamera (2016) shares that post-ODF follow-up is central to long term sustainability of open defecation free status which needs to be integrated into CLTS programming from the onset. The USAID KIWASH project concurs that while CLTS contributes to the achievement of ODF status, there is need to create avenues for strengthening supply chain of improved and affordable sanitation technologies which prevents relapse of the communities to open defecation (USAID, 2019).

The success of intervention is measured by its sustainability. Therefore, understanding the dynamics surrounding CLTS implementation is crucial to improve and appreciate the long-term sustainability of ODF communities, realizing their full potential in improving people's lives and well-being.

## **1.2 Problem statement**

The study problem is lack of clarity whether ODF status is sustainable in Butere or not and what factors are influencing its sustainability or lack of it. The advent of Millennium development Goals

and Sustainable development Goals created innovative hygiene and sanitation promotional approaches such as Community-Led Total Sanitation (CLTS) to address the issue of open defecation.

The Government of Kenya, partners and Living Water Service Centre have heavily invested financially and technically on CLTS approach to address issues of open defecation status in Butere Sub- County, and to ensure attainment of open defecation free communities and increase access to improved sanitation and hygiene practices. The partnership resulted to increased access to sanitation and achievement of ODF status in some areas, yet studies indicate that villages are reverting to open defecation among certified ODF villages (UNICEF, 2014). According to (Crocker, Saywell & Bartram, 2017), sustainability of CLTS for sustainable sanitation hygiene practices remains a challenge to improved water, sanitation, and hygiene.

Movement up the sanitation ladder remains a hindrance to sustainability of ODF, especially among poor and marginalized households (Thomas, 2016). An ODF sustainability study by United Nation Children Education Fund (UNICEF, 2014) found little evidence of households climbing up the sanitation ladder. Another study realised that ODF status is only a beginning, but maintaining it is the real problem (Vernon & Bongartz, 2016).

The concept of manageability of sanitation has not been methodologically investigated or achieved in Kenya (Wamera, 2011). Long-term sustainability has been a challenge to CLTS at scale because of reversion and slippage (Tyndale-Biscoe *et al*, 2013, and Pasteur, 2014). The reasons for slippage and reversion of ODF villages are not clear and therefore the need for more information on the causes and prevention is crucial (Singh & Balfour, 2015). Some of the challenges affecting sustainability are the assumptions that ODF villages will automatically sustain themselves, lack of plans for post ODF activities, low public funds for sanitation, dependency on donor funds with involvement of NGOs (Non-Governmental Organizations), CBOs (Community Based Organizations), and faith-based organizations highly funding sanitation (Mansour *et al*, 2017).

Lack of post ODF plans threaten improved sanitation and entrenched behaviours as communities are left on their own (Thomas, 2016). Furthermore, the activities implementation carries financial implications derailed by low investments by government and reliance on non-state actors affecting sustainability (Crocker *et al*, 2015 and Mansour *et al*, 2017). Wamera, (2016) argues that advancement of post ODF activities, social and administrative structures are to be integrated for follow up and embed the new social norms.

In Kenya, interventions, and current approaches of integrating CLTS, Behaviour Change Communication and Sanitation marketing from the onset of CLTS approach, which would lead to change of attitude on Sanitation and hygiene practices and climbing up the sanitation ladder has not been assessed to establish their role in sustainability of ODF status.

### **1.3 Justification /significance of the study**

This study will devise factors contributing to sustainability of open defecation free status and provide useful information to address the challenges of sustainability of communities declared as open defecation free in Butere sub county, Kakamega County.

Despite the successes in CLTS roll out across the country and the increase in the number of villages declared open defecation free, rates of reversion to non-ODF status remain high, raising concerns on the sustainability of ODF status in Kenya and thwarting the country's efforts of becoming ODF (UNICEF, 2015). This study will find out the factors that contribute to sustainability of ODF status.

The ODF Rural Kenya 2020 Campaign framework failed to achieve 100% ODF partly due to the unsustainability of ODF status. The current devolution process in Kenya provides a strong opportunity to support the acceleration of access to sanitation in all the 47 counties, and as such sustaining ODF. However, the devolution and the transfer of health functions to the counties, is not without challenges. Counties have not embraced CLTS as an intervention that improves standards of sanitation and hygiene, and this may be due to the unsustainability of ODF. As such, counties have accorded low priority to CLTS approach and do not fund CLTS activities nor promote its uptake. The study seeks to identify the gaps for sustainable sanitation and hygiene for all, to enhance evidence based and informed decision making towards achievement of SDG (Sustainable Development Goals) target 6.2.

Information on the sanitation sector in Kenya is either insufficient or out-dated, including the current levels of service provision and consumer demand. This lack of information limits effective planning and the efficiency of service provision, particularly to low-income areas where the information gap is greatest (Mansour *et al*, 2017, and Lee & Cha, 2017). This study will contribute to documentation of evidence and effective approaches to increase uptake of sustainable sanitation.

Sanitation improvements are cost effective intervention for the prevention of childhood mortality and morbidity as it reduces episodes of diarrheal cases. However, there has been heavy investment by state and non-state actors implementing WASH with limited evidence on the resultant effects and the associated costs of this sanitation and hygiene intervention. The study will enable Living water and other WASH stakeholders to assess the usefulness of sanitation and hygiene promotion strategies for improved health outcomes. This will in turn provide return on investment through attainment of sustainable results and value for money on interventions.

The evaluation of sustainable ODF communities following successful CLTS implementation is critical to direct programming of Living Water interventions and for other stakeholders, the study will provide insights to public health practitioners, stakeholders, and sanitation partners towards development of long-term sustainability framework to maximize the benefits of CLTS as an intervention to the community.

The results will further be useful to National and County Governments in the formulation and implementation of policies, strategies and guidelines that revolve around post ODF interventions. It will also be useful in ensuring that Kenya meets ODF development targets set in Kenya Vision 2030. The study will therefore inform the Government and WASH stakeholders understand their

responsibility and contribution for sustainability of ODF villages. Thus, it is imperative to evaluate factors contributing to sustainability of ODF villages in Butere sub-county.

## **1.4 Objectives of the study**

### **1.4.1 Main objective of the study**

To evaluate factors contributing to sustainability of open defecation free status in the communities declared to be ODF free in Butere sub county, Kakamega County.

### **1.4.2 Specific objectives of the study**

1. To find out how demographic factors influence sustainability of ODF status in the villages declared to be ODF in Butere sub-county, Kakamega County.
2. To find out how socio-economic factors influence sustainability of ODF status in Butere Sub County, Kakamega County
3. To examine whether the ODF declared communities have sustained ODF status in Butere Sub County, Kakamega County.
4. To assess how behavior change communication influence ODF status sustainability in Butere sub-county, Kakamega County
5. To determine how management structures influence sustainability of ODF status in villages of Butere Subcounty, Kakamega County.

## **1.5 Research questions**

- How do demographic factors influence sustainability of ODF status in villages in Butere? Butere Subcounty, Kakamega County?
- How do socio-economic factors contribute to sustainability of ODF status in villages of Butere? Butere Subcounty, Kakamega County?
- Have communities in Butere Subcounty, Kakamega County sustained their ODF status.
- How does behavior change communication influence ODF sustainability in Butere Sub County Kakamega County?
- How do management structures influence sustainability of ODF status in communities of Butere Subcounty, Kakamega County?

## **1.6 Theoretical framework**

The theoretical framework illustrates most important variables to behaviour change and how the variables relate or interact. Since behaviour change is difficult to achieve and maintain, due to the personal, societal, and cultural influences that govern human behaviour. The study will adopt Theory of planned behavior which has shown more utility in public health. To make the model more integrated social cognitive theory was integrated to address limitations of the TPB.

### **1.6.1 Theory of Planned Behaviour (TPB)**

The theory of planned behavior by (Ajzen 1985) aims to explain all behaviors through which people can exert self-control. Fundamentally, the theory outlines how attitudes predict human



attitudes (Dainton & Zelle, 2010). The theory maintains that three core components, namely, attitude, subjective norms, and perceived behavioral control, together shape an individual's behavioral intentions. The model has been utilized successfully to forecast and explain a diverse range of certain health behaviors and intentions such as drinking, smoking, substance abuse, health services utilization and many more (Feng, 2007)

### 1.6.2 Social Cognitive Theory

Social Cognitive Theory (SCT) by started 1960s by Albert Bandura posits that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behaviour. The unique feature of SCT is the emphasis on social influence and its emphasis on external and internal social reinforcement. SCT considers the unique way in which individuals acquire and maintain behaviour, while also considering the social environment in which individuals perform the behaviour. The theory considers a person's past experiences, which factor into whether behavioural action will occur. These past experiences influence reinforcements, expectations, and expectancies, all which shape whether a person will engage in a specific behaviour and the reasons why a person engages in that behaviour.

Many theories of behaviour used in health promotion do not consider maintenance of behaviour but focus on initiating behaviour. This is unfortunate as maintenance of behaviour, and not just initiation of behaviour, is the true goal in public health. The goal of SCT is to explain how people regulate their behaviour through control and reinforcement to achieve goal-directed behaviour that can be maintained over time.

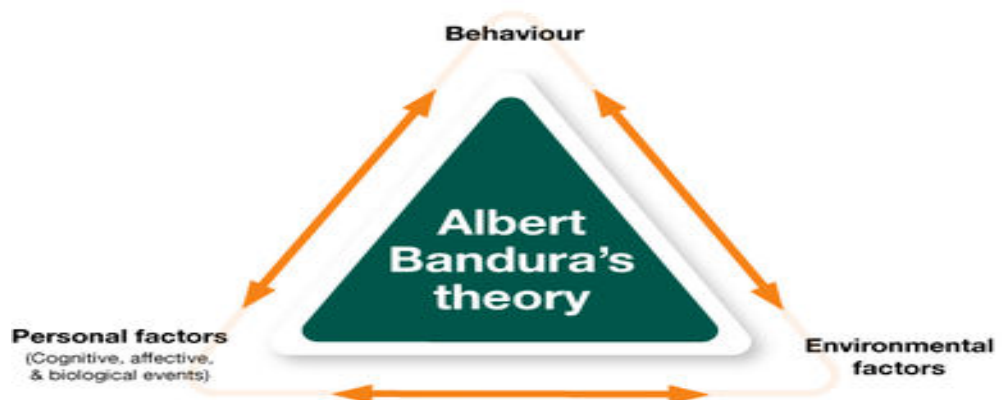
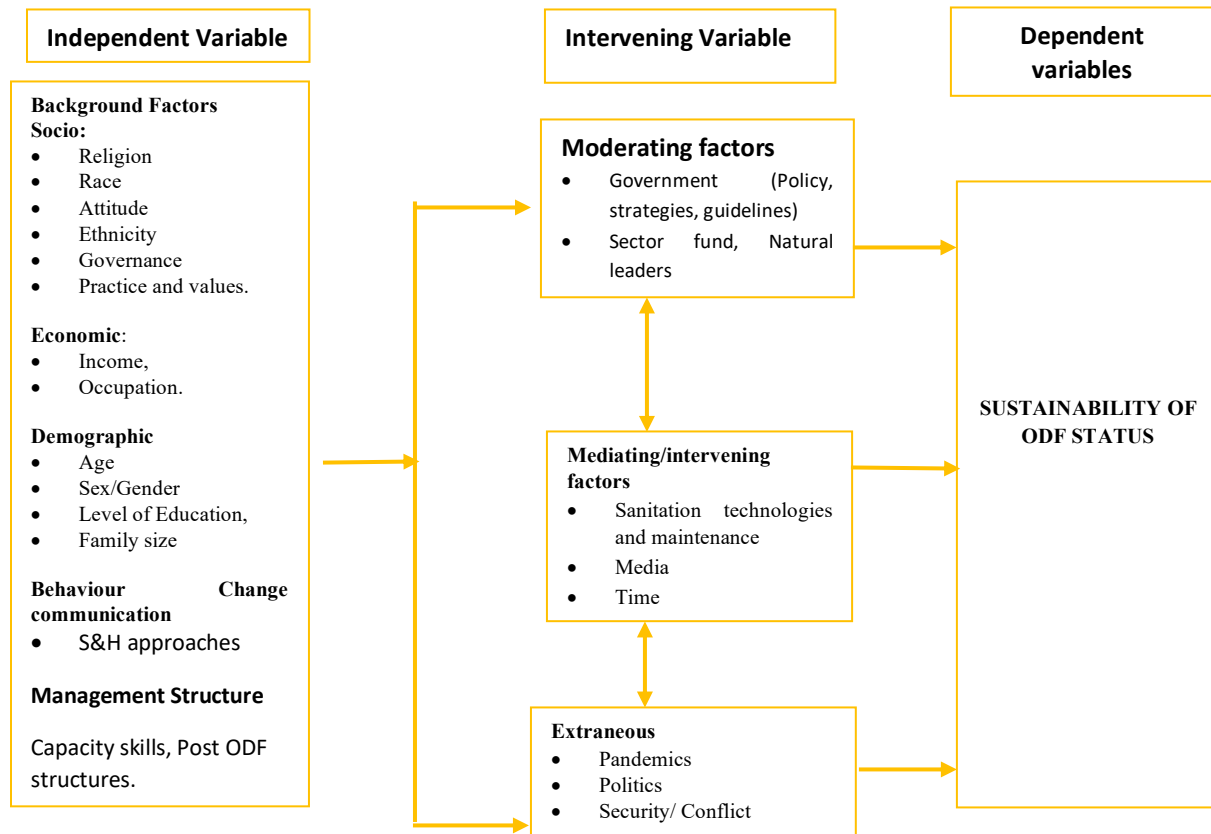


Figure 1: Social cognition theory by Bandura

### 1.6.3 Conceptual framework

Based on this conceptual framework the independent variables will be socio-economic and demographic factors, behaviour change communication approaches and management structures that influence sustainability of ODF status (dependent variable). To better understand the relationship between the independent and dependent variables, moderating factors such as

government policies, strategies, guidelines, sector fund and natural leaders will be studied. Additionally, mediating factors which includes Media, time, and sanitation technologies as well as extraneous factors such as pandemics, politics and conflicts which could affect the dependent variable will be examined.



**Fig 2. Conceptual framework**

## CHAPTER TWO: LITERATURE

Desk review of the relevant literature relating to sustainability of ODF was undertaken prior to the development of the study methodology. The aim of the review was to establish the extent of other similar research on ODF sustainability and to inform the design of the study specifically thematic scope and research questions. The review focused on the following themes: demographic factors, socio-economic factors, ODF sustainability and slippage, and factors influencing ODF sustainability including sanitation technology, quality and maintenance factors, behaviour change communication approaches and management structure factors. The review compiled a list of 59 articles (including reports, evaluations, and discussion papers) that were related to ODF sustainability.

## **2.1 ODF Sustainability**

Sustainability is a complex context which is an integration and interconnection of environmental health, social equity, and economic vitality to create thriving, healthy, diverse, and resilient communities for this generation and generations to come (UCLA, 2012).

