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and

School of Medicine (SOM)

**Evaluation of Reward System on HIV Treatment Outcomes of Patients with Suspected Treatment Failure at Kakamega County, Kenya**

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# Operational Definition

**HIV/AIDS:** Refers to a spectrum of conditions caused by the Human Immunodeficiency Virus (HIV), which attacks the body’s immune system. If left untreated, HIV can progress to Acquired Immunodeficiency Syndrome (AIDS), the most advanced stage of the infection, where the immune system becomes severely weakened, making the body vulnerable to opportunistic infections and certain cancers.

**Reward:** Comprise of transport, food and watches/alarms given to patients to facilitate access to care and comply on treatment.

**Suspected Treatment Failure:** Refers to a situation where a patient shows signs that a medical treatment; typically for chronic conditions like HIV, tuberculosis, or cancer; is not working effectively. This may be indicated by persistent or worsening symptoms, laboratory markers (e.g., rising viral load), or clinical deterioration, suggesting that the therapy may not be achieving its intended outcomes and further evaluation is needed.

**Token Reward System:** is a behavioral reinforcement strategy where individuals earn tokens (such as points, stars, or digital credits) for displaying desired behaviors.

# Acronyms and Abbreviations

**3TC:** Lamivudine

**AMPATH:** Academic Model Providing Access to Healthcare

**ART:** Anti Retrovirals Treatment

**AZT:** Zidovudine

**CHW:** Community Health Worker

**d4T:** Stavudine

**DHIs:** Digital Health Interventions

**DTG:** Dolutegravir

**EFV:** Efavirenz

**EMRs:** Electronic Medical Records

**FTC:** Emtricitabine

**HIV:** Human Immunodeficiency Virus

**INSTI:** Integrase Inhibitor

**LDL:** Low Density Lipoprotein

**MTRH:** Moi Teaching and Referral Hospital

**NNRTI:** Nonnucleoside Reverse-transcriptase Inhibitor

**NRTIs:** Nucleoside Reverse-Transcriptase Inhibitors

**NVP:** Nevirapine

**PEPFAR:** U.S. President's Emergency Plan for AIDS Relief

**PLWHIV:** People Living With HIV

**TDF:** Tenofovir Disoproxil Fumarate

**UNAIDS:** Joint United Nations Programme on HIV/AIDS

**USAID:** United States Agency for International Development

**VL:** Viral Load

**WHO:** World Health Organization

# Executive Summary

Kenya faces a significant HIV burden with 1.5 million people living with HIV, and while national ART coverage is 75% for adults, adherence and viral suppression remain challenging, with only 68% of patients virally suppressed. Kakamega County, with a higher prevalence of 5.9%, mirrors these challenges, particularly concerning patient retention and treatment failure, evidenced by significant AIDS-related deaths in 2013 and a 78% retention rate. Severe side effects, drug stock-outs, and patient financial constraints are identified as key drivers of treatment failure, exacerbated by inadequate tracking systems and a near-total lack of health insurance coverage (99.4% of patients having no other insurance).

This study evaluated the effectiveness of a reward system on HIV treatment outcomes for patients with suspected treatment failure in Kakamega County. Its broad objective was to determine if incentivizing positive outcomes could improve adherence, viral suppression, and retention in care. Specifically, the study: evaluated the outcomes of a reward system on clients with suspected treatment failure, identified factors hindering retention of these clients, identified factors promoting retention of these clients, and developed an integrated system for improving adherence for this patient group.

Utilizing a quasi-experimental design with mixed methods, the study compared a treatment group receiving rewards with a control group. Key patient indicators included viral load (gold standard for treatment failure, with >1000 copies/mL indicating suspected failure), CD4 counts, clinic appointment attendance, missed pills, and clinical presentation. Rewards were provided at month 3 based on successful outcomes. The study involved a sample size of 513 patients, drawn from 4 randomly selected sub-counties in Kakamega, ensuring geographical diversity.

The findings from this research were expected to critically inform future HIV strategic directions in Kenya. By focusing on a reward system within an integrated care framework, the study was seeking to enhance patient tracking, improving access and equity in service delivery, strengthening ART uptake and adherence advocacy, and ultimately improving the quality of care and health outcomes for people living with HIV in Kakamega County.

# CHAPTER ONE

# INTRODUCTION

## Overview

This chapter provides a comprehensive overview of the study, “Evaluation of Reward System on HIV Treatment Outcomes of Patients with Suspected Treatment Failure at Kakamega County, Kenya.” It begins by establishing the global and national context of the HIV epidemic, highlighting the significant progress made in treatment and prevention alongside persistent challenges, particularly concerning treatment adherence and viral suppression. The chapter then narrows its focus to the specific situation in Kakamega County, detailing its unique epidemiological profile and the local impact of HIV/AIDS. Following this contextual background, the chapter articulates the problem statement, outlining the critical gaps in achieving optimal HIV treatment outcomes that this study aims to address. It further specifies the study’s broad and specific objectives, followed by the precise research questions that guided the investigation. Finally, the chapter concludes with a justification and rationale for the study, emphasizing its contributions to policy, practice, and the overall improvement of health outcomes for people living with HIV in the region.

## Background on Disease and Literature Review

According to UNAIDS, 2020 Kenya has about 1.5 million people living with HIV with an adult (15-49 years) prevalence rate of 4.5% and 42,000 annual new infections. There are 21,000 HIV related deaths due to the fact that 75% adults and 61% children are on Anti Retrovirals Treatment (ART). The HIV epidemic affects most of its general population, but groups of men who have sex with men, women, sex workers and people who inject drugs are still more vulnerable to infection. In 2018, 69% of adults living with HIV in Kenya were accessing treatment. However, treatment coverage among children aged under 15 was lower, at 61%. Although awareness of HIV and AIDS is high in Kenya, many people living with HIV face high levels of stigma and discrimination which prevent people accessing HIV services.

Kakamega County has a prevalence of 5.9 % with 57,952 people infected, of whom children constitute 16%. The HIV prevalence among women stands at 7.3% and men at 4.4%, with 154 new adult infections in 2013. Of the 2,754 pregnant women living with HIV in the County, 76% did not deliver in a health facility. Approximately 1,605 adults and 462 children died of AIDS-related conditions in 2013 in the County (HIV Strategic Plan -2016-20). As of December 2020, the number of people living with HIV (PLWHIV) was estimated at 46374 with 96% (44778) on Antiretroviral therapy (ART).

Antiretroviral drugs have been shown to substantially reduce AIDS related deaths. If used properly ART can also lower a person’s viral load and prevent onward transmission of HIV (Kenya county HIV profiles, 2014). Recommended First-line ART for adults (including lactating and pregnant women) consists of two nucleoside reverse- transcriptase inhibitors (NRTIs) plus a nonnucleoside reverse-transcriptase inhibitor (NNRTI) or an integrase inhibitor (INSTI). T DF + 3TC (or FTC) + EFV as a fixed-dose combination is preferred option to initiate ART in Kenya and by extension, Kakamega. However, the following combinations are used in cases of un availability, toxicity or contraindications: AZT + 3TC + EFV, AZT + 3TC + NVP or TDF + 3TC (or FTC) + NVP (3TC -lamivudine, AZT- zidovudine, d4T- stavudine, DTG- dolutegravir, EFV- efavirenz, FTC- emtricitabine, NVP- nevirapine, TDF- tenofovir) Viral load is the gold standard for measuring treatment failure. Viral failure is defined by a persistently detectable viral load exceeding 1000 copies/mL (that is, two consecutive viral load measurements within a 3-month interval with adherence support between measurements) after at least 6 months of starting a new ART regimen. In cases or situations where viral load is not routinely available, CD4 count and clinical monitoring should be used to diagnose treatment failure (WHO, 2016).

In Kakamega HIV, AIDS and Sexually Transmitted Infections Management ACT provides an opportunity for direct partnership in a first of its kind Government-to- Government HIV funding. USAID-PEPFAR supports MTRH-AMPATHPlus to provide care for over 39,000 people living with HIV in Kakamega County. In the USA, HIV test sites offering financial incentives, patients were offered $125 gift cards if they accessed linkage to care. In intervention treatment sites, patients could earn $70 gift cards quarterly if they accessed antiretroviral treatments and remained virally suppressed (Journal of the American Medical Association). The financial incentives did drive the number of patients accessing viral suppression treatment. By study’s end, the proportion of patients accessing the treatment increased by 3.8 percent.

## Problem Statement

The Joint United Nations Programme on HIV/AIDS (UNAIDS) in 2014, set global targets to be achieved by every country in 2020. By 2020, 90% of all people living with HIV should know their HIV status, 90% of all people with diagnosed HIV infection should be on sustained antiretroviral therapy (ART). 90% of all people receiving antiretroviral therapy should have viral suppression. In Kenya (2021), 90% know their status but only 74% are on ART, and 68% are virally suppressed. This points to challenges in retention on treatment and adherence and hence treatment failures. In Kakamega, retention stands at 78% and out of this 93% are suppressed, pointing to the fact, success of HIV programme rests on the retention rates.

Approximately 1,605 adults and 462 children died of AIDS-related conditions in 2013 in Kakamega County. Studies done in Kenya have found that retention is associated with socio economic status and tracking. This means the low socioeconomic status and inadequate systems to track patients between clinics are hampering efforts to accurately estimate retention in care in resource-limited settings, like Kakamega.

In poor African countries to include Kenya, Asia and South America, antiquated health management systems, tracking and managing chronic diseases such as HIV&AIDS is difficult and unreliable. In addition, hundreds of billions of dollars are donated for healthcare each year, but much of this investment is wasted, stolen or mismanaged because of paper based tracking systems.

## Study Objectives

### Broad objective

To evaluate the effectiveness of reward system on HIV treatment outcomes of patients with suspected treatment failure at Kakamega County.

### Specific Objectives

1. To evaluate the outcome of the reward system on HIV/AIDS clients with suspected treatment failure at Kakamega County.
2. To identify factors hindering retention of the HIV/AIDS clients with suspected treatment failure at Kakamega County.
3. To identify factors promoting retention of HIV/AIDS clients with suspected treatment failure at Kakamega County.
4. To develop an integrated system for improving treatment adherence for HIV/AIDS clients with suspected treatment failure at Kakamega County.

### Research Questions

1. What are the outcomes of reward system on HIV/AIDS clients with suspected treatment failure at Kakamega County?
2. What are the factors hindering retention of the HIV/AIDS clients with suspected treatment failure at Kakamega County?
3. What are the factors promoting retention of HIV/AIDS clients with suspected treatment failure at Kakamega County?
4. How does an integrated reward system improve treatment adherence for HIV/AIDS clients with suspected treatment failure at Kakamega County?

## Study Rationale and justification.

This study contributes to the future Strategic Direction on HIV intervention, thereby improving health outcomes and wellness of all people living with HIV, through a tracking mechanisms for referrals, improving on access to and equal distribution of services and human resources so as to avoid loss in the cascade of care, increased advocacy on ART uptake and adherence and scale up interventions to improve quality of care and improve health outcomes.

# CHAPTER TWO

# RESEARCH METHODOLOGY

## Overview

## Study design

The study adopted quasi experimental with mixed methods (both qualitative and quantitative data collection methods). Quasi-experimental research design is an experimental design that tests causal hypotheses. In this design, the rewards were viewed as an intervention or treatment that was tested on how well it achieved its objectives (effectiveness), as measured by a pre-specified set of indicators.

### Patient indicators

1. Virologic treatment failure where viral load measurement in copies per ml was the most objective measure.

* Viral load: persistently detectable viral load below 1000 copies/mL (that is, two consecutive viral load measurements within a 3-month interval with adherence support between measurements) after at least 6 months of starting a new ART regimen

### Design of the scoring criteria:

* 1. 1000 c/ml is suspected treatment failure;
  2. Between 400-999c/ml is low level viremia – attributed to mutation risk;
  3. 0-<400 c/ml is suppressed LDL (Low Density Lipoprotein).

