Journal: Texila International Journal of Public Health
Publisher: Texila International Journal
ISSN: 2520-3134
Volume 14 Issue 1, 2026
DOI: DOI: 10.21522/TIJPH.2013.14.01.Art024

Mismatch Between Perceived and Objective HIV Risk Among Individuals Discontinuing PrEP in Homa Bay and Kisii Counties, Kenya

Muchele Polycarp Musee[1]*, Collins Ouma[2]
[1]*Department of Public Health, Texila American University, Guyana*
[2]*Department of Biomedical Science, Maseno University, Kenya*

Abstract

Pre-exposure prophylaxis (PrEP) is highly effective HIV prevention strategy, yet discontinuation may leave individuals vulnerable. Guided by the Health Belief Model, this study examined whether perceived reductions in HIV susceptibility among PrEP discontinuers aligned with objectively assessed epidemiological risk in Homa Bay and Kisii Counties. A cross-sectional analytical study was conducted among 293 clients, of whom 175 reported a decreased perceived risk. Participants were selected using proportionate stratified random sampling across population groups. HIV risk was objectively evaluated using NASCOP-Risk Assessment Screening Tool (RAST). Descriptive statistics, chi-square and Fisher's exact tests, and logistic regression were applied to examine alignment between perceived and actual risk and identify predictors of high-risk status. Marked discrepancies were observed between perceived and objective HIV risk. 91.4% of participants who perceived reduced HIV risk were classified as high or substantial risk by RAST. County-underestimation was 94.7% in Homa Bay and 72.0% in Kisii ($p < 0.01$). Despite reporting reduced perceived risk, many continued to engage in high-risk behaviors, including multiple sexual partnerships (48.4%), condomless sex (28.6%), prior sexually transmitted infections (18.7%), and low consistent condom use (22.5%). County of residence was the only significant predictor of objective high risk (aOR = 0.15; 95% CI: 0.04–0.58); Age, sex, marital status, education, and income were not independently associated. Substantial mismatch between perceived and actual HIV risk exists among PrEP discontinuers, particularly in high-prevalence settings. Strengthened risk assessment, tailored counseling, psychosocial support, and county-specific interventions are critical to prevent premature discontinuation and maintain HIV prevention gains.

Keywords: *Discontinuation, PrEP, Risk-Assessment, Risk-Perception.*

Introduction

In 2022, an estimated 39 million people were living with HIV globally, with approximately 1.3 million new infections recorded that year. Africa remained the most heavily affected region, accounting for about 25.6 million people living with HIV, 660,000 new infections, and 60% of all AIDS-related deaths worldwide [1]. Compared to 2010, new HIV infections had declined by 38% by 2022 [1].

When taken correctly, HIV pre-exposure prophylaxis (PrEP) significantly reduces the likelihood of acquiring HIV [2]. Its effectiveness is well established among individuals at elevated risk [13], with protection levels reaching up to 99% when adherence is consistent and accurate [3].

Despite these clear benefits, adherence to PrEP remains suboptimal. Globally, up to 40% of users stop taking PrEP within the first six months, and only about one-third maintain optimal adherence [4]. Around 35%

Received: 31.12.2025 ***Accepted: 05.02.2026*** ***Published on: 31.03.2026***
****Corresponding Author: pmusee1980@gmail.com***

discontinue within the first year [5]. Perceived low HIV risk is one of the most frequently cited reasons for discontinuation, reported by nearly half of PrEP users [3]. Notably, as many as 50% of those who stop PrEP eventually restart within the same year [4].

Although PrEP is one of the most effective biomedical tools for preventing HIV among high-risk populations, discontinuation threatens to undermine its overall impact. Many individuals stop PrEP because they believe their risk has decreased; however, this perception is not always accurate. Some clients may continue to face significant exposure during periods of non-use, placing them at avoidable risk of HIV infection. A clearer understanding of actual HIV risk during perceived low-risk discontinuation is therefore critical for strengthening prevention strategies, particularly in high-prevalence settings.

Evidence from various global and regional studies illustrates the complexity of PrEP discontinuation and its associated outcomes. In Antwerp, Belgium, 10% of PrEP users discontinued within one year, largely due to perceived low risk, logistical barriers, and concerns about follow-up schedules, with no documented HIV seroconversions among discontinuers [6]. In contrast, a study among sexual and gender minorities in Boston reported that four clients seroconverted after discontinuing PrEP, highlighting persistent risk even when individuals self-identify as low risk [7]. Operational research from Northern California similarly demonstrated seroconversions among clients who discontinued PrEP due to loss of insurance, while high sexually transmitted infection (STI) incidence suggested continued exposure to HIV risk [8, 9].

In West Africa, a demonstration study among female sex workers in Benin found high discontinuation rates, with two seroconversions occurring among clients who had discontinued PrEP for nearly a year. STI incidence remained substantial among those retained on PrEP, underscoring ongoing behavioral vulnerability [10]. In East Africa, population-based PrEP delivery in Kenya and Uganda showed that up to 66% of clients discontinued PrEP within five years, with 72% of HIV seroconversions occurring among individuals who had stopped taking PrEP for more than one month [11]. Qualitative research from Western and Central Kenya further revealed that PrEP discontinuation is often a deliberate and context-driven decision, primarily motivated by perceived reductions in risk, although many clients remain open to reinitiating PrEP when circumstances change [12].

Collectively, these findings illustrate that while some individuals appropriately discontinue PrEP due to genuine reductions in HIV exposure, others may remain at significant risk during discontinuation periods. The mismatch between perceived and actual risk, coupled with structural and behavioral factors influencing discontinuation, underscores the need for better risk assessment tools, more responsive prevention approaches, and enhanced monitoring systems. These gaps are particularly relevant in high-prevalence counties such as Homa Bay and Kisii in Kenya, where PrEP uptake and adherence remain central to HIV prevention efforts.

This study examined the mismatch between perceived and objective HIV risk among individuals who discontinued PrEP due to self-assessed low vulnerability in Homa Bay and Kisii Counties, Kenya. It aims to determine the extent to which objective behavioral and biological risk persists following discontinuation. The study further characterizes participants' socio-demographic, behavioral, and clinical profiles, including sexual practices, partner risk dynamics, history of sexually transmitted infections, and prior adherence patterns.

Theoretical Framework

This study is grounded in the Health Belief Model (HBM), which posits that engagement in

preventive health behavior is primarily determined by perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. In the context of PrEP use, perceived susceptibility to HIV infection is a key determinant of continuation or discontinuation. When individuals perceive their HIV risk to be low, they may discontinue PrEP despite objective exposure. This study therefore conceptualizes perceived HIV risk as a cognitive determinant influencing preventive behavior and examines the alignment between perceived susceptibility and objectively measured epidemiological risk (Figure 1).

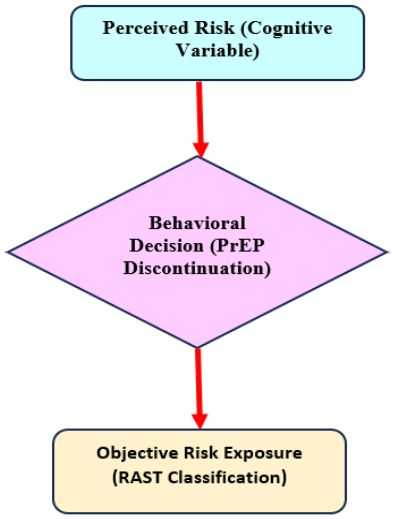

Figure 1. Conceptual Framework

Materials and Methods

Description of the Site

The study was conducted in Homa Bay and Kisii Counties in Western Kenya. Homa Bay, located along Lake Victoria, has a population of approximately 1.31 million across 262,036 households. The county is served by 304 health facilities—202 public, 74 private, and 28 faith-based—and 284 community health units staffed by 2,950 volunteers providing primary healthcare. Homa Bay ranks second nationally in HIV burden, with 109,786 people living with HIV, an overall prevalence of 10.6% (7.4% men, 13% women), 984 new infections, a mother-to-child transmission rate of 7.9%, and 1,404 HIV-related deaths. Kisii County has 1.27 million residents in 312,665 households, 156 health facilities—84 public, 46 private, 26 faith-based—and 190 community health units supported by 2,100 volunteers. Kisii ranks tenth nationally, with 48,202 people living with HIV, a prevalence of 3.8% (2.5% men, 5% women), 443 new infections, 11.1% mother-to-child transmission, and 663 HIV-related deaths. Both counties maintain robust health systems, yet their HIV burden highlights the need for targeted interventions.