According to (Kar & Chamber, 2008), sustainability of ODF villages is indicated when the general trend in a community is to go up the sanitation ladder and monitored behavior change. A community-based sanction to individuals practicing open defecation is a form of social sustainability. Even though the initial quality of latrines constructed because of CLTS are low cost with a short lifetime, sustainability is indicated with spontaneous construction of another latrine by households following collapse or filling up. In some instance construction of better structures and more durable ones as a trend of sanitation improved

According to Tyndale-Biscoe et al., (2013) and Cavill et al., (2015) some of the motivators for maintaining ODF status include privacy, security, convenience, and comfort while de-motivators were financial constraints, lack of support, maintenance, and frequent repairs. However, good health was perceived as construction and sustainability of latrines because of reduction in the number of visits they made to the health facilities which resulted in saving of time and money. To a significant extent, the stability and durability of CLTS is determined by long-term behavior change. It thus becomes of importance to understand the factors contributing to undermining or sustaining behavior change.

## **2.2 ODF slippage**

According to Hickling, (2019), understanding the pattern of slippage, as well as the factors that contributed to it, is the starting point for tackling it. Attempts have been made to define slippage for a uniform comparison, assessment, and monitoring to address slippage. The following definitions have been made, “The return to previous unhygienic behaviors or the inability of some or all community members to continue to meet all ODF criteria” (Jerneck et al. 2016). It has also been defined as “The percentage of households found to have reverted to the practice of OD or focus on access to facilities – the percentage of households no longer served by a household latrine – which is easier to measure but moves away from the elimination of OD as a behavioral outcome of CLTS” (USAID, 2018).

The study by Hickling, 2019 reasons that it is likely that slippage happens in all CLTS programmes to a certain extent, but importantly does not always lead to a critical failure of ODF status. Slippage factors are inter-connected and grouped into four inter-related categories which are technology factors, behavior factors, poverty and vulnerability related and external factors.

Slippage is often attributed to a lack of follow-up support once communities have reached ODF to reinforce attitudes, consolidate social norms change and to provide in-time troubleshooting. Some studies show that Community action groups have been established in several countries to provide continued support and encouragement after ODF declaration and to immediately address slippage (Rieiro 2019). While (Wamera, 2016) concurs that change drivers need to be localized with the

idea of nurturing Natural Leaders from the local community to transform community behavior for a long-lasting change.

### **2.3 Sanitation technology quality and maintenance.**

The Water Institute's synthesis of lessons of CLTS projects implemented in different countries through case studies indicated obstacles that affected sustainability of ODF communities. Key factors to sustainability included latrines utilization however, it is affected by Individuals' personal efficacy to operate and maintain latrines, lack of resources, smell from latrine and inadequate ventilation. In addition, access to sanitation facilities hinders use of latrines which is the first step on the sanitation ladder. As revealed in a study conducted in India among mothers where the closer the latrines were to the residence the easier the utilization that attributed to a clean environment. (Sherin et al, 2017).

The sustainability of CLTS approach is questionable given that the initial sanitation technologies adopted are cheap as households are empowered to start off at levels, they can afford which posed a challenge to sustainable access to sanitation (Venkataraman & Shannon, 2016) (Keller, 2019). According to Kar & Chamber, (2008) increased demand for better and affordable sanitation hardware improves designs of sanitation options which lead to adoption of appropriate hygiene behaviors. This is confirmed by a study done in Tanzania which revealed that an association exists between use of latrines, the type and functionality of the latrines. Whereby the flush type of latrines was seen to be highly utilized compared to pit latrines (Keema et al, 2012).

### **2.4 Socio-economic factors influencing sustainability of ODF status.**

The social, cultural, and economic factors affect sustainability of ODF status. These include cultural norms, taboos, values, and human attitudes. Understanding the barriers to access, and the underlying social dynamics and inequalities that operate in society is critical to developing inclusive programming. Without this, CLTS and other sanitation programmes could in fact reinforce these existing inequalities (Cavill *et al.*, 2016, Gupta et al., 2016, Patkar, 2016, Regmi, 2016, and Bardosh, 2015).

According to a study conducted on open defecation in rural communities on cultural values that reinforced its practice revealed that open defecation was surrounded by cultural taboos and beliefs that were particularly related to ethno-linguistic groups who lived within the same area (Water Aid, 2008). However, a study (Sherin et al, 2017) showed there were no cultural rules or taboos against use of latrines.

The study conducted by Routray et al., (2015) in rural coastal Odisha revealed that constructing of latrines by male heads was for their female members especially newlywed, daughter-in-law whom they believed that they spent a lot of time at home. Providing a latrine also meant protecting and preserving dignity, privacy, and security of their new daughter- in law/bride.

The beliefs that faeces are impure also caused some people to considered using the toilet within the house as 'sin' because idols and pictures of gods that are revered are kept and worshiped in every house and having toilets within and near the house made the entire house impure (Laungani,

2007). A similar study by Arku (2010), it shows that clean water was believed to be more important than toilet facilities, as people were unable to construct toilets because it was not part of their culture to pay money to use toilet facilities. Furthermore, the impact of social norms on safe disposal of faeces was also associated with open defecation because some community members felt that they were influenced by others to defecate in the bush with belief of being good. This situation led to the old, weak, and sick people without support end up disposing their excreta badly (Devine, 2010). According to Mafuya (2010), people in the rural community believed that the use of toilets was of western origin and therefore prefer using the bush.

A study conducted in Malawi revealed that some people went back to open defecation because they believed that it was a taboo to mix faeces with in-laws (UNICEF, 2012). In a similar study conducted in Zambia, revealed that In-laws, different generations, and opposite gender were some of the barriers to using the toilets (Lawrence et al, 2014).

A study on adoption of ODF innovations conducted in Ghana indicated that continued attachment to ancestral links because of culture and tradition has impeded the adoption of ODF innovation and perpetuated the practice of open defecation. It showed that socio-cultural issues led to resistance of new innovations. It found out that households attributed cultural beliefs to the unwillingness to own household latrines and sustain behavior change in ODF innovation (Alhassan & Anyarayor, 2018).

In 2010, Ghana's WaterAid conducted a study in Mali, Nigeria, Burkina Faso, and Ghana to find out activities and procedures adopted to eliminate open defecation (Alhassan and Anyarayor, 2018). They found out that, indiscipline was the main cause of people in low socioeconomic status leading to open defecation. Residents in this class could not afford to construct proper sanitation facilities. In addition, lack of funds was also the major economic factor contributing to unsafe sanitation, to either build a new or maintain the existing structures (Mafuya, 2010; Tyndale Biscoe et al, 2013). This is in tandem with Devine (2010), who revealed that households with strong financial pressures usually place less value on sanitation and were not motivated to acquire a toilet facility.

Alarmingly, the slowest rates of progress are among the poorest quintiles of society (WHO/UNICEF, 2015). The poorest and most marginalized often also have a high use of unhygienic, unimproved latrines (Mukherjee, 2016), (Hanchett, 2016), and reversion to OD has also been found to be higher (Robinson & Gnilo, 2016).

Alhassan & Anyarayor 2018 concluded that low-income level is a hindrance to the maintenance of household latrines and the practice of ODF innovation on sustainable basis. There was a positive correlation between household latrine adoption rate, and sanitation change behavior and household wealth status. Tyndale-Biscoe et al 2013 agree that indeed the cost of sanitation is of significance to households. He states that low-cost or free local materials motivated many households to build latrines delivering inferior quality latrines which require more maintenance. Further in post ODF,

little evidence of households investing to upgrade latrines was noted. The findings indicated that it is the prioritization of other household expenditure over latrines as opposed to lack of funds that prevented investment on latrines upgrade.

## **2.5 Demographic factors contributing to ODF sustainability**

WaterAid Ghana also found out that individuals could fight open defecation. There are sanitation facilities constructed by communities to campaign against open defecation, and they are succeeding in changing people's state of mind. Family socio-economic status is linked to its income and education levels. Families that use better restrooms are richer and highly educated than those using poor toilets or open defecators. Families with educated members were found to be motivated to enjoy wellbeing and good health. (Alhassan and Anyarayer, 2018). It is believed that students are more exposed to hygiene information in the school environment which in turn positively influences persuasion of latrine utilization in the home environment (Sherin et al, 2017).

When it comes to equity and inclusiveness of efforts, gender is of course a central consideration when addressing access. While constituting more than half of the world's population, women and girls are disproportionately affected by a lack of access to WASH (WHO/UNICEF, 2010) (Cavill et al, 2016, and Patkar, 2016). As Cavill et al. 2016 describe women have increased WASH burdens; they are usually responsible for cleaning and maintenance of toilets, and have additional needs, for example relating to menstrual hygiene, pregnancy, and motherhood that must be met. There is also evidence that ODF status is more likely to be sustained and embedded if women are central or lead the process (Adeyeye, 2011. Mahbub, 2011, and Tyndale-Biscoe et al., 2013).

UNICEF Kenya's ODF sustainability study showed a strong correlation between social cohesion factors and retention of ODF behaviours two years after certification, but it also showed that, where children were not included as part of the sensitization and norm building activities, children were a defining variable in post-ODF slippage (Singh and Balfour, 2015). Recent research in Uganda and Zambia indicates that a person who is older, disabled, or chronically ill is more likely to defecate in the open (Wilbur & Danquah, 2015; Cavill et al., 2016). As CLTS and WASH programmes are often not reaching these groups. Thomas (2016) argues that this is likely to be an issue of planning, political prioritization, and inclusion, as opposed to purely an issue of financial resources.

## **2.6 Behaviour changes approaches influencing ODF sustainability.**

Behaviour change is brought out by people understanding who they are and the roles they play in society. Wash programs run by BCC (Behaviour Change Communication) urges that smooth advertising can make people change their behaviour towards open defecation (Mir et al., 2020). People need to be taught the importance of ending open defecation smoothly.

CLTS has worked well in changing behaviours and achieving sanitation outcomes better than any other approach the sector has seen. It is also clear that sustaining behaviours is difficult, and most programmes lose out on their initial efforts by not investing more resources into the factors that



will sustain both behaviours and structures. Often these factors imply complementing interventions beyond CLTS since changing the minds of these individuals need time and cautiousness to sustain behaviour change and sanitation.

In Bangladesh, dynamic and vocal people have helped the community become ODF (open defecation free) (Mir et al., 2020). The promoters come from the non-educated and poor groups, and they educate people on the disadvantages of open defecation. They help people understand how their medical issues have been brought out by poor sanitation and preventive measures that can be employed. In Kenya, Kakamega County, Kenya Integrated Water, Sanitation, and Hygiene (KIWASH) project in partnership with Ministry of health that has helped achieve defecation free status by urging people to practice sanitation and hygiene practices (Ogendo et al., 2016). This was achieved through community health volunteers in collaboration with artisan as sanitation promoters to ensure that people heed to simple hygiene practices and adopt improved sanitation.

The adoption and sustenance of ODF is promoted by messages using behavior change communication processes, affordable cost of constructing latrines, gender and socially inclusive process and improvement in the health statuses of respondents. A recommendation for stakeholders in the WASH sector should intensify education to eliminate cultural fear of people in the use of latrines for sustainability. The education should be done in collaboration with the traditional leaders where the traditional leaders are given the lead role to reduce resistance from communities and promote acceptance (Alhassan & Anyarayer, 2018).

Proximity to the community served offers both immediate access and in-person support, while also establishing a degree of accountability by the community and its leadership. The use of community selected WASH committee approach selected after ODF has already been reached for continual enthusiasm post ODF. Studies from (Hanchett et al., 2011) (Tyndale-Biscoe et al., 2013) (UNICEF, 2014).Indicates that Post-ODF follow-up, support and encouragement have been shown to help maintain ODF and support progression.The continuation of support coming from diverse sources such as dissemination of follow-up messages via mosques, churches, women's groups and prenatal clinics can be effective in preventing slippage (Odagiri et al. 2017).On the other hand, people have particular needs for their access to sanitation, which vary within a household, and change over the course of their lives (Cavill et al., 2016,). All these should be considered and integrated into programming and policy at every level of the process. Through meaningful engagement and participation of diverse groups of people in all stages of Post ODF.

Understanding these factors and systematically applying the knowledge into programmes is a sector priority. Putting it all together at a meaningful scale with the right investments in capacity building, local leadership, coordination, and strategy is the goal. Sector diagnostic tools are a step in the direction towards understanding what makes CLTS work at scale, and their use is becoming more ubiquitous as countries look for more evidence-based ways of making policy and decisions for the sector (Thomas, 2016).

## 2.7 Management structures for sustainability of ODF status

Acknowledgement that progression up the sanitation ladder does not happen spontaneously (UNICEF, 2016) and that without a planned next-step show that gains made in the flurry of action post-triggering may not be sustained (Jacob, 2018). (Mukherjee, 2016,) suggest establishment of national monitoring system to track progress and outcomes as a key element needed for sustainability. (UN Habitat, 2017) recommends provision of measures for routine follow up and individual monitoring with clear processes and indicators. While Hickling, (2019) proposes post ODF strategies with mutually reinforcing elements. The main, post-ODF action plans encourage ODF sustainability by reinforcing behaviors and encouraging movement up the sanitation ladder to more durable facilities and higher levels of environmental sanitation services. (Bevan & Thomas 2013, and Gibson et al 2018, and Robinson & Gnilo 2016). Besides the plans, routine data collection that continues past ODF declaration is required to track progress and identify slippage towards universal targets. Continuous follow-up visits for support and encouragement and most importantly BCC (Behavior Change Communication) activities for behavioral reinforcement.

A strategy implemented by (Social Sector Service Delivery, 2015) involved inter-departmental convergence centered on demand generation and behavior change as priority areas to prevent ‘slip back’ cases in ODF villages. To enhance community involvement key innovations of this approach focused on encouragement of community consensus on ODF, mason training and construction of demonstration toilet, community contributions and provision of revolving funds. The revolving funds were managed in cooperative societies or self-help groups for cheap finances with flexible loans among members for sanitation improvements according to guidelines. Musyoki (2016,) raises concern that funding levels allocated to national level activities as opposed to the community which need revising so that more funding is made available to communities to carry out activities such as post-ODF and long-term monitoring and follow-up.

(Tyndale Boscoe et al, 2013) proposes adoption of sanitation marketing to encourage households’ investment to improve household prioritization of sanitation expenditure, since CLTS approach is a non-subsidy approach, and does not address the supply side of the sanitation problem. Post-ODF interventions should be centered on construction of durable, user-friendly, and disaster-resilient sanitation facilities as well as development of pro-poor financing mechanisms. To strengthen the supply chain of latrine construction, training of masons, adoption of local financing mechanisms identified to advance availability of a good range of choices and households purchase power to complement CLTS (Venkataramana & Shannon, 2016).



## CHAPTER THREE: METHODOLOGY

### 3.1 Study Location

The study was conducted in Kakamega County which covers an area of **3,020 KM<sup>2</sup>** with a population of **1,867,579 (KNBS 2019)**. The study area was Butere sub-county which has five wards namely: Marama Central, North, South, West and Marenyo -Shianda. The study was conducted in all the 97 ODF declared villages that were supported by the county government and partners including LWSC (Living Water Service Centre). LWSC (Living Water Service Centre) triggered and celebrated 57 villages while the county in partnership with UNICEF declared 40 villages to have attained ODF status.