1. CD4 Counts: CD4 count above 250 cells/mm where a criteria on rate of reducing or increasing viral load (VL) will be used to measure progressive change outside the three blocks as illustrated in indicator 1.
2. Scheduled clinic appointments honored.
3. Missed pills- established through pill count and home visit.
4. Clinical presentation of Suspected Treatment Failure where clinical symptoms of treatment failure and Opportunistic Infections shall be assessed by clinical team.
5. CD4 Counts for immunologic treatment failure which progress from Viral Load failure to Immunologic failure and finally to a worse state of clinical failure.
6. Retention in care: Retention in care at 6 months = participants retained in clinic + participants confirmed active in care elsewhere/all enrolled study participants.

A promise of rewards to patients at month 3 based on successful treatment outcomes from the above indicators was effected while monitoring the care processes to guide rewarding of health care providers at month three.

Quasi-experimental designs identify a comparison or control group that is as similar as possible to the intervention/treatment in terms of baseline (pre-intervention) characteristics. The comparison group captures what would have been the outcomes if the incentives had not been implemented (i.e., the counterfactual). Hence, the rewards could be said to have caused any difference in outcomes between the treatment and comparison groups (UNICEF, 2014). Focus group discussions and in-depth interviews were used to identify the socio-economic factors hindering retention by the HIV patients with suspected treatment failures.

## Sampling

The 12-month retention rate in 2020 for the County was estimated at 77.7% (Ampath 2020 report). The number of treatment failures (defaulters) from the table stands at 1134.

Sample size calculation> P=1132

Margin of error =0.05 Confidence level=95% Standard deviation=0.5 Z-score=1.96

Therefore, using the Fischer’s formula,

Sample Size = [z2 \* p(1-p)] / e2 / 1 + [z2 \* p(1-p)] / e2 \* N]

= [1.962 \* 0.5(1-0.5)] / 0.052 / 1 + [1.962 \* 0.5(1-0.5)] / 0.052 \* 1134]

= [3.8416 \* 0.25] / 0.0025 / 1 + [3.8416 \* 0.25] / 2.835]

= 384.16/ 1.3388

=286.9435

Sample size =287

Kakamega county had a total of 12 sub counties where 30% of this was randomly selected to represent the entire county.

Therefore, (30% \* 12=3.6)

A total of 4 sub counties were identified to represent Kakamega (two to generate 243 participants for control group and two to generate 270 participants for treatment group) which was more than the sample size calculated. The treatment and control facilities should be far apart to avoid cross-over contamination.

Facilities with high volume of treatment failures were prioritized where necessary, but taking into consideration geographical diversity (rural-urban divide) and representation.

**Table 1: Retention rates (12 months) in 2020**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Subcounty** | **Retention rate** | **Recruited** | **On ART** | **Treatment Failure** |
| Navakholo | 64.40% | 298 | 192 | 106 |
| Butere | 69.90% | 372 | 260 | 112 |
| Ikolomani | 70.90% | 340 | 241 | 99 |
| Mumias West | 71.60% | 469 | 336 | 133 |
| Matungu | 74.20% | 326 | 242 | 84 |
| Mumias East | 75.80% | 331 | 251 | 80 |
| Likuyani | 78.70% | 357 | 281 | 76 |
| Shinyalu | 79.40% | 710 | 564 | 146 |
| Khwisero | 81.10% | 280 | 227 | 53 |
| Lugari | 82.20% | 471 | 387 | 84 |
| Lurambi | 85.20% | 681 | 580 | 101 |
| Malava | 87.00% | 461 | 401 | 60 |
| **Kakamega County** | **77.70%** | **5,096** | **3,962** | **1134** |

**Table 2: Sampled sub counties and participants**

|  |  |
| --- | --- |
| **Sub county** | **Participants** |
| **Treatment** |  |
| Lurambi | 104 |
| Shinyalu | 120 |
| Total | **124** |
| **Control** |  |
| Matungu | 84 |
| Likuyani | 40 |
| **Total** | **124** |

**Staff: in the selected facilities (CCC)**

Ten staff was purposely selected from the various Comprehensive Care clinics (CCCs) and represented service points where paper work was in use. Such service points included;

* Doctors and clinical officers: 4
* Records Clerk: 1
* Nurses: 4
* Social Worker: 1

## Inclusion and Exclusion Criteria

### Inclusion Criteria:

Suspected treatment failure (STF) clients for the treatment group for the following reasons

* Defaulted from Care
* Withdrew from care
* Lost to follow up

### Exclusion criteria:

* Children < 18Years
* Retained in care at 12 months
* Active in Care (Informally transferred out but active in care, formally transferred out and active in care and returned to the clinic at the time of tracing)
* Defaulted, but died
* Patients with co-morbidities
* Female patients who are pregnant

## Enrollment

All the participants were traced through their link facility comprehensive care clinic (CCC) by the social worker. A baseline was then done for all the 513 patients (270 treatments and 243 controls) to establish treatment failure clinically, immunologically and biologically. The reasons for defaulting was also established during this baseline for each patient

## Intervention

Upon successful treatment outcome at month 3, the socio-economist did an evaluation of each of the 270 patients on treatment (Reward) group and developed a support plan so that rewards were packaged for purposes that facilitated access to care best suit the business capacity of the client. The main purpose of this intervention was to empower patients with suspected treatment failure and have them sustain themselves as they adhere to treatment.

The patients were followed up for a period six months

The other 243 patients on control were given normal care at the CCC.

Immunify life Technologies built a distributed ledger network to support a decentralized, safe and trusted precision healthcare ecosystem that provided over 100,000 transactions per second payment-for-outcomes, immutable records, patient contact tracing, data management and storage regardless of location meeting the strictest standards of privacy and data security.

## Research Assistants

The programme adopted the existing paperless data capture used in Comprehensive Care Centers (CCC) of selected facilities in Kakamega County. Research assistants were trained on the e-mobile tool (Appendix II) for data capture.

Use and adherence to paperless data system for real time tracking patients in the continuum of care from testing, recruitment, ART initiation, retention in care and viral suppression was the driving outcome.

## Ethical considerations

Ethical approval was sought from Institutional Ethics Review Committee (IERC) in MMUST, Kakamega County and NACOSTI. An approval from the Ministry of Health in Kakamega County was also sought before commencement of the research.

### Autonomy-Informed consent

The purpose of the intervention was explained to all individuals identified for recruitment into the study. Informed consent was obtained from all individuals willing to participate in the study before any procedure was performed as part of the investigation by a trained member of the investigation team. Each participant was informed that participation in the investigation was voluntary and that s/he was free to withdraw, without justification, from the study at any time without consequences and without affecting professional responsibilities.

### Beneficence and Minimizing harm

This study posed minimal risk to participants, involving the collection of personal data. The primary benefit of the study was both direct and indirect in that data collected helped improve and guide efforts to understand extent of incentives/tokens improving retention on treatment and might prevent further transmission of the virus.

### Justice

Any benefits that arose out of this study like preventive information will be disseminated to the communities that participated in the study. No group or class of persons bore more than its fair share of the burdens of participation in research and no group was deprived of its fair share of the benefits of research. These benefits as mentioned included the direct benefits of participation as well as the new knowledge that the research was designed to yield.

### Confidentiality

Participant confidentiality was maintained throughout the investigation. All subjects who participate in the investigation were assigned a study identification number by the investigation team for the labeling of questionnaires and specimens. The link of this identification number to individuals was maintained by the investigation team and the University and will not be disclosed elsewhere. The Online data management system met the strictest standards of privacy and data security.

### Community considerations

The Researchers had duty of care to minimize any negative effects on communities such as stigma and promoting, as relevant, positive effects on communities, including those related to health effects through health education to address myths and infodemics. During contact tracing the researchers were sensitive to and respected the communities’ cultural, traditional and religious practices.

### Prevention of COVID-19 virus infection in investigation personnel

All personnel involved in the study were trained in infection prevention and control procedures (standard contact and droplet precautions, as per national guidelines). These procedures included proper hand hygiene and the correct use of surgical masks, where necessary, not only to minimize their own risk of infection but also minimizing the risk of spread among other participants in the study. There was a provision of face masks and sanitizers to the research personnel.

# CHAPTER THREE

# DATA PRESENTATION ANALYSIS AND DISCUSSIONS

## Overview

This chapter presents a comprehensive overview of the data collected during the study, “Evaluation of Reward System on HIV Treatment Outcomes of Patients with Suspected Treatment Failure at Kakamega County, Kenya.” It outlines the systematic process through which raw data was organized, summarized, and prepared for in-depth analysis. The chapter begins by detailing the methods used for data presentation, ensuring clarity and accessibility of the findings. Subsequently, it delves into the rigorous analytical techniques employed, encompassing both quantitative and qualitative approaches as dictated by the mixed-methods quasi-experimental design. The core of this chapter lies in the discussion of the analyzed data, where the findings are interpreted in relation to the study’s specific objectives and research questions. This section critically examines the outcomes of the reward system, identifies the multifaceted factors influencing patient retention, and explores how the proposed integrated system can enhance treatment adherence. The discussions draws connections between the observed data and existing literature, highlighting implications for policy and practice in HIV care within Kakamega County and similar resource-limited settings.

## Findings

### Occupational Status of Study Participants

The occupational data presented provides a critical socioeconomic profile of the study population, revealing the underlying economic vulnerabilities that likely influence their ability to access and sustain HIV treatment. With a total of 503 participants in a sample size of 513 participants, the distribution of occupations highlighted significant challenges related to employment stability and financial security.

The most striking finding is that over half of the participants, 50.5% (254 individuals), were Not Employed. This demographic reality is a major and undeniable barrier to consistent healthcare. Being unemployed often translates to a complete lack of a stable income, which can make it impossible for patients to cover even the indirect costs associated with care, such as transportation to health facilities, food, and other household expenses. This finding strongly correlates with the reason for stopping treatment (Patient lack of finance) and validates the assumption that socioeconomic status is a critical factor in treatment retention.

The remaining employed portion of the sample is primarily engaged in precarious or informal work. Casual workers constitute 27.8% (140 individuals), and the Self Employed make up 20.7% (104 individuals). Both of these categories are characterized by unstable and often low-wage incomes. Casual work provides no security or benefits, and the income can be highly unpredictable. Similarly, self-employment in this context is likely to be informal, small-scale, and vulnerable to economic shocks. The collective instability of these occupations means that a vast majority of the study population lacks the financial buffer needed to navigate the challenges of a chronic illness.

In stark contrast, only a minuscule 1.0% (5 individuals) are Salaried. This figure underscores the limited representation of individuals in formal, stable employment with regular income and potential benefits like health insurance or paid sick leave. The overwhelming majority of the population lacks this support system, making them far more susceptible to treatment interruptions when faced with a financial setback or the need to take time off work for clinic appointments.

In the broader context of the study’s objectives, this occupational data provides a powerful rationale for investigating the impact of a reward system. The findings suggest that the challenges of treatment adherence and retention are not solely clinical or behavioral; they are fundamentally rooted in the socioeconomic realities of the patients. An integrated reward system, as proposed, could serve as a direct intervention to mitigate these financial barriers by providing a tangible incentive that helps cover costs and motivates sustained engagement with the healthcare system. The occupational profile of the participants confirms that any successful strategy to improve HIV treatment outcomes in this population must address the profound effects of unemployment and economic precarity.

**Table 3: Respondents’ occupation**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Casual | 140 | 27.8 |
| Not Employed | 254 | 50.5 |
| Salaried | 5 | 1.0 |
| Self Employed | 104 | 20.7 |
| Total | 503 | 100.0 |

### Participants’ Housing Types

The data on housing types among the study population offers valuable insights into the socio-economic and residential stability of the participants. With a sample size of 503, the distribution reveals a clear and dominant pattern of home ownership.

The most significant finding is that the vast majority of participants reside in their own homes, accounting for 79.5% (400 individuals). This high rate of home ownership suggests a population with a high degree of residential stability and, by extension, a potential for greater social and economic security. Owning a home can be indicative of established community ties, access to assets, and a consistent address, which are factors that can positively influence a patient’s ability to attend regular clinic appointments and manage chronic disease care. This stability can be a protective factor against treatment interruptions and loss to follow-up.

A smaller but still significant segment of the population, 14.9% (75 individuals), lives in rented housing. This group may be more transient than the homeowners, potentially facing different challenges. Mobility associated with renting could pose a risk to consistent care, as frequent address changes might lead to difficulties in tracking patients or maintaining a stable link to a single healthcare facility. This population segment may also be more susceptible to financial insecurity, as rent payments represent a continuous and often substantial expense, which could compete with other needs and potentially act as a barrier to accessing care or adhering to treatment.