Research Design

A cross-sectional analytical study design was employed to assess the association between perceived HIV risk and objectively measured HIV risk among individuals who discontinued PrEP, using data collected at a single point in time.

Sampling and Sample Size

The study sample size was determined using standard sample size estimation procedures for cross-sectional studies. The calculated minimum sample size was 292.87, which was rounded up to 293 participants to account for whole-number requirements.

A proportionate stratified random sampling technique was employed to ensure adequate and representative inclusion of key population

subgroups accessing PrEP services. The study population was first stratified into predefined categories based on programmatic HIV risk profiles, including high-risk populations, fisherfolk, individuals in Sero discordant relationships, adolescents and young people, and pregnant and breastfeeding women. The number of participants selected from each stratum was proportional to the size of that subgroup within the target population, as summarized in Table 1. Within each stratum, participants were randomly selected to participate in the study.

A structured questionnaire was administered to all 293 selected respondents. Individuals whose PrEP discontinuation was attributed to reasons other than perceived low HIV risk, as documented in program records, were excluded from further analysis, as illustrated in Figure 2. Additional eligibility screening was conducted to include only participants who reported a declining perception of HIV risk while continuing PrEP, resulting in a final analytical sample of 175 respondents, as shown in Figure 2. The HIV risk status of these 175 participants—who had discontinued PrEP due to a perceived reduction in HIV risk—was assessed using the NASCOP-approved Risk Assessment Screening Tool (RAST). This tool is routinely used in Kenyan PrEP programs to objectively evaluate ongoing HIV vulnerability and guide decisions related to PrEP initiation, continuation, or enhanced risk-reduction counseling.

Study Population

The study targeted 1,224 individuals from Homa Bay and Kisii Counties who stopped using PrEP after assessing themselves as being at low risk of HIV infection. Participants were identified using a PrEP line list generated from the Kenya EMR database by the LVCT Vukisha95 health informatics team. This line list captured whether clients were still on PrEP or had discontinued, as well as their reported reasons for discontinuation. All individuals had initiated PrEP within LVCT Vukisha95-supported health facilities.

The target population of 1,224 represented the annual average number of PrEP discontinuations recorded by the project in the two counties over the last three years. Homa Bay and Kisii were selected due to their strong involvement in the Vukisha95 program, which focuses on enhancing HIV prevention and care. From this population, the sample size was determined using the formula recommended by Kothari and Garg (2016).

$$n = \frac{Z^2.p.q.N}{e^2.(N-1) + Z^2\,p.q}$$

This resulted in a calculated sample size of 292.87, which was rounded up to 293 participants. A stratified random sampling technique was employed to achieve proportional representation of key population groups, including high-risk populations, fisherfolk, individuals in Sero discordant relationships, adolescents and young people, and pregnant and breastfeeding women, as summarized in Table 1. Within each stratum, participants were randomly selected for inclusion in the study. A structured questionnaire was administered to all 293 respondents. Individuals whose PrEP discontinuation was attributed to reasons other than perceived low HIV risk, as documented in program records, were excluded, as illustrated in Figure 2.

Further screening was conducted to include only respondents who reported a declining perception of HIV risk while on PrEP, resulting in a final analytical sample of 175 participants, as shown in Figure 2. The HIV risk profile of these 175 individuals—who had discontinued PrEP due to a belief that their risk of HIV acquisition had diminished—was then assessed using the NASCOP-approved Risk Assessment Screening Tool (RAST).

The RAST is used to support objective evaluation of ongoing HIV vulnerability and to guide decisions regarding PrEP initiation,

continuation, or the provision of enhanced risk-reduction counselling. It is routinely applied during follow-up visits and when clients are considering discontinuing PrEP. The tool assesses multiple behavioral and clinical risk factors, including having multiple sexual partners, engagement in condomless sex, a recent history of sexually transmitted infections, having a sexual partner who is HIV-positive or of unknown HIV status, involvement in transactional sex, inconsistent condom use, recent use of post-exposure prophylaxis (PEP), and alcohol or substance use that may compromise safer sexual practices.

Table 1. Distribution of Participants Across Various Strata

Population Typology (Strata)	Population Count	Percentage of Population	Calculation (Sample of 293)	Sample Count
Discordant relationship	159	13%	0.13 x 293	38
Dreams Girl	79	6%	0.6 x 293	19
Female Sex Worker	192	16%	0.16 x 293	46
Fisher fork	104	8%	0.8 x 293	25
General Population	468	38%	0.38 x 293	112
MSM	63	5%	0.5 x 293	15

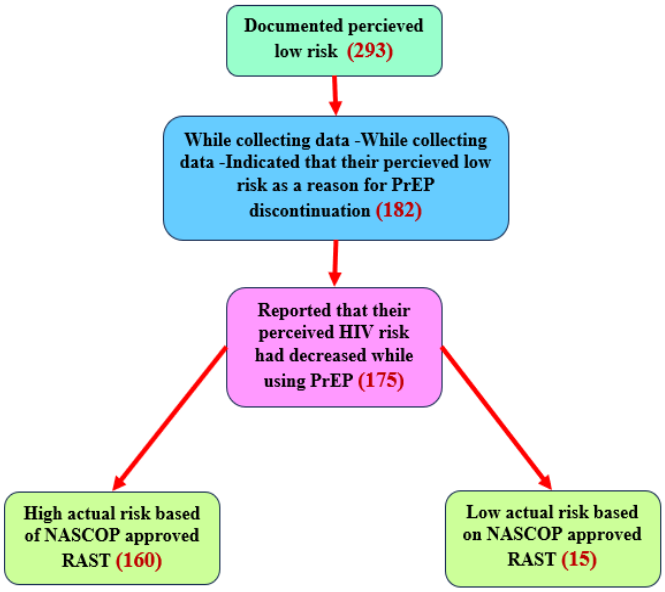

Figure 2. Perception vs Actual Risk Matrix

Inclusion and Exclusion Criteria

Eligible participants for this study were individuals who were initiated on PrEP at LVCT Vukisha95-supported health facilities in Homa Bay and Kisii Counties, were followed up by healthcare workers in these facilities, and discontinued PrEP within three months prior to the interview due to a perceived low risk of HIV infection.

Research Instruments

A structured questionnaire incorporating the NASCOP Risk Assessment Screening Tool (RAST), which included both open- and closed-ended questions was used. It was pilot-tested with twenty respondents to assess clarity, effectiveness, and reliability, with adjustments made based on feedback. Validity was ensured through expert review and field testing, which

confirmed that the questions accurately captured the intended variables. Ambiguous, complex, or leading questions were avoided, and response scales carefully structured. Standardized administration procedures ensured consistency in questioning and recording, providing reliable and accurate data for the study.