### 3.2 Study design

The study adopted cross-sectional design approach, to find out the present status of ODF certified communities. Cross-sectional studies are carried out at a one point in time to estimate the prevalence of the outcome of interest for a given population, allow the researchers to look at numerous characteristics at once (age, income, education gender etc.) and sometimes carried out to investigate associations between factors and the outcome of interest (Henneken & Buring, 1987; Setia, 2016). The study investigated the association between socio-economic and demographic factors, behaviour change communication, management structures and sustainability of ODF villages. The design was exploratory and observational and primary data collection methods involved observing and exploring through in-depth interviews with households regarding sanitation and hygiene practices and sustainability of ODF villages at one point in time.

The study collected both qualitative and quantitative data. Quantitative data was collected using structured questionnaires to interview respondents from sampled households. Qualitative data was collected through focus group discussions (FGD) with key stakeholders and sanitation and hygiene actors including CHVs and CHEWs (Community Health Extension Workers). In addition, key informant interviews were conducted with relevant experts targeting development partners, Sub County officials and heads of relevant departments.

### 3.3 Target population

The study population comprised a sample of 8685 households obtained from 97 villages in three wards namely, (Marama Central, West and Marenyo - Shianda) where CLTS approach was implemented, and villages declared ODF.

### 3.4 Sample size

The total targeted sample population of **409** households from ODF certified villages declared ODF between January 2015 and December 2020 in Butere Sub- County.

Fischer's formula (Fischer *et al*, 1998) was used to calculate sample size as follows:

$$n = \frac{Z^2 P (1-P)}{I^2}$$

$I^2$

Where:

n = Sample size [where population is > 10,000]

Z = 1.96 the factor from normal deviation taken at 95% confidence interval

P = Proportion of the population with the desired characteristic.

Q = Proportion of the population without the desired characteristic (1-P).

I = Degree of precision; will be taken to be 5%.

Since the proportion of the population with the characteristic was not known, 50% was used.

Therefore  $n = \frac{Z^2 P (1-P)}{I^2}$

$n = \frac{(1.96)^2 \times 0.5 (1-0.5)}{0.05^2}$

n = 384.16

This resulted in a sample size of 384.

Since the target population is < 10,000 sample adjustments were done as follows

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

Where,

nf = The desired sample size for population <10,000

n = the calculated sample size

N = the total population

Therefore,

$nf = \frac{384}{1 + 384/8685}$

nf = 367.7 Therefore, the study used 368 respondents as the sample size.

Nonresponse occurs when a sampled unit fails to provide either part or all the information requested in a survey. This may be due to non-contact, refusal, or other reasons, such as an inability to understand the request. Nonresponse can lead to bias in survey estimates. (Bethlehem et al., 2011). To cater for non-response, the formula below was used.

Final sample size = Desired sample size / (1 - nonresponse rate anticipated) (Nilima, 2017)

= 368 / (1 - 0.1)

= 409 The sample size was adjusted to 409. The sample size was apportioned based on the differences in populations in villages as attached in appendix one.

### 3.5 Sampling technique

The study used purposive sampling for qualitative survey and respondents were picked based on their knowledge and role in sustainability of ODF villages. Key Informant Interviews were held with 3 PHOs, Chiefs, ward administrators, Sub County WASH coordinators while 2 focus group discussions were held with CHAs and CHVs of the different community units. Cluster sampling design was used for quantitative survey where the population was clustered into villages. In each

village, sampled households were distributed proportionately based on the number of households in ODF villages. The households visited in each village were randomly selected using simple random walk sampling technique and only one respondent was interviewed in every sampled household. In each household the enumerator interviewed the head of the household and if they were not present, the enumerator interviewed the spouse to the head or any other adult aged over 18 years in the household. In case adult members of a selected household were absent or they declined to take part in the study, the nearest neighbouring household was visited.

Households were identified using random walk sampling method to ensure each household had a random walk sampling method to ensure each household had an equal chance of selection developed by UNICEF/WHO (Zeller, 2000) as explained below in selecting an equal chance of selection as developed by UNICEF/WHO (Zeller, 2000) as explained below in selection of respondents.

### 3.6 Selection of respondents.

Community Health Volunteers (CHVs) were used as village guides during the data collection and identified the village boundaries followed by dividing the village into four quarters and traveling to each quarter. Upon arrival in each quarter in every village, the random walk sampling method was used to select households. The random walk method included two separate steps<sup>1</sup>, the first was choosing a starting point (in our case the centre of every quarter in the village), and the second was selecting households from that point onward. The following steps were followed.

1. Approximating the village boundaries with help of CHVs and drawing a map.
2. Dividing the village into quarters, reflecting approximate four quarters of the population.
3. In each quarter, the research team allocated the sample from total households sampled in that village; *Sample per quarter = sample allocated per village/4*
4. In each quarter, the research team determined a pivotal point and proceeded to that point
5. Considering the pivotal point of the quarter (in each village) as the starting point, the research team spined a pen and the direction of movement was determined by the tip of the pen and subsequent households followed the selected direction and selected households in intervals of selected number (**this was equal total households/target sample**).
6. The household nearest to the starting point was the first one selected.
7. Households were selected in such a way that those far from the quarter centre, or those distant from main roads (foot paths also applied), had the same chance of being sampled as more accessible households.
8. In cases where the enumerator ended up in a place where it was hard to continue in same direction, the enumerator would spin a pen again to develop a new starting point, and then continue in the same way until the required number of households was reached.

### **3.7 Inclusion Criteria**

The study included all 97 villages that were declared ODF between January 2015 and December 2020 in Butere Sub County with support from Kakamega County Government and partners including LWSC who implemented CLTS program. The timeframe was determined by the time during which LWSC declared the first ODF village in Butere (2015) and exit time which was 2020.

### **3.8 Exclusion Criteria**

The study excluded villages that were not declared ODF between January 2015 and December 2020. It excluded the villages that were declared ODF before January 2015 and after 2020 December.

### **3.9 Variables**

Independent variables (Background factors)

- Socio-economic
- Demographic
- Behavior change communication
- Management structure

Intervening variables

- Moderating variable which includes government and sector fund
- Mediating/intervening factors which include Sanitation technologies, time, and media.
- Extraneous factors which include pandemics, conflict, and politics

Dependent variable

- Sustainability of ODF status

### **3.10 Data Collection Technique**

The primary data collection was done using a mixed met approach constituting of both qualitative and quantitative data. The following data collection tools were used:

- i. Structured questionnaires were administered at household level using KOBO application.
- ii. Key informant interview guides were administered to opinion leaders and technical experts at Sub County level to give first-hand knowledge about the area of interest
- iii. Focus group discussions guides were used among key community groups to provide insights into different opinions among different parties involved in the process
- iv. Observation checklists were used to take inventory of key aspects for evaluation.

Quantitative survey preceded the qualitative survey. Quantitative data was collected through household surveys by enumerators. Qualitative survey was collected data using open ended questionnaires' by LWSC staff. Qualitative survey collected data on some of the issues that need more insight from the quantitative data. The enumerators for the study were identified through a competitive process where only enumerators that have experience in using KOBO application were selected and consequently trained for two days and then carried out a pilot test.

During household surveys, all respondents were asked the same set of questions in the same sequence for increased objectivity of data collection and questionnaire completion response rate. Skip logics were designed into the questionnaire to reduce burden of non-relevant questions. The study used the Kobo application (a mobile application technology) for primary data collection. Kobo is an application with the capability of capturing data via android phones and tablets and programmed to capture geographically referenced data. The questionnaires were developed using word's Microsoft office before uploading the definitive version online.

### **3.11 Pilot Study**

A pilot study was conducted to test whether the outline of inquiries was consistent and if the questions in the data tool were clear and effectively reasonable to the respondents. It further enabled enumerators to familiarize with survey procedure, investigate the time taken by respondents to complete the questionnaire, identify potential problem area and check whether the enumerators were sufficiently skilled for the main study. The pre-test enabled the researcher to keep an eye on whether the gathered factors were captured effectively for the evaluation analysis. This was conducted among households in a village setup away from the actual study area as part of training of enumerators. The pre-test checked reliability and validity of the data collection tools.

#### **3.11.1 Validity**

A validity test was conducted to gauge the research instrument. Content validity guarantees that the instruments will cover the topic of the investigation as proposed by the researcher. Draft surveys were given to two specialists to determine the effectiveness of collecting data as per the research objectives. A chosen lead expert checked the validity of the research instrument based on the results from the pilot study.

#### **3.11.2 Reliability**

The pretest ensured that the tools were collecting the same information on the same variables repeatedly if applied to different respondents by different interviewers. Any inconsistencies observed in the tools in relation to question, skip patterns and coherence were corrected prior to the actual study.

### **3.12 Data analysis**

Quantitative data obtained from closed ended questions in the questionnaire/interview guide and observational checklists were analysed using Statistical Package for Social Sciences (SPSS) version 25.0 and MS Excel. Descriptive statistical analysis techniques (Frequencies, percentages, mean and standard deviation) were used to summarize the quantitative findings. Data was presented in form of tables, charts, and graphs. Qualitative data obtained from interviews and focus group discussions was analysed using thematic, content, and narrative analysis techniques. Statistical tests including chi-squares tests and correlations were used to test association of variables and significance level on variables. Summaries were presented in tables and texts. All key values below P-value (significance level) of 0.05 were considered statistically significant.

### **3.13 Ethical Considerations**

The following ethical practices were considered during this study.

- i. The right of the participants was protected in line with research ethics.
- ii. Informed consent was sought from the respondents.
- iii. The responses were made confidential, and the respondents assured of confidentiality.
- iv. Participation in the study was on voluntarily basis.
- v. The names of the households that were sampled were not specified, coded names or identifiers were utilized to recognize the respondents.
- vi. All the county government guidelines on research were be followed.
- vii. Regular feedback to the relevant stakeholders was provided to guarantee quality and adherence to the terms of reference.
- viii. All survey activities of this study were undertaken while respecting the government directives and guidelines on preventive measures against Covid-19.
- ix. The study was conducted according to the schedule in appendix 2.

## CHAPTER FOUR: RESULTS

This chapter provides the main findings from the evaluation on factors contributing to sustainability of open defecation free communities in Butere sub-county. The evaluation team collected data on the key indicators regarding sanitation and hygiene behaviors and practices through surveys which were complemented by focus group discussions and key informant interviews with key stakeholders. Based on analysis of the collected data, this chapter provides the demographic information of the surveyed households, and a documentation of factors contributing (as well as barriers) to sustainability of open defecation free. The study surveyed a total of 397 households out of the targeted sample size of 409 because of incomplete or non-response in some of the questionnaires.

### 4.1 Demographic Factors

In exploring how demographic factors contribute to ODF sustainability of villages, the study assessed the following variables (I) age of respondent, (ii) gender of respondent, (iii) Marital status iv) level of education of the respondent, (v)family size, and (vi) households having children aged below 5 years.

The table below shows the descriptive analysis of the 6 demographic parameters.

**Table 1. Demographics of surveyed households**

| N=397  |   | Count | %   |
|--|---|-------|-----|
| <i>Gender of respondents</i>                       | Female  | 272   | 69% |
|  | Male  | 125   | 31% |
| <i>Age of respondents</i>                          | 18 – 35 years                                 | 131   | 33% |
|  | 36 – 55 years                                 | 173   | 44% |
|  | 56 – 65 years                                 | 65    | 16% |
|  | 66 years and older                            | 27    | 7%  |
| <i>Marital status of respondents</i>               | Divorced                                      | 7     | 2%  |
|  | Married                                       | 327   | 82% |
|  | Never married                                 | 31    | 8%  |
|  | Widow/widower                                 | 32    | 8%  |
| <i>Households with children aged below 5 years</i> | No  | 227   | 57% |
|  | Yes   | 170   | 43% |
| <i>Highest level of schooling of respondents</i>   | Never attended                                | 52    | 13% |
|  | Post-secondary                                | 22    | 6%  |
|  | Primary                                       | 191   | 48% |
|  | Secondary                                     | 132   | 33% |
| <i>Family size</i>                                 | An average of five members for each household |       |     |

Majority of the respondents were females, 69% while males accounted for 31% across the three wards. In terms of age, a larger proportion of the respondents were 36 – 55 years (44%) and 18 – 35 years (33%) while the elderly above 56 years old were fewer i.e., 56 – 65 years (16%) and 66 years and older (7%).

A larger proportion of the respondents 87% had formal education with majority having completed primary level 48%, secondary level 33%, and post-secondary at 6%. 43% of the households surveyed had children aged below 5 years. Married respondents were (82%), single (8%), divorced (2%), and widowed (8%). The average family size was five members per household. These findings are consistent with the typical household composition structure of 5 household members with an average of 1 female and 1 male adult above 18 years and 1 female and 1 male child below 18 years.

To understand the relationship between the demographic factors and ODF sustainability of the villages, both chi-square and correlation tests and analysis were applied. The chi-square test checked association between the categorical parameters (age, gender, and highest level of education of the respondents; and whether a household had children aged below aged below 5 years) while the point biserial correlation was applied for checking association between (family size (continuous variable) and ODF sustainability of the villages.

The results in **Table 3** below shows the analysis of the categorical parameters

**Table 2. Chi-Square tests for Demographic variables influencing ODF sustainability**

| <b>Age of respondent * ODF sustainability</b>  |                     |    |                                   |                      |
|--|---------------------|----|-----------------------------------|----------------------|
|  | Value               | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) |
| Pearson Chi-Square   | 11.802 <sup>a</sup> | 3  | .008                              | .009                 |
| Fisher's Exact Test  | 11.056              |    |                                   | .010                 |
| N of Valid Cases   | 396                 |    |                                   |                      |
| <i>a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.41.</i> |                     |    |                                   |                      |
| <b>Gender of respondent * ODF sustainability</b>   |                     |    |                                   |                      |
| Pearson Chi-Square   | 1.125 <sup>a</sup>  | 1  | .289                              | .329                 |
| Fisher's Exact Test  |                     |    |                                   | .329                 |
| N of Valid Cases   | 397                 |    |                                   |                      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.74.</i> |                     |    |                                   |                      |
| <b>Highest level of education * ODF sustainability</b>   |                     |    |                                   |                      |
| Pearson Chi-Square   | 19.123 <sup>a</sup> | 3  | .000                              | .000                 |
| Fisher's Exact Test  | 16.572              |    |                                   | .001                 |
| N of Valid Cases   | 397                 |    |                                   |                      |
| <i>a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.77.</i> |                     |    |                                   |                      |
| <b>Marital status * ODF sustainability</b>   |                     |    |                                   |                      |



|  |                    |   |      |      |
|--|--------------------|---|------|------|
| Pearson Chi-Square   | 6.188a             | 4 | .186 | .168 |
| Fisher's Exact Test  | 5.590              |   |      | .180 |
| N of Valid Cases   | 397                |   |      |      |
| <i>a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .76.</i>  |                    |   |      |      |
| <b>Households with children under 5 years * ODF sustainability</b>                             |                    |   |      |      |
| Pearson Chi-Square   | 1.818 <sup>a</sup> | 1 | .178 | .221 |
| Fisher's Exact Test  |                    |   |      | .221 |
| N of Valid Cases   | 397                |   |      |      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.41.</i> |                    |   |      |      |

**Table 3. Chi-Square tests for Demographic variables influencing ODF sustainability**

The table shows that there is a significant association between ODF sustainability of villages and both (i) age of respondents (*Fisher's Exact test which shows the corresponding p-value is small ( $p=0.010$ ) which is less than the significance level (0.05)*); and (ii) Highest level of education (*Fisher's Exact test which shows the corresponding p-value is small ( $p=0.001$ ) which is less than the significance level (0.05)*). On the other hand, there was no significant link between sustainable ODF villages and other variables, i.e., gender of respondents, marital status and whether a household had children aged below 5 years.