The category of Hosted housing, representing 5.4% (27 individuals), highlights a segment of the population that is reliant on the support of family or friends. This situation may indicate a lack of independent economic means, making these individuals particularly vulnerable. While social support from family can be a positive influence, the lack of an independent living arrangement may introduce its own set of challenges, including limited privacy and potential for disruption that could impact treatment adherence.

Finally, the Squatter category is negligible, comprising only 0.2% (1 individual) of the sample. While this number is extremely small, it represents the most precarious housing situation. Individuals in this category face extreme residential instability, lack of legal rights to their dwelling, and significant social and economic vulnerability, which can be major hindrances to receiving and maintaining effective healthcare.

In the context of the study on HIV treatment, the high prevalence of home ownership is a positive indicator of population stability. However, the presence of a notable renting population and smaller Hosted and Squatter groups highlights the need for a nuanced approach to patient support. Interventions designed to improve retention and adherence should consider the differing levels of residential stability. While the majority of the population may benefit from standard care models, a targeted approach is necessary for those in less stable housing situations to mitigate the risk of treatment failure due to residential and economic challenges.

**Table 4: Housing types**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Hosted | 27 | 5.4 |
| Own | 400 | 79.5 |
| Rented | 75 | 14.9 |
| Squatter | 1 | .2 |
| Total | 503 | 100.0 |

**Figure 1: Housing types**

### Marital Status and Implications for HIV Treatment

The marital status of 503 patients out of the sample of 513 patients offers valuable insights into the social and relational contexts of the study population. Understanding these dynamics is crucial; as a patient’s marital status can significantly influence their support systems, socioeconomic stability, and ultimately, their engagement with healthcare services, particularly for a chronic condition like HIV.

The most dominant group by a significant margin is Married (one spouse), which constitutes over half of the sample at 57.1% (287 patients). This finding suggests that a large portion of the study's patients are in stable, monogamous relationships. For these individuals, the marital partner can be a key source of emotional, financial, and logistical support, which are all vital for maintaining treatment adherence. A supportive spouse can act as a reminder for medication, accompany the patient to clinic appointments, and provide a confidential space to manage the challenges of living with HIV. However, this dynamic also presents complexities, such as the potential for non-disclosure, fear of stigma within the relationship, or the added stress of managing the health of a spouse.

The next largest group is Single patients, representing 20.3% (102 patients). This group may face unique challenges related to a lack of a primary support person in their immediate household. Without the built-in support of a partner, single individuals might rely more heavily on family, friends, or formal support groups for their well-being and adherence. Interventions targeting this group should consider mechanisms to connect them with peer support networks and other community-based resources to mitigate social isolation and promote consistent care.

The remaining categories, while smaller in frequency, represent significant diversity in lived experience. Widowed patients (8.5%, 43 individuals), Divorced (5.0%, 25 individuals), and Separated (3.6%, 18 individuals) all face the potential for social and economic disruption. The loss of a partner, the stress of a separation, or navigating single parenthood can introduce new stressors and financial strains that may impede a person's ability to prioritize their health and adhere to a strict treatment schedule. These patients may require specialized counseling and social support services to help them cope with their circumstances while managing their health.

Finally, the presence of Married (multiple spouses) (4.0%, 20 individuals) and those Living with Partner (1.6%, 8 individuals) highlights the need for culturally sensitive and contextually aware support. For patients in polygamous marriages, dynamics of disclosure, support, and potential for transmission among spouses can be complex. Similarly, those living with partners, while having an immediate support person, may not have the legal or social protections that come with a formal marriage, which could impact their stability and access to care.

In summary, the diverse marital status distribution of the study population underscores the need for a highly personalized and flexible approach to HIV care. A single intervention strategy will not yield much result. For the majority who are married, programs could focus on couple counseling and partner support. For single, divorced, separated, or widowed patients, the emphasis should shift towards building broader social support networks and addressing economic barriers. A nuanced understanding of these social contexts is essential for designing effective and sustainable reward systems or other interventions to improve HIV treatment outcomes.

**Table 5: Marital Status**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Divorced | 25 | 5.0 |
| Living with Partner | 8 | 1.6 |
| Married (multiple spouses) | 20 | 4.0 |
| Married (one spouse) | 287 | 57.1 |
| Separated | 18 | 3.6 |
| Single | 102 | 20.3 |
| Widowed | 43 | 8.5 |
| Total | 503 | 100.0 |

**Figure 2: Marital Status**

### Average Household Income

Average household income data provides a critical demographic snapshot of the study’s patient population. The findings reveal a bimodal distribution, with a significant concentration of individuals in the mid-to-higher income brackets, while a smaller but notable portion of the sample reports very low household income.

The most striking finding is that nearly half of the respondents (48.5%) report an average household income of Ksh 3,001 and above. This group, combined with the next largest segment earning between Ksh 2,001 and Ksh 3,000 (30.6%), constitutes a substantial majority of the patient population. This suggests that a large proportion of patients in the study have a moderate to a relatively stable source of household income.

In contrast, the data also highlights the presence of economic vulnerability, with a small percentage of patients living on very low incomes. Specifically, 2.2% of the sample reports an average household income of Ksh 500 or less, and another 2.0% are in the Ksh 501 to Ksh 1,000 bracket. While these percentages may seem small, they represent a highly vulnerable subset of the patient population for whom even minor financial burdens can pose significant barriers to care. This finding directly correlates with the, patient lack of finance, reason for stopping treatment identified in the previous discussion, reinforcing the reality that a lack of financial resources, even for a minority of patients, is a genuine and impactful barrier to care.

This income distribution is of great significance to the proposed study on the effectiveness of a reward system. For patients in the lowest income brackets, financial incentives, even if modest, could serve as a powerful motivator to attend clinic appointments, cover transport costs, and sustain adherence. For the majority of the population with higher average household incomes, the effectiveness of a reward system may depend on the value and nature of the reward. It raises questions about whether non-financial incentives or a different type of reward structure would be more appealing or effective for those who are not as financially vulnerable.

The average household income data provides a nuanced understanding of the economic landscape of the patient population. It underscores that while a large portion of the sample may have some financial capacity, a targeted and tailored approach to incentives is necessary. Any reward system must be sensitive to the diverse economic realities of the patient population, ensuring that it effectively supports the most vulnerable while remaining relevant and motivating for all. The findings suggest that a one-size-fits-all reward mechanism may not achieve optimal results across the entire spectrum of patients.

**Table 6: Average Household Income**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | 0 - 500 | 11 | 2.2 |
| 501 - 1000 | 10 | 2.0 |
| 1001 - 2000 | 85 | 16.8 |
| 2001 - 3000 | 155 | 30.6 |
| 3001 and above | 246 | 48.5 |
| Total | 507 | 100.0 |

**Figure 3: Average Household Income**

### Average Expenditure and its Implications

Average monthly expenditure among the study participants provides a valuable, even though complex, insight into their socioeconomic status. The findings show a clear concentration of expenditure in the higher brackets, which warrants a detailed discussion in the context of the study’s objectives.

The most striking finding is that the vast majority of the study population (81.0%) reports an average expenditure of KSh 2,001 or more. Specifically, over half of the respondents (54.0%) fall into the highest bracket, with an average expenditure of KSh 3,001 and above. Conversely, only a very small fraction (0.4%) reports spending KSh 500 or less, and just 4.0% spend KSh 1,000 or less.

These figures suggest that most patients in the study, suspected of treatment failure, have a relatively stable or high level of monthly expenditure. This appears to contradict one of the finding that patient lack of finance as a reason for treatment discontinuation, which only accounted for a small percentage (0.8%) of cases. However, this may not necessarily be a contradiction but rather a more nuanced picture of the financial landscape.

The high average expenditure could reflect a number of factors. Higher expenditure may serve as a proxy for better socioeconomic standing, indicating that most participants are able to meet their basic living costs, including food, transport, and other household needs. This aligns with research that shows a positive association between higher income or socioeconomic status and better health outcomes and adherence to treatment. The expenditure figures, particularly those in the KSh 2,001+ range, might represent a significant financial burden even if they are being met. Out-of-pocket costs, particularly for transportation to and from the clinic, can be a major barrier to care even when the medication itself is free. For instance, a monthly transport pass can cost KSh 3,000 or more in urban areas, which would place patients directly into the highest expenditure bracket. While ART is provided at no cost, there are numerous associated expenses for people living with HIV. These can include costs for managing opportunistic infections or co-morbidities like hypertension and diabetes, as well as the cost of nutritious food and supplements needed for well-being. These indirect costs could be what is captured in the average expenditure and may still pose a barrier, especially for those in the lower-income brackets.

This finding is crucial for addressing the study’s specific objectives, particularly to identify factors hindering retention. While the numbers suggest that overt financial distress is not a widespread reason for treatment failure, the high reported expenditure could be a key factor in severe side effects for some patients. The high costs of transportation or other essential expenses may be a more subtle, yet powerful, barrier to consistent clinic visits and treatment retention. The findings from other studies in Kenya and the broader region confirm that transportation costs and other out-of-pocket expenses are significant barriers to HIV care, even when services are ostensibly free.

The average expenditure data reveals that the majority of the study participants in Kakamega County have a significant monthly outlay. This information, when combined with the previous qualitative data, suggests that financial barriers to HIV treatment are not necessarily absolute but may be related to specific, high-cost line items, such as transportation, which consume a substantial portion of a patient’s budget. To improve retention, interventions should not only address adherence but also consider targeted support to alleviate these specific financial burdens, ensuring that patients can consistently access their care without facing overwhelming out-of-pocket costs. Further qualitative investigation is needed to disaggregate what these expenditures are for and to truly understand their impact on treatment adherence.

**Table 7: Average Expenditure**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | 0 - 500 | 2 | 0.4 |
| 501 - 1000 | 18 | 3.6 |
| 1001 - 2000 | 76 | 15.0 |
| 2001 - 3000 | 137 | 27.0 |
| 3001 and above | 274 | 54.0 |
| Total | 507 | 100.0 |
|

**Figure 4: Average Expenditure**

### Education Level of Study Participants

The findings on education level of the study participants provide a crucial demographic context for understanding the challenges faced in HIV treatment adherence. Out of the 500 of the 513 respondents that provided their views on this matter, the vast majority have a low to moderate level of formal education.

The most striking finding is that over half of the participants, 53.2% (266 individuals), have only a primary education. This is followed by a substantial group, 37.6% (188 individuals), who have attained a secondary education or high school level. Conversely, the number of participants with no formal education (6.2%) or a vocational qualification (3.0%) is relatively small.

This educational profile has significant implications for health communication and patient management. Individuals with a lower level of formal education may face challenges in understanding complex medical information, such as the rationale behind their antiretroviral regimen, the importance of consistent daily adherence, the concept of viral load suppression, and the long-term consequences of treatment failure. The high percentage of participants with only primary education strongly suggests that standard, text-heavy patient education materials or technical explanations from healthcare providers may be ineffective.

The data provides a potential link to the issue of severe side effects. A lack of foundational knowledge and health literacy, potentially stemming from lower educational attainment, could directly contribute to a patient’s inability to comprehend the critical need for daily medication intake. Therefore, the observed rates of severe side effects and patients stopping treatment due to a lack of understanding may not be a simple matter of forgetfulness, but rather a deeper issue related to comprehension.

The findings underscore the necessity for health services in Kakamega County to adopt communication strategies that are tailored to the educational background of their patient population. This includes: using basic, non-technical terms when explaining treatment protocols; Using charts, diagrams, and other visual tools to illustrate concepts like viral load and CD4 counts; asking patients to explain the information back to the healthcare provider to confirm their understanding; enlisting the support of peer educators or community health workers who can communicate effectively in local languages and with cultural sensitivity.

While the low percentage of individuals with no formal education is a positive sign that most participants have some foundational literacy, the overall educational profile points to a critical need for targeted and accessible health education interventions. Understanding and addressing this demographic reality is fundamental to designing a reward system that effectively motivates and empowers patients to achieve and maintain viral suppression.