Ethical Clearance

The protocol was submitted to the Amref Ethics and Scientific Review Committee (ESRC) and the Kisii Teaching and Referral Hospital Institutional Scientific and Ethics Review Committee (KTRH–ISERC). Both committees reviewed the evaluation for technical rigor and ethical compliance. After receiving ethical clearance, permission to conduct the study was obtained from the National Council for Science, Technology and Innovation (NACOSTI) and the County Health Management Teams (CHMTs), following stakeholder engagement meetings that introduced and explained the study. Key personnel with ethics certification also completed an online ethics course before the evaluation began.

Data Analysis

Data were analyzed using descriptive and inferential statistical methods to examine the demographic characteristics of participants, the alignment between perceived and objectively assessed HIV risk, and predictors of high-risk status. Descriptive statistics, including frequencies and percentages, were used to summarize participant characteristics by county (Homa Bay and Kisii). Chi-square and Fisher's exact tests were used to assess differences in categorical variables across counties, with p-values < 0.05 considered statistically significant.

The HIV risk profile was assessed using the NASCOP-approved Risk Assessment Screening Tool (RAST). The proportion of participants whose self-perceived HIV risk decreased but were classified as high-risk according to RAST was calculated to quantify risk underestimation. A one-sample proportion test was conducted to determine whether the proportion of participants classified as high objective risk among those reporting decreased perceived risk was significantly greater than 50%, representing substantial discordance between perception and epidemiological risk. County-level differences in misclassification were assessed using Pearson's chi-square test and Fisher's exact test where appropriate. These analyses allowed testing of the null hypothesis, which states that the proportion of individuals classified as high objective risk among those reporting decreased perceived risk is fewer than or equal to 50%.

To identify potential predictors of high objective HIV risk, a logistic regression model was fitted with high objective risk status as the binary outcome variable (Yes = 1, No = 0). The predictor variables included county, age, sex, marital status, education level, and income. Model diagnostics were performed to assess stability and goodness of fit. However, due to substantial outcome imbalance—approximately 91% of participants were classified as high objective risk—evidence of quasi-complete separation was observed. This imbalance resulted in inflated standard errors and wide confidence intervals for several covariates, thereby limiting the precision and interpretability of the estimated effects for most demographic predictors. Given these methodological challenges, future studies may benefit from using penalised logistic regression to improve model stability and yield more reliable parameter estimates in the presence of highly imbalanced outcomes.

Behavioral data were analyzed to corroborate the validity of RAST classifications. The prevalence of high-risk behaviours—including multiple sexual partners, condomless sex, recent sexually transmitted infections, and inconsistent condom use—was compared between participants

categorised as high-risk and low-risk. These analyses provided evidence that participants classified as high-risk were indeed engaging in behaviors associated with increased vulnerability to HIV infection.

All analyses were performed using R statistical software, and results were presented in tables and figures to illustrate patterns of perceived versus actual risk, county-level differences, and behavioral correlates of risk. Statistical significance was set at $p < 0.05$, and 95% confidence intervals were reported where applicable.

Results

As shown in Table 2, 293 participants were included in the analysis, with 200 (68.3%) from Homa Bay County and 93 (31.7%) from Kisii County. The age distribution differed between the two counties, with Kisii having a relatively younger population. Participants aged 15–24 years constituted a larger proportion in Kisii (56.0%) compared to Homa Bay (22.5%), while Homa Bay had higher representation in the 25–44-year age groups, particularly those aged 30–34 years (24.5%).

Females predominated in both counties, accounting for 69.0% in Homa Bay and 77.4% in Kisii, although this difference was not statistically significant ($p = 0.14$). Marital status varied significantly by county ($p = 0.002$). A higher proportion of participants in Homa Bay were married (52.0%) compared to Kisii (31.2%), whereas single participants were more common in Kisii (52.7%) than in Homa Bay (32.0%).

Educational attainment differed markedly between the two counties ($p < 0.001$). Homa Bay had a higher proportion of participants with primary education (44.5%), while Kisii had a greater share with secondary (50.5%) and tertiary education (26.9%). Participants with no formal education were more common in Kisii (8.6%) than in Homa Bay (1.5%).

Significant differences were also observed in occupation status ($p < 0.001$). Formal employment was more prevalent in Homa Bay (58.0%), whereas unemployment was substantially higher in Kisii (43.0%) compared to Homa Bay (18.0%). Income levels varied significantly across counties ($p = 0.006$), with the majority of participants earning less than KES 10,000, particularly in Kisii (81.7%) compared to Homa Bay (63.0%).

Documented HIV risk classification showed significant county-level variation ($p < 0.001$). In Kisii, over half of participants were classified as having very low risk (53.8%), whereas the majority in Homa Bay were categorized as low risk (59.0%). Notably, Kisii had a higher proportion of participants in the high and very high-risk categories (20.5%) compared to Homa Bay (4.0%), despite many reporting low perceived risk.

Table 2. Demographic Characteristics

Variable	Homa Bay N = 2001	Kisii N = 931	p-value2
Age			
15-19 years	17 (8.5%)	22 (23.7%)	
20-24 years	28 (14.0%)	30 (32.3%)	
25-29 years	41 (20.5%)	21 (22.6%)	
30-34 years	49 (24.5%)	10 (10.8%)	
40-44 years	31 (15.5%)	3 (3.2%)	
45-49 years	17 (8.5%)	3 (3.2%)	
35-39 years	6 (3.0%)	2 (2.2%)	
50+ Years	11 (5.5%)	2 (2.2%)	
Sex			**0.14**

Female	138 (69.0%)	72 (77.4%)	
Male	62 (31.0%)	21 (22.6%)	
Marital status			**0.002**
Married	104 (52.0%)	29 (31.2%)	
Single	64 (32.0%)	49 (52.7%)	
Divorced/Separated	22 (11.0%)	13 (14.0%)	
Widowed	10 (5.0%)	2 (2.2%)	
Education Level			**<0.001**
No Formal education	3 (1.5%)	8 (8.6%)	
Primary education	89 (44.5%)	13 (14.0%)	
Secondary education	82 (41.0%)	47 (50.5%)	
Tertiary education	26 (13.0%)	25 (26.9%)	
Occupation Status			**<0.001**
Unemployed	36 (18.0%)	40 (43.0%)	
Self-employed	7 (3.5%)	7 (7.5%)	
Informal employment	41 (20.5%)	18 (19.4%)	
Formal employment	116 (58.0%)	28 (30.1%)	
Income level			**0.006**
Less than KES 10,000	126 (63.0%)	76 (81.7%)	
KES 10,001 to KES 20,000	54 (27.0%)	12 (12.9%)	
KES 20,001 to KES 30,000	14 (7.0%)	2 (2.2%)	
More than KES 30,000	6 (3.0%)	3 (3.2%)	
Documented risk			**<0.001**
Very low	48 (24.0%)	50 (53.8%)	
Low	118 (59.0%)	15 (16.1%)	
Moderate	26 (13.0%)	9 (9.7%)	
High	4 (2.0%)	9 (9.7%)	
Very high	4 (2.0%)	10 (10.8%)	
[1]n (%)			
[2]NA; Pearson's Chi-squared test; Fisher's exact test			

Table 3 illustrates the distribution of clients classified as having high objective HIV risk according to self-reported changes in risk perception, disaggregated by county. Overall, the results reveal a pronounced discrepancy between subjective risk perception and objectively assessed HIV risk, particularly among clients who reported a decline in perceived risk.

In Homa Bay County, most participants (150) stated that they believed their HIV risk had decreased. Despite this perception, nearly all of them (142; 94.7%) were objectively assessed as being at high risk of HIV acquisition. This finding points to a substantial underestimation of continued exposure among individuals who felt their risk had diminished. Although very few clients reported no change or an increase in perceived risk, all such individuals were also classified as high risk (100%), though the small sample sizes limit interpretability.