The point biserial correlation was run to determine the relationship between ODF sustainability of villages and family size as shown in the table 3 below.

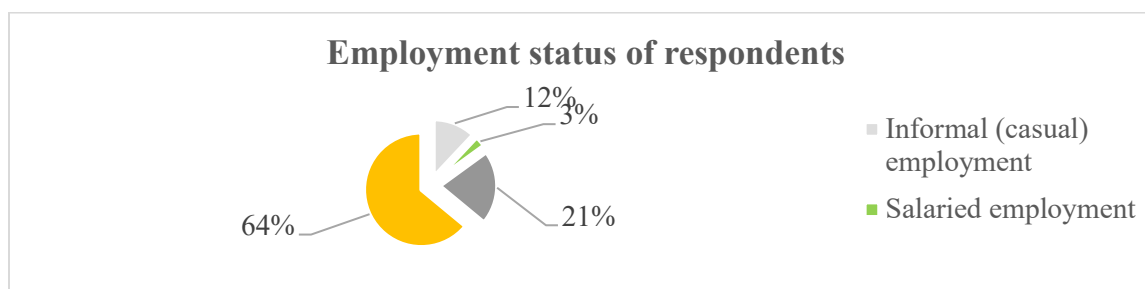
**Table 4. Correlation analysis for Demographic variable (Family size)**

| <b>Point Biserial Correlations</b>                           |                     |                    |             |
|--|---------------------|--------------------|-------------|
|  |                     | ODF sustainability | Family size |
| ODF sustainability   | Pearson Correlation | 1                  |             |
|  | Sig. (2-tailed)     |                    |             |
|  | N                   | 397                |             |
| Family size  | Pearson Correlation | -.070              | 1           |
|  | Sig. (2-tailed)     | .164               |             |
|  | N                   | 397                | 397         |
| **. Correlation is significant at the 0.01 level (2-tailed). |                     |                    |             |

The results in **Table 4** below show a negative correlation coefficient (-.070) and the corresponding p-value is 0.164 which is more than the significance level (0.05) hence there is **NO** significant relationship between ODF sustainability and household family size.

## 4.2 Socio-economic factors

The study analysed the relationship between ODF sustainability and the following socio-economic factors namely, (i) employment status of respondents, (ii) knowledge about cultural or social reasons that affect the sustainability of ODF villages, and factors that influenced the decision to construct, upgrade or reconstruct the facility (i.e., CHVs, Cultural beliefs, Moral beliefs, social status, Government directives/policies/by laws, and Continued follow-up visits).



**Figure 3. Employment status of respondents**

A considerable proportion of the respondents were not employed 64%, self-employed 21% and a comparatively smaller proportion engaged in informal or casual employment, 12% as illustrated in the figure above.

**Table 5. Descriptive analysis of socio-economic variables**

|  |  | Count | Percent |      |
|--|--|-------|---------|------|
| Are there cultural or social reasons that affect the sustainability of ODF villages        | Yes                                    | 13    | 3%      |      |
|  | No                                     | 352   | 89%     |      |
|  | Does not know                          | 32    | 8%      |      |
| What influenced your decision to construct, upgrade or reconstruct the sanitation facility | CHVs                                   | Yes   | 35      | 16%  |
|  |  | No    | 185     | 84%  |
|  | Cultural beliefs                       | Yes   | 2       | 1%   |
|  |  | No    | 218     | 99%  |
|  | Moral beliefs                          | Yes   | 1       | 1%   |
|  |  | No    | 219     | 99%  |
|  | Social status                          | No    | 12      | 6%   |
|  |  | Yes   | 208     | 94%  |
|  | Government directives/policies/by laws | No    | 220     | 100% |
|  | Continued follow-up visits             | Yes   | 2       | 1%   |
|  |  | No    | 218     | 99%  |

The **Table 5** above further shows the descriptive analysis of these socio-economic variables. Only 3% of the respondents were aware of cultural or social reasons that affect the sustainability of ODF villages the other proportion did not know 8%, while majority were not aware 89%. In terms of Influencers to construct, upgrade or reconstruct the sanitation facility, only a small proportion of the respondents confirmed having been influenced by social status 94%, and CHVs 16% while other factors did not influence the respondents.

In examining the relationship between socio-economic factors and ODF sustainability of the villages, the chi-square test was applied. In instances where the chi-square test assumptions were violated the study applied the Fisher's exact test as shown in table 5 below.

**Table 6. Chi-Square test for socio-economic factors influencing ODF sustainability**

| <b>Employment status of respondents * ODF sustainability</b>   |                     |    |                                   |                      |
|--|---------------------|----|-----------------------------------|----------------------|
|  | Value               | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) |
| Pearson Chi-Square   | 13.520 <sup>a</sup> | 3  | .004                              | .005                 |
| Fisher's Exact Test  | 11.197              |    |                                   | .008                 |
| N of Valid Cases   | 397                 |    |                                   |                      |
| <i>a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 1.51.</i>                     |                     |    |                                   |                      |
| <b>Existence of cultural or social reasons that affect the sustainability of ODF villages * ODF sustainability</b> |                     |    |                                   |                      |
| Pearson Chi-Square   | 3.238 <sup>a</sup>  | 2  | .198                              | .185                 |
| Fisher's Exact Test  | 2.916               |    |                                   | .211                 |
| N of Valid Cases   | 397                 |    |                                   |                      |
| <i>a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.64.</i>                     |                     |    |                                   |                      |
| <b>What influenced your decision to construct, upgrade or reconstruct the sanitation facility:</b>                 |                     |    |                                   |                      |
| <b>CHVs * ODF sustainability</b>   |                     |    |                                   |                      |
| Pearson Chi-Square   | .063 <sup>a</sup>   | 1  | .802                              | 1.000                |
| Fisher's Exact Test  |                     |    |                                   | 1.000                |
| N of Valid Cases   | 220                 |    |                                   |                      |
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.45.</i>                     |                     |    |                                   |                      |
| <b>Cultural beliefs * ODF sustainability</b>   |                     |    |                                   |                      |
| Pearson Chi-Square   | .294 <sup>a</sup>   | 1  | .587                              | 1.000                |
| Fisher's Exact Test  |                     |    |                                   | 1.000                |
| N of Valid Cases   | 220                 |    |                                   |                      |
| <i>a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .25.</i>                      |                     |    |                                   |                      |
| <b>Moral beliefs * ODF sustainability</b>  |                     |    |                                   |                      |
| Pearson Chi-Square   | .146 <sup>a</sup>   | 1  | .702                              | 1.000                |
| Fisher's Exact Test  |                     |    |                                   | 1.000                |

|  |                    |   |      |      |
|--|--------------------|---|------|------|
| N of Valid Cases   | 220                |   |      |      |
| <i>a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .13</i>   |                    |   |      |      |
| <b>Social status * ODF sustainability</b>  |                    |   |      |      |
| Pearson Chi-Square   | 4.852 <sup>a</sup> | 1 | .028 | .041 |
| Fisher's Exact Test  |                    |   |      | .041 |
| N of Valid Cases   | 220                |   |      |      |
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.53.</i> |                    |   |      |      |
| <b>Continued follow-up visits * ODF sustainability</b>   |                    |   |      |      |
| Pearson Chi-Square   | 2.524 <sup>a</sup> | 1 | .112 | .239 |
| Fisher's Exact Test  |                    |   |      | .239 |
| N of Valid Cases   | 220                |   |      |      |
| <i>a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .25.</i>  |                    |   |      |      |

The result in **Table 6** above table shows significant association between ODF sustainability and both (i) employment status (*Fisher's Exact test which shows the corresponding p-value is small ( $p=0.008$ ) which is less than the significance level (0.05)*); and (ii) social status (*Fisher's Exact test which shows the corresponding p-value is small ( $p=0.041$ ) which is less than the significance level (0.05)*).

Further results show no significant relationship between all the other socio-economic factors studied and ODF sustainability (*Fisher's Exact test which shows the corresponding p-value is greater than the significance level (0.05)*).

The findings are further supported from discussions with community members who attributed availability of a sanitation facility to a household's financial capacity.

### **Employment status**

- Households with at least one member engaged in income-generating activities (the head or spouse) were likely to build, upgrade or rebuild a sanitation facility if necessary (i.e., collapsing of existing facility or when a facility is full).
- On the contrary, households which did not have any members engaging in any income generating activity were less likely to upgrade or reconstruct sanitation facility attributed to the financial constraints
- Households with at least a member engaging in self-employment and/or salaried employment were more likely to have improved sanitation facilities – more sustainable - while those who were not employed or engaging in casual employment were more likely to construct an unimproved facility - less sustainable.

### **Social status**

- Social status was defined in relation to level of respect, honour, assumed competence; and it was linked to employment status and highest level of education.

- Households which had a member (s) engaging in a form of employment or pursuing higher levels of education were more likely to be in the higher rank in terms of social status; this further influenced them to construct, upgrade or reconstruct the sanitation facility with ease whenever it was damaged or full or in need of a new one.
- Opinion leaders, influential community members, key resource persons in the community, etc. were more likely to have a sanitation facility in their homes and in some instances improved facilities.

### 4.3 Open Defecation Free Sustainability

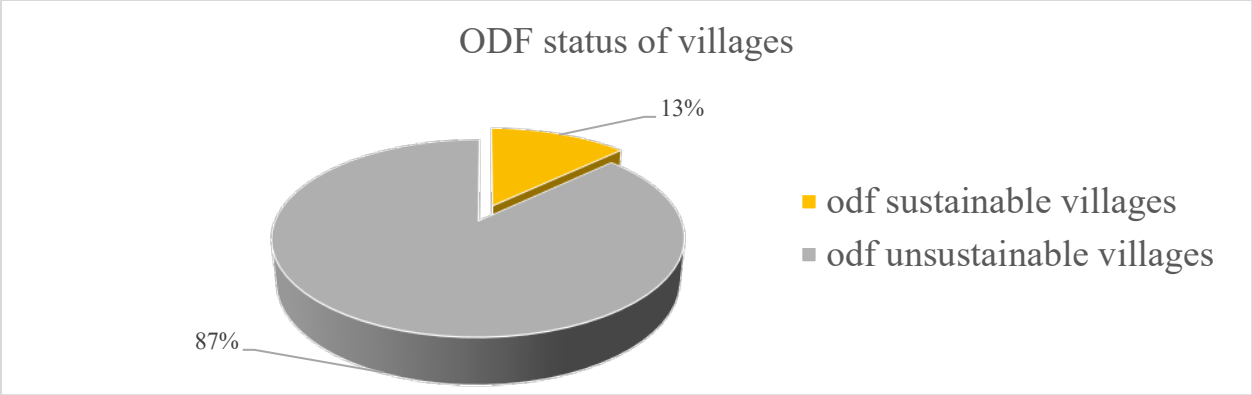
The study used a range of non-negotiable parameters (Kamal Kar& chamber 2008) to evaluate the ODF status, and every surveyed household was expected to have the following.

The table below shows the proportion of the households based on the non-negotiable parameters.

**Table 7. Open defecation free status parameters**

| N=397  |                          | Count | %   |
|--|--------------------------|-------|-----|
| Presence of a sanitation facility            | No                       | 11    | 3%  |
|  | Yes                      | 386   | 97% |
| Privacy in the sanitation facility           | No permission to observe | 11    | 2%  |
|  | No                       | 78    | 20% |
|  | Yes                      | 308   | 78% |
| Presence of a drop hole cover                | No                       | 278   | 70% |
|  | Yes                      | 119   | 30% |
| Open defecation in the household surrounding | No permission to observe | 11    | 3%  |
|  | No                       | 376   | 95% |
|  | Yes                      | 10    | 2%  |
| Functional hand washing point                | No                       | 346   | 87% |
|  | Yes                      | 51    | 13% |

Upon application of these parameters the study found out that 97% of households had functional sanitation facilities, 78% had a sanitation facility which offers privacy. Majority 95% of the households were free of human excreta in the compound, 2% had visible signs of open defecation around the house indicating that OD was practiced at these households while 3% did not allow the interviewer to observe, 30% had a sanitation facility with a drop hole cover and only 13% of the surveyed households had a functional hand washing facility (presence of water and soap/detergent/ash). Figure 3. Below shows the ODF status of all villages



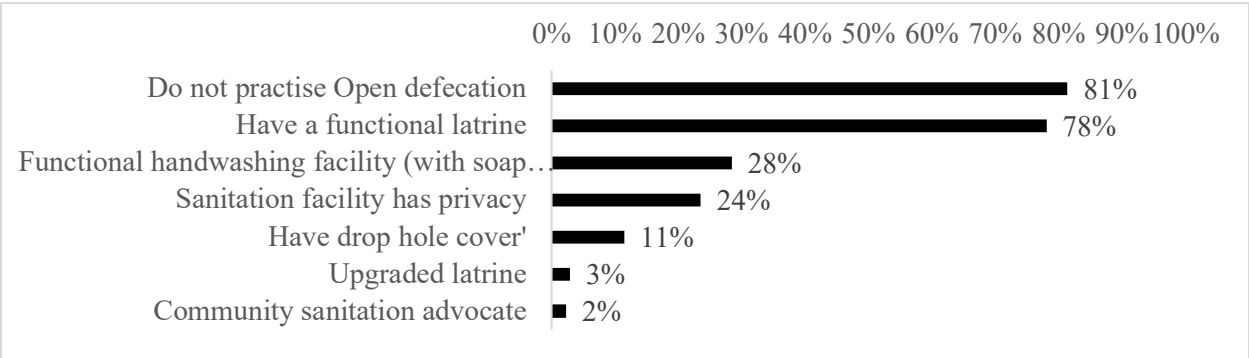
**Figure 4. ODF status of the villages**

The study finds that the proportion of villages maintaining ODF status declines to 13% when all the 5 parameters are evaluated indicating an overall reversion rate of 87% as illustrated in the figure below.

**Level of awareness of villages ODF status** Table 7 below shows that 77% of sampled households demonstrated awareness to the fact that the villages were declared ODF; while 23 % reported that they were not aware.