**Table 8: Education Level**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | No formal education | 31 | 6.2 |
| Primary education | 266 | 53.2 |
| Secondary education or high school | 188 | 37.6 |
| Vocational qualification | 15 | 3.0 |
| Total | 500 | 100.0 |

**Figure 5: Education Level**

### Household Size

The data on household size offers a valuable demographic snapshot of the study population, revealing patterns that are crucial for understanding the social and economic context of HIV treatment adherence. While the total frequency of 482 out of 513 represents a significant portion of the sample. The distribution reveals a clear pattern, with the majority of households falling within a concentrated range of sizes.

The most frequent household size is 4 members, representing nearly 20% of the sample. This is followed by significant proportions of households with 3, 2, 5, and 6 members. Combined, these sizes account for a substantial majority of the study population, suggesting a prevalence of either nuclear family structures or small extended families. This finding is consistent with common family dynamics in many parts of Kenya.

The wide variation in household size, from single-person households to those with 10 or more members, is an important factor to consider in the context of health outcomes, particularly for chronic diseases like HIV. Household size is a crucial proxy for understanding resource availability, social support systems, and potential stressors.

Larger households, particularly those with more than 6 members, are likely to face greater socio-economic pressure. The financial burden of supporting more individuals can reduce the resources available for a single person's healthcare needs, such as transport to clinics, a balanced diet, or even the opportunity cost of time spent on clinic visits. This aligns with the patient lack of finance reason for stopping treatment identified in the previous analysis.

The presence of other family members can be a double-edged sword. A larger household may offer a strong social support network, providing encouragement for treatment adherence and practical assistance. Conversely, a patient may be a primary caregiver for a large family, making it difficult to prioritize their own health needs and attend clinic appointments regularly. Conversely, patients from smaller households (1-2 members) might lack this immediate support system, potentially leading to social isolation that can negatively impact their adherence and mental well-being.

In larger, more crowded households, a patient may have less privacy, making it more challenging to take medication discreetly, especially if they fear stigma from family members who are unaware of their HIV status. This lack of privacy can be a significant barrier to consistent adherence.

The demographic data on household size is not merely a descriptive statistic. It is a critical socio-demographic variable that provides insight into the potential drivers of treatment adherence and retention. The prevalence of mid-sized households suggests a strong family context, while the presence of very large and very small households highlights the need for targeted interventions that can address the unique challenges of resource scarcity and social support deficits faced by these patient groups. The study’s reward system must therefore be sensitive to these varying household dynamics to effectively improve treatment outcomes. This is illustrated in the table and figure below;

**Table 9: Household Size**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | 1 | 43 | 8.9 |
| 2 | 59 | 12.2 |
| 3 | 78 | 16.2 |
| 4 | 96 | 19.9 |
| 5 | 59 | 12.2 |
| 6 | 51 | 10.6 |
| 7 | 37 | 7.7 |
| 8 | 28 | 5.8 |
| 9 | 16 | 3.3 |
| 10 | 13 | 2.7 |
| 11 | 1 | .2 |
| 16 | 1 | .2 |
| Total | 482 | 100 |

**Figure 6: Household Size**

### House Characteristics and Socioeconomic Status

Data on house characteristics offers a clear and compelling snapshot of the socioeconomic status of the study population. The findings reveal a stark disparity in housing types, with one category overwhelmingly dominant.

The most striking observation is that the vast majority of patients, 69.2% (355 individuals), live in houses constructed of Mud & Thatched materials. This finding is highly significant as it serves as a powerful proxy for the low socioeconomic status of the study participants. In many rural and developing regions, mud and thatched houses are indicative of limited resources, subsistence living, and a lack of access to modern building materials and infrastructure. This aligns directly with the problem statement of the study, which identified low socioeconomic status as a key factor hampering retention in care.

In contrast, the more durable and expensive housing types, such as Brick (23.0%), Wooden (3.1%), and Stone (2.9%), represent a small minority of the population. This indicates that while there is some socioeconomic diversity, the study is predominantly focused on a highly vulnerable population.

This distribution of housing types has direct implications for the study’s core objectives. The challenges associated with poverty; including food insecurity, limited access to clean water, poor sanitation, and the high cost of transportation to and from health facilities; are magnified for individuals living in such conditions. These factors can create significant barriers to consistent adherence to complex ART regimens and regular clinic attendance, which are essential for achieving viral suppression.

Therefore, the housing characteristics data provides crucial context for understanding the high rates of severe side effects and other treatment-related challenges observed in the study. It reinforces the rationale for exploring interventions, such as a reward system, that could help mitigate these socio-economic barriers by providing incentives that address the daily struggles of patients. The data suggests that any successful intervention must be designed with the realities of this population’s economic circumstances firmly in mind.

**Table 10: House Characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Brick | 118 | 23.0 |
| Mud & Thatched | 355 | 69.2 |
| Other | 1 | .2 |
| Stone | 15 | 2.9 |
| Wooden | 16 | 3.1 |
| Total | 505 | 100.0 |

### NHIF Insurance Cover

The data presented is both stark and alarming: out of a sample of 513 patients, a staggering 99.0% (508 individuals) do not have National Hospital Insurance Fund (NHIF) insurance cover. This finding reveals a profound and systemic barrier to healthcare access that has significant implications for both the individual patients and the broader public health system in Kakamega County.

The National Hospital Insurance Fund is Kenya’s government health insurance scheme, designed to provide affordable medical care, including coverage for inpatient and outpatient services, surgical procedures, and the management of chronic illnesses like HIV/AIDS. For self-employed individuals, the monthly contribution was previously a flat KES 500. However, recent legal reforms have transitioned this to the Social Health Insurance Fund (SHIF), where non-salaried individuals are required to contribute 2.75% of their annual household income, with a minimum monthly contribution of KES 300.

The almost complete lack of coverage in this patient sample suggests that the vast majority of these individuals are likely in the informal sector, unemployed, or living in poverty, making even the minimum monthly contribution unaffordable or not a priority compared to other basic needs.

This lack of financial protection has several critical consequences. While ART drugs are often provided for free, managing HIV involves more than just pills. Patients require regular viral load and CD4 count monitoring, treatment for opportunistic infections, and management of co-morbidities like hypertension or diabetes. Without NHIF, these services are not free and must be paid for out-of-pocket, creating a significant financial burden that can lead to delayed care or avoidance of necessary medical attention. This directly contributes to the treatment failure a patient might experience.

The absence of insurance coverage makes patients highly vulnerable to catastrophic health expenditures. A sudden hospitalization, an unexpected surgery, or a complex medical issue could drive an already economically marginalized individual or household deeper into poverty, creating a cycle where poor health leads to financial destitution, which in turn leads to poorer health outcomes.

The study’s problem statement correctly identifies low socioeconomic status as a factor hindering retention in care. The inability to afford transport to a clinic, pay for essential lab tests, or cover the cost of a non-ART prescription can lead to missed appointments and, as the previous data showed, severe side effects and treatment cessation. The lack of NHIF cover is a powerful manifestation of this socio-economic barrier.

This data points to a critical public health and policy gap. While the government has introduced subsidy programs, such as the Health Insurance Subsidy Program (HISP) and the Linda Mama program, to assist vulnerable populations, the overwhelming non-coverage among this patient sample suggests that these programs are either not reaching this specific demographic effectively, or the barriers to enrollment are too high. For instance, the identification of indigent or vulnerable households, which is a requirement for premium subsidies, can be a complex and imperfect process.

The minuscule percentage of patients with NHIF cover is not just a statistic; it is a clear indicator of systemic failure to provide financial protection for a highly vulnerable population. Any intervention aimed at improving HIV treatment outcomes, including the proposed reward system, must be complemented by efforts to address this foundational issue. A comprehensive approach would involve increasing awareness about NHIF/SHIF benefits and enrollment processes, simplifying registration for the informal and vulnerable sectors, and perhaps exploring direct financial support for premium contributions for patients with suspected treatment failure as a form of reward or incentive. Without such measures, the high rate of non-coverage will continue to undermine efforts to achieve universal health coverage and control the HIV epidemic in Kakamega County.

**Table 11: NHIF insurance cover**

|  |  |  |
| --- | --- | --- |
|  | Frequency | Percent |
| Have NHIF insurance cover | 5 | 1.0 |
| No NHIF insurance cover | 508 | 99.0 |
| Total | 513 | 100.0 |

**Figure 7: NHIF insurance cover**

### Other Active Insurance Cover

Data on other active insurance cover presents a stark and critical finding: an overwhelming majority of the patients in the study cohort (99.4%, or 510 out of 513) have no form of health insurance cover. Only a negligible fraction (0.6%) reported having a separate insurance plan.

This finding carries significant implications for the health and financial well-being of the patient population and for the success of HIV treatment programs. While antiretroviral drugs are often provided free of charge in Kenya through government and international donor support, this data highlight that the vast majority of patients are highly vulnerable to the indirect and associated costs of healthcare. These costs include transportation to and from clinics, consultation fees for services not covered by the program, laboratory tests outside of routine monitoring, and treatment for opportunistic infections or other co-morbidities. Without a financial safety net, any minor health issue can quickly escalate into a major financial crisis, potentially leading to a choice between basic necessities and healthcare.

The almost complete lack of insurance coverage also directly links to the previously discussed problem of patient lack of finance as a reason for stopping treatment. This financial challenge is a major structural barrier to consistent care. Patients without insurance are less likely to seek care for non-HIV related health issues, which can compromise their overall health and ability to adhere to their ART regimen. It also places a greater burden on the public health system, as patients may only present for care when their condition has become advanced and requires more complex and expensive, interventions.

In the context of a study evaluating a reward system, this finding provides a powerful justification for the intervention. The proposed rewards, whether financial or in-kind, could serve as a direct mechanism to mitigate the financial barriers faced by these patients. The incentives could help cover the very costs; like transport and food; that a lack of insurance would otherwise make prohibitive. The study’s focus on a reward system therefore not only addresses the behavioral aspect of adherence but also implicitly acknowledges and attempts to alleviate the deep-seated socio-economic vulnerabilities of the patient population.

The data clearly demonstrates that this patient population is highly financially exposed. Designing and implementing effective interventions for HIV care in Kakamega County must recognize and address this reality. The success of programs aimed at improving adherence and retention is inextricably linked to their ability to provide support that helps patients overcome the financial obstacles posed by a lack of health insurance.

**Table 12: Other active insurance cover**

|  |  |  |
| --- | --- | --- |
|  | Frequency | Percent |
| Have other insurance cover | 3 | 0.6 |
| No insurance cover | 510 | 99.4 |
| Total | 513 | 100.0 |

**Figure 8: Other active insurance cover**

### Clinic Intervention Group and Clinic Control Group

The provided table illustrates the distribution of study participants into two distinct groups: a Clinic Control Group and a Clinic Intervention (Treatment) Group. Out of a total of 512 out of 513 participants whose responses were captured for this item, 242 individuals (47.27%) were assigned to the Control Group, while 270 individuals (52.73%) were assigned to the Treatment Group.

This distribution is fundamental to the quasi-experimental design outlined in the study methodology. The primary objective of such a design is to evaluate the effectiveness of an intervention; in this case, a reward system; by comparing outcomes between a group that receives the intervention and a group that does not.

The Clinic Treatment Group, comprising a slightly larger proportion of the participants, was exposed to the reward system intervention. Their outcomes, particularly regarding HIV treatment adherence, viral suppression, and retention in care, were observed to determine the impact of the rewards.

Conversely, the Clinic Control Group, while not receiving the specific reward intervention, continued to receive standard care. This group served as the crucial counterfactual. By observing the outcomes in the control group, researchers were able to estimate what would have happened to the treatment group participants in the absence of the reward system. Any significant differences in outcomes between the two groups, after accounting for baseline characteristics, were then attributed to the effect of the reward system.

While the distribution is not perfectly balanced (i.e., not exactly 50% in each group), the slight numerical difference between the control and treatment groups (242 vs. 270) is generally acceptable within a quasi-experimental framework. It is common for practical considerations in real-world settings to lead to minor imbalances in group sizes. The key was to ensure that, despite this slight numerical difference, the two groups were as comparable as possible in terms of critical baseline characteristics (e.g., demographics, initial viral load, duration on ART, socio-economic status) that could influence treatment outcomes. Any significant baseline differences needed to be statistically controlled for during the analysis to isolate the true effect of the reward system. This deliberate group assignment was used to set the stage for a robust evaluation of the reward systems potential to improve HIV treatment outcomes in Kakamega County.