Table 3. Actual High Risk by Perception Change Category

County	Perception Change	Total Clients	High Risk Count	% High Risk
Homa Bay	Yes, my perceived risk decreased	150	142	94.7%
Homa Bay	No, it remained the same	1	1	100.0%
Homa Bay	Yes, my perceived risk increased	4	4	100.0%
Kisii	Yes, my perceived risk decreased	25	18	72.0%
Kisii	No, it remained the same	0	0	0.0%
Kisii	Yes, my perceived risk increased	2	2	100.0%

A comparable, though less pronounced, pattern was observed in Kisii County. Among the 25 clients who perceived their risk to have decreased, 18 (72.0%) remained at high objective risk, indicating ongoing vulnerability despite reduced perceived risk. All participants who reported an increase in perceived risk (2; 100%) were accurately identified as high risk. No respondents in Kisii reported unchanged risk perception, and consequently no high-risk cases were recorded in that category.

Taken together, these findings indicate that a substantial proportion of clients—particularly in Homa Bay—who believed their HIV risk had declined continued to face considerable objective risk. This misalignment highlights the limitations of relying on self-perceived risk to guide HIV prevention decisions and underscores the importance of continuous risk assessment and targeted counselling to support appropriate PrEP continuation.

Consistent with these findings, HIV risk assessment using the NASCOP-approved Risk Assessment Screening Tool (RAST) revealed a marked and concerning divergence between perceived and objectively measured risk. Overall, 160 of the 175 participants (91.4%) who reported a reduction in perceived HIV risk were classified as having high or substantial risk of HIV acquisition based on RAST criteria (Table 4). Notably, the majority of individuals who discontinued PrEP due to perceived lower risk remained objectively vulnerable to infection, highlighting a critical gap between self-assessment and clinical evaluation. This discordance reflects shortcomings in risk awareness and communication within PrEP programs, where decisions to discontinue may be driven by inaccurate perceptions, leaving clients unprotected during periods of continued exposure. These findings reinforce the need for enhanced counselling, routine risk reassessment, and tailored communication strategies to support informed and sustained PrEP use.

Table 4. Risk Underestimation Among Clients with Decreased Perception

County	N with Decreased Perception	N Actually High Risk	% Under estimators	N Accurate	% Accurate
Homa Bay	150	142	94.7%	8	5.3%
Kisii	25	18	72.0%	7	28.0%
TOTAL	**175**	**160**	**91.4%**	**15**	**8.6%**

Table 4 summarizes the extent of HIV risk underestimation among clients who reported a decrease in their perceived risk, disaggregated by county. Overall, the findings demonstrate a high level of discordance between perceived and objectively assessed HIV risk, with the majority of clients underestimating their actual vulnerability.

In Homa Bay County, all 150 clients included in the analysis reported a decreased perception of HIV risk. Of these, 142 clients (94.7%) were objectively classified as being at high risk of HIV acquisition, indicating widespread risk underestimation (Figure 3). Only 8 clients (5.3%) had risk perceptions consistent with their assessed risk status, suggesting limited accuracy in self-assessment in this population.

In Kisii County, 25 clients reported a reduction in perceived risk. Among them, 18 clients (72.0%) were assessed as high risk, reflecting substantial underestimation, though to a lesser extent than in Homa Bay (Figure 3). Conversely, 7 clients (28.0%) demonstrated accurate alignment between perceived and actual risk, indicating comparatively better risk awareness.

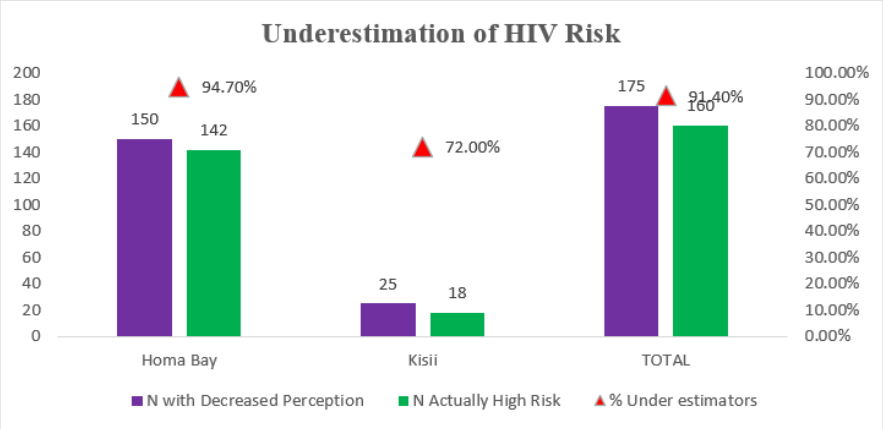

Figure 3. Underestimation of HIV Risk Among Clients Who Stopped PrEP

When data from both counties were combined, 175 clients reported decreased risk perception. Of these, 160 clients (91.4%) were objectively classified as high risk, confirming that risk underestimation was pervasive across the study population. Only 15 clients (8.6%) accurately assessed their HIV risk.

Statistical findings presented in Table 5 revealed significant county-level differences in HIV risk underestimation. Both Fisher's Exact Test ($p = 0.0016$) and the chi-square test ($p = 0.0008$) demonstrated a statistically significant variation in the discrepancy between perceived and objectively measured HIV risk across the study sites. Furthermore, the one-sample proportion test indicated that the proportion of individuals categorized as high objective risk among those reporting reduced perceived risk was significantly above the 50% threshold ($p = 0.0004$). Consequently, the null hypothesis that this proportion is $\leq 50\%$ was rejected, indicating that more than half of participants who believed their risk had declined were, in fact, still at high objective risk. This reflects considerable misalignment in risk perception, with notable contextual or behavioural variation between Homa Bay and Kisii counties.

To further interrogate this relationship, a one-sample proportion test was conducted to determine whether the observed proportion of high objective risk among those perceiving reduced risk exceeded the hypothesized 50% benchmark. Differences in misclassification across counties were assessed using Pearson's chi-square and Fisher's exact tests, as appropriate. The overall prevalence of risk underestimation was high, averaging 83.3%

across the two counties. Both county-level tests (p = 0.0016 and p = 0.0008) confirmed significant variation in the extent of discordance. The one-sample proportion test (p = 0.0004) further supported the conclusion that the observed proportion was significantly greater than 50%.

Taken together, these results provide strong statistical evidence against the null hypothesis and confirm a marked and significant mismatch between perceived and objectively assessed HIV risk. The findings highlight the need for enhanced counseling approaches, systematic risk reassessment, and targeted risk communication strategies to ensure that individuals discontinuing PrEP make well-informed decisions and remain adequately protected during periods of continued HIV exposure.

Table 5. Hypothesis Testing Results

Test	P-Value	Interpretation
Fisher's Exact Test	0.001577	Significant difference between counties
Chi-square Test	0.0007729	Significant difference between counties
One-sample Proportion Test	0.0003865	Underestimation is significantly >0%

Table 6 presents the findings of a multivariable logistic regression analysis assessing factors associated with high objective HIV risk. The predictor variables included in the model were county of residence, age, sex, marital status, education level, and income**.** Overall, the model indicates that the county of residence was the only variable that showed a statistically significant association with the outcome after adjustment for potential confounders.

Residence in Kisii County was significantly associated with lower odds of the outcome compared with those from the reference county (Homa Bay). Participants from Kisii had an 85% reduction in odds (OR = 0.15; 95% CI: 0.04–0.58; p = 0.006), indicating a strong and statistically significant county-level effect even after controlling for age, sex, marital status, education, and income. This finding suggests important contextual or programmatic differences between the two counties that may influence client outcomes.

Across age categories**,** none of the estimates was statistically significant. Although some age groups showed odds ratios above or below unity—for example, individuals aged 30–34 years had higher estimated odds (OR = 2.36)—the wide confidence intervals and non-significant p-values suggest substantial uncertainty and no clear age-related pattern in the adjusted analysis. Several age categories (35–39 years and ≥50 years) were omitted from interpretation, likely due to sparse data or serving as reference categories. This suggests that, within this study population, age did not independently predict the outcome after controlling for other factors.

With respect to sex, males had slightly lower odds compared to females (OR = 0.80), but this association was not statistically significant (p = 0.784), indicating no meaningful difference by sex in the adjusted model. For marital status, single and divorced/separated participants showed lower odds relative to the reference group, with divorced/separated individuals approaching statistical significance (OR = 0.12; 95% CI: 0.01–1.31; p = 0.071). However, these findings did not meet conventional significance thresholds.

Education level was not associated with the outcome, as reflected by null estimates and infinite confidence intervals, suggesting limited variability or small cell sizes within education categories. At the same time, income level showed no statistically significant associations. Although participants earning KES 10,001–20,000 had higher estimated odds (OR = 1.77),

the confidence interval was wide and crossed unity ($p = 0.561$).

The regression findings indicate that county of residence emerged as the main predictor of the outcome, whereas individual socio-demographic factors—including age, sex, marital status, education, and income—were not independently associated with high objective HIV risk. This suggests that contextual and structural influences operating at the county level may play a more significant role than individual demographic characteristics. Consequently, geographically targeted interventions may yield greater impact than strategies focused solely on personal attributes.

Table 6. Logistic Regression Results

Term	Estimate	Std. Error	Statistic	OR	(95%CI Lower)	(95%CI Upper)	P-value
(Intercept)	-	-	0.00297	-	-	-	0.99763
County Kisii	0.1527	0.68727	-2.73447	0.15270	0.03728	0.57890	0.00625
Age_20-24 years	0.92636	0.83759	-0.09132	0.92636	0.17224	4.94959	0.92724
Age_25-29 years	0.67235	1.04857	-0.37859	0.67235	0.08300	5.58704	0.70499
Age_30-34 years	2.35857	1.32141	0.64935	2.35857	0.21104	57.97330	0.51611
Age_40-44 years	0.4721	1.62942	-0.46063	0.47210	0.02204	18.29920	0.64507
Age_45-49 years	0.08964	1.74996	-1.37831	0.08964	0.00257	3.67752	0.16811
Age_35-39 years	-	-	0.00456	-	-	-	0.99636
Age_50+ Years	-	-	0.00465	-	-	-	0.99629
Sex Male	0.80495	0.79313	-0.27357	0.80495	0.17856	4.40238	0.78442
Marital Single	0.26556	0.8654	-1.53216	0.26556	0.04319	1.40538	0.12548
Divorced/Separated	0.12081	1.17133	-1.80435	0.12081	0.01089	1.30620	0.07118
Marital Widowed	-	-	0.00546	-	-	-	0.99565
Primary education	0	-	-0.00229	-	-	Inf	0.99817
Secondary education	0	-	-0.00245	-	-	Inf	0.99805
Tertiary education	0	-	-0.00247	-	-	Inf	0.99803
Income							
KES 10,001- 20,000	1.77016	0.98177	0.58168	1.77016	0.29463	16.24880	0.56079
KES 20,001- 30,000	-	-	0.00676	-	-	-	0.9946
>KES 30,000	-	-	0.00479	-	-	-	0.99618

Table legend: *Inf=infinite; Conf. low= Lower bound of 95% Confidence Interval; Conf. high= higher bound of 95% Confidence Interval; OR = Odds ratio; STD. Error =Standard Error*

The behavioral findings were consistent with the RAST-based HIV risk classification (Table 7). Clients categorized as high risk frequently reported behaviors strongly associated with increased HIV acquisition, including multiple sexual partnerships, condomless sexual activity, prior sexually transmitted infections, and inconsistent condom use. These findings suggest that, despite perceiving themselves to be at low risk, many clients continued to engage in behaviors that sustained substantial vulnerability to HIV infection. This divergence between perceived and objectively assessed risk highlights the critical need for strengthened risk assessment processes, targeted counselling, and tailored prevention messaging, particularly in Homa Bay County (Table 8).

As shown in Table 7, multiple sexual partnerships were the most commonly reported risk behavior, affecting nearly half of participants (48.4%), indicating considerable ongoing exposure. Condomless sex was reported by 28.6% of participants, further elevating risk. A history of sexually transmitted

infections was documented among 18.7% of respondents, reflecting biological susceptibility to HIV. In addition, 14.3% reported having a sexual partner living with HIV, representing direct exposure, while consistent condom use was reported by only 22.5%, suggesting limited adoption of protective practices. Collectively, these behaviors point to sustained high-risk practices despite variations in individual risk perception.

Table 7. Behavioral Comparison

Multiple partners	Condomless sex	STI infection	Partner HIV	Condom use
0.4835165	0.2857143	0.1868132	0.1428571	0.2252747

Table 8 summarizes HIV risk classification by county. In Homa Bay County, an overwhelming majority of clients (94.8%) were assessed as being at high risk of HIV acquisition, with only 5.2% classified as low risk. Although Kisii County demonstrated comparatively lower risk levels, a substantial proportion of clients (74.1%) were still categorized as high risk, while 25.9% were assessed as low risk.

Table 8. County Level Summary

County	n	# high risk	Percent high risk	# low risk	Percent low risk
Homa Bay	155	147	94.8	8	5.2
Kisii	27	20	74.1	7	25.9

Taken together, the behavioral profiles and county-level risk distributions confirm persistent HIV exposure across both settings, with a particularly high burden in Homa Bay. The convergence of multiple partnerships, condomless sex, and low condom use with high objective risk classification underscores the urgency of implementing intensified, behavior-focused risk reduction strategies, enhanced counselling, and context-specific prevention interventions to address ongoing HIV vulnerability at both individual and county levels.

Overall, these findings reveal a serious mismatch between perceived and actual HIV risk among clients who discontinued PrEP. They emphasize the urgent need for strengthened risk assessment, enhanced counselling, and tailored prevention messaging to ensure that clients make informed decisions about PrEP use and understand their true HIV risk profile. Without these interventions, discontinuation based on inaccurate self-perception may undermine HIV prevention efforts and increase vulnerability, particularly in high-prevalence settings like Homa Bay.

Discussion

This study provides important insights into the discrepancy between perceived and objectively assessed HIV risk among clients who discontinued pre-exposure prophylaxis (PrEP) due to their belief that their risk of acquiring HIV had decreased. Our findings show that a substantial majority of clients who reported a decline in perceived risk remained objectively at high risk. Specifically, 94.7% of clients in Homa Bay and 72.0% in Kisii who believed their risk had decreased were, in fact, classified as high-risk according to the NASCOP-approved Risk Assessment Screening Tool (RAST). This significant mismatch underscores a critical challenge for HIV prevention programs: client reliance on self-perceived risk may result in premature discontinuation of PrEP, leaving individuals vulnerable to HIV infection during periods of ongoing risk.

A key finding of this study is that over 90% of participants who reported a decreased perception of HIV risk were objectively classified as high risk using the NASCOP-approved Risk Assessment Screening Tool. This level of risk underestimation exceeds that reported in many international studies and highlights a serious vulnerability in HIV prevention programming. While several studies from Europe and North America have documented PrEP discontinuation driven by perceived reductions in risk, many of those contexts reported genuinely reduced exposure through partner viral suppression, monogamy, or consistent condom use, with minimal subsequent HIV seroconversion [6, 15]. In contrast, the present study demonstrates that, in high-prevalence settings such as Homa Bay, perceived reductions in risk frequently occur in the absence of meaningful behavioral or contextual risk reduction.

These findings align more closely with evidence from sub-Saharan Africa and the United States, where a substantial proportion of HIV seroconversions occur among individuals who discontinue PrEP based on perceived low risk [7, 11]. For example, in Kenya and Uganda, most HIV seroconversions occurred among clients who had stopped PrEP, highlighting the potential consequences of misperceived low-risk behavior [11]. Similarly, clients in Western and Central Kenya frequently made deliberate decisions to stop PrEP based on reduced perceived exposure, such as ending sexual relationships with HIV-positive partners or relying on partners achieving viral suppression [14]. However, many of these individuals remained at substantial risk due to ongoing sexual behaviors or partner exposures, emphasizing that subjective assessments of risk may not fully reflect actual vulnerability. This aligns closely with our findings, which show that clients' perceptions are often misaligned with their epidemiological reality. The high level of underestimation observed in this study suggests that risk perception among clients is often shaped by cognitive heuristics, relationship assumptions, or temporary changes in circumstances, rather than by sustained reductions in exposure.

The county-level variations identified in this study underscore the critical role of contextual factors in shaping HIV risk perception and PrEP discontinuation. Clients in Homa Bay were significantly more likely to underestimate their HIV risk than those in Kisii, reflecting differences in local epidemiological contexts. Homa Bay's exceptionally high HIV prevalence may contribute to this pattern through normalization of HIV within the community, potentially fostering cognitive biases such as risk compensation, whereby individuals modify their perceived vulnerability despite ongoing exposure. As a result, perceived risk may diverge from actual epidemiological and behavioral realities, reinforcing the need for geographically tailored prevention strategies.

County of residence was the sole variable that remained significantly associated with risk underestimation in multivariable analysis, highlighting the influence of structural and contextual determinants beyond individual socio-demographic characteristics. In high-prevalence settings like Homa Bay, dense sexual networks can sustain elevated HIV risk even when individuals perceive reductions in their personal exposure. The combination of a high proportion of objectively classified high-risk clients and pronounced risk underestimation suggests that individuals may discount cumulative or moderate-risk behaviors in environments where HIV is highly prevalent.

By contrast, Kisii County demonstrated a closer alignment between perceived and objectively assessed risk, although underestimation persisted. Variations in education, employment, service delivery environments, and the quality of risk counselling may partly account for these differences. Comparable regional disparities in PrEP discontinuation and HIV risk perception

have been documented in Kenya and Nigeria, reinforcing the importance of context-specific, geographically responsive interventions rather than uniform national approaches [14, 16].

Contrary to findings from several international studies, this study did not identify age, sex, marital status, education, or income as independent predictors of the outcome after adjustment. While younger age, female sex, marital status, and socioeconomic vulnerability have been linked to PrEP discontinuation elsewhere [17-19], the present findings suggest that socio-demographic characteristics alone do not adequately explain risk underestimation in this context. Instead, risk perception appears to be shaped by broader contextual, relational, and behavioral factors that cut across demographic groups.

This reinforces evidence from Kenya and Uganda showing that PrEP discontinuation is often a deliberate decision informed by perceived "seasons of risk," even when those perceptions are inaccurate [14, 15]. The absence of strong demographic predictors underscores the limitation of targeting interventions solely based on age, gender, or marital status and highlights the need for universal, high-quality risk assessment and counselling.

Behavioral factors were strongly associated with high-risk classification in our cohort. High-risk clients frequently reported multiple sexual partnerships, condomless sex, exposure to partners with unknown HIV status, and recent sexually transmitted infections. These behaviors are well-established predictors of HIV acquisition and mirror evidence from Northern California, where elevated rates of sexually transmitted infections were observed among individuals who discontinued PrEP, indicating ongoing engagement in high-risk sexual practices even after stopping prophylactic use [8, 9]. Likewise, studies among female sex workers in Benin have documented continued sexual risk and STI incidence following PrEP discontinuation, demonstrating that stopping PrEP does not inherently correspond to a reduction in HIV vulnerability [10]. Collectively, these studies reinforce the critical need for behavioral assessment and targeted counseling interventions that address both perceived and actual risk. The persistence of these behaviors among clients who perceived themselves to be at low risk demonstrates that PrEP discontinuation was often not accompanied by effective alternative prevention strategies. This contrasts with findings from lower-prevalence or well-resourced settings, where discontinuation is sometimes offset by consistent condom use or stable viral suppression among partners [6].

The alignment between behavioral indicators and RAST classification strengthens the validity of the objective assessment and suggests that the primary challenge lies not in misclassification by providers, but in clients' understanding and interpretation of risk. This gap highlights deficiencies in risk communication and shared decision-making within PrEP services.

The findings underscore the critical role of healthcare providers in shaping risk perception and PrEP continuation decisions. While the literature emphasizes counselling, adherence reminders, and flexible service delivery as effective strategies [4, 20], this study suggests that counselling may not sufficiently address cognitive biases and contextual realities that drive risk underestimation. Clients may interpret reduced sexual frequency, trust in partners, or short-term relationship changes as indicators of safety, even when objective risk remains high.

Strengthening provider capacity to deliver nuanced, behaviorally informed counselling is therefore essential. Routine, structured risk reassessment, use of visual or scenario-based risk communication tools, and explicit discussion of local HIV epidemiology may help clients better contextualize their risk. Additionally, post-discontinuation follow-up

and clear guidance on re-initiating PrEP during periods of increased exposure are critical to preventing HIV acquisition during PrEP gaps.

The observed gap between perceived and actual risk also underscores the importance of psychosocial and cognitive factors in PrEP decision-making. Clients may base their risk perception on trust in partners, assumptions about fidelity, or reliance on partner viral suppression. Studies in different settings indicate that younger age, mental health challenges, substance use, and gender identity can also influence risk perception and adherence behaviors [7, 14]. For instance, individuals with lower risk perception may be less likely to use condoms consistently, more likely to engage in concurrent sexual partnerships, or experience challenges in negotiating safer sex practices. These factors highlight that discontinuation decisions are shaped not only by epidemiological reality but also by individual psychology, social relationships, and contextual circumstances.

Our findings demonstrate the urgent need for strengthened counseling and tailored communication strategies within PrEP programs. Routine and structured risk assessments, such as the RAST, are essential for objectively identifying clients who remain at high risk despite their own perceptions of reduced vulnerability. Integrating these assessments into follow-up visits and PrEP discontinuation consultations can help align clients' understanding with their actual risk, promoting more informed decision-making. Enhanced counseling should include clear discussions about the dynamic nature of HIV risk, the role of sexual networks, partner status, and behavioral risk factors. In addition, client education should emphasize that perceived risk can fluctuate and that discontinuation may not always reflect a reduced probability of HIV acquisition.

County-specific strategies may further improve PrEP retention and mitigate premature discontinuation. In Homa Bay, where risk underestimation was particularly pronounced, interventions could include community-level awareness campaigns, partner-inclusive counseling, and peer education initiatives to promote accurate risk perception. In Kisii, while underestimation was less pronounced, targeted counseling and behavioral support remain crucial for preventing seroconversions during periods of discontinuation. Tailoring interventions to the local epidemiological context, cultural norms, and social dynamics enhances their effectiveness and sustainability.

Evidence from higher-income settings also underscores the universal relevance of misperceived risk. Study in Antwerp, Belgium, clients discontinued PrEP due to perceived low risk, yet ongoing risk was mitigated by protective behaviors such as condom use or monogamous partnerships [6]. Conversely, in the U.S., seroconversions among clients who stopped PrEP for similar reasons illustrate that even with relatively robust healthcare systems, reliance on self-perception can have tangible consequences [7]. These international comparisons emphasize that interventions to improve risk assessment, counseling, and adherence support are broadly applicable, regardless of resource setting, though local adaptation is essential.

The public health implications of these findings are significant. Premature discontinuation of PrEP due to perceived low risk undermines the effectiveness of HIV prevention programs and may contribute to ongoing transmission, particularly in high-prevalence regions. Integrating objective risk assessment, behavioural counselling, and ongoing monitoring into PrEP programs is therefore critical for sustaining HIV prevention gains. Moreover, proactive strategies to support timely re-initiation of PrEP when risk increases can reduce vulnerability during periods of discontinuation. These measures are essential for aligning programmatic goals with real-world behaviors and ensuring that high-risk populations remain protected.

Despite the contributions of this study, certain limitations must be acknowledged. While we documented a substantial perception–reality gap, we did not explore the underlying cognitive, psychosocial, or relational factors driving clients' misperceptions. Future research should investigate determinants such as trust in partners, stigma, mental health, and substance use to design interventions that address both informational gaps and social determinants of behavior. Additionally, the study focused on behavioral and clinical risk indicators at a single point in time, without longitudinal follow-up to assess how risk perception and behavior evolve after PrEP discontinuation. Longitudinal studies would provide richer insights into dynamic risk patterns, adherence decisions, and potential seroconversions, enabling more precise intervention design.

This study reveals a substantial underestimation of HIV risk among individuals who discontinued PrEP based on perceived low vulnerability, with clear disparities across counties. Consistent with the Health Belief Model, diminished perceived susceptibility appeared to outweigh objective measures of exposure, leading to premature PrEP discontinuation despite persistent behavioral and epidemiological risk. Clients' subjective risk appraisals frequently did not reflect their actual exposure, thereby increasing their susceptibility to HIV acquisition.

These findings highlight the need to strengthen objective risk assessment, provide more individualized counseling, and implement tailored risk-communication strategies to better align perceived and actual risk. Such measures are vital to preventing premature discontinuation, supporting informed decision-making, and sustaining effective HIV prevention in high-burden settings such as Homa Bay and Kisii Counties, Kenya. Addressing both behavioral and psychosocial drivers of risk perception will enable PrEP programs to enhance adherence, mitigate HIV acquisition following discontinuation, and improve overall population-level prevention outcomes.

Conclusion

This study demonstrates a substantial and concerning mismatch between perceived and objectively assessed HIV risk among clients who discontinued PrEP due to their belief of reduced vulnerability. Overall, 94.7% of clients in Homa Bay and 72.0% in Kisii who perceived a decrease in HIV risk were, in fact, classified as high-risk according to the NASCOP-approved Risk Assessment Screening Tool (RAST). This discrepancy highlights a critical challenge for HIV prevention programs: reliance on self-perceived risk may lead to premature PrEP discontinuation, leaving individuals vulnerable to HIV acquisition during periods of ongoing exposure.

Our findings align with prior studies across sub-Saharan Africa and other regions. In Kenya and Uganda, majority of HIV seroconversions occurred among clients who had stopped PrEP, emphasizing the real-world consequences of misperceived low-risk behavior [11]. In Western and Central Kenya often made deliberate decisions to discontinue PrEP based on reduced perceived exposure, such as ending sexual relationships with HIV-positive partners or relying on partners achieving viral suppression, yet many remained at high risk due to ongoing behaviors [14]. Comparable trends have been reported in high-income settings. In the United States, HIV seroconversions have occurred among individuals who discontinued PrEP based on a perceived reduction in risk [7]. In contrast, findings from Belgium indicate that PrEP discontinuation did not consistently lead to seroconversion, largely because many clients compensated by adopting alternative protective strategies, such as consistent condom use or maintaining monogamous relationships [6]. Collectively, these studies underscore the need for accurate risk assessment, tailored counseling, and behavioral support to mitigate HIV vulnerability during PrEP discontinuation.

County-level differences in our study highlight the importance of contextual factors. Clients from Homa Bay, a high-prevalence region, were more likely to underestimate risk compared to Kisii. This may reflect normalization of HIV in high-prevalence settings or cognitive biases such as risk compensation. Behavioral factors—multiple sexual partners, condomless sex, exposure to partners of unknown HIV status, and STIs—were strongly associated with objectively assessed high risk, consistent with findings in other settings [8-10]. Psychosocial determinants, including trust in partners, assumptions about fidelity, mental health, and substance use, further influence risk perception and decision-making [7, 14].

Recommendations

Healthcare workers (HCWs) should conduct routine and structured risk assessments for all clients using PrEP, including those seeking to discontinue it. Tools such as the NASCOP-approved Risk Assessment Screening Tool (RAST) should be incorporated into follow-up and discontinuation consultations to accurately identify individuals who remain at high risk despite perceiving themselves as low-risk.

Health managers should focus on enhancing counselling and risk communication by providing personalised guidance that addresses dynamic HIV risk, sexual networks, partner HIV status, and behavioural factors. Clients should be made aware that a perceived low risk does not always reflect a reduced likelihood of HIV exposure.

County-specific interventions are recommended to improve risk perception and PrEP adherence. In high-prevalence areas like Homa Bay, this may include community awareness campaigns, partner-inclusive counseling, and peer education programs. In Kisii, targeted behavioral support should remain a priority.

All PrEP clients should receive behavioral and psychosocial support to address factors influencing risk perception, including trust in partners, stigma, mental health challenges, and substance use, enabling informed decisions about PrEP use. Finally, health managers should implement monitoring and re-initiation strategies to track clients whose HIV risk increases after discontinuation and to facilitate timely re-initiation of PrEP, thereby reducing vulnerability to infection.

Conflict of Interest

The author reports no conflicts of interest associated with this study and affirms that the research, analysis, and reporting were conducted with full impartiality and objectivity.

Ethical Clearance

The protocol was submitted to the Amref Ethics and Scientific Review Committee (ESRC) and the Kisii Teaching and Referral Hospital Institutional Scientific and Ethics Review Committee (KTRH–ISERC). Both committees reviewed the evaluation for technical rigor and ethical compliance. After receiving ethical clearance, permission to conduct the study was obtained from the National Council for Science, Technology and Innovation (NACOSTI) and the County Health Management Teams (CHMTs), following stakeholder engagement meetings that introduced and explained the study. Key personnel with ethics certification also completed an online ethics course before the evaluation began.

Data Availability

De-identified raw data supporting the conclusions of this manuscript will be made available by the authors, without undue reservation, to any qualified researcher. Requests to access these datasets should be directed to the corresponding author.

Author Contributions

Polycarp Musee Muchele conceptualized and designed the study, carried out data collection and analysis, and prepared the initial

manuscript. Professor Collins Ouma provided technical oversight of the study design and the interpretation of results. All authors reviewed and approved the final version of the manuscript.

Acknowledgements

I acknowledge the LVCT Health Vukisha95 project for its invaluable support and provision of resources that made this study possible. Appreciation is also extended to the County Governments of Homa Bay County and Kisii County for their collaboration and for granting the necessary approvals to conduct the research within their jurisdictions.

Funding

This study did not receive dedicated funding from public, commercial, or non-profit organizations and was self-funded, with guidance provided by Texila American University.

Reference

[1]. World Health Organization, 2023, HIV statistics, globally and by WHO regions, 2023, *Global HIV, Hepatitis and Sexually Transmitted Infections Programs*. https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/strategicinformation/hiv-data-and-statistics

[2]. Tailor, J., Rodrigues, J., Meade, J., Segal, K., Benjamin Mwakyosi, L., 2022, Correlations between oral Pre-Exposure Prophylaxis (PrEP) initiations and policies that enable the use of PrEP to address HIV globally. *PLOS Glob Public Health, 2022 Dec 7;2(12):e0001202, Doi: 10.1371/journal.pgph.0001202.*

[3]. Whitfield, T. H., John, S. A., Rendhina, A. J., Grov, C., Parsons J. T., 2018, Why I quit pre-exposure prophylaxis (PrEP)? A mixed-method study exploring reasons for PrEP discontinuation and potential re-initiation among gay and bisexual men. *AIDS Behaviour,* 2018 Nov;22(11):3566-3575, Doi: 10.1007/s10461-018-2045-1.

[4]. Zhang, J., Li, C., Xu, J., Hu, Z., Rutstein, S. E., & Tucker, J. D., Ong, J. J., Jiang, Y., Geng, W., et al., 2022, Discontinuation, suboptimal adherence, and reinitiation of oral HIV pre-exposure prophylaxis: a global systematic review and meta-analysis. *Lancet HIV,* 2022 Apr;9(4):e254-e268*,* Doi: 10.1016/S2352-3018(22)00030-3.

[5]. Stankevitz, K., Grant, H., Lloyd, J., Gomez, G. B., Kripke, K., Torjesen, K., Terris-Prestholt, F., 2020, Oral preexposure prophylaxis continuation,measurementa and reporting. *AIDS*, 2020 Oct 1;34(12):1801-1811, Doi: 10.1097/QAD.0000000000002598.

[6]. Vanbaelen, T., Rotsaert, A., Jacobs, B. K., Florence, E., Kenyon, C., Vuylsteke, B., Laga, M., Thijs, R., 2022, Why Do HIV Pre-Exposure Prophylaxis Users Discontinue Pre-Exposure Prophylaxis Care? A Mixed Methods Survey in a Pre-Exposure Prophylaxis Clinic in Belgium. *AIDS PATIENT CARE and STDs*, 2022 Apr;36(4):159-167, Doi: 10.1089/apc.2021.0197.

[7]. Krakower, D., Maloney, K. M., Powell, V. E., Levine, K., Grasso, C., Melbourne, K., Marcus,J,. Mayer Kenneth H, 2019, Patterns and clinical consequences of discontinuing HIV preexposure prophylaxis during primary care. *International AIDS Society*, 2019 Feb;22(2):e25250, doi: 10.1002/jia2.25250.

[8]. Marcus, J. L., Hurley, L. B., Hare, C. B., Nguyen, D. P., Phengrasamy, T., Silverberg, M. J., Stoltey, J. E,. Volk Johnathan, E., 2017, Preexposure Prophylaxis for HIV Prevention in a Large Integrated Health Care System: Adherence, Renal Safety, and Discontinuation. *Pub Med Central*, 540-546, Doi: 10.1097/QAI.0000000000001129.

[9]. Marcus, J. L., Hurley, L. B., Ngoyen, D. P., Silverberge, M. J., Volk Johnathan, E., 2017, Redefining Human Immunodeficiency Virus (HIV) Preexposure Prophylaxis Failures. *Clinical Infectious Diseases*, 1768 – 1769, Doi: 10.1093/cid/cix593.

[10]. Mboup, A., Behanzin, L., Guedou, F. A., Geraldo, N., Matsetse, E. G., Giguere, L., Aza-Gnandji, M.,et al., 2018, Early antiretroviral therapy and daily pre-exposure prophylaxis for HIV

prevention among female sex workers in Cotonou, Benin: a prospective observational demonstration study. *Journal of International AIDS SOciety*, 21(11), 21:e25208, https://doi.org/10.1002/jia2.25208

[11]. Koss, C. A., Havlir, D. V., Ayieka, J., Kwarisiima, D., Kabami, J., Chamie, G., Atukunda, M., Mwinike, J., et al., 2021, HIV incidence after pre-exposure prophylaxis initiation among women and men at elevated HIV risk: A population-based study in rural Kenya and Uganda. *PLOS Medicine*, 2021 Feb 9;18(2):e1003492, Doi: 10.1371/journal.pmed.1003492, eCollection 2021 Feb.

[12]. Ogolla, M., Nyabiage, O. L., Musingila, P., Gachau, S., Odero, T. M., June, E. O., Ochanda, B., Appolonia, A., Katiku, E., et al., 2023, Uptake and continuation of HIV pre-exposure prophylaxis among women of reproductive age in two health facilities in Kisumu County, Kenya. *Journal for International AIDS Society*, 023 Mar;26(3):e26069, Doi: 10.1002/jia2.26069.

[13]. Blumenthal, J., Jain, S., Mulvihill, E., Sun, S., Marvin, H., Ellorin, E., Graber, S., Haubrich, R., Morris, S., 2019, Perceived Versus Calculated HIV Risk: Implications for Pre-exposure Prophylaxis Uptake in a Randomized Trial of Men Who Have Sex With Men. *J Acquir Immune Defic Synd*, 80(2): e23–e29, Doi: 10.1097/QAI.0000000000001888.

[14]. Ongolly, F. K., Dolla, A., Irungu, E. M., Odoyo, J., Wamoni, E., Peebles, K., Mugwanya, K., Mugo, N. R., Bukusi, E. A., Morton, J., Baeten, J. M., O`Malley, G., 2022, "I just decided to stop:" Understanding PrEP discontinuation among individuals initiating PrEP in HIV care centers in Kenya. *J Acquir Immune Defic Syndr,* 2021 May 1;87(1):e150-e158, Doi: 10.1097/QAI.0000000000002625.

[15]. Gilbert, H. N., Wyatt, M. A., Pisarki, E. E., Mumonge, T. R., Heffron, R., Katabira, E. T., Celum, C. L., Baeten, J. M., Haberer, J. E., Ware Norman, C., 2019, PrEP Discontinuation and Prevention-Effective Adherence: Experiences of PrEP Users in Ugandan HIV Serodiscordant couples. *Journal Acquired Immune Deficiency Syndrom*, 2019 Nov 1;82(3):265-274, Doi: 10.1097/QAI.0000000000002139.

[16]. Anyasi, H., Idemudia, A., Badru, T., Onyegbule, S., Isang, E., Sanwo, O., Pandey, S.R., Chiegil, R.,et al., 2024, Discontinuation of HIV oral pre-exposure prophylaxis: findings from programmatic surveillance within two general population HIV programs in Nigeria. *BMC Public Health*. 2024 May 16;24(1):1325, Doi: 10.1186/s12889-024-18808-z.

[17]. Dzenga, T., Moyo, E., Moyo, P., Kamangu, J., Dzinamarira, T., 2023, Factors influencing the retention of clients in oral pre-exposure prophylaxis (PrEP) care at 3 months after initiation in the Omusati region of Namibia. *International Journal of Africa Nursing Sciences*, Volume 19, 2023, 100623, https://doi.org/10.1016/j.ijans.2023.100623

[18]. Herns, S., Panwala, R., Pfeil, A., Sardinho, M., Rossi, V., Blumenthal, J., & Hill, L., 2023, Predictors of PrEP retention in at risk patients seen at a HIV primary care clinic in San Diego. *International Journal of STD and AIDS*, 785–790, 2023 Oct;34(11):785-790, Doi: 10.1177/09564624231179276.

[19]. Garofoli, M., Siguier, M., Robineau, O., Valette, M., Phung, B., Bachelard, A., Rioux, C., Gac, S.L., Digumber, M., Pialoux, G., Ghosn, J., Champenois, K., 2024, Incidence and factors associated with PrEP discontinuation in France. *Journal of Antimicrobial Chemotherapy*, 2024 Jul 1;79(7):1555-1563, Doi: 10.1093/jac/dkae133.

[20]. Shover, C. L., Shoptaw, S., Javanbakhat, M., Lee, S. J., Bolan, R. K., Cunningham, N. J., Beymer, M., DeVost, M. A., Gorbach Pamina, M., 2020, Mind the Gaps: Prescription coverage and HIV incidence among patients receiving pre-exposure prophylaxis from a large federally qualified health center in Los Angeles, California. *PubMed Central*, 2730 - 2740. Doi: 10.1007/s10461-019-02493.