**Table 8: Level of awareness of village ODF status**

| Response | Frequency | Percentage |
|----------|-----------|------------|
| Yes      | ,306      | 77         |
| No       | 91        | 23         |
| Total    | 397       | 100        |



**Figure 5. Household contribution to maintenance of ODF status**

**Contributors to maintenance of ODF status**

The study noted that the 77% who were aware that their village was declared ODF contributed to ensuring maintenance of ODF status by shunning open defecation 81%, and having a functional latrine, 74%, an indication that knowledge was key in ODF sustainability. Other ways were not

common as shown in the figure below including presence of hand washing facility, privacy of the sanitation facility and presence of a drop hole cover in the sanitation facility – these are among the range of parameters used to define ODF sustainability of the villages. The minimal numbers of households reporting such practices contributes the smaller proportion (13%) of ODF sustainable villages and households as indicated above

**Table 9. Motivators and enabling factors for households maintaining ODF status**

| <b>Motivating factors for ODF status</b>   | <b>%</b> | <b>Enabling factors for ODF status</b>      | <b>%</b> |
|--|----------|---|----------|
| Comfort and convenience                    | 74%      | Availability of Locally available Materials | 77%      |
| Health                                     | 60%      | Availability of land                        | 64%      |
| Avoid shame and stigma                     | 47%      | Availability of low-cost labour             | 44%      |
| Public health requirement                  | 27%      | Availability of water                       | 21%      |
| Sanitation & Hygiene promotional campaigns | 6%       | Ground condition                            | 17%      |
| Follow up visits                           | 4%       | Support from the community                  | 5%       |
| Rewards                                    | 2%       | Availability of funds for construction      | 4%       |
| By laws, penalties, and threats            | 1%       | External support from partners              | 2%       |

**Motivating factors for ODF status:** The study established that comfort and convenience 74% and health, 60%, avoidance of shame and stigma 47%, and public health requirement at 27 % were the major motivators.

**Enabling factors for ODF status:** On the other hand, the major enabling factors were availability of locally available materials 77%, availability of land, 64%, Availability of low-cost labour forty-four% and availability of water 21% Other enabling factors included: - support from the community, availability of funds for construction, and external support from partners.

The study further sought to understand the extent through which these factors were contributing and motivating villages to maintain ODF through discussions with community members and key stakeholders.

### **Comfort and convenience**

The community members were motivated to use a sanitation facility because.

- It is easier than defecating in the open; and it is safer to use at night rather than the bushes
- Visitors find a proper place to use whenever they want to use a latrine
- It is better knowing the faeces have been dumped deep in the soil rather than on the open where flies easily carry onto food eaten in the home
- By disposing faeces in the toilet, one has discouraged presence of rats and birds in the compound which become a menace
- During the rains, it is easier to use the toilet rather than defecating in the open because it floods often, or the ground is wet always

- Through using a toilet, it encourages proper anal cleansing unlike defecating in the open

### **Health**

- Open defecation results in water borne diseases due to water contamination, which is common during and after the rains, thus by avoiding it the community is preventing themselves from such diseases
- Faeces in the open can be picked by flies which also land in food that is not covered thus this contributes to disease from contamination of food with faecal matter
- Young children are prone to diarrhoea because they easily consume anything lying on the ground more so fruits which may be contaminated with faecal matter disposed in the open, hence by disposing faeces properly a household would be protecting their children from such diseases

### **Avoid shame and stigma**

- It is embarrassing for both the elderly and children to defecate in the bush
- Households which do not have a sanitation facility are said to be unhygienic, and often despised
- In instances where a household head lives with son/daughters-in-law in the same homestead, it is embarrassing for the head to meet them defecating in the bush.
- A clean toilet is a sign of civilized and well-respected household in the community, on the contrary households which have poor latrines or do not have one are said to be uneducated.

### **Public health requirement**

- It is a requirement for a household to have access to a sanitation facility by Ministry of Health; however, the community members note that there is not enforcement of such guidelines hence the few cases of households without toilets.
- Community leaders strongly recommend each household to have a toilet, but it is not enforced as per the MoH guidelines

### **S&H promotional campaigns**

- Frequent awareness reminds the community member on the need to adopt good sanitation and hygiene practices, however, it is rarely done hence households easily revert to old practices
- The MoH rarely conducts these awareness campaigns, instead organizations take up the role, however, whenever they exit an intervention area, the community members are likely to revert.

Qualitative findings from analysis of the enabling factors are discussed below.



### **Availability of Locally available Materials**

- Local materials including wood, mud, bricks, concrete, iron sheets, etc. are readily available in the nearby markets hence households easily construct sanitation facilities
- The cost of constructing a wooden slab is manageable by the community because one needs strong poles, wire mesh, and mud; at the same time, the super structure is cheap with availability of poles and grass or iron sheets.
- Concrete slabs require an extra cost, but it is manageable and enhances durability of the sanitation facilities.
- Majority of the households practice farming as well as plant trees thus there is always timber and wood logs which can be used to construct or repair the sanitation facilities.
- The cost of materials is approximated to be between Kes. 10,000 – 15,000 (\$100 - \$150) inclusive of materials for constructing the slab and putting up the superstructure.

### **Availability of land**

- At least every household has a sizeable piece of land (a least one acre) where they live and usually the sanitation facilities cover a small proportion of the available land (approximately 3 square meters) hence it is easy to construct a sanitation facility even for those with small plots.
- In homesteads where several families live together, they are likely to have large piece of land, thus it is easier to construct more than one toilet a well as new ones whenever old one's collapse beyond repair or are full beyond emptying.

### **Availability of low-cost labour**

- Casual labourers are available who can dig pits; in addition, they charge an affordable fee based on the type of soil
- Within the community there are artisans well skilled in construction and repair of toilets this encourages the community members to build or repair the facilities easily at an affordable fee.
- The cost of labour is approximated to be between Kshs.5,000 - 10,000 (\$50 - \$100) inclusive of digging the pits, constructing the slab, and putting up the superstructure.

### **Ground condition**

- Casual labourers charge an affordable fee of Kes. 5,000 (\$50) for digging a pit in a less rocky ground while the fee goes up to Kes. 8,000 (\$80) for a rocky ground.
- The villages surveyed are in a less rocky ground hence the ease in constructing the toilets at an affordable fee while those in a rocky area negotiate with the casual labourers.
- Majority of the community members live farther away from the rivers – areas in higher grounds – thus the sanitation facilities do not experience flooding, hence improving their durability.

### **Support from the community**

- In households where only the elderly live, community members mobilize each other to construct sanitation facilities for them thus enhance open defecation free amongst them.
- Community members who are unable to construct their own toilets tend to share with their neighbours as well as situations where a latrine is not usable households freely share the toilets.

### **Demotivators of ODF sustainability.**

Despite a village having been certified to have attained ODF status. This study shows reversion to open defecation. The study revealed that sharing latrine with neighbour 82%, financial constraints 27%, and collapsing soil 27% are the major factors contributing to household reverting to open defecation these findings are further supported by the below qualitative findings.

### **Sharing latrine with neighbour**

- Households which share a sanitation facility were more likely to practice open defecation more at night whenever they are unable to access the shared facilities which is outside their home.
- Shared sanitation facilities are more likely to be full in a short duration and with the design of the facilities not allowing emptying, the households tend to practice open defecation before constructing a new latrine.
- Sanitation facilities which are shared are less likely to be cleaned on daily basis thus not allowing users to use them conveniently, these results in members opting to practice open defecation.
- Households which share a latrine are less motivated to construct their own sanitation facility thus putting pressure on the available facilities; this makes the facilities less durable.

### **Financial constraints**

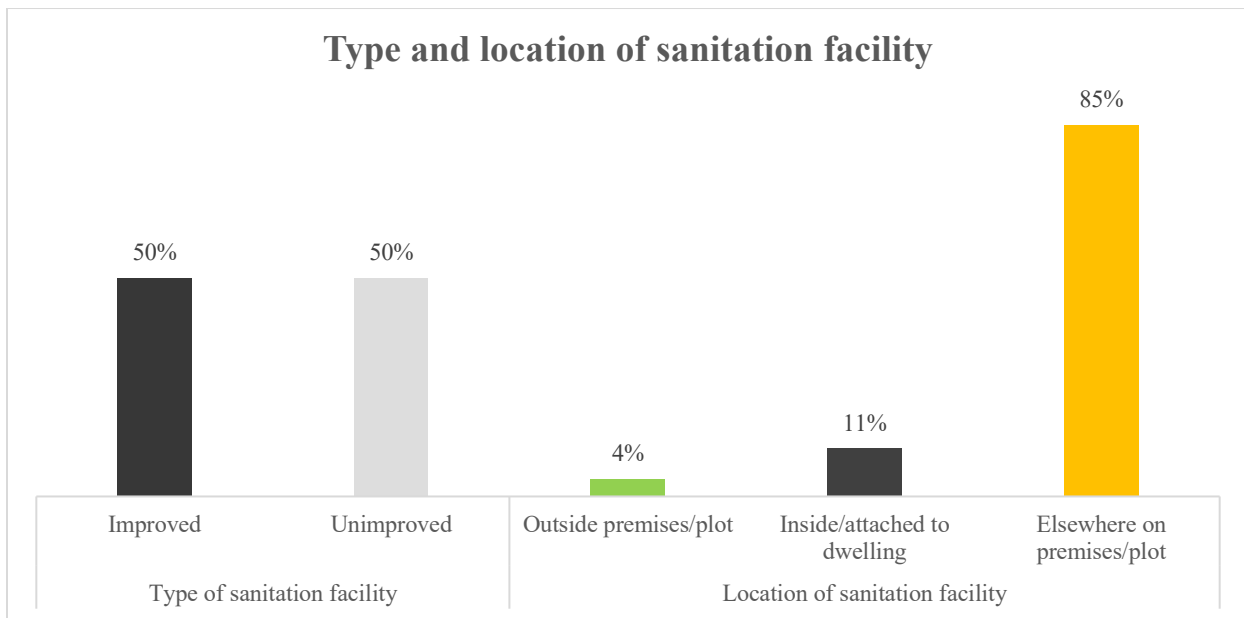
- Majority of the households do not have income generating activities (evident from the study as 62% of the respondents noted they are unemployed) hence community members cited lack of financial resources as a major hurdle in constructing and/or repairing the sanitation facilities.
- The cost of constructing a new sanitation facility was estimated between Kes. 15,000 – Kes. 25,000 (\$150 - \$250) while that of repair was approximated at Kes. 5,000 – Kes 8,000 (\$50 - \$80). These costs are considered high by the community members who struggle to fend for their families in terms of food, shelter, and clothing (necessities).

### **Collapsing soil**

- Just a few of the community members live and have constructed sanitation facilities in ground which tend to collapse during the rains. In such cases, community members were less motivated to construct a new toilet taking into consideration the cost and lack of sources of income.
- In areas where the soil collapses, community members are less motivated to construct a toilet, since they anticipate the rains to damage the facilities thus no need to invest in a toilet which is going to collapse soon.

### Sanitation Technology Quality and Maintenance factors

The study explored how sanitation technology, quality and maintenance of sanitation facilities contributed to ODF sustainability of the villages. Data was collected from households on the following variables: (i) location of the sanitation facility, (ii) distance of the sanitation facility from the house, (iii) whether a facility was improved or unimproved, and (iv) whether a household had experienced any issues with their facility during the previous 5 years (i.e., leaking, collapsing soil, broken parts, flooding, cracking, etc.).



**Figure 6. Type and location of sanitation facility**

The study revealed that 85% of the surveyed households had a sanitation facility elsewhere on premise/plot, 11% had sanitation facilities inside dwelling/attached to dwelling and 4% had it outside premise/plot, and the average distance to the sanitation facility was 24 meters. Further analysis shows, equal proportions of households were using improved and unimproved sanitation facilities at 50% each.

**Table 10. Sanitation technology, quality, and maintenance variables**

| N=386 | Count | percent | average |
|-------|-------|---------|---------|
|-------|-------|---------|---------|

|   |                 |     |     |
|---|-----------------|-----|-----|
| <i>Distance of sanitation facility from the house (meters)</i>      | Mean            |     | 24  |
| <i>Households which experienced issues with sanitation facility</i> | No              | 319 | 83% |
|   | Yes             | 67  | 17% |
| <i>Issues with sanitation facility</i>                              | Leaking         | 20  | 30% |
|   | Collapsing soil | 23  | 34% |
|   | Broken parts    | 28  | 41% |
|   | Flooding        | 10  | 15% |
|   | Cracked         | 22  | 33% |

The study noted that only 17% of the households had experienced issues with sanitation facilities that included breaking of parts 41%, collapsing soil 34%, cracking 33%, leaking 30% and flooding at 10%.

The Chi-Square test of independence<sup>2</sup> was further used to determine whether there is an association between these sanitation technology, quality, and maintenance variables and ODF sustainability with the Pearson Chi-Square coefficient. The chi-square test was used for checking association between the three variables which were in categories (*Location of sanitation facility, type of sanitation facility and whether households experienced issues with sanitation facility*) while the point biserial correlation<sup>3</sup> was used for checking association between the continuous variable (*Distance of sanitation facility from the house (meters)*) and ODF sustainability.

In determining the association between ODF sustainability of the villages and these variables, the following hypothesis were tested - null hypothesis  $H_0$  - ODF sustainability of households is independent of each of the variable (no significant association)), and alternative hypothesis ( $H_1$  - ODF sustainability of the villages is dependent of each of the variable (s), (there is a significant association)).

**Table 11. Chi-Square tests for Sanitation Technology Quality and Maintenance variables**

| <i>Location of sanitation facility * ODF sustainability</i>                                   |                    |    |                                   |                      |
|---|--------------------|----|-----------------------------------|----------------------|
|   | Value              | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) |
| Pearson Chi-Square  | 2.731 <sup>a</sup> | 1  | .098                              | .144                 |
| Fisher's Exact Test   |                    |    |                                   | .144                 |
| N of Valid Cases  | 386                |    |                                   |                      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.57.</i> |                    |    |                                   |                      |
| <i>Type of sanitation facility * ODF sustainability</i>                                       |                    |    |                                   |                      |

<sup>2</sup> Chi-square test of independence is used to determine whether there is an association between categorical variables

<sup>3</sup> Point biserial correlation is used to determine whether there is an association between a continuous variable and a categorical variable.

|  |                     |   |      |       |
|--|---------------------|---|------|-------|
| Pearson Chi-Square   | 18.349 <sup>a</sup> | 1 | .000 | .000  |
| Fisher's Exact Test  |                     |   |      | .000  |
| N of Valid Cases   | 386                 |   |      |       |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 24.87.</i> |                     |   |      |       |
| <b><i>Issues with sanitation facility * ODF sustainability</i></b>                             |                     |   |      |       |
| Pearson Chi-Square   | .017 <sup>a</sup>   | 1 | .898 | 1.000 |
|  |                     |   |      | .844  |
| N of Valid Cases   | 386                 |   |      |       |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.68.</i>  |                     |   |      |       |

The table above show results from the chi-square test of independence which show there is a significant association between ODF sustainability and type of sanitation facility [ $\chi(1) = 18.349, p < 0.05$ ]; however, there is **NO** significant association between ODF sustainability and both location of sanitation facility [ $\chi(1) = 2.731, p > 0.05$ ]; and whether a household had issues with their sanitation facility [ $\chi(1) = 0.017, p > 0.05$ ].