**Table 13: Clinical intervention and control group**

|  |  |  |
| --- | --- | --- |
|  | Frequency | Percent |
| Control Group | 242 | 47.27 |
| Treatment Group | 270 | 52.73 |
| Total | 512 | 100.00 |

**Figure 9: Clinical intervention and control group**

### Reasons for Antiretroviral Drug Substitution

The data, detail the reasons for antiretroviral (ARV) drug substitution among 79 instances, and offers crucial insights into the operational and clinical challenges faced in maintaining optimal HIV treatment regimens.

Overwhelmingly, drug out of stock stood out as the primary driver for drug substitution, accounting for a staggering 79.75% (63 out of 79 cases). This finding was extremely concerning and points to significant systemic vulnerabilities in the ARV supply chain or inventory management within healthcare facilities in Kakamega County. Frequent stock-outs necessitated immediate changes to patient regimens, which could have several detrimental effects.

Patients may be switched to less optimal or second-line regimens, potentially impacting viral suppression rates. Further, unplanned switches or interruptions due to stock-outs can increase the risk of developing drug resistance, limiting future treatment options.

Unexpected changes can confuse patients, erode trust in the healthcare system, and make adherence more difficult, especially if the new regimen has different dosing schedules or side effect profiles.

Finally, managing frequent substitutions due to stock-outs places an additional burden on clinicians and pharmacists, diverting resources from other essential patient care activities.

The high frequency of this reason underscores the urgent need for a more resilient and efficient supply chain management system to ensure consistent availability of essential ARV medications.

Other significant reasons for drug substitution reflect clinical best practices and patient safety considerations. New drug available (6.33%, 5 cases) indicates a positive trend where patients are being switched to newer, often more potent, tolerable, or convenient regimens. This aligns with global efforts to optimize ART and improve patient quality of life and adherence.

Risk of pregnancy (6.33%, 5 cases) and Pregnancy (5.06%, 4 cases) collectively represent a substantial proportion of substitutions. This is a critical clinical decision, as certain ARVs have contraindications or are less preferred during pregnancy due to potential risks to the fetus or inadequate data on safety. Switching regimens for pregnant individuals or those at risk is a crucial measure to ensure both maternal and child health, aligning with prevention of mother-to-child transmission (PMTCT) guidelines.

Less frequent, but clinically important, reasons include newly diagnosed TB (1.27%, 1 case) and Toxicity side effects (1.27%, 1 case). Co-infection with Tuberculosis often requires careful adjustment of ARV regimens to avoid drug-drug interactions and manage the combined treatment effectively. Similarly, severe toxicity or intolerable side effects necessitate immediate drug substitution to improve patient tolerance and adherence, thereby preventing treatment discontinuation.

Finally, while clinical considerations like pregnancy, new drug availability, and toxicity are expected reasons for ARV substitution, the overwhelming dominance of drug out of stock as the primary cause is a major concern. Addressing this systemic issue through improved procurement, supply chain logistics, and inventory management is paramount. Simultaneously, robust clinical monitoring and adherence support remain vital to ensure that drug substitutions, whether supply-driven or clinically indicated, do not compromise the long-term success of HIV treatment programs in Kakamega County. This is summarized in the table and figure below.

**Table 14: Reasons for drug substitute**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Drug out of stock | 63 | 79.75 |
| New drug available | 5 | 6.33 |
| Newly diagnosed TB | 1 | 1.27 |
| Pregnancy | 4 | 5.06 |
| Risk of pregnancy | 5 | 6.33 |
| Toxicity side effects | 1 | 1.27 |
| Total | 79 | 100.0 |

**Figure 10: Reasons for drug substitute**

**Figure 11: Reasons for drug substitute**

### Reasons for HIV Treatment Switch

The data, summarizes the reasons for HIV treatment regimen switches among 15 patients, highlights two primary drivers: clinical treatment failure and virologic failure. This distribution offers valuable insights into the clinical decision-making process for patients experiencing challenges with their current ART regimen.

Clinical treatment failure is the dominant reason, accounting for a substantial 66.67% (10 out of 15) of all switches. This indicates that a significant proportion of treatment changes are prompted by the observable worsening of a patient’s health, or the recurrence of opportunistic infections, despite being on ART. Clinical signs might include unexplained weight loss, persistent fever, chronic diarrhea, or the development of new or recurrent opportunistic infections, signaling that the current regimen is no longer effectively controlling the HIV infection or allowing immune recovery. In resource-limited settings, where routine viral load monitoring might not always be immediately accessible or affordable, clinical presentation often serves as a crucial early indicator for suspected treatment failure and the need for investigation and potential switch.

Virologic failure, while less frequent in this specific dataset at 33.33% (5 out of 15 switches), is the gold standard for defining ART failure. This occurs when the patient’s viral load remains persistently detectable and above a certain threshold (e.g., 1000 copies/mL), despite adherence to the regimen. Virologic failure indicates that the virus is actively replicating, potentially due to severe side effects, drug resistance, or pharmacokinetic issues. Ideally, virologic failure should be detected early through regular viral load monitoring, allowing for a timely regimen switch before significant clinical deterioration occurs.

The interplay between these two reasons is critical. Often, clinical treatment failure is a consequence of underlying uncontrolled viral replication (virologic failure). Patients who experience virologic failure over an extended period will eventually manifest clinical symptoms as their immune system deteriorates.

Understanding these reasons for treatment switch is vital for improving HIV care. It underscores the importance of a holistic approach to patient monitoring that integrates both robust clinical assessment and timely viral load testing. For patients with suspected treatment failure, as highlighted in the broader study context, identifying the precise reason for their failure (whether primarily clinical or virologic) is paramount for guiding appropriate and effective second-line or third-line ART regimens. Furthermore, these findings indirectly reinforce the need for interventions that promote adherence, as severe side effects is a primary driver of both clinical and virologic failure, necessitating subsequent treatment switches. The table and figure below summarizes this information.

**Table 15: Reasons for treatment switch**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Clinical treatment failure | 10 | 66.67 |
| Virologic failure | 5 | 33.33 |
| Total | 15 | 100.0 |

**Figure 12: Reasons for treatment switch**

### Reasons for HIV Treatment Switch by Clinic category group

The cross-tabulation of clinic group versus reason for switching treatment reveals a marked disparity between the control and treatment groups. Among patients who switched due to clinical treatment failure, a substantial majority 90% belonged to the treatment group, while only 10% were from the control group. Similarly, in the category of virologic failure, 80% of the patients were from the treatment group, and only 20% from the control group. These findings suggest that individuals in the treatment group were significantly more likely to switch treatment due to either form of failure, with virologic failure being slightly more common 80 cases for every 100 than clinical failure 90 cases for every 100 within that group. The overall proportions further emphasize this trend: out of all the switches, 85% were from the treatment group, highlighting a potential association between being in the treatment group and a higher likelihood of experiencing treatment failure requiring a switch. This may warrant further investigation into treatment protocols, adherence levels, or baseline characteristics within each group to understand the underlying cause of the observed differences.

**Table 16: Reason for switching treatment**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Reason for switching treatment | | |
|  |  | Clinical treatment failure | Virologic failure |
| Clinic | Control Group | 10 | 20 |
| Treatment group | 90 | 80 |
| Total | 100 | 100 |

**Table 17: Reason for switching treatment**

### End of Follow-up Reasons for Patients on HIV Treatment

The study also collected data on the end of follow-up reasons, and out of the 513 responses, 117 patients receiving HIV treatment presents a critical challenge to effective long-term HIV care responded to this item. The most striking and concerning finding is that 94.02% (110 out of 117 patients) were lost to follow-up within three months. This overwhelming proportion signifies a severe leakage in the cascade of care, profoundly impacting treatment outcomes and program effectiveness.

Being lost to follow-up means that a vast majority of these patients were no longer accessing their antiretroviral therapy (ART) or receiving essential clinical monitoring. The implications of such a high rate of loss are dire. Patients who discontinue ART are at a significantly higher risk of experiencing disease progression, opportunistic infections, and premature death. Unsuppressed viral loads in individuals lost to follow-up pose a continued risk of HIV transmission within the community, undermining public health efforts to control the epidemic, irregular or interrupted ART can lead to the development of drug-resistant HIV strains, complicating future treatment options for both the individual and potentially for others if transmitted.

The resources invested in the initially diagnosing, initiating, and treating these patients become largely wasted when they are lost from care. Further, high rates of loss to follow-up obscure the true picture of program success and make it difficult to accurately assess treatment effectiveness and retention rates.

The reasons for such a high rate of loss to follow-up are multifaceted, drawing from the broader context of HIV care challenges in Kakamega County. They include fear of being identified as HIV-positive can lead patients to avoid clinic visits or seek care elsewhere covertly, making them difficult to track, lack of finance for transport, food, or even the opportunity cost of time spent at the clinic can prevent consistent attendance. Patients may also discontinue care if they feel well and no longer perceive a need for medication, or conversely, if they experience challenging side effects without adequate counseling and support. Some patients moving for work or personal reasons without transferring their care can also become lost to the system. Further, paper-based health management systems also hinder effective patient tracking and referral mechanisms, particularly across different clinics or sub-counties. Finally, insufficient support or understanding of the importance of lifelong adherence can lead to disengagement.

Death accounted for a smaller but significant 4.27% (5 cases) of the end of follow-up reasons. While death is an unfortunate outcome, it underscores the importance of maintaining patients in care to prevent disease progression that could lead to mortality. These deaths could also be a consequence of delayed diagnosis or late presentation to care.

The “Not Applicable” category (1.71%, 2 cases) likely refers to administrative closures or other specific study-related criteria that do not fit into the other categories.

The alarmingly high percentage of patients lost to follow-up directly informs the critical need for the proposed study’s objectives. An integrated reward system, as hypothesized, could serve as a powerful incentive to improve patient retention and adherence, thereby reducing the number of individuals dropping out of care. Furthermore, the development of robust tracking mechanisms is paramount to actively trace patients who miss appointments, re-engage them in care, and prevent them from becoming statistics in the lost to follow-up category. Addressing this severe challenge is central to achieving sustainable HIV treatment outcomes and realizing the broader public health goals in Kakamega County. Table and figure below, summarizes this

**Table 18: End of Follow-up Reasons**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Death | 5 | 4.27 |
| Lost to follow-up (< 3 months) | 110 | 94.02 |
| Not Applicable | 2 | 1.71 |
| Total | 117 | 100.0 |

**Figure 13: End of Follow-up Reasons**

### Reasons for Stopping HIV Treatment

This data, outlines reasons for stopping HIV treatment among a sample of 513 patients, reveals critical insights into the challenges of achieving sustained antiretroviral therapy (ART) adherence and retention in care.

The most prominent reason for treatment discontinuation is severe side effects, accounting for a significant 50% of all reported reasons, or 18 individual cases. This finding is particularly concerning given that adherence is the cornerstone of effective ART, directly impacting viral suppression and preventing the development of drug resistance. Severe side effects can stem from a multitude of factors, including forgetfulness, complex dosing regimens, side effects, stigma, lack of social support, and insufficient understanding of the treatment’s importance. The high incidence of severe side effects underscores the urgent need for robust patient education, counseling, and innovative support systems to ensure consistent medication intake.

Other notable reasons for treatment cessation include drug out of stock accounting for (13.9%) and patient lack of finance accounting for 11.1%. These factors highlight systemic and socio-economic barriers to treatment continuity. Drug out of stock points to potential weaknesses in the pharmaceutical supply chain or inventory management within healthcare facilities. Unreliable drug availability can severely disrupt treatment regimens, erode patient trust, and ultimately lead to treatment failure. Similarly, patient lack of finance underscores the economic vulnerabilities faced by patients, where even indirect costs associated with treatment (e.g., transport to clinics, lost wages during clinic visits) can become insurmountable barriers, despite ART often being provided free of charge in Kenya. Addressing these supply chain and financial challenges is crucial for ensuring equitable and continuous access to life-saving medication.

Virologic failure also contributed to treatment discontinuation 11.1%. While virologic failure can be a consequence of severe side effects, it can also indicate the development of drug resistance or a need for regimen switch. This necessitates effective viral load monitoring and prompt clinical responses to adjust treatment strategies and prevent further progression of the disease.

Other relevant reasons include patient decision 5.6% and pregnancy 8.3%. Patient decision might encompass a range of personal choices, including self-stigma, feeling well and believing treatment is no longer necessary, or seeking alternative remedies. Pregnancy, while a positive life event, can sometimes lead to treatment modifications or, less commonly, discontinuation if not properly managed with comprehensive counseling and support to ensure continued maternal and child health.

In the context of Kakamega County, where retention rates are critical for the success of the HIV program, these identified reasons for stopping treatment provide a clear roadmap for intervention. The high prevalence of severe side effects suggests that strategies aimed at enhancing patient motivation and support, such as the proposed reward system, could be highly beneficial. Furthermore, addressing the structural issues of drug availability and financial barriers through improved health management systems and patient support programs is essential. Understanding these multifaceted reasons for treatment discontinuation is fundamental to developing targeted, effective interventions that strengthen the HIV care cascade and ultimately improve patient outcomes in Kakamega County and similar resource-limited settings.

**Table 19: Reason for stopping treatment**

|  |  |  |
| --- | --- | --- |
|  | | Percent |
|  | Drug out of stock | 13.9 |
| Patient decision | 5.6 |
| Patient lack of finance | 11.1 |
| Severe side effects | 50.0 |
| Pregnancy | 8.3 |
| Virologic failure | 11.1 |
| Total | 100.0 |

When missing values are removed we get

**Figure 14: Treatment\_2 Reason for stopping treatment**

### Reasons for Stopping HIV Treatment per study arms

The cross-tabulation analysis of reasons for stopping treatment between the control and treatment clinic groups reveals distinct patterns and contrasts in patient behavior and treatment challenges.

In the control group, the overwhelming majority of patients, 74.0% stopped treatment due to severe side effects, making it the most dominant reason by far. Other factors such as lack of finance accounted for 13.0%, while drug stock-outs accounted for 8.7%, and patient decision accounting for 4.3%, played a smaller role, while pregnancy and virologic failure were not reported at all. This suggests that in the absence of targeted interventions, adherence issues remain the primary barrier to continuous treatment.

In contrast, the treatment group presented a much more diversified distribution of reasons for discontinuing treatment. Virologic failure accounted for 30.8% and pregnancy accounted for 23.1% emerged as the leading causes, followed by drug stock-outs at 23.1%. Notably, Severe side effects, which was a major issue in the control group, accounted for only 7.7% in the treatment group; indicating a significant improvement in adherence under the treatment intervention. Similarly, patient decision and lack of finance each accounted for 7.7% of cases in the treatment group.

Overall, these findings suggest that the intervention applied in the treatment group may have positively influenced patient adherence and financial access, shifting the primary challenges toward more clinical and supply-related issues like virologic failure and pregnancy. The contrast also highlights the need for comprehensive strategies that address not only adherence but also structural and medical barriers to sustained treatment.

**Table 20: Cross tabulation for reasons for stopping treatment**

| **Reasons for Stopping Treatment** | **Control Group (%)** | **Treatment Group (%)** | **Total (%)** |
| --- | --- | --- | --- |
| Drug out of stock | 8.7 | 23.1 | 31.8 |
| Patient decision | 4.3 | 7.7 | 12.0 |
| Patient lack of finance | 13.0 | 7.7 | 20.7 |
| Severe side effects | 74.0 | 7.7 | 81.7 |
| Pregnancy | 0 | 23.1 | 23.1 |
| Virologic failure | 0 | 30.8 | 30.8 |
| **Total** | **100** | **100.1** | **200.1**\* |

**Table 21: Cross tabulation for reasons for stopping treatment**

## Discussion on Evidence of Suspected Treatment Failure among HIV Patients in Kakamega County

### Evidence of Adherence Concerns

The data presented provides a critical understanding of the practical challenges patients face in maintaining consistent HIV treatment. Out of 513 patients, the 465 patients who responded to this question, a significant majority exhibited various forms of adherence issues, with certain patterns dominating the landscape.

The most prevalent adherence concern is missed appointments, accounting for a staggering 65.2% (303 cases) of the total. This number of cases highlights a fundamental challenge in the continuity of care. Missed appointments are not merely administrative oversights; they represent lost opportunities for vital clinical monitoring which include viral load and CD4 counts, refill of ART medications, and adherence counseling. Frequent missed appointments can lead to drug stock-outs for patients, interruptions in treatment, and subsequently, an increased risk of virologic failure and disease progression. The sheer volume of missed appointments suggests systemic barriers, patient-related factors, or a combination thereof.

Closely related and equally concerning was the combination of missed appointments and missed pills, which constitutes 32.9% (153 cases) of the reported issues. This category directly indicates a failure in consistent medication intake, which is the direct measure of adherence. When patients miss both their scheduled clinic visits and doses of medication, it creates a significant risk for suboptimal viral suppression, the development of drug resistance, and the potential for increased morbidity and mortality. This combined concern points to a deeper pattern of disengagement from care and self-management of their condition.

The other aspect that was less frequent, but providing crucial qualitative insights, are missed appointments and stress (1.3%, 6 cases) and stigma and long distance to health facility (0.6%, 3 cases). These factors underscore the psychological and logistical burdens that impact adherence. Stress, often linked to mental health issues or socio-economic pressures, can overwhelm a patient's capacity to prioritize and manage their treatment. Similarly, the ongoing challenge of stigma, coupled with geographical barriers like long distances to health facilities, can deter patients from seeking or consistently accessing care. These specific concerns emphasize the need for holistic support that addresses mental well-being, community-based care models, and improved accessibility.

The overwhelming evidence of missed appointments, often coupled with missed pills, points to significant gaps in patient retention and adherence within the HIV care cascade. These findings strongly reinforce the problem statement of the study, which highlights challenges in retention and adherence leading to treatment failures in Kakamega. Addressing these concerns will require multi-pronged interventions, potentially including the exploration of reward systems to incentivize adherence, strengthening patient tracking mechanisms, providing targeted adherence counseling, and implementing strategies to mitigate the impact of stress, stigma, and geographical barriers to care.

Table below and figure below illustrates this information.

**Table 22: Evidence of Adherence Concerns**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Missed Appointment | 303 | 65.2 |
| Missed Appointments and Missed Pill | 153 | 32.9 |
| Missed Appointments and Stress | 6 | 1.3 |
| Stigma Long Distance to Health Facility | 3 | .6 |
| Total | 465 | 100.0 |

**Figure 15: Evidence of Adherence Concerns a.**

### Evidence of Adherence Concerns in the Control vs. Treatment

The cross-tabulation analysis of Clinic group (Control vs. Treatment) and Evidence of Adherence Concerns reveals important patterns in patient adherence behaviors.

Among the Control Group, the most frequently reported adherence concern was Missed Appointments, with 160 cases, followed by Missed Appointments and Missed Pills at 68 cases, and a single case of Missed Appointments and Stress. No instances were reported under Stigma or Long Distance to Health Facility.

In contrast, the Treatment Group demonstrated slightly lower instances of Missed Appointments alone at 143 cases, but a higher number of cases involving multiple adherence challenges, including Missed Appointments and Missed Pills at 85 cases, Missed Appointments and Stress at 5 cases, and notably, 3 cases of Stigma related to Long Distance to the Health Facility, which were completely absent in the Control Group.

On overall, across both groups, Missed Appointments accounted for the largest share of adherence concerns at 303 total, while multi-factor challenges such as Missed Appointments and Missed Pills at 153 cases were also common. Stress-related and stigma-related concerns were relatively rare, though they appeared more frequently in the Treatment Group, possibly due to more rigorous or transparent reporting mechanisms.

This pattern may indicate that while the Treatment Group had more complex adherence challenges reported, it might also reflect better detection or disclosure due to enhanced engagement or support mechanisms. Further qualitative analysis would be helpful to determine whether these differences stem from actual behavioral changes or improved monitoring and communication.

**Table 23: Evidence of Adherence Concerns b.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Evidence of Adherence Concerns | | |  |  |
|  |  | Missed Appointment | Missed Appointments and Missed Pill | Missed Appointments and Stress | Stigma Long Distance to Health Facility |
| Clinic | Control Group | 160 | 68 | 1 | 0 |
| Treatment group | 143 | 85 | 5 | 3 |
| Total | 303 | 153 | 6 | 3 |

**Figure 16: Evidence of Adherence Concerns b.**

### Likely Root Cause of Severe side effects

The data presents a compelling overview of the likely root causes contributing to severe side effects among patients, with a total of 513 responses analyzed. A significant portion of responses (9.4%) were missing values, indicating a potential need for improved data collection methods or a deeper investigation into why these values were not recorded. However, based on the available data, several key themes emerge as dominant factors influencing severe side effects.

Stigma stands out as the most frequently cited barrier, either as a standalone factor or in combination with other challenges. With 68 responses (13.3%), Stigma alone represents a substantial portion of the reported reasons for severe side effects. When combined with other factors, its pervasive influence becomes even more evident. For instance, disclosure and stigma accounts for 7.4% of responses, Stigma and Financial Challenges for 8.8%, and Disclosure, Stigma and Mental Health Issues for 6.8%. This strong prevalence suggests that the fear of social disapproval, discrimination, and the perceived negative consequences of revealing one’s condition significantly deter patients from consistently adhering to their treatment regimens. This finding aligns with the general understanding of HIV care, where stigma remains a major hurdle globally, and particularly in communities where awareness may be high but acceptance remains low.

Financial challenges emerge as another critical and widespread barrier to adherence. “Financial Challenges” as a standalone reason accounts for 9.7% of responses, making it the second most frequent individual factor. Its frequent co-occurrence with other issues, such as Disclosure and Financial Challenges (0.6%), Disclosure, Stigma and Financial Challenges (0.8%), Mental Health Issues and Financial Challenges (1.0%), and Stigma and Financial Challenges (8.8%), underscores the economic burden faced by patients. This suggests that even when patients are aware of the importance of adherence, financial constraints related to transportation to facilities, cost of medications (if applicable, or associated costs like food and transport for clinic visits), or loss of income due to illness or clinic visits can directly impede their ability to follow treatment plans.

Disclosure, closely linked with stigma, is a significant determinant of adherence. While Disclosure alone accounts for 2.3% of responses, its frequent appearance in combination categories like Disclosure and Stigma (7.4%), Disclosure, Stigma and Mental Health Issues (6.8%), and Stigma, Disclosure and Inadequate Preparations (3.5%) highlights the profound impact of the decision to reveal one's health status. Patients may fear negative reactions from family, friends, or community members, leading them to avoid situations that might reveal their status, such as clinic visits or taking medication in front of others. This fear can directly translate into missed appointments and inconsistent medication intake.

Mental health issues represent a notable and concerning root cause. Mental Health Issues alone contributes 3.1% to severe side effects, but its combined presence with Disclosure, Stigma and Mental Health Issues (6.8%), Mental Health Issues and Financial Challenges (1.0%), and Mental Health Issues and Religious Belief (1.2%) indicates that psychological well-being is intrinsically linked to treatment compliance. Depression, anxiety, and other mental health conditions can diminish a patient's motivation, ability to remember to take medication, or navigate the complexities of their treatment plan. The presence of Mental Health Issues, Financial Challenges and Religious Belief (2.7%) further emphasizes the multifaceted nature of these challenges.

Religious beliefs, though less frequent than stigma or financial challenges, still play a role. Religious Belief as a standalone factor accounts for 2.3% of responses. Its combination with other factors like Disclosure and Religious Belief (0.8%), Mental Health Issues and Religious Belief (1.2%), and Religious Beliefs, Ignorance and Financial Challenges (1.9%) suggests that certain religious interpretations or practices might discourage conventional medical treatment or promote alternative healing methods, leading to severe side effects.

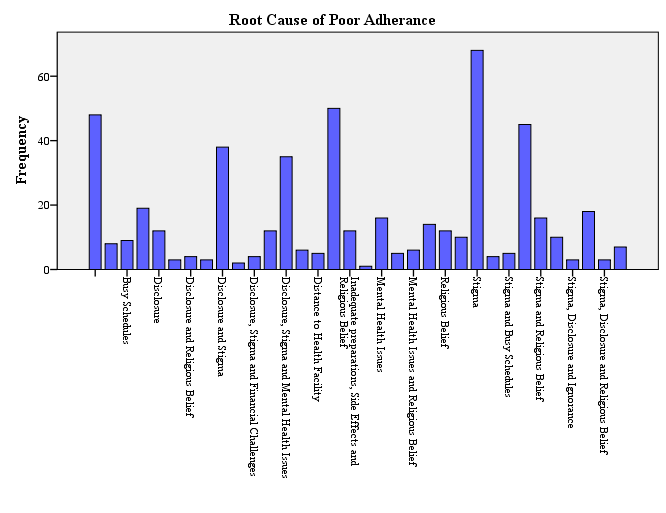
Other contributing factors, though less prevalent individually, collectively contribute to the complexity of adherence challenges. These include Busy Schedules (1.8%), Caregiver Changes, Ignorance, Disclosure and Stigma (3.7%), Side Effects (appearing in various combinations), Distance to Health Facility (1.0%) and Long Distance to Facility (0.2%), and Inadequate Preparations. The mention of inadequate preparations (e.g., Disclosure, Stigma and Inadequate Preparations at 2.3%, and Stigma, Disclosure and Inadequate Preparations at 3.5%) could point to issues with patient education, understanding of their treatment, or practical aspects of managing their condition.

The data strongly suggests that stigma, financial challenges, and issues related to disclosure are the primary systemic barriers to adherence. Mental health issues also play a significant and often intertwined role. The interconnectedness of these factors highlights the need for comprehensive interventions that address not only the medical aspects of treatment but also the socio-economic, psychological, and cultural contexts in which patients live. Future strategies to improve adherence should prioritize destigmatization efforts, provide financial support or incentives, enhance counseling on disclosure, and integrate mental health services into HIV care. Furthermore, understanding the nuances of how these factors combine (e.g., Stigma and Financial Challenges) is crucial for developing targeted and effective support mechanisms.

The table below and figure illustrate the information.

**Table 25: Likely Root Cause of Severe side effects**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Frequency | Percent |
|  | Missing Values | 48 | 9.4 |
| Alcohol | 8 | 1.6 |
| Busy Schedules | 9 | 1.8 |
| Caregiver Changes, Ignorance, Disclosure and Stigma | 19 | 3.7 |
| Disclosure | 12 | 2.3 |
| Disclosure and Financial Challenges | 3 | .6 |
| Disclosure and Religious Belief | 4 | .8 |
| Disclosure and Side Effect | 3 | .6 |
| Disclosure and Stigma | 38 | 7.4 |
| Disclosure, Ignorance and Financial Challenges | 2 | .4 |
| Disclosure, Stigma and Financial Challenges | 4 | .8 |
| Disclosure, Stigma and Inadequate Preparations | 12 | 2.3 |
| Disclosure, Stigma and Mental Health Issues | 35 | 6.8 |
| Disclosure, Stigma and Side Effects | 6 | 1.2 |
| Distance to Health Facility | 5 | 1.0 |
| Financial Challenges | 50 | 9.7 |
| Inadequate preparations, Side Effects and Religious Belief | 12 | 2.3 |
| Long Distance to Facility | 1 | .2 |
| Mental Health Issues | 16 | 3.1 |
| Mental Health Issues and Financial Challenges | 5 | 1.0 |
| Mental Health Issues and Religious Belief | 6 | 1.2 |
| Mental Health Issues, Financial Challenges and Religious Belief | 14 | 2.7 |
| Religious Belief | 12 | 2.3 |
| Religious Beliefs, Ignorance and Financial Challenges | 10 | 1.9 |
| Stigma | 68 | 13.3 |
| Stigma Disclosure and Side Effect | 4 | .8 |
| Stigma and Busy Schedules | 5 | 1.0 |
| Stigma and Financial Challenges | 45 | 8.8 |
| Stigma and Religious Belief | 16 | 3.1 |
| Stigma and Side Effects | 10 | 1.9 |
| Stigma, Disclosure and Ignorance | 3 | .6 |
| Stigma, Disclosure and Inadequate Preparations | 18 | 3.5 |
| Stigma, Disclosure and Religious Belief | 3 | .6 |
| Stigma, Lack of Family Support | 7 | 1.4 |
| **Total** | **513** | **100.0** |



**Figure 17: Likely Root Cause of Severe side effects**

## Discussions

### Exploratory Study

This study was an exploratory study and would serve as a crucial preliminary phase for the larger quasi-experimental research on the effectiveness of a reward system in Kakamega County. Its primary purpose would be to gain a deeper, understanding of the local context, refining the research questions, identifying key variables, and uncovering unforeseen factors that could influence the design and implementation of the main intervention. This acts as an initial phase is vital for ensuring that the subsequent quasi-experimental design that is well-informed, culturally appropriate, and addresses the most pressing local needs.

## Factors Hindering Retention of HIV/AIDS Clients with Suspected Treatment Failure at Kakamega County (Objective 2)

Retention in HIV care is paramount for achieving viral suppression, preventing drug resistance, and improving the overall health outcomes of people living with HIV (PLHIV). In Kakamega County, where the study was conducted, and with a reported retention rate of 78%, identifying and addressing factors that hinder retention, especially among clients with suspected treatment failure, is critical. Based on the provided context and general knowledge of challenges in HIV care in Kenya and Sub-Saharan Africa, several key factors were identified.

**A. Socioeconomic Factors and Poverty:**

Lack of Financial Resources: It was established that some patient lack of finances which was a reason for stopping treatment and the extremely low rate of other insurance coverage, poverty significantly impacts retention. Patients often struggle to afford indirect costs of care, such as transport to clinics, food (especially for those needing to take medication with meals), and even lost wages due to clinic visits. This financial strain can force patients to prioritize immediate survival needs over consistent healthcare.

Food Insecurity: Studies from similar settings in Kenya have shown that food insecurity is directly associated with major adherence lapses. Patients may find it difficult to adhere to medication when they are hungry, leading to missed doses and disengagement from care.

Unemployment/Underemployment: High rates of unemployment contribute to the pervasive poverty, making it challenging for patients to sustain their engagement in care.

**B. Adherence Challenges and Patient-Related Factors:**

This is explicitly stated as a major reason for stopping treatment (3.5%). Beyond financial constraints, severe side effects can be influenced by:

Side Effects: Undesirable side effects of ART can lead patients to discontinue treatment in an attempt to alleviate discomfort.

Forgetfulness and Complex Regimens: Maintaining a daily medication schedule, especially with complex regimens, can be difficult without strong adherence support.

Lack of Knowledge/Misconceptions: Some patients may not fully understand the importance of lifelong adherence, believing that once they feel better, they can stop medication, or holding misconceptions about the treatment’s efficacy.

Alcohol and Substance Abuse: These can severely impair a patient's ability to adhere to their ART regimen and keep appointments.

**C. Health System and Facility-Level Barriers:**

Drug Stock-Outs: The data explicitly mentions drug out of stock (1.0%) as a reason for stopping treatment. Inconsistent drug supply can lead to treatment interruptions, frustration, and disengagement.

Long Waiting Times and Distance to Clinics: Patients may face long queues at facilities, consuming valuable time and incurring additional transport costs. For those living far from clinics, the travel burden can be prohibitive, especially if they are already economically vulnerable. Decentralizing ART services could mitigate this.

Poor Attitude by Health Service Providers: Negative interactions with healthcare workers can deter patients from returning to clinics. A supportive and non-judgmental environment is crucial for retention.

Inadequate Tracking Systems: The existing antiquated health management systems make it difficult to accurately track patients, especially those who are lost to follow-up or silently transfer to other facilities. This results in an inaccurate estimation of retention rates and a failure to re-engage patients promptly. Electronic health records (EHRs) with clinical decision support systems have been shown to reduce loss to follow-up.

Staff Shortages and High Workload: Healthcare providers in high-volume clinics often operate under immense strain, which can compromise the quality of patient interaction and follow-up.

**D. Social and Psychological Factors:**

Stigma and Discrimination: Despite increased awareness, high levels of stigma and discrimination persist in Kenya. This can lead to fear of disclosure, social isolation, and reluctance to attend clinics or pick up medication, for fear of being identified as PLHIV. Stigma can also lead to internalized negative feelings, affecting self-worth and motivation for adherence.

Lack of Social Support: Patients without strong family or community support networks may struggle more with adherence and retention. Support from peers, family, and community health workers is crucial.

Fear of Side Effects and Disclosure: Patients might fear side effects, or disclosing their status, which can lead to discreet but irregular medication intake or missing appointments.

Mental Health Issues: Depression and anxiety are common among PLHIV and can significantly impair their ability to adhere to treatment and remain in care.

**E. Other Contextual Factors:**

Mobility/Migration: Patients moving for work, education, or family reasons may self-transfer to other clinics without official documentation, making them appear lost to follow-up.

Belief in Alternative Healing: Some patients may seek traditional or spiritual healers, sometimes discontinuing ART based on beliefs that alternative methods can cure HIV.

Pregnancy: While essential for preventing mother-to-child transmission, pregnancy can introduce complexities if not managed with proper counseling, potentially leading to treatment interruptions.

Addressing these multifactorial barriers requires a comprehensive and integrated approach. The study’s focus on a reward system, alongside qualitative exploration of hindering and promoting factors, is crucial for developing interventions tailored to the specific needs and challenges faced by PLHIV in Kakamega County. This understanding will inform strategies that go beyond mere provision of drugs to encompass holistic patient support, health system strengthening, and community-level interventions to foster an environment conducive to sustained HIV care.



**Figure 18: Factors Hindering Retention of HIV/AIDS Clients with Suspected Treatment Failure**

## Factors Promoting Retention of HIV/AIDS Clients with Suspected Treatment Failure at Kakamega County (Objective 3)

In the context of patients with suspected treatment failure in Kakamega County, identifying and strengthening factors that promote retention in HIV/AIDS care is paramount. Based on general understanding of HIV care in resource-limited settings like Kenya, and drawing from the literature, several key areas contribute to improved patient retention:

**A. Patient-Centered Care and Strong Provider-Patient Relationships:**

Empathetic and Non-judgmental Healthcare Providers: Patients are more likely to remain in care when they feel respected, understood, and supported by their healthcare team. Training healthcare providers in communication skills and stigma reduction can significantly improve patient trust and comfort.

Tailored Adherence Counseling: Generic counseling often falls short. Effective retention is promoted by individualized adherence counseling that addresses specific patient barriers (e.g., lifestyle, side effects, mental health). This includes practical advice on medication storage, taking pills with food, and managing side effects.

Reduced Wait Times and Flexible Clinic Hours: Long wait times and rigid clinic schedules can be significant deterrents, especially for patients who are employed or have other family responsibilities. Minimizing time away from work or home can greatly improve retention. Offering appointments during non-working hours or on weekends can also be beneficial.

**B. Socio-Economic Support and Reduced Financial Burden:**

Financial Incentives (as proposed in the study): Direct financial incentives, such as gift cards or vouchers, can significantly alleviate the economic burdens associated with accessing care (e.g., transport costs, food insecurity, lost wages). As highlighted in the background, such incentives have shown promise in improving viral suppression and clinic attendance in other settings, including a study in Kenya where incentives helped patients prioritize care-seeking by alleviating transport barriers and food insecurity. This directly addresses the high lack of insurance coverage observed in the target population.

Ancillary Services: Providing access to services like child care, emergency financial assistance, housing support, or nutrition programs can remove significant practical barriers that often lead to missed appointments or treatment interruptions.

Integrated Services: Co-locating HIV services with other essential health services (e.g., family planning, TB screening, mental health support) can reduce the number of separate visits patients need to make, improving convenience and overall engagement.

**C. Social Support and Community Engagement:**

Family and Treatment Supporters: Encouraging and educating family members or designated treatment supporters to provide emotional, practical, and reminder support can significantly boost adherence and retention. Studies consistently show the positive impact of involving close contacts in patient care.

Peer Support Groups: Connecting patients with their peers who are also living with HIV provides a crucial platform for sharing experiences, coping strategies, and mutual encouragement. Peer support can reduce feelings of isolation, combat stigma, and offer practical advice from lived experience, significantly improving adherence and retention. Peer navigators, who often have personal experience with HIV, can also guide clients through the healthcare system.

Community Health Workers (CHWs): CHWs play a vital role in bridging the gap between healthcare facilities and communities. They can conduct home visits, provide psychosocial support, deliver health education, track missed appointments, and offer direct reminders, especially to those who are more vulnerable or hard to reach. Their familiarity with local issues and rapport with community members make them effective in promoting long-term engagement.

**D. Effective Tracking and Follow-up Mechanisms:**

Robust Patient Tracking Systems: Given the challenges with antiquated health management systems mentioned in the problem statement, developing an integrated system for tracking patient attendance, missed appointments, and viral load results is crucial. This allows for timely intervention when a patient is at risk of defaulting.

Appointment Reminders: Simple interventions like phone calls or SMS reminders for scheduled appointments can dramatically reduce missed visits. Digital health solutions, including patient portals and mobile apps, are showing high feasibility and acceptability in Kenya for this purpose, offering reminders, peer support forums, and access to health information.

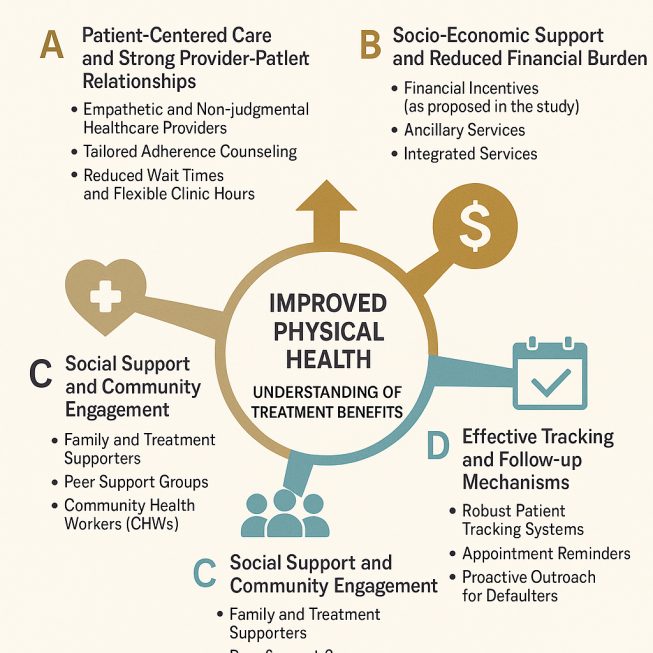
Proactive Outreach for Defaulters: When a patient misses an appointment or shows signs of treatment failure, prompt and respectful outreach (e.g., by CHWs or clinic staff) to understand the reasons and re-engage them in care is essential.

Personal Motivation and Perceived Health Benefits:

Improved Physical Health: Patients who experience tangible improvements in their health status after initiating ART are strongly motivated to remain in care. This feeling better reinforces the value of treatment.

Understanding of Treatment Benefits: Clear and consistent education on the importance of ART for viral suppression, preventing opportunistic infections, and improving quality of life, including the ability to live a normal life and prevent transmission, strengthens personal commitment to retention.

Promoting retention in Kakamega County requires a multi-faceted approach that goes beyond simply providing drugs. It necessitates a patient-centered healthcare system that addresses both clinical and socio-economic barriers, leverages strong social and community support networks, integrates modern tracking technologies, and continuously reinforces the personal benefits of sustained adherence. The proposed reward system, by directly addressing financial and motivational aspects, aligns well with many of these identified promoting factors.



**Figure 19: Factors Promoting Retention of HIV/AIDS Clients with Suspected Treatment Failure**

## Developing an Integrated System for Improving Treatment Adherence for HIV/AIDS Clients with Suspected Treatment Failure at Kakamega County (Objective 4)

Developing an integrated system for improving treatment adherence in Kakamega County is a crucial strategic imperative to address the persistent challenges in HIV treatment outcomes, especially for patients with suspected treatment failure. The current context, marked by significant rates of severe side effects, drug stock-outs, and profound patient financial vulnerability which include a near-total lack of active insurance cover, necessitates a multi-faceted and coordinated approach.

An effective integrated system must move beyond isolated interventions and instead create a seamless web of support that addresses the various determinants of adherence. This requires a shift from standalone HIV clinics towards a more holistic, person-centered approach embedded within existing primary healthcare structures, as advocated by Kenya's Ministry of Health and global recommendations. The goal is to provide comprehensive care that normalizes HIV treatment, reduces stigma, and improves efficiency.

A good integrative systems need to cover the following factors;

**A. Enhanced Patient-Provider Relationships and Counseling:**

Tailored Adherence Support: Recognizing that severe side effects is a complex issue, the system must incorporate individualized counseling approaches. This means assessing each patient’s specific barriers such as, forgetfulness, side effects, stigma, busy schedules, mental health issues and developing personalized strategies. This goes beyond initial counseling to ongoing, constructive, collaborative, and non-judgmental support.

Multidisciplinary Team Approach: An integrated system should involve a team of healthcare professionals, including clinicians, nurses, pharmacists, social workers, and community health volunteers (CHVs). This team can collectively identify and address the diverse needs impacting adherence, from medical concerns to psycho-social and economic challenges.

Positive Reinforcement: As proposed by this study, reward systems can be a powerful tool for positive reinforcement. Incentivizing consistent adherence and successful viral suppression, as demonstrated by the US study and conceptualized in this research, can motivate patients. This moves beyond punitive measures to a supportive framework that celebrates progress.

**B. Robust Supply Chain and Pharmaceutical Management:**

Addressing Drug Out of Stock: An integrated system must ensure a reliable and consistent supply of ART medications. This involves strengthening logistics, forecasting, and inventory management at both county and facility levels. Early warning systems for potential stock-outs and rapid redistribution mechanisms are vital.

Pharmacy-Based Adherence Support: Pharmacists play a crucial role in adherence. Their integration into the adherence support system can involve providing clear medication instructions, discussing potential side effects, conducting pill counts, and offering direct adherence counseling.

**C. Financial and Socio-Economic Support Mechanisms:**

Targeted Financial Incentives: Given the widespread concern of patients’ lack of finance and negligible insurance coverage, the reward system can directly alleviate some financial burdens such as, transport costs to clinics, food insecurity. The study’s proposed rewards offer a tangible way to address these external barriers.

Linkage to Social Services: An integrated system should facilitate referrals to social support services, including food programs, housing assistance, and other welfare initiatives that can reduce the overall stress on patients, thereby indirectly improving their capacity to adhere to treatment. Community health workers (CHWs) and peer navigators can be crucial in this linkage. Studies in Western Kenya and Ethiopia have shown the effectiveness of interventions combining food support and peer navigation.

**D. Leveraging Technology for Adherence and Tracking:**

Digital Health Interventions (DHIs): Incorporating technology, such as SMS reminders for appointments and medication, mobile health portals for accessing results and communicating with providers, and even smart pillboxes for real-time monitoring, can significantly enhance adherence, especially among tech-savvy populations like youth. Kenyan studies show high acceptability and feasibility of such digital tools.

Improved Patient Tracking Systems: Moving away from paper-based systems to integrated electronic medical records (EMRs) is critical. This allows for accurate tracking of appointments, medication pick-ups, viral load results, and identification of patients at risk of treatment failure or loss to follow-up. A robust EMR system supports real-time monitoring and targeted outreach.

**E. Community-Based Support and De-Stigmatization:**

Community Health Worker (CHW) and Peer Support Networks: Empowering CHWs and peer educators to conduct home visits, provide adherence reminders, offer social support, and trace patients who miss appointments has proven effective in rural settings like Kakamega. These community-based approaches help normalize HIV and reduce stigma by integrating care into daily life.

Integration of Services at Facility Level: Kenya’s drive to integrate HIV services into broader primary healthcare platforms, rather than having standalone stigmatizing HIV clinics, is crucial. This diagonal approach not only improves comprehensive care for patients with co-morbidities but also minimizes missed opportunities and reduces patient loss within the system.

By integrating these components, Kakamega County can create a more resilient and patient-centered system that not only addresses suspected treatment failure but proactively prevents it. Such an integrated approach, supported by evidence-based interventions like a reward system and robust technological infrastructure, is essential for achieving and sustaining high rates of viral suppression and improving the overall health outcomes for people living with HIV.



**Figure 20: Constructs of an Integrated System for Improving Treatment Adherence for HIV/AIDS Clients with Suspected Treatment Failure**

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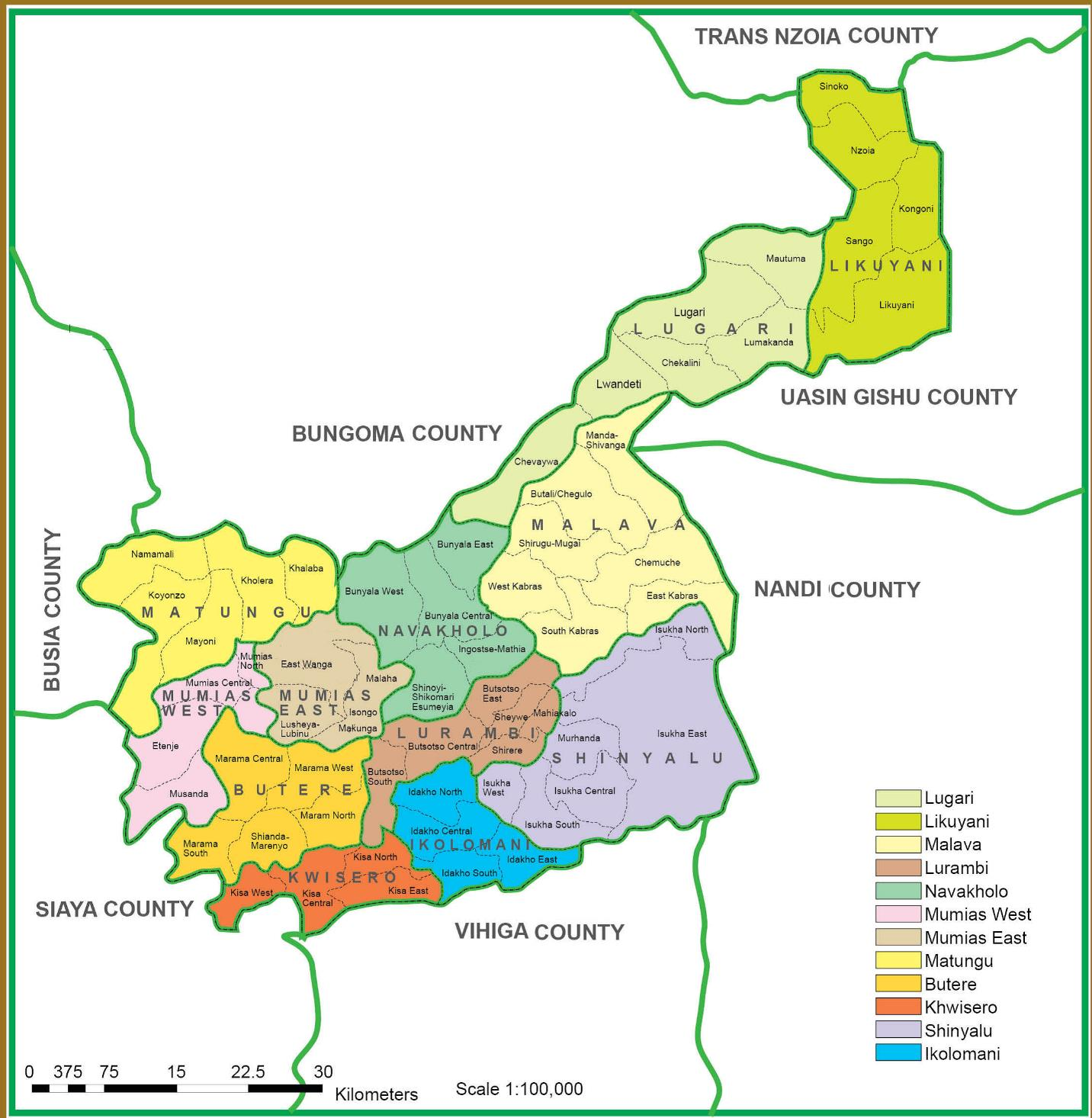
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# APPPENDICES

APPENDIX I: INFORMED CONSENT

**APPENDIX V: MAP OF THE STUDY AREA**



Source: Kakamega County Integrated Development Plan. (2018-2022)