**Table 12. Correlation analysis for Sanitation Technology Quality and Maintenance variables**

| <b>Point Biserial Correlations</b> |                     |                    |                                 |
|------------------------------------|---------------------|--------------------|---------------------------------|
|                                    |                     | ODF sustainability | Distance of sanitation facility |
| ODF sustainability                 | Pearson Correlation | 1                  |                                 |
|                                    | Sig. (2-tailed)     |                    |                                 |
|                                    | N                   | 386                |                                 |
| Distance of sanitation facility    | Pearson Correlation | -.007              | 1                               |
|                                    | Sig. (2-tailed)     | .893               |                                 |
|                                    | N                   | 386                | 386                             |

In addition, the point biserial correlation was run to determine whether there is a relationship between ODF sustainability and distance of the sanitation facility from the house. The results in table **Table 12** 11 above show a negative correlation coefficient (-.007) between the two variables and the corresponding p-value is 0.893 which is greater than the significance level ( $p > 0.05$ ) hence there is no significant relationship between ODF sustainability and distance of the sanitation facility from the house. Overall, there is a significant relationship between an ODF sustainable villages and whether a household has a sanitation that is improved or unimproved. These results are corroborated by discussions with community members who reported that improved sanitation facilities are likely to last longer as compared to unimproved facilities; this is attributed to majority of the unimproved sanitation facilities being constructed using mud and wood as observed during the study. This type of infrastructure is prone to destruction during flash floods and fierce winds not durable to serve the households in the long term.

**Type of sanitation facility (improved or unimproved)**

- The common unimproved sanitation facilities were basic latrines made of wood and mud (slab and walls), and grass or iron sheets (roof). These types of structures are prone to destruction during flash floods and intense winds thus cannot be sustained in the long-term thus cannot be sustainable in the long-term.
- Similarly, users are likely to avoid using such unimproved facilities because of fear of collapsing soil and lack of privacy leading to defecation in nearby bushes.
- On the other hand, improved sanitation facilities are durable, offer privacy, comfort, and convenience to users hence discourages open defecation.

#### 4.4 Behaviour Change Approaches

The study explored how behaviour change approaches influenced ODF sustainability of the villages. The table below indicates descriptive analysis of parameters considered

**Table 13. Descriptive analysis of behaviour change parameters**

|  |                             |     | Count | Percent |
|--|-----------------------------|-----|-------|---------|
| Are you aware that this village was declared open defecation free?             | No                          |     | 91    | 23%     |
|  | Yes                         |     | 306   | 77%     |
| Have you ever heard of any Sanitation and hygiene teachings in your community? | No                          |     | 80    | 20%     |
|  | Yes                         |     | 303   | 76%     |
|  | Does not know               |     | 14    | 4%      |
| What did you learn in the teachings?   | Sanitation promotion        | No  | 10    | 3%      |
|  |                             | Yes | 293   | 97%     |
|  | Hygiene promotion           | No  | 17    | 6%      |
|  |                             | Yes | 286   | 94%     |
| What were the sources of sanitation and hygiene messages?                      | Local church                | No  | 237   | 78%     |
|  |                             | Yes | 66    | 22%     |
|  | Media                       | No  | 247   | 82%     |
|  |                             | Yes | 56    | 18%     |
|  | Hospital                    | No  | 261   | 86%     |
|  |                             | Yes | 42    | 14%     |
|  | Health officials            | No  | 211   | 70%     |
|  |                             | Yes | 92    | 30%     |
|  | CHVs                        | No  | 28    | 9%      |
|  |                             | Yes | 275   | 91%     |
|  | Community dialogue sessions | No  | 238   | 78%     |
|  |                             | Yes | 65    | 22%     |
|  | Chief                       | No  | 274   | 90%     |
|  |                             | Yes | 29    | 10%     |
|  | No                          | 292 | 96%   |         |

|  |   |   |     |      |
|--|---|---|-----|------|
|  | Poster/billboards/pamphlets/fliers  | Yes   | 11  | 4%   |
| Did you participate in CLTS triggering session in your community                     |   | No  | 351 | 88%  |
|  |   | Yes   | 29  | 7%   |
|  |   | Do not remember   | 17  | 4%   |
| What do you remember from the triggering session?                                    |   | Transect walk   | 12  | 41%  |
|  |   | Shit calculation  | 12  | 41%  |
|  |   | Food demonstration  | 19  | 66%  |
|  |   | Medical expense   | 8   | 28%  |
|  |   | Do not remember   | 3   | 10%  |
| Triggering session benefits you and your community                                   |   | Yes   | 29  | 100% |
| If yes, explain how?   |   | Constructed latrine   | 12  | 41%  |
|  |   | NO OD   | 20  | 69%  |
|  |   | Have functional hand washing facilities with flowing and soap/Ash | 18  | 62%  |
|  |   | Water treatment   | 17  | 59%  |
|  |   | Covering food   | 17  | 59%  |
|  |   | No sanitation and hygiene related disease                         | 7   | 24%  |
| Are there cultural or social reasons that affect the sustainability of ODF villages? |   | Does not know   | 32  | 8%   |
|  |   | No  | 352 | 89%  |
|  |   | Yes   | 13  | 3%   |
| If yes, list them  | Do not share a latrine with in-laws   |   |     |      |
|  | Daughter-in-law cannot share a toilet with father-in-law                                |   |     |      |
|  | Father in-law cannot use the same sanitation facility as daughter in-law and vice versa |   |     |      |
|  | If you are practicing OD, you are forced to carry it bare hands to the chief's office   |   |     |      |
|  | It is wrong to OD in someone's land   |   |     |      |
|  | Not recommended to use the same latrine as the kids                                     |   |     |      |
|  | The elderly men do not share latrine with daughter-in-law                               |   |     |      |
|  | The older people cannot use the same sanitation facility with the young ones            |   |     |      |
|  | The parents are not supposed to use the same facility with their in-laws                |   |     |      |
|  | The parents are not using the same sanitation as their in-law                           |   |     |      |
|  | The parents cannot use the same sanitation facility as their in-laws                    |   |     |      |
|  | The parents do not use the same latrine as the children                                 |   |     |      |
| You cannot use the same sanitation facility as the in-laws.                          |   |   |     |      |

The analysis above shows 77% of the respondents were aware that their villages were declared open defecation free. In addition, 76% of them heard about sanitation and hygiene teachings in their community with common teaching being sanitation promotion and hygiene promotion at 97% and 94% respectively. The most common source of information was Community Health Volunteers 91%, health officials 30%, Community dialogue sessions, and local church 22% each, media 18%, hospital 14%, Local administration 10% and IEC materials (Posters /billboards/pamphlets/fliers) 4%.

Notably, only 7% of the respondents (29 out of 397) confirmed having participated in CLTS triggering session in their community and all of them (n=29) reported benefitting from the sessions. The respondents reported to remembering the following CLTS tools from triggering activity: food demonstration 66%, transect walk and shit calculation 41% each, medical expense 28% while others did not know 10%. They further noted the benefit of the triggering sessions as follows It has led to no open defecation 69%, having functional hand washing facilities 62%, covering food and water treatments at 59% each, constructed latrines 41% and No sanitation and hygiene related illness at 24%.

A few respondents noted that there were social and cultural reasons which affected ODF sustainability at 3%, such as father in-laws not sharing latrines with daughter in-laws. The chi-square test of independence was further used to determine the association between ODF sustainability of the villages and the behavioural change variables as shown in the table below

**Table 14. Chi-Square test for Behaviour Change parameters**

| <b>Awareness about village declared ODF * ODF sustainability</b>                               |                   |    |                                   |                      |
|--|-------------------|----|-----------------------------------|----------------------|
|  | Value             | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) |
| Pearson Chi-Square   | .307 <sup>a</sup> | 1  | .580                              | .591                 |
| Fisher's Exact Test  |                   |    |                                   | .591                 |
| N of Valid Cases   | 397               |    |                                   |                      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.46.</i> |                   |    |                                   |                      |
| <b>Heard any Sanitation and hygiene teachings in the community * ODF sustainability</b>        |                   |    |                                   |                      |
| Pearson Chi-Square   | .627 <sup>a</sup> | 2  | .731                              | .710                 |
| Fisher's Exact Test  | .708              |    |                                   | .707                 |
| N of Valid Cases   | 397               |    |                                   |                      |
| <i>a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.76.</i> |                   |    |                                   |                      |
| <b>Sanitation promotion teachings * ODF sustainability</b>                                     |                   |    |                                   |                      |
| Pearson Chi-Square   | .417 <sup>a</sup> | 1  | .518                              | .626                 |
| Fisher's Exact Test  |                   |    |                                   | .626                 |
| N of Valid Cases   | 303               |    |                                   |                      |



|  |                    |   |      |       |
|--|--------------------|---|------|-------|
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.32.</i> |                    |   |      |       |
| <b>Hygiene promotion teachings * ODF sustainability</b>  |                    |   |      |       |
| Pearson Chi-Square   | .032 <sup>a</sup>  | 1 | .857 | 1.000 |
| Fisher's Exact Test  |                    |   |      | 1.000 |
| N of Valid Cases   | 303                |   |      |       |
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.24.</i> |                    |   |      |       |
| <b>Sources of sanitation and hygiene messages:</b>   |                    |   |      |       |
| <b>Local church * ODF sustainability</b>   |                    |   |      |       |
| Pearson Chi-Square   | 6.682 <sup>a</sup> | 1 | .010 | .014  |
| Fisher's Exact Test  |                    |   |      | .014  |
| N of Valid Cases   | 303                |   |      |       |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.71.</i>  |                    |   |      |       |
| <b>Media * ODF sustainability</b>  |                    |   |      |       |
| Pearson Chi-Square   | .371 <sup>a</sup>  | 1 | .543 | .665  |
| Fisher's Exact Test  |                    |   |      | .665  |
| N of Valid Cases   | 303                |   |      |       |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.39.</i>  |                    |   |      |       |
| <b>Hospital * ODF sustainability</b>   |                    |   |      |       |
| Pearson Chi-Square   | .511 <sup>a</sup>  | 1 | .475 | .624  |
| Fisher's Exact Test  |                    |   |      | .465  |
| N of Valid Cases   | 303                |   |      |       |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.54.</i>  |                    |   |      |       |
| <b>Health officials * ODF sustainability</b>   |                    |   |      |       |
| Pearson Chi-Square   | 4.669 <sup>a</sup> | 1 | .031 | .041  |
| Fisher's Exact Test  |                    |   |      | .041  |
| N of Valid Cases   | 303                |   |      |       |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.15.</i> |                    |   |      |       |
| <b>CHVs * ODF sustainability</b>   |                    |   |      |       |
| Pearson Chi-Square   | 3.748 <sup>a</sup> | 1 | .053 | .073  |
| Fisher's Exact Test  |                    |   |      | .073  |
| N of Valid Cases   | 303                |   |      |       |
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.70.</i> |                    |   |      |       |
| <b>Community dialogue sessions * ODF sustainability</b>  |                    |   |      |       |
| Pearson Chi-Square   | 9.409 <sup>a</sup> | 1 | .002 | .004  |
| Fisher's Exact Test  |                    |   |      | .004  |
| N of Valid Cases   | 303                |   |      |       |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.58.</i>  |                    |   |      |       |
| <b>Chief * ODF sustainability</b>  |                    |   |      |       |

|  |                     |   |      |      |
|--|---------------------|---|------|------|
| Pearson Chi-Square   | 3.348 <sup>a</sup>  | 1 | .067 | .082 |
| Fisher's Exact Test  |                     |   |      | .082 |
| N of Valid Cases   | 303                 |   |      |      |
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.83.</i> |                     |   |      |      |
| <b>Poster/billboards/pamphlets/fliers * ODF sustainability</b>                                 |                     |   |      |      |
| Pearson Chi-Square   | .247 <sup>a</sup>   | 1 | .619 | .644 |
| Fisher's Exact Test  |                     |   |      | .644 |
| N of Valid Cases   | 303                 |   |      |      |
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.45.</i> |                     |   |      |      |
| <b>Participation in CLTS triggering session in community * ODF sustainability</b>              |                     |   |      |      |
| Pearson Chi-Square   | 23.868 <sup>a</sup> | 2 | .000 | .000 |
| Fisher's Exact Test  | 17.354              |   |      | .000 |
| N of Valid Cases   | 397                 |   |      |      |
| <i>a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.14.</i> |                     |   |      |      |

The results in table 13 above show there is a significant association between ODF sustainability and local churches [ $\chi(1) = 6.682, p < 0.05$ ], Health officials [ $\chi(1) = 4.669, p < 0.05$ ], Community dialogue (Fisher's Exact test which shows the corresponding p-value is small ( $p = 0.004$ ) which is less than the significance level (0.05)); as sources of sanitation and hygiene messages and respondents' participation in CLTS triggering session. (Fisher's Exact test which shows the corresponding p-value is small ( $p < 0.001$ ) which is less than the significance level (0.05). On the other hand, there was no significant relationship between ODF sustainability of the villages and the other behavioural change variables.

### **The findings correspond with qualitative analysis shown below**

#### **Local church as a source of sanitation and hygiene messages**

- Local churches have been instrumental in sensitizing of community members on the negative impact of mass open defecation. The study noted that, a substantial number of households are affiliated to a religion, and they often attend these religious meetings where they get to listen to health talks during sanitation and hygiene promotion sessions.
- It was eminent that LWAR approach through Church Mobilization and Gospel Proclamation had reached several community members with ease and simplicity in understanding the gospel and promoting proper sanitation and hygiene practices.
- The respondents pointed out that church leaders trained on WASH trainings are equipped with knowledge and understanding of the sanitation and hygiene approaches which they replicate to the congregants. The Church Mobilization Groups formed from the LWSC Flourish approach have enhanced proper sanitation and hygiene practices at the household level.

#### **Health officials as a source of sanitation and hygiene messages**

- The study revealed that all community members are linked to health facilities where they sought medical services at the dispensaries, health centres and hospitals which are vital in sustaining proper sanitation and hygiene behaviours hence a high likelihood of continuation in sensitization.
- CHVs, Public Health Officers, and CHAs as structured in the community health strategy were crucial in providing the program valuable information and support in its implementation approaches including conducting certification of ODF villages.

### Community dialogue sessions as a source of sanitation and hygiene messages

- Community dialogue sessions provided the community members an opportunity to air their views while identifying the most urgent needs regarding sanitation and hygiene hence it was more likely to encourage households to adopt good sanitation and hygiene practices.
- Through the sessions, households and community leaders laid down measures and mechanisms to mobilize community members in construction of sanitation facilities thus contributing to ODF sustainable communities.

### Participation in CLTS triggering session in the community

- Community members who participated in the CLTS triggering sessions were more likely to construct sanitation facilities mainly because of trainings and teaching on the negative impact of open defecation. Community members learnt several CLTS tools including *Transect walk*, *Shit calculation*, *Food demonstration* and *medical expenses* that stimulated the need to shun open defecation

## 4.5 Management structures

The study reviewed the relationship between ODF sustainability of villages and the following management structure parameters – knowledge about; (i) availability of trained local artisans within the community, (ii) existence of active sanitation and hygiene committee in the village, (iii) Post ODF follow-up (iv) existing by laws governing on sanitation and hygiene practices and (v) penalties for not having or using a sanitation facility.

The table below shows descriptive analysis for the variables.

**Table 15. Descriptive analysis for management structure parameters**

|   |               | Count | Percent |
|---|---------------|-------|---------|
| Do you know any trained local artisan who can construct /rebuild/maintain your sanitation facility? | No            | 98    | 25%     |
|   | Yes           | 299   | 75%     |
| Is there an active sanitation and hygiene committee in the village?                                 | No            | 70    | 18%     |
|   | Yes           | 275   | 69%     |
|   | Does not know | 52    | 13%     |

|  |  |     |     |
|--|--|-----|-----|
| If yes, who are they?  | Community Health Volunteers              | 266 | 97% |
|  | Admin department (Chief, village elders) | 81  | 29% |
|  | Community members                        | 40  | 15% |
|  | Natural leaders                          | 2   | 1%  |
| Has any follow up occurred since this village was declared ODF?                  | No                                       | 98  | 25% |
|  | Yes                                      | 299 | 75% |
| Who conducted the Post ODF follow up?  | LWSC staff                               | 40  | 13% |
|  | CHVs (Community Health Volunteers)       | 292 | 98% |
|  | Village elders                           | 46  | 15% |
|  | Other NGO                                | 1   | 0%  |
|  | Sub county public health offices         | 8   | 3%  |
| Existing by laws governing the use of sanitation facilities within the villages? | No                                       | 223 | 56% |
|  | Yes                                      | 174 | 44% |
| Are there penalties for not having / using a sanitation facility?                | No                                       | 40  | 23% |
|  | Yes                                      | 134 | 77% |
| How have the laws/ penalties benefitted the community?                           | No shitting in the bush                  | 152 | 87% |
|  | Practice of proper hand washing          | 69  | 40% |
|  | Proper use of latrines                   | 150 | 86% |
|  | Homestead cleanliness                    | 73  | 42% |
|  | Cultures / myths demystified             | 9   | 5%  |

The study revealed that 75% of the respondents were aware of trained local artisans who can construct /rebuild/maintain a sanitation facility and only 69% of them were aware of an active sanitation and hygiene committee in their village that comprised of Community health volunteers 97%. local administration 29%, community members 15% and natural leaders at 1%.

In addition, 75% of the respondents stated that follow up had occurred after their village was declared ODF. The follow -ups were frequently conducted by Community health Volunteers 98%, village elders 15%, Living water service centre staff 13%and public health officers 3%. In terms of laws, only 44% of the respondents noted that there were existing laws governing sanitation and hygiene practices and penalties at 77% for not having/using a sanitation facility. The respondents stated that the laws and penalties have benefitted the community by reducing shitting in the bush 87%, proper use of latrines 86%, keeping homestead clean 42% practice of proper hand washing 40%, while demystifying myths and cultures at 5%.

**Table 16. Chi-Square test for management structures**

The chi-square test of independence was used to determine the association between ODF sustainability of the villages, and the management structure variables as shown in the table below

| <b>Knowledge about trained local artisans * ODF sustainability</b>                                    |                    |    |                                   |                      |
|---|--------------------|----|-----------------------------------|----------------------|
|   | Value              | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) |
| Pearson Chi-Square  | 2.321 <sup>a</sup> | 1  | .128                              | .160                 |
| Fisher's Exact Test   |                    |    |                                   | .160                 |
| N of Valid Cases  | 397                |    |                                   |                      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.34.</i>        |                    |    |                                   |                      |
| <b>Knowledge about an active sanitation and hygiene committee in the village * ODF sustainability</b> |                    |    |                                   |                      |
| Pearson Chi-Square  | 2.572 <sup>a</sup> | 2  | .276                              | .278                 |
| Fisher's Exact Test   | 2.437              |    |                                   | .317                 |
| N of Valid Cases  | 397                |    |                                   |                      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.55.</i>         |                    |    |                                   |                      |
| <b>Knowledge about follow up since the village was declared ODF * ODF sustainability</b>              |                    |    |                                   |                      |
| Pearson Chi-Square  | 1.375 <sup>a</sup> | 1  | .241                              | .294                 |
| Fisher's Exact Test   |                    |    |                                   | .294                 |
| N of Valid Cases  | 397                |    |                                   |                      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.34</i>         |                    |    |                                   |                      |
| <b>Knowledge about laws governing sanitation and hygiene practices * ODF sustainability</b>           |                    |    |                                   |                      |
| Pearson Chi-Square  | 7.386 <sup>a</sup> | 1  | .007                              | .009                 |
| Fisher's Exact Test   |                    |    |                                   | .009                 |
| N of Valid Cases  | 397                |    |                                   |                      |
| <i>a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.91.</i>        |                    |    |                                   |                      |
| <b>Knowledge about penalties for not having / using a sanitation facility * ODF sustainability</b>    |                    |    |                                   |                      |
| Pearson Chi-Square  | 1.900 <sup>a</sup> | 1  | .168                              | .179                 |
| Fisher's Exact Test   |                    |    |                                   | .179                 |
| N of Valid Cases  | 174                |    |                                   |                      |
| <i>a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.99.</i>        |                    |    |                                   |                      |

The above analysis shows there is a significant association between ODF sustainability and whether the respondent's knowledge on existence of laws governing sanitation and hygiene. [ $\chi^2(1) = 7.386, p < 0.05$ ]. However, there was no significant relationship between ODF sustainability of the villages and the other management structure variables as shown in the table below ( $p > 0.05$ ).

In addition to the above findings qualitative analysis found out that

### **Availability of trained artisan**

The discussions indicated trained artisans were available at the community level to construct sanitation facilities which is a crucial indicator in ODF sustainability; they further noted that the prohibitive cost of constructing durable latrines kept away community members from engaging trained artisans.

Natural factors such as flooding, high water tables, rocky grounds and loose soil structures affect sustainability of poorly constructed latrines. However, the respondents cited that artisan were not actively involved in CLTS approach from the beginning, to enhance construction of affordable and durable sanitation facilities.

### **Post ODF follow-up.**

The findings indicated that community health volunteers and Natural leaders played a key role in post ODF sustainability through frequent door to door follow ups, conducting community action and dialogues days. The follow- ups acted as a reminder to community members on the need of appropriate sanitation and hygiene practices.

### **POST ODF monitoring system**

The discussion revealed that MOH (Ministry of Health) 515 reporting tool was used to monitor sanitation and hygiene activities in the community as routine reporting tool, the reports were cascaded from CHVs, CHAs to ward in charges and finally to Community health services focal person. It was noted that the MOH 515 reporting tool does not comprehensively capture post ODF indicators.

### **Laws governing S&H**

The study further revealed that laws governing sanitation and hygiene are enforced by public health department in collaboration with the local administration department. Local administrators addressed sanitation and hygiene issues at *baraza* with act as platform for health promotion in addition they gave ultimatums and imposed penalties to non-compliant households to improve on sanitation and hygiene practices.

### **Binary logistic regression model construction**

The study further sought to examine all the variables which had a significant relationship with ODF sustainability of the villages through a **binary logistic regression model construction**. The binary regression model was used to understand how changes in the independent variables were associated with likelihood of a villages being ODF sustainable. Prior to constructing the model, all associated assumptions were validated which informed the study to continue. The variables in **Table 17** below were included in the model (dependent and independent variables).

**Table 17. Variables used for binary logistic regression model construction**

| Dependent Variable  |  |   |           |
|---|--|---|-----------|
| ODF sustainability of households                              |  |   | Frequency |
|   |  | No  | 347       |
|   |  | Yes   | 50        |
| Independent Variables   |  |   |           |
| <i>Sanitation Technology, Quality and Maintenance factors</i> | Type of sanitation facility  | Unimproved  | 194       |
|   |  | Improved  | 192       |
| <i>Socio-economic factors</i>                                 | What is your Employment status?  | Informal (casual) employment                                    | 47        |
|   |  | Salaried employment   | 12        |
|   |  | Self-employment   | 83        |
|   |  | Unemployed  | 255       |
|   | Social status influenced decision to construct the sanitation facility | No  | 12        |
|   |  | Yes   | 208       |
| <i>Demographic factors</i>                                    | Age of respondent  | 18 – 35 years   | 131       |
|   |  | 36 – 55 years   | 173       |
|   |  | 56 – 65 years   | 65        |
|   |  | 66 years and older  | 27        |
|   | Highest level of education of respondents                              | Never attended  | 52        |
|   |  | Post-secondary  | 22        |
|   |  | Primary   | 191       |
|   |  | Secondary   | 132       |
| <i>Behavior change approaches</i>                             | Source of S & H messages: Local churches                               | No  | 237       |
|   |  | Yes   | 66        |
|   | Health officials   | No  | 211       |
|   |  | Yes   | 92        |
|   | Community dialogue sessions  | No  | 238       |
|   |  | Yes   | 65        |
|   | Participation in Community Led Total Sanitation triggering             | No  | 351       |
|   |  | Yes   | 29        |
|   |  | Do not remember   | 17        |
|   | <i>Management structure factors</i>                                    | Knowledge about laws governing sanitation and hygiene practices | No        |
| Yes   |  |   | 174       |

The results in **Table 18** below shows the logistic regression model was **NOT** statistically significant,  $\chi^2(8) = 10.323$ ,  $p > .05$  and model explains only 49% (Nagelkerke R Square) of the variation in ODF sustainability of the villages. Results in **Table 19** below shows (*Wald test*) only one variable was statistically significant to the model i.e., knowledge about laws governing sanitation and hygiene practices ( $p = .048$ ). On the contrary, the other variables did not add significantly to the model ( $p > 0.05$ ).

**Table 18. Logistic regression model results**

| <b>Hosmer and Lemeshow Test</b>   |                                      |                      |                                      |    |                    |
|---|--------------------------------------|----------------------|--------------------------------------|----|--------------------|
| Step  | Chi-square                           | df                   | Sig.                                 |    |                    |
| 1   | 10.323                               | 8                    | .243                                 |    |                    |
| <b>Model Summary</b>  |                                      |                      |                                      |    |                    |
| Step  | -2 Log likelihood                    | Cox & Snell R Square | Nagelkerke R Square                  |    |                    |
| 1   | 76.063 <sup>a</sup>                  | .259                 | .493                                 |    |                    |
| a. Estimation terminated at iteration number 20 because maximum iterations have been reached. |                                      |                      |                                      |    |                    |
| <b>Classification Tables</b>  |                                      |                      |                                      |    |                    |
| Observed  |                                      |                      | Predicted                            |    |                    |
|   |                                      |                      | ODF sustainability of the households |    | Percentage Correct |
| Step 1  | ODF sustainability of the households | No                   | 145                                  | 4  |                    |
|   |                                      | Yes                  | 9                                    | 12 | 57%                |
| Overall Percentage  |                                      |                      |                                      |    | 92%                |
| a. The cut value is .500  |                                      |                      |                                      |    |                    |



**Table 19. Significance test for variables in the logistic regression model**

|  | Independent variables (categorical)   | B      | S.E.  | Wald  | df | Sig. | Exp(B) | 95% C.I. for EXP(B) |        |
|--|---|--------|-------|-------|----|------|--------|---------------------|--------|
|  |   |        |       |       |    |      |        | Lower               | Upper  |
| Sanitation Technology, Quality and Maintenance factors | Type of sanitation facility (1)   | -1.492 | .871  | 2.937 | 1  | .087 | .225   | .041                | 1.239  |
| Socio-economic factors                                 | What is your Employment status  |        |       | 3.048 | 3  | .384 |        |                     |        |
|  | Casual employment (1)   | .050   | 1.448 | .001  | 1  | .973 | 1.051  | .062                | 17.948 |
|  | Salaried employment (2)   | 1.802  | 1.329 | 1.838 | 1  | .175 | 6.061  | .448                | 81.999 |
|  | Self-employment (3)   | -.568  | .828  | .470  | 1  | .493 | .567   | .112                | 2.873  |
|  | What influenced your decision to construct, upgrade or reconstruct the sanitation facility? Social status (1) | -.712  | 1.093 | .425  | 1  | .515 | .491   | .058                | 4.179  |
| Demographic factors                                    | Age of respondent   |        |       | 1.707 | 3  | .635 |        |                     |        |
|  | 18 – 35 years (1)   | -1.539 | 1.646 | .875  | 1  | .350 | .215   | .009                | 5.399  |
|  | 36 – 55 years (2)   | -.292  | 1.268 | .053  | 1  | .818 | .747   | .062                | 8.972  |
|  | 56 – 65 years (3)   | .143   | 1.351 | .011  | 1  | .916 | 1.153  | .082                | 16.298 |
|  | Highest level of education of respondents   |        |       | 3.968 | 3  | .265 |        |                     |        |
|  | Never attended (1)  | -.553  | 1.474 | .141  | 1  | .708 | .575   | .032                | 10.343 |
|  | Primary (2)   | -1.400 | 1.284 | 1.188 | 1  | .276 | .247   | .020                | 3.055  |
|  | Secondary (3)   | .176   | 1.198 | .022  | 1  | .883 | 1.193  | .114                | 12.478 |

|                     |           |   |        |           |           |     |       |              |       |        |
|---------------------|-----------|---|--------|-----------|-----------|-----|-------|--------------|-------|--------|
| Behavior approaches | change    | Local churches being the source of sanitation and hygiene messages                          | -0.969 | .810      | 1.431     | 1   | .232  | .379         | .078  | 1.856  |
|                     |           | What were the sources of sanitation and hygiene messages? Community dialogue session (1)    | -1.231 | .678      | 3.301     | 1   | .069  | .292         | .077  | 1.102  |
|                     |           | Health officials being the source of sanitation and hygiene messages                        | -.188  | .731      | .066      | 1   | .797  | .828         | .198  | 3.474  |
|                     |           | Did you participate in Community Led Total Sanitation triggering session in your community? |        |           | 8.021     | 2   | .018  |              |       |        |
|                     |           | No (1)  | 19.584 | 40192.674 | .000      | 1   | 1.000 | 319900972.8  | 0.000 |        |
|                     |           | Yes (2)   | 21.785 | 40192.674 | .000      | 1   | 1.000 | 2891129862.4 | 0.000 |        |
| Management factors  | structure | Knowledge about laws governing sanitation and hygiene practices (1)                         | 1.405  | .711      | 3.909     | 1   | .048  | 4.076        | 1.012 | 16.415 |
| Constant            |           |   | 4.480  | -19.339   | 40192.674 | .00 | 1     | 1.000        | .000  |        |

## CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 DISCUSSION

**The main objective of the study was to evaluate factors contributing to sustainability of open defecation free status of communities of Butere sub county, Kakamega County.**

Specifically, the study was set out to 1) To find out how demographic factors influence sustainability of ODF status villages 2) To find out how socio-economic factors influence sustainability of ODF villages.3) To examine whether the communities that were declared ODF have sustained ODF status.4) To assess how behavior change communication influence ODF sustainability and 5) To determine how management structures influence sustainability of ODF villages.

#### **5.1.1 Influence of demographic factors on sustainability of ODF status in villages declared ODF.**

The research question on this sub-objective was to find out how demographic factors influence sustainability of ODF status in Butere villages. To understand the relationship between the demographic factors and ODF sustainability, both Chi-square and correlation tests analysis were applied. The chi-square test checked on the association between the categorical parameters (*age, gender, and highest level of education of the respondents; and whether a household had children aged below 5 years*) while the point biserial correlation was applied for checking association between (family size (continuous variable) and ODF sustainability of the surveyed communities.

The study found a significant association of ODF sustainability with age and level of education. However, there was no relationship between ODF sustainability and other variables, namely a) gender of respondents b) presence of children aged below five years in the household and c) family size.

The study agrees with the findings of WaterAid Ghana, which pointed out that: Families that use better restrooms are richer and highly educated whereby their economic status could be linked to education level. Families with educated members were found to be motivated, enjoy wellbeing, and have good health. (Alhassan and Anyarayer, 2018). The study further agrees with (Sherin et al, 2017) findings that students are more exposed to hygiene information in the school environment which in turn positively influences persuasion of latrine utilization in the home environment.

The study indicated that visible signs of OD were observed in 7/10 households which had children under five years associating open defecation to age of the children. And this corresponds to UNICEF Kenya's ODF sustainability study showed children were a defining variable in post-ODF slippage (Singh and Balfour, 2015). While research in Uganda and Zambia indicates that a person

who is older, disabled, or chronically ill is more likely to defecate in the open (Wilbur & Danquah, 2015; Cavill et al., 2016) hence affecting ODF sustainability. Women and young girls have always taken the responsibility of maintaining sanitation and hygiene facilities in the homes, thus, the higher proportion of females interviewed at 69% provided the study an opportunity to understand women's perspective regarding impact of the program's activities on their households' specifically on sanitation and hygiene behaviours and practices. However, this study found out that there was no significant relationship between ODF sustainability with gender and/or Children aged below 5 years and family size. The study contradicts (Adeyeye, 2011. Mahbub, 2011, and Tyndale-Biscoe et al., 2013) findings that depict that there is evidence that ODF status is more likely to be sustained and embedded if women are central or lead the process.

### **5.1.2: Influence of socio-economic factors on sustainability of ODF villages.**

The research question on this sub objective was to find out how socio-economic factors contribute to sustainability of ODF communities. The result showed there is a significant association between ODF sustainability with employment and social status. The study finding corresponds with Devine (2010): Households with low income are less motivated to acquire a sanitation facility since they place less value on sanitation. This further relates with a study by (Alhassan and Anyarayor, 2018): where there was a positive correlation between household latrine adoption rate, wealth status and sanitation changed behavior. Tyndale-Biscoe et al 2013 agree that indeed the cost of sanitation is of significance to households. He states that low-cost or free local materials motivated many households to build latrines with poorer quality which require more maintenance.

Results also showed no relationship between other socio-economic factors and ODF sustainability namely, cultural, or social reasons that affect the sustainability and factors that influenced the decision to construct, upgrade or reconstruct the facility (i.e., CHVs, Cultural beliefs, Moral beliefs, social status, Government directives/policies/by laws, and continued follow-up visits). The findings concur with a study by (Sherin et al, 2017) showed there were no cultural rules or taboos against use of latrines and ODF sustainability.

### **5.1.3 To examine whether the communities that were declared ODF have sustained ODF status.**

The third research question on this sub objective was to find out whether ODF communities have sustained their ODF status. Living Water Africa Region used a range of CLTS non-negotiable parameters by Kar & Chamber, (2008) to evaluate ODF status as follows:

- A functional sanitation facility with a superstructure and evidence of use (a well-trodden path) at 97%
- A sanitation facility which offers privacy at 78%
- A functional hand washing facility inside/near the sanitation facility (presence of water and soap, ash, or detergent), and evidence of use – a well-trodden path at 13%
- Absence of human feces on the surrounding of the house at 95%
- Presence of a drop hole cover at 30%

All the above CLTS parameters had a correlation with ODF sustainability. Based on the above finding's sanitation promotion proved effective as 97% of the households still had a functioning latrine. If ODF sustainability status was equated to households having a functioning latrine, then the rate of reversion (or 'slippage') was just 3%.

Out of the 97% of households that had functional sanitation facilities, 95% had no visible signs of open defecation around the household and 2% practiced open defecation. Correspondingly, 78 % of households had sanitation facilities with privacy denoting a reversion rate of 22 %.

With respect to hand washing facilities and the presence of soap or ash and drop hole covers only 13% and 30% of households respectively complied increasing the reversion rate to 87% and 70%, respectively. If all five non-negotiable parameters are applied, the ODF sustainability rate in Butere sub-county stands at 13% depicting an overall reversion/slippage rate of 87%.

The finding shows that CLTS programs have been successful at getting households to build – and retain – latrines and have been less successful at achieving improvements in hygiene behaviors. In particular, the programs have not resulted in households continuing to maintain handwashing facilities supplied with water and soap/ash and drop hole cover.

Based on the qualitative findings from both FGDS and KII, most of the respondents thought that the upsurge of COVID 19 pandemic positively contributed to improved hand hygiene practices. However, the study findings revealed low presence and use of hand washing facilities was a major indicator that led to reversion rate in communities that were declared open defecation free.

The study sought to find out the motivating and enabling factors to ODF sustainability **Motivating factors:** Comfort and convenience 74% and health 60% were the major motivators while a smaller number were of the opinion avoiding shame and stigma 47%. **Enabling factors** were availability of locally available materials 77% and availability of land, 64% while a few indicated availabilities of low-cost labor 44%. The findings agree with the study done by Tyndale-Biscoe et al., (2013) and Cavill et al., (2015) who stated that comfort and convenience are some of the motivators for maintaining ODF status. It also perceived good health as a motivating factor to construct and sustain latrines.

The study findings show from the chi-square test of independence that there was a significant association between ODF sustainability and type of sanitation facility with equal proportion of unimproved and improved sanitation facilities at 50% each. The study further indicates that unimproved sanitation facilities requires more maintenance including reconstruction and frequent upgrading since they experience issues like; broken parts 41%, collapsing soil 34%, cracking 33% leaking 30% .Similar studies by (Venkataraman & Shannon, 2016) (Keller, 2019), found out that sustainability of CLTS approach is questionable given that the initial sanitation technologies

adopted are cheap as households are empowered to start off at levels, they can afford which posed a challenge to ODF sustainability.

Tyndale-Biscoe et al 2013 realized that indeed the cost of sanitation is of significance to households. He states that low-cost or free local materials motivated many households to build latrines delivering poorer quality latrines which require more maintenance. Further in post ODF, little evidence of households investing to upgrade latrines was noted. The findings indicated that it is the prioritization of other household expenditure over latrines as opposed to lack of funds that prevented investment on latrines upgrade.

According to Kar & Chamber, (2008) increased demand for better and affordable sanitation hardware improves designs of sanitation options which lead to adoption of appropriate hygiene behaviors. This is confirmed by a study done in Tanzania which revealed that associations exist between use of latrines, the type and functionality of the latrines. Whereby the flush type of latrines was seen to be highly utilized compared to pit latrines (Keema et al, 2012) affecting sustainability of ODF status in communities.

#### **5.1.4 Influence of behaviour change communication to ODF sustainability.**

The research question on this sub objective was to find out how behavior change communication influences ODF sustainability. The chi-square test of independence was used to determine the association between ODF sustainability and the behavioral change variables. The results show that there is a significant association between ODF sustainability and (i) local churches being the source of sanitation and hygiene messages (ii) Health officials being the source of sanitation and hygiene messages (iii) Community dialogue sessions being the source of sanitation and hygiene messages and (iv) Whether the respondents participated in CLTS triggering session in their community.

The findings coincide with (Odagiri et al. 2017) who indicated that, the continuation of support from diverse sources such as dissemination of information via churches, mosques, women groups, and prenatal clinics can be effective in preventing slippage. Some studies show that Community action groups have been established in several countries to provide continued support and encouragement after ODF declaration and to immediately address slippage (Rieiro 2019). While (Wamera, 2016) concurs that change drivers need to be localized with the idea of nurturing Natural Leaders from the local community to transform community behavior for a long-lasting change.

#### **5.1.5 Influence of management structures on sustainability of ODF villages.**

The final question of this study was to find out how management structures influence sustainability of ODF status. The chi-square test of independence was used to determine the association and found out that there was a direct correlation between knowledge of Law governing sanitation and hygiene practices and ODF sustainability. The study revealed that laws governing sanitation and hygiene are enforced by public health department in collaboration with the local administration

department. Local administrators addressed sanitation and hygiene issues at *baraza* with act as platform for health promotion in addition they gave ultimatums and imposed penalties to non-compliant households to improve on sanitation and hygiene practices. Wamera, (2016) agrees that advancement of post ODF activities, social and administrative structures are to be integrated for follow up and embed the new social norms for ODF sustainability.

## **5.2 Conclusion**

Sanitation and hygiene programming in Butere sub county proved effective as ascertained by the post ODF follow-ups in the communities by county government officials together with community health volunteers which resulted to households retaining sanitation coverage, along with sanitation facilities that offered privacy, and households free from human excreta in the compound. Despite the frequent Post ODF follow -up, the study observed low coverage sanitation facilities fitted with drop hole covers and hand washing facilities lacking soap and flowing water at the point of the study .Therefore the study concludes that there is significant reversion rate from 100% ODF status compliance to 13% , based on the two non-negotiable parameters that were not sustained by the communities.

The study further concludes as follows on each study objective:

### **5.2.1 To find out how demographic factors influence sustainability of ODF villages.**

Sustainability of Open defecation free status is positively influenced by age and education levels. Education level exposes households to increased income, knowledge and potentially a sustained motivation to maintain ODF status. Households that were practicing open defecation had children aged five and below. For this reason, the government should increase investment in education creating employment opportunities as these are long term and sustainable measures to manage sanitation crisis.

### **5.2.2 To find out how socio-economic factors, influence sustainability of ODF villages.**

The study concludes that economic factors such as employment positively influence sustainability of ODF status in communities. Employment is associated with income, social status and purchasing power which often influence the choice of sanitation technology the household will adopt and exposure to information and general motivation to sustain all non-negotiable criteria for ODF status. Therefore, promotion of sanitation including CLTS processes should incorporate market-based approaches that increase incomes and uplift the status of the target communities.

### **5.2.3 To examine whether the communities that were declared ODF have sustained ODF status.**

The study concluded that sustainability of ODF status is achievable and sanitation promotion proved effective with increased access to sanitation facilities which offered privacy and absence of human faeces in the compound. Conversely, reduction of ODF sustainability was attributed to low adoption and maintenance of handwashing facilities and drop hole covers. Therefore, behaviour change communication should focus and emphasis on use and maintenance of

functional handwashing facilities, drop hole covers, while reinforcing enabling and motivating factors .

#### **5.2.4 To assess how behaviour change communication influence ODF sustainability.**

The study concludes that sustainability of ODF status can be attained as behavior is reinforced by messages from health facilities, by frequent follow –ups and community dialogues and religious institutions. The church is revered and is considered a reliable enabler of sustainable ODF status in communities since they are community based, respected, and outlive any project /program intervention. Other studies mirror this conclusion by showing that change drivers need to be localized and respect entities. The wash actors should consider involvement of churches and religious institutions in their interventions.

#### **5.2.5 To determine how management structures influence sustainability of ODF villages.**

The study concludes that law governing sanitation and hygiene practices positively influenced sustainability of ODF status. In this regard WASH actors should follow and respect S&H laws to enhance ODF status sustainability among communities.

### **5.3 RECOMMENDATIONS**

Based on the above findings and conclusions, the study therefore makes the following recommendations:

#### **TO LWI, MoH (Ministry of Health) and Partners**

Promote construction of improved sanitation facilities which can be sustained in the long-term by the households.

- Promote **construction of improved sanitation** facilities through sanitation marketing. About half or surveyed households (50%) were using unimproved sanitation facilities which were not sustainable due to the structural nature of materials (mainly wood and mud). Households with improved sanitation facilities were more likely to be ODF sustainable than households with unimproved sanitation facilities.
- Promote more improved sanitation technologies to cater for the children, old and persons living with disabilities.

Increase awareness campaigns on simple-to-use hand washing points and drop hole covers to enhance proper hygiene and sustainability of ODF status.

- **Facilitate frequent hygiene promotion campaigns during** implementation of behaviour change communication to instil sustainable good hygiene practices.
- Hand washing facilities and drop hole covers are key in defining the ODF sustainability of communities. More emphasis should be given to the use of functional handwashing



facilities, drop hole covers, enabling and motivating factors during CLTS process to promote ODF sustainability.

Conduct further studies to figure out why drop hole covers and handwashing facilities are the most difficult criteria to sustain after ODF status certification. In this study the two criteria were the least sustained and hence households were considered to have reverted to Open defecation status.

Capitalize on age and level of education during awareness creation to promote sustainability of ODF status, by targeting the less educated and illiterate individuals with right S&H promotion messages in communities.

- The government to advocate for educational advancement to community members since it is a factor that affects ODF sustainability
- sustainable sanitation is positively associated with education, employment and status, governments should increase investment in education, creating employment opportunities as these are long term and sustainable measures to manage sanitation crisis.

Explore positive cultural practices and societal norms to promote safe sanitation and hygiene among communities

Explore positive sanitation messaging channels for behaviors change communication through churches, mosques, health facilities and community meetings.

Consider investing in meaningful partnership with the local churches as enablers of sustainable change. The church being in the community and being a respected voice is a vital ingredient to long term sustainability of sanitation and hygiene practices.

Increase awareness of Laws governing sanitation and hygiene practices to positively influence sustainability of ODF status.

The government and partners to develop post ODF strategy and monitoring tools that will guide implementers and enhance continued follow -up and reporting after declaring villages open defecation free.

The government and partners to avail resources for post ODF activities.

The government, partners and MOH to include artisan from the onset of CLTS approach to enhance construction of durable and sustainable sanitation facilities.

#### **To communities in Butere sub county, Kakamega County.**

- Promote positive cultural practices and norms that uphold safe sanitation and hygiene practices.
- Embrace positive parameters, motivating and enabling factors to sustain ODF status.
- Embrace sanitation and hygiene messaging for behaviors change communication.

- Adopt improved sanitation technologies for sustainable ODF status.

#### **To Provincial Administration**

- Enforce adherence to laws, regulations and policies governing safe sanitation and hygiene practices to sustain ODF status.
- Involve local administration from the onset of sanitation promotion activities (CLTS) approach to reinforce adoption of sanitation and hygiene practices.

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## **APPENDICES**

### **Appendix I: Sample size allocation across the villages**



APPENDIX 1 -HH  
SAMPLE.docx

### **Appendix II: Authorization Letter**



APPENDIX -2  
AUTHORIZATION LETI

### **Appendix III: Key Informant Interview and Focus Group Discussion Guide**



APPENDIX 3-KII AND  
FGD.docx

### **Appendix IV: Household Questionnaire.**



Appendix 4 - Post  
ODF Study Questionn: