

Prevalence and correlates of physical, sexual, and threatened violence among partners of people who
inject drugs living with HIV in Kenya

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Abstract

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Background: People who inject drugs (PWID) have a higher HIV burden compared to the general adult population in Kenya. Violence among PWID is also common and associated with increased HIV risk and decreased HIV service uptake. Understanding the nature, distribution, and correlates of violence among PWID in Kenya may inform population-specific public health interventions and policy recommendations.

Methods: Using a cross-sectional study, we identified the prevalence and correlates of different types of violence experienced by sexual and injecting partners of HIV-positive PWID in Kenya, who were contacted through assisted partner services. We used a Chi-squared test to estimate the risk of violence and conducted a pairwise comparison and two-sided Fisher's exact test to identify the socio-demographic characteristics associated with violence. Using the Woolf test for homogeneity, we conducted a stratified analysis and tested for effect modification by gender and HIV status.

Results: Among 3302 participants, 1439 (44%) had experienced some form of violence within the past one year. Physical violence was the most common form of violence experienced (35%; 95%CI 33.3%, 36.5%), followed by being threatened (23%; 21.5%, 24.4%), and sexual violence (7%; 95% CI 6.2%, 7.9%). Being male (Relative risk [RR]=1.22; 95% confidence interval [CI] 1.11, 1.33; $p<0.001$), living in coastal Kenya (RR=1.53; 95%CI 1.41, 1.66; $p<0.001$), having multiple sexual partners (vs. single)

(RR=1.39; 95%CI 1.22, 1.6; p<0.001), being divorced/ separated or widowed (vs. single) (RR=1.24; 95%CI 1.13, 1.37; p<0.001), not having a stable place to live (RR=1.14; 95%CI 1.03, 1.27; p=0.019), being both a sexual and injecting partner (vs. sexual partner only) (RR=1.16; 95%CI 1.01, 1.33; p=0.041), being an active injection drug user not on methadone (vs. non-active injection drug users taking methadone) (RR=1.53; 95%CI 1.04, 2.25; p=0.018), and identifying as a man who has sex with men or man who have sex with both men and women (MSM/MSMW) (vs. man who has sex with women) (RR=1.36; 95%CI 1.21, 1.54; p<0.001) were associated with experiencing violence. The stratified analysis revealed that gender was an effect modifier on the association between partner characteristics (region, employment, partner type) and experiencing violence while HIV status was not.

Conclusion: The study identified that the prevalence of violence among partners of PWID in Kenya differs for different genders and regions, and physical violence was the most frequent form of violence reported. There was strong evidence of an association between several partner characteristics and experiencing violence and it was modified by different Genders. This information will be useful to formulate and tailor effective public health interventions, and policy recommendations to increase HIV-related services among key populations in Kenya.

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LIST OF ABBREVIATIONS

APS	assisted partner services
ART	antiretroviral therapy
CI	confidence intervals
HIV	human immunodeficiency virus
KPs	key populations
MMT	methadone maintenance treatment
MSM	men who have sex with men
MSMW	men who have sex with both men and women
MSW	men who have sex with women
NASCOP	National AIDS and STI Control Programme
ODK	open data kit
PLWH	people living with HIV
PWID	people who inject drugs
RR	relative risk (risk ratio)
SHARP	Integrated Assisted Partner Services and Phylogenetics for HIV and Hepatitis C Prevention among people who inject drugs in Nairobi
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNODC	United Nations Office on Drugs and Crime
WHO	World Health Organization

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I. INTRODUCTION

Background and Significance

With the joint third-largest HIV epidemic in the world, alongside Mozambique and Uganda, 1.5 million people were living with HIV in Kenya in 2019 (1,2). Kenya's Ministry of Health has identified key populations that the HIV epidemic disproportionately impacts including people who inject drugs (PWID), sex workers, and men who have sex with men (MSM). According to 2020 data from Joint United Nations Programme on HIV/AIDS (UNAIDS), an estimated 18.3% of PWID were living with HIV in Kenya compared to 4.2% (3.7% - 4.9%) among the general adult population aged 15 to 49 years (1,3).

Violence is also a leading public health problem globally. According to 2002 World Health Organization (WHO) report, violence is one of the leading causes of death among 15-44 years old adults, and more than 1.6 million people lose their lives as a result of violence every year (4). In Kenya, violence against PWID is also common, perpetrated by police, other authority figures, and community members (5). As the number of PWID increases in Kenya, reports of violence by PWID have also been increasing, from 121 cases in 2013 to 873 cases in 2017 (6). As per the third national behavioral assessment survey among key populations in Kenya, 44% of PWID experienced violence in the past 6 months (7), associated with arbitrary police sweeps, harassment, beatings, bribery, remand, and imprisonment (8). The existing Kenyan legal system and in-country laws also criminalize drug users and make them more vulnerable (9). The combined effect of these restrictive and ineffective laws and policies, cultural norms, social stigma, and structural discrimination prevent PWID and their partners from regularly accessing and engaging in HIV-related health services (10). Health programs and interventions focusing on the needs of PWID, and their partners are very limited.

Many studies revealed that there is strong evidence of an association between violence and HIV infection among key populations (KPs) (8,11). Violence against KPs results in a decrease in HIV services uptake and an increase in intermediate HIV risk including unsafe sex and injecting practices (eg: having sex without a condom and injecting drugs with unclean used needles and syringes) (8,12,13). One study identified that HIV prevalence is higher among Kenyan women who had experienced violence (14). According to the 2007 report of the United Nations Office for the Coordination of Humanitarian Affairs

(UNOCHA), half of Kenya women have experienced any form of violence during their lifetime (15). Fear of violence, social stigma, and discrimination may result in prioritizing their safety over their concerns about HIV and service uptake. As per the UNAIDS data, Kenya achieved the 90-90-90 target for 2020 in two areas – achieving 90% of people living with HIV know their HIV status (first 90) and 92% of the people on ART with suppressed viral load (third 90). However, only 82% of the people who know their HIV status were on ART treatment which highlights the gaps in accessing regular treatment and care services for people who are in need (16). The combined epidemic of drug use, HIV, and violence causes a disproportionate burden on the underserved KPs including PWID in Kenya (17).

For addressing the HIV epidemic among PWID and their partners, it is not enough to focus only on HIV and drug use. It is important to understand how these health consequences correlate to violence and its underlying determinants including the biological, environmental, socio-cultural, economic, and political factors. The evidence strongly suggests that promoting the safety and well-being of KPs and addressing the violence among them by the national government can achieve the 2025 95-95-95 target of Kenya HIV prevention program (6).

This analytic study and secondary data analysis assessed the distribution, trends, types of violence and their potential correlates among the partners of PWID enrolled in the SHARP study in Kenya. There is limited research assessing the violence among the partners of PWID (sexual and/or injecting partners) in Kenya and yet they are often members of key populations themselves, e.g., sex workers, MSM, and persons who use alcohol and non-injection drugs. In addition, individual characteristics associated with experiencing violence within subgroups of partner participants were analyzed to identify the potential effect modifiers. As the majority of our study sample (82%) were injecting partners of PWID (PWID themselves), the findings from our analyses could reflect a better understanding of the nature and risk of violence among the PWID population in Kenya.

By understanding the distribution of different forms of violence among the targeted community, the priority sub-groups will be identified for addressing further program recommendations and implementation in Kenya and elsewhere. Furthermore, the findings will help us to tailor interventions and design future programs to meet the needs of the targeted community. In addition, by assessing the effect modification,

we may be able to navigate a subset of participants who are more susceptible to the risk of experiencing violence, to modify the existing interventions to prioritize them, and promote achieving the target of Kenya's HIV prevention program.

II. METHODS

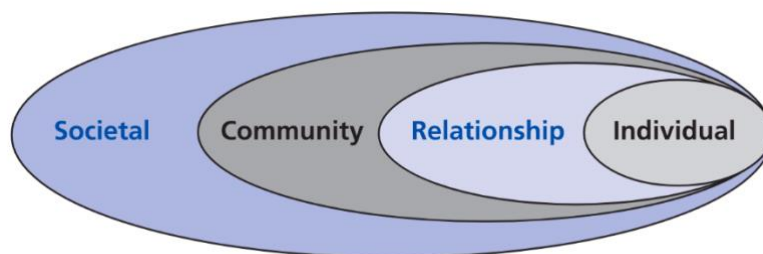
Study Design

This is a cross-sectional study using baseline data from the prospective cohort study, "Integrated Assisted Partner Services and Phylogenetics for HIV and Hepatitis C Prevention among people who inject drugs in Nairobi (SHARP Study)." It was implemented at public health centers, needle syringe programs and methadone clinics throughout Nairobi and coastal Kenya from February 2018 to December 2021 (18). The primary study examined the effectiveness of peer-mediated assisted partner notification services (APS) in identifying, testing, and linking to HIV care the partners of people living with HIV (PLWH) in Kenya (18). Assessing the risk of violence was part of the primary study.

Conceptual Framework

We used the WHO's ecological model as a conceptual framework to characterize the risk and correlates of violence among the study population.

Figure 1: Ecological Model for understanding violence



Source: <https://www.who.int/groups/violence-prevention-alliance/approach>

According to this model, violence is a complex outcome of interaction among different levels of individual, interpersonal, community, and societal factors (4,19). To understand the nature and distribution of violence among targeted population, we explored the personal experiences and socio-demographic characteristics of study participants which may trigger the likelihood of being victims of violence. We identified the potential correlates, and triggering factors of violence for creating violence prevention programs and interventions (4).

Study Setting

Study procedures took place in 8 public health centers, needle syringe programs (NSP), and methadone clinics in Nairobi, Kilifi, and Mombasa counties in Kenya (18).

Study Population

The study population was the sexual and injecting partners of PWIDs enrolled in the primary cohort study. They were identified and recruited through a peer-mediated APS from different geographic areas of Kenya. Partners were eligible to participate in the study if they were >18 years of age at the time of enrollment, had sexual intercourse and/or injecting experiences in the past three years with the index PWID enrolled in the primary cohort study, provided written informed consent to participate in the study, and enrolled in one of the primary study sites. Speaking English or Kiswahili was required for all study participants (18).

Study Procedures

Study Definition of Violence

The SHARP study defines violence as any physical, threatened, or sexual harm inflicted on a person by anyone in the past one year. Physical violence includes being hit, slapped, kicked, or otherwise physically hurt by anyone. Threatened violence includes being threatened psychologically or with a weapon by anyone. Sexual violence includes someone was being forced to perform sexual acts against his/her own will by anyone. The potential perpetrators include spouses, family members, sexual partners, police officers, drug dealers, gang members, communities, and others. (18)

Data Collection

In the primary study, partner participants were contacted confidentially by the trained peer-educators without revealing the identity of index PWID. They were invited to test for HIV and hepatitis C and asked if they would like to participate in the study. After getting written informed consent, the researchers collected information about socio-demographic characteristics, history of experiencing violence and instability, HIV, Hepatitis C, and drug use history of participants by using a structured questionnaire through open data kit (ODK) software on tablet devices. All the collected data were uploaded and stored securely on the servers of the Kenya National AIDS and STIs Control Programme (NASCO). All the participants were compensated for their transportation expenses (18).

Data Analysis and Statistical Method

This secondary data analysis used the baseline data of partner participants from primary cohort study. The data were analyzed by using R statistical software (Version 4.1.1). We used seventeen variables for data analysis and the variables were chosen depending on the research interest, hypotheses, and conceptual framework. The independent (exposure) variables included age, sex, marital status, income sources, housing, region, partner type, HIV status, ART status, drug injecting status, methadone treatment, and sexual orientation, and they were treated as categorical variables. The dependent (outcome) variable was experiencing violence among the study participants. It included experiencing physical, threatened, sexual violence, and any violence. During the analysis, all the variables were treated as binary. Furthermore, any individual with missing data was excluded from the corresponding univariable analysis (eg: if some participants did not have marital status data, they were excluded from that analysis but included in the other analyses).

To understand the nature and distribution of violence among the study participants (Aim-1), the proportions of different forms of violence were compared across different genders and regions using count and proportions (Table 2).

Bivariate analysis was performed to identify the socio-demographic characteristics associated with experiencing violence (Aim-2). For multiple categorical variables such as age groups, marital status, and

types of employment, we did a pairwise comparison to calculate the risk ratio (RR). We used Chi-squared test to estimate 95% confidence intervals of RR and two-sided Fisher's exact test for differences in the distribution of violence rates across partner characteristics. The results were reported in count, proportions, RR, 95% CIs, and p-values (Table 2). We repeated the same analysis stratified by gender (Table 3 for Male only, and Table 4 for Female only).

To investigate whether the effect of partner characteristics on experiencing violence is modified by gender and HIV status of partners (Aim-3), we conducted a stratified analysis. We used the Woolf test to assess the homogeneity of stratum-specific risk ratios (RR). The results were reported in crude RR, stratum-specific RRs, 95% CIs, and two-sided p-values (Table 5 for Gender, and Table 6 for HIV status).

Consent and Ethical Approval

The parent study was approved by the Institutional Review Board at the University of Washington and the Ethics and Research Committee of Kenyatta National Hospital. All participants provided written informed consent before data were collected (18). For secondary data analysis, a Use of Human and Animal Subjects for UW Graduate Student Theses and Dissertations Form was submitted to UW Global Health Department, and it was approved in October 2021.

III. RESULTS

Overall characteristics of study population

The study enrolled 3302 sexual and injecting partners of HIV-positive PWID across eight main sites including Nairobi, Kilifi, and Mombasa counties in Kenya. Overall, 71% of study participants were male (n=2,336 male and n=966 female), with a median age of 33 years (interquartile range (IQR): 27, 39). 52% (n=1,714) of participants were recruited from Nairobi region while the remaining 48% (n=1,558) were from Coastal Kenya. Regarding marital status, 41% (n=1,368) of participants were single, 26% (n=857) were married, 7% (n=221) had partners, and 26% (n=854) were divorced/ separated/ widows at the time of their first enrollment. And then, 5% (n=176) of the participants worked in formal employment (driver,

hairdresser, healthcare worker, military, tailor, secretary, teacher), 12% (n=391) were self-employed (small business), 15.5% (n=511) worked for informal employment (farmer, trader, metal, panhandle, charity), 15% (n=491) worked illegal business (selling illegal drugs, sex work, stealing), and 8% (n=256) had no income (housewife, partner or family support, jobless). Most participants (87%, n=2,888) had a stable place to live. Furthermore, 70% of participants were identified as injecting partners of PWID, while 18% were sexual partners and 12% were both injecting and sexual partners of PWID.

Overall, 18% (n=594) of partners tested positive for HIV. Among them, 78% (n=461) were on ART. Moreover, 79% (n=2,620) of participants reported active injecting drug use (injected drugs at least twice in the past month) and 4% (n=126) had a history of injection drug use but were not currently active injecting drug users. And only 20% (n=676) of all participants were on the methadone program. When we looked at the sexual orientation among all male participants, 92% (n=2,138) were men who have sex with women (MSW) while the remaining 8% (n=190) reported men who have sex with men or men who have sex with both men and women (MSM/MSMW). Among 190 MSM/MSMW, 79% (n=150) lived in Coast and 21% (n=40) lived in Nairobi.

Table 1: Socio-demographic characteristics of study participants stratified by Gender

Socio-demographics Characteristics	Total N = 3302	Male N = 2336 (71%)	Female N = 966 (29%)
Age years (Median, IQR)	33 (27 – 39)	34 (28 – 40)	30 (25 – 36)
Region			
Nairobi	1714 (52%)	1088 (47%)	626 (65%)
Coast	1588 (48%)	1248 (53%)	340 (35%)
Marital status			
Single	1368 (41%)	898 (38%)	470 (49%)
Married	857 (26%)	669 (29%)	188 (19%)
Partnered	221 (7%)	114 (5%)	107 (11%)
Divorced/ Separated/ Widowed	854 (26%)	654 (28%)	200 (21%)
Missing data	2		
Employment			
Formal	176 (5%)	133 (6%)	43 (4%)
Self-employ	391 (12%)	252 (11%)	139 (14%)
Informal	511 (15%)	465 (20%)	46 (5%)
Illegal	491 (15%)	167 (7%)	324 (34%)
No income or partner family support	256 (8%)	76 (3%)	180 (19%)
Others unspecified and missing data	1477 (45%)		
Housing			
Stable	2888 (87%)	2027 (87%)	861 (89%)
Unstable	410 (12%)	307 (13%)	103 (11%)
Missing data	4		
Partner types			
Sexual	590 (18%)	367 (16%)	223 (23%)

Injecting	2326 (70%)	1685 (72%)	641 (66%)
Both injecting and sexual	380 (12%)	279 (12%)	101 (10%)
Missing data	6		
HIV status			
Negative	2697 (82%)	2046 (88%)	651 (67%)
Positive	594 (18%)	280 (12%)	314 (33%)
Missing data	11		
ART status			
On ART	461 (14%)	221 (9%)	240 (25%)
Not on ART	133 (4%)	59 (3%)	74 (8%)
NA	2708 (82%)		
Drug use status			
Nonactive	126 (4%)	74 (3%)	52 (5%)
Active	2620 (79%)	1908 (82%)	712 (74%)
Incomplete and missing data	556 (17%)		
Methadone			
Yes MMT	676 (20%)	530 (23%)	146 (15%)
No MMT	2289 (69%)	1633 (70%)	656 (68%)
Missing data	337 (10%)		
Sexual Orientation			
MSW	2138 (65%)	2138 (92%)	-
MSM/MSMW	190 (6%)	190 (8%)	-

Association between partner characteristics and experiencing violence (All Participants)

The data provided that 44% of study participants had experienced any form of violence within one year prior to their participation in the SHARP study (95%CI 41.9%, 45.3%). Among them, physical violence was the most common form of violence reported (35%; 95%CI 33.3%, 36.5%), followed by being threatened (23%; 21.5%, 24.4%), and sexual violence (7%; 95% CI 6.2%, 7.9%).

Several partner characteristics were associated with experiencing violence among study participants. Being male ($p < 0.001$), living in coastal Kenya ($p < 0.001$), having sexual partner (vs. Single) ($p < 0.001$), being divorced/separated or widowed (vs. Single) ($p < 0.001$), not having a stable housing ($p = 0.019$), being both sexual and injecting partner (vs. sexual partner) ($p = 0.041$), being MSM/MSMW ($p < 0.001$), being an active injecting drug user taking methadone (vs. non-active drug users taking methadone) ($p = 0.002$) and being an active injecting drug user not taking methadone (vs. non-active drug users taking methadone) ($p = 0.018$) were associated with experiencing violence.

The analysis showed that females were 18% less likely to have experienced any form of violence (RR=0.82; 95%CI 0.75, 0.90) than male participants. The risk of having been threatened with violence was 41% lower times lower (RR=0.59; 95%CI 0.50, 0.70) and sexual violence was 2.11 times higher (95%CI 1.65, 2.70) among females, compared to male participants.

Participants living in coastal Kenya were 1.53 times more likely to have experienced any violence (95%CI 1.41, 1.66) compared to those who lived in Nairobi. The risk of experiencing threatened violence was 2.07 times (95%CI 1.81, 2.36) higher and sexual violence was 3.56 times (95%CI 2.64, 4.79) higher among the participants living on the coast compared to those from Nairobi.

Furthermore, compared to the reference category of participants who were single, participants who had partners (RR=1.39; 95%CI 1.22, 1.60) or who were divorced, separated, or widowed (RR=1.24; 95%CI 1.13, 1.37) reported higher experiences of violence, especially threatened and sexual violence.

Despite not being significant, the risk of experiencing violence among participants who were in the self-employment category (RR=0.89; 95%CI 0.72, 1.10), and partner/family support category (RR=0.86; 95%CI 0.68, 1.08) were lower, and among participants who involved in a form of illegal employment (RR=1.15; 95%CI 0.95, 1.39) were higher, compared to the reference category of formal employment.

There was strong evidence of association between having unstable housing and experiencing violence ($p=0.019$). Participants who had unstable housing were 1.14 times more likely to have experienced any form of violence (95%CI 1.03, 1.27) compared to the participants who had a stable place to live. The risk of experiencing physical violence was 1.16 times higher (95%CI 1.12, 1.44), threatened violence was 1.27 times higher (95%CI 1.03, 1.45), and sexual violence was 0.45 times lower (95%CI 0.27, 0.77) among the participants without stable housing compared to those who had stable housing.

Participants who identified as both sexual and injecting partners of PWID were 1.16 times more likely to have experienced any form of violence (95%CI 1.01, 1.33) compared to the reference category of sexual partners of PWID, especially the risk of experiencing physical violence (RR=1.22; 95%CI 1.04, 1.43). In contrast, injection partners of PWID were 16% less likely to have experienced threatened violence (RR=0.84; 95%CI 0.72, 0.99) and 38% less likely to have experienced sexual violence (RR=0.62; 95%CI 0.46, 0.83) compared to those who were only sexual partners.

Regarding HIV and ART status, there was no evidence of significant association with overall violence.

However, when looking at the sexual violence, there was a significant association: participants living with HIV were 1.39 times more likely (95%CI 1.03, 1.85; $p=0.033$) to have experienced sexual violence than

HIV-negative individuals, and participants not being on ART were 1.88 times more likely (95%CI 1.11, 3.18; p=0.025) to have experienced sexual violence than those who were on ART.

Compared to the participants identified as non-active injecting drug users who were on methadone treatment, the risk of experiencing violence was higher among the active injecting drug users who were on methadone (RR=1.75; 95%CI 1.18, 2.59), and active injecting drug users who were not on methadone (RR=1.53; 95%CI 1.04, 2.25).

Table 2: Association between partner characteristics and violence among all study participants

Variables	Any Violence		Physical Violence		Threaten Violence		Sexual Violence	
	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]
Total	1439/3302 [0.44]		1152/3302 [0.35]		758/3302 [0.23]		232/3302 [0.07]	
Sex								
Male	1074/2336 [0.46]	1(Ref)	839/2336 [0.36]	1(Ref)	609/2336 [0.26]	1(Ref)	124/2336 [0.05]	1(Ref)
Female	365/966 [0.38]	0.82 ** [0.75, 0.9]	313/966 [0.32]	0.9 [0.81, 1]	149/966 [0.15]	0.59 ** [0.5, 0.7]	108/966 [0.11]	2.11 ** [1.65, 2.7]
Age								
18-30 years	542/1273 [0.43]	1(Ref)	442/1273 [0.35]	1(Ref)	273/1273 [0.21]	1(Ref)	97/1273 [0.08]	1(Ref)
31-40 years	623/1354 [0.46]	1.08 [0.99, 1.18]	504/1354 [0.37]	1.07 [0.97, 1.19]	333/1354 [0.25]	1.15 [1, 1.32]	105/1354 [0.08]	1.02 [0.78, 1.33]
>40 years	274/675 [0.41]	0.95 [0.85, 1.07]	206/675 [0.31]	0.88 [0.77, 1.01]	152/675 [0.23]	1.05 [0.88, 1.25]	30/675 [0.04]	0.58 * [0.39, 0.87]
Region								
Nairobi	595/1714 [0.35]	1(Ref)	510/1714 [0.3]	1(Ref)	260/1714 [0.15]	1(Ref)	54/1714 [0.03]	1(Ref)
Coast	844/1588 [0.53]	1.53 ** [1.41, 1.66]	642/1588 [0.4]	1.36 ** [1.24, 1.49]	498/1588 [0.31]	2.07 ** [1.81, 2.36]	178/1588 [0.11]	3.56 ** [2.64, 4.79]
Marital Status								
Single	537/1368 [0.39]	1(Ref)	445/1368 [0.33]	1(Ref)	265/1368 [0.19]	1(Ref)	84/1368 [0.06]	1(Ref)
Married	365/857 [0.43]	1.08 [0.98, 1.2]	276/857 [0.32]	0.99 [0.87, 1.12]	204/857 [0.24]	1.23 * [1.05, 1.44]	71/857 [0.08]	1.35 [1, 1.83]
Partnered	121/221 [0.55]	1.39 ** [1.22, 1.6]	95/221 [0.43]	1.32 * [1.11, 1.57]	72/221 [0.33]	1.68 ** [1.35, 2.09]	24/221 [0.11]	1.77 * [1.15, 2.72]

Variables	Any Violence		Physical Violence		Threaten Violence		Sexual Violence	
	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]
Divorced/ Separated/ Widow	416/854 [0.49]	1.24 ** [1.13, 1.37]	336/854 [0.39]	1.21 * [1.08, 1.35]	217/854 [0.25]	1.31 ** [1.12, 1.54]	53/854 [0.06]	1.01 [0.72, 1.41]
Employment								
Formal	76/176 [0.43]	1(Ref)	57/176 [0.32]	1(Ref)	42/176 [0.24]	1(Ref)	13/176 [0.07]	1(Ref)
Self-employ	151/391 [0.39]	0.89 [0.72, 1.1]	119/391 [0.3]	0.94 [0.72, 1.22]	75/391 [0.19]	0.8 [0.58, 1.12]	26/391 [0.07]	0.9 [0.47, 1.71]
Informal	218/511 [0.43]	0.99 [0.81, 1.2]	172/511 [0.34]	1.04 [0.81, 1.33]	124/511 [0.24]	1.02 [0.75, 1.38]	16/511 [0.03]	0.42 * [0.21, 0.86]
Illegal	243/491 [0.49]	1.15 [0.95, 1.39]	200/491 [0.41]	1.26 [0.99, 1.6]	121/491 [0.25]	1.03 [0.76, 1.4]	59/491 [0.12]	1.63 [0.92, 2.89]
No income or partner family support	95/256 [0.37]	0.86 [0.68, 1.08]	78/256 [0.3]	0.94 [0.71, 1.25]	50/256 [0.2]	0.82 [0.57, 1.18]	26/256 [0.1]	1.38 [0.73, 2.6]
Housing								
Stable	1238/2888 [0.43]	1(Ref)	976/2888 [0.34]	1(Ref)	646/2888 [0.22]	1(Ref)	218/2888 [0.08]	1(Ref)
Unstable	201/410 [0.49]	1.14 * [1.03, 1.27]	176/410 [0.43]	1.27 ** [1.12, 1.44]	112/410 [0.27]	1.22 * [1.03, 1.45]	14/410 [0.03]	0.45 * [0.27, 0.77]
Partner type								
Sexual	256/590 [0.43]	1(Ref)	206/590 [0.35]	1(Ref)	154/590 [0.26]	1(Ref)	59/590 [0.1]	1(Ref)
Injecting	988/2326 [0.42]	0.98 [0.88, 1.09]	782/2326 [0.34]	0.96 [0.85, 1.09]	512/2326 [0.22]	0.84 * [0.72, 0.99]	144/2326 [0.06]	0.62 * [0.46, 0.83]
Both sex and inject	191/380 [0.5]	1.16 * [1.01, 1.33]	162/380 [0.43]	1.22 * [1.04, 1.43]	90/380 [0.24]	0.91 [0.72, 1.14]	27/380 [0.07]	0.71 [0.46, 1.1]
HIV status								
Negative	1178/2697 [0.44]	1(Ref)	937/2697 [0.35]	1(Ref)	635/2697 [0.24]	1(Ref)	177/2697 [0.07]	1(Ref)
Positive	255/594 [0.43]	0.98 [0.89, 1.09]	211/594 [0.36]	1.02 [0.91, 1.15]	120/594 [0.2]	0.86 [0.72, 1.02]	54/594 [0.09]	1.39 * [1.03, 1.85]
ART								
On ART	199/461 [0.43]	1(Ref)	163/461 [0.35]	1(Ref)	90/461 [0.2]	1(Ref)	35/461 [0.08]	1(Ref)
Not on ART	56/133 [0.42]	0.98 [0.78, 1.22]	48/133 [0.36]	1.02 [0.79, 1.32]	30/133 [0.23]	1.16 [0.8, 1.67]	19/133 [0.14]	1.88 * [1.11, 3.18]
Drug use and Methadone status								
No active DU/ MMT	19/69 [0.28]	1(Ref)	18/69 [0.26]	1(Ref)	7/69 [0.1]	1(Ref)	1/69 [0.01]	1(Ref)
Active DU/ MMT	228/474 [0.48]	1.75 * [1.18, 2.59]	181/474 [0.38]	1.46 [0.97, 2.21]	123/474 [0.26]	2.56 * [1.25, 5.25]	56/474 [0.12]	8.15 * [1.15, 57.94]

Variables	Any Violence		Physical Violence		Threaten Violence		Sexual Violence	
	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]
Active DU/ No MMT	903/2146 [0.42]	1.53 * [1.04, 2.25]	728/2146 [0.34]	1.3 [0.87, 1.94]	445/2146 [0.21]	2.04 * [1.01, 4.15]	103/2146 [0.05]	3.31 [0.47, 23.39]
No active DU/ No MMT	26/57 [0.46]	1.66 * [1.03, 2.67]	22/57 [0.39]	1.48 [0.88, 2.48]	12/57 [0.21]	2.08 [0.87, 4.92]	5/57 [0.09]	6.05 [0.73, 50.33]

* Significant at 0.05 alpha level (p value <0.05)

** Significant at 0.001 alpha level (p value <0.001)

Association between partner characteristics and experiencing violence (Male participants only)

When conducting sub-analysis on male participants data only, the outcome of experiencing violence was significantly associated with some exposure variables including region (p<0.001), marital status (partner vs single) (p=0.003) and (divorced/separated/widowed vs single) (p=0.005), employment type (illegal vs formal employment) (p=0.008), unstable housing (p=0.043), sexual orientation (p<0.001), drug use and methadone status (active injection drug users on methadone vs non-active injection drug users on methadone) (p=0.019) and (active injection drug users not on methadone vs non-active injection drug users on methadone) (p=0.017).

Regarding regional differences, participants living on the Coast were 1.35 times more likely (95%CI 1.23, 1.48) to have experienced violence compared to those who lived in Nairobi. Noticeably, the risk of experiencing sexual violence among Coastal males was nearly six times higher than those from Nairobi (RR=5.88; 95%CI 3.5, 9.89). Furthermore, male participants who were in partnered, divorced/ separated/ widow categories showed higher experiences of violence, especially threatened form, compared to those who were single. The risk of experiencing violence was 1.39 times more likely (95%CI 1.08, 1.77) among males involved in a form of illegal employment compared to formally employed males, and 1.14 times more likely (95%CI 1.01, 1.28) among the unstably housed group compared to the stably housed group.

Furthermore, males who were active injection drug users reported higher experiences of violence compared to those who were non-active injection drug users taking methadone. Interestingly, the risk of experiencing sexual violence among males who did not take ART was 3.75 times higher (95%CI 1.47, 9.56) than those who took ART. Moreover, when analyzing the risk of experiencing violence among male

participants depending on their sexual orientation, MSM/MSMW were 1.36 times more likely to have experienced any violence (95%CI 1.21, 1.54) compared to MSW. This association was statistically significant across all physical (RR=1.3; 95%CI 1.11, 1.54; p=0.004), threatened (RR=1.96; 95%CI 1.65, 2.31; p<0.001), and sexual violence (RR=3.75; 95%CI 2.57, 5.48; p<0.001).

Table 3: Association between partner characteristics and violence among Male participants

Variables	Any Violence		Physical Violence		Threaten Violence		Sexual Violence	
	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]
Total	1074/2336 [0.46]		839/2336 [0.36]		609/2336 [0.26]		124/2336 [0.05]	
Age								
18-30 years	362/775 [0.47]	1(Ref)	287/775 [0.37]	1(Ref)	205/775 [0.26]	1(Ref)	42/775 [0.05]	1(Ref)
31-40 years	477/999 [0.48]	1.02 [0.93, 1.13]	379/999 [0.38]	1.02 [0.91, 1.16]	268/999 [0.27]	1.01 [0.87, 1.19]	66/999 [0.07]	1.22 [0.84, 1.77]
>40 years	235/562 [0.42]	0.9 [0.79, 1.01]	173/562 [0.31]	0.83 * [0.71, 0.97]	136/562 [0.24]	0.91 [0.76, 1.1]	16/562 [0.03]	0.53 * [0.3, 0.92]
Region								
Nairobi	422/1088 [0.39]	1(Ref)	366/1088 [0.34]	1(Ref)	213/1088 [0.2]	1(Ref)	16/1088 [0.01]	1(Ref)
Coast	652/1248 [0.52]	1.35 ** [1.23, 1.48]	473/1248 [0.38]	1.13 * [1.01, 1.26]	396/1248 [0.32]	1.62 ** [1.4, 1.87]	108/1248 [0.09]	5.88 ** [3.5, 9.89]
Marital Status								
Single	383/898 [0.43]	1(Ref)	316/898 [0.35]	1(Ref)	202/898 [0.22]	1(Ref)	43/898 [0.05]	1(Ref)
Married	298/669 [0.45]	1.04 [0.93, 1.17]	218/669 [0.33]	0.93 [0.8, 1.07]	174/669 [0.26]	1.16 [0.97, 1.38]	50/669 [0.07]	1.56 * [1.05, 2.32]
Partnered	66/114 [0.58]	1.36 * [1.14, 1.62]	47/114 [0.41]	1.17 [0.92, 1.48]	47/114 [0.41]	1.83 ** [1.43, 2.35]	9/114 [0.08]	1.65 [0.83, 3.29]
Divorced/Separated/Widow	327/654 [0.5]	1.17 * [1.05, 1.31]	258/654 [0.39]	1.12 [0.98, 1.28]	186/654 [0.28]	1.26 * [1.06, 1.5]	22/654 [0.03]	0.7 [0.42, 1.16]
Employment								
Formal	54/133 [0.41]	1(Ref)	38/133 [0.29]	1(Ref)	28/133 [0.21]	1(Ref)	7/133 [0.05]	1(Ref)
Self-employ	102/252 [0.4]	1 [0.77, 1.29]	75/252 [0.3]	1.04 [0.75, 1.45]	57/252 [0.23]	1.07 [0.72, 1.6]	10/252 [0.04]	0.75 [0.29, 1.94]
Informal	204/465 [0.44]	1.08 [0.86, 1.36]	160/465 [0.34]	1.2 [0.9, 1.62]	117/465 [0.25]	1.2 [0.83, 1.72]	15/465 [0.03]	0.61 [0.26, 1.47]
Illegal	94/167 [0.56]	1.39 * [1.08, 1.77]	74/167 [0.44]	1.55 * [1.13, 2.13]	63/167 [0.38]	1.79 * [1.22, 2.63]	10/167 [0.06]	1.14 [0.45, 2.91]
No income or partner family support	27/76 [0.36]	0.88 [0.61, 1.26]	21/76 [0.28]	0.97 [0.62, 1.52]	18/76 [0.24]	1.12 [0.67, 1.89]	5/76 [0.07]	1.25 [0.41, 3.8]

Variables	Any Violence		Physical Violence		Threaten Violence		Sexual Violence	
	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]
Housing								
Stable	916/2027 [0.45]	1(Ref)	700/2027 [0.35]	1(Ref)	518/2027 [0.26]	1(Ref)	119/2027 [0.06]	1(Ref)
Unstable	158/307 [0.51]	1.14 * [1.01, 1.28]	139/307 [0.45]	1.31 ** [1.14, 1.5]	91/307 [0.3]	1.16 [0.96, 1.4]	5/307 [0.02]	0.28 ** [0.11, 0.67]
Partner type								
Sexual	169/367 [0.46]	1(Ref)	132/367 [0.36]	1(Ref)	104/367 [0.28]	1(Ref)	26/367 [0.07]	1(Ref)
Injecting	772/1685 [0.46]	0.99 [0.88, 1.12]	599/1685 [0.36]	0.99 [0.85, 1.15]	438/1685 [0.26]	0.92 [0.76, 1.1]	82/1685 [0.05]	0.69 [0.45, 1.05]
Both sex and inject	130/279 [0.47]	1.01 [0.86, 1.2]	107/279 [0.38]	1.07 [0.87, 1.3]	66/279 [0.24]	0.83 [0.64, 1.09]	15/279 [0.05]	0.76 [0.41, 1.41]
HIV status								
Negative	938/2046 [0.46]	1(Ref)	739/2046 [0.36]	1(Ref)	529/2046 [0.26]	1(Ref)	107/2046 [0.05]	1(Ref)
Positive	130/280 [0.46]	1.01 [0.89, 1.16]	96/280 [0.34]	0.95 [0.8, 1.13]	77/280 [0.28]	1.06 [0.87, 1.3]	16/280 [0.06]	1.09 [0.66, 1.82]
ART								
On ART	103/221 [0.47]	1(Ref)	76/221 [0.34]	1(Ref)	59/221 [0.27]	1(Ref)	8/221 [0.04]	1(Ref)
Not on ART	27/59 [0.46]	0.98 [0.72, 1.34]	20/59 [0.34]	0.99 [0.66, 1.47]	18/59 [0.31]	1.14 [0.73, 1.78]	8/59 [0.14]	3.75 * [1.47, 9.56]
Drug use and Methadone status								
No active DU/ MMT	13/47 [0.28]	1(Ref)	12/47 [0.26]	1(Ref)	6/47 [0.13]	1(Ref)	0/47 [0]	1(Ref)
Active DU/ MMT	171/366 [0.47]	1.69 * [1.05, 2.72]	133/366 [0.36]	1.42 [0.86, 2.36]	101/366 [0.28]	2.16 * [1.01, 4.65]	36/366 [0.1]	Inf * [NaN, Inf]
Active DU/ No MMT	696/1542 [0.45]	1.63 * [1.02, 2.6]	554/1542 [0.36]	1.41 [0.86, 2.3]	371/1542 [0.24]	1.88 [0.89, 4]	50/1542 [0.03]	Inf [NaN, Inf]
No active DU/ No MMT	13/27 [0.48]	1.74 [0.95, 3.19]	10/27 [0.37]	1.45 [0.73, 2.9]	8/27 [0.3]	2.32 [0.9, 5.98]	2/27 [0.07]	Inf [NaN, Inf]
Sexual Orientation								
MSW	957/2138 [0.45]	1(Ref)	751/2138 [0.35]	1(Ref)	518/2138 [0.24]	1(Ref)	93/2138 [0.04]	1(Ref)
MSM/MSMW	116/190 [0.61]	1.36 ** [1.21, 1.54]	87/190 [0.46]	1.3 * [1.11, 1.54]	90/190 [0.47]	1.96 ** [1.65, 2.31]	31/190 [0.16]	3.75 ** [2.57, 5.48]

* Significant at 0.05 alpha level (p value <0.05)

** Significant at 0.001 alpha level (p value <0.001)

Association between partner characteristics and experiencing violence (Female participants only)

Similar exposure variables showed significant association with experiencing violence among females.

The data provided that female respondents who lived in Coastal Kenya were 2.04 times more likely

(95%CI 1.75, 2.39) to have experienced violence compared to those from Nairobi (for physical violence (RR=2.16; 95%CI 1.81, 2.58), for threatened violence (RR=4; 95%CI 2.90, 5.50), and for sexual violence (RR=3.39; 95%CI 2.34, 4.92)). Furthermore, females who had partners or were divorced/ separated/ widowed reported a greater risk of experiencing violence than those who were single (for the partnered category (RR=1.57; 95%CI 1.25, 1.96), and for divorced/ separated/ widowed category (RR=1.36; 95%CI 1.11, 1.66)). Besides, females identified as active injection drug users on methadone showed higher experiences of violence than those who were non-active injection drug users taking methadone (RR=1.94; 95%CI 0.96, 3.92).

Table 4: Association between partner characteristics and violence among Female participants

Variables	Any Violence		Physical Violence		Threaten Violence		Sexual Violence	
	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]
Total	365/966 [0.38]		313/966 [0.32]		149/966 [0.15]		108/966 [0.11]	
Age								
18-30 years	180/498 [0.36]	1(Ref)	155/498 [0.31]	1(Ref)	68/498 [0.14]	1(Ref)	55/498 [0.11]	1(Ref)
31-40 years	146/355 [0.41]	1.14 [0.96, 1.35]	125/355 [0.35]	1.13 [0.93, 1.37]	65/355 [0.18]	1.34 [0.98, 1.83]	39/355 [0.11]	0.99 [0.68, 1.46]
>40 years	39/113 [0.35]	0.95 [0.72, 1.26]	33/113 [0.29]	0.94 [0.68, 1.29]	16/113 [0.14]	1.04 [0.63, 1.72]	14/113 [0.12]	1.12 [0.65, 1.94]
Region								
Nairobi	173/626 [0.28]	1(Ref)	144/626 [0.23]	1(Ref)	47/626 [0.08]	1(Ref)	38/626 [0.06]	1(Ref)
Coast	192/340 [0.56]	2.04 ** [1.75, 2.39]	169/340 [0.5]	2.16 ** [1.81, 2.58]	102/340 [0.3]	4 ** [2.9, 5.5]	70/340 [0.21]	3.39 ** [2.34, 4.92]
Marital Status								
Single	154/470 [0.33]	1(Ref)	129/470 [0.27]	1(Ref)	63/470 [0.13]	1(Ref)	41/470 [0.09]	1(Ref)
Married	67/188 [0.36]	1.09 [0.86, 1.37]	58/188 [0.31]	1.12 [0.87, 1.46]	30/188 [0.16]	1.19 [0.8, 1.78]	21/188 [0.11]	1.28 [0.78, 2.11]
Partnered	55/107 [0.51]	1.57 ** [1.25, 1.96]	48/107 [0.45]	1.63 ** [1.26, 2.11]	25/107 [0.23]	1.74 * [1.15, 2.63]	15/107 [0.14]	1.61 [0.92, 2.79]
Divorced/Separated/Widow	89/200 [0.44]	1.36 * [1.11, 1.66]	78/200 [0.39]	1.42 * [1.13, 1.78]	31/200 [0.16]	1.16 [0.78, 1.72]	31/200 [0.16]	1.78 * [1.15, 2.75]
Employment								
Formal	22/43 [0.51]	1(Ref)	19/43 [0.44]	1(Ref)	14/43 [0.33]	1(Ref)	6/43 [0.14]	1(Ref)
Self-employ	49/139 [0.35]	0.69	44/139 [0.32]	0.72	18/139 [0.13]	0.4 * [0.13]	16/139 [0.12]	0.82

Variables	Any Violence		Physical Violence		Threaten Violence		Sexual Violence	
	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]	n/N (%)	RR [95% CI]
		[0.48, 1]		[0.47, 1.09]		[0.22, 0.73]		[0.34, 1.98]
Informal	14/46 [0.30]	0.59 [0.35, 1.01]	12/46 [0.26]	0.59 [0.33, 1.07]	7/46 [0.15]	0.47 [0.21, 1.05]	1/46 [0.02]	0.16 [0.02, 1.24]
Illegal	149/324 [0.46]	0.9 [0.66, 1.23]	126/324 [0.39]	0.88 [0.61, 1.26]	58/324 [0.18]	0.55 * [0.34, 0.9]	49/324 [0.15]	1.08 [0.49, 2.38]
No income or partner family support	68/180 [0.38]	0.74 [0.52, 1.04]	57/180 [0.32]	0.72 [0.48, 1.07]	32/180 [0.18]	0.55 * [0.32, 0.93]	21/180 [0.12]	0.84 [0.36, 1.94]
Housing								
Stable	322/861 [0.37]	1(Ref)	276/861 [0.32]	1(Ref)	128/861 [0.15]	1(Ref)	99/861 [0.11]	1(Ref)
Unstable	43/103 [0.42]	1.12 [0.87, 1.42]	37/103 [0.36]	1.12 [0.85, 1.48]	21/103 [0.2]	1.37 [0.91, 2.07]	9/103 [0.09]	0.76 [0.4, 1.46]
Partner type								
Sexual	87/223 [0.39]	1(Ref)	74/223 [0.33]	1(Ref)	50/223 [0.22]	1(Ref)	33/223 [0.15]	1(Ref)
Injecting	216/641 [0.34]	0.86 [0.71, 1.05]	183/641 [0.29]	0.86 [0.69, 1.08]	74/641 [0.12]	0.51 ** [0.37, 0.71]	62/641 [0.1]	0.65 * [0.44, 0.97]
Both sex and inject	61/101 [0.6]	1.55 ** [1.23, 1.94]	55/101 [0.54]	1.64 ** [1.27, 2.12]	24/101 [0.24]	1.06 [0.69, 1.62]	12/101 [0.12]	0.8 [0.43, 1.49]
HIV status								
Negative	240/651 [0.37]	1(Ref)	198/651 [0.3]	1(Ref)	106/651 [0.16]	1(Ref)	70/651 [0.11]	1(Ref)
Positive	125/314 [0.4]	1.08 [0.91, 1.28]	115/314 [0.37]	1.2 [1, 1.45]	43/314 [0.14]	0.84 [0.61, 1.17]	38/314 [0.12]	1.13 [0.78, 1.63]
ART								
On ART	96/240 [0.4]	1(Ref)	87/240 [0.36]	1(Ref)	31/240 [0.13]	1(Ref)	27/240 [0.11]	1(Ref)
Not on ART	29/74 [0.39]	0.98 [0.71, 1.35]	28/74 [0.38]	1.04 [0.75, 1.46]	12/74 [0.16]	1.26 [0.68, 2.32]	11/74 [0.15]	1.32 [0.69, 2.53]
Drug use and Methadone status								
No active DU/ MMT	6/22 [0.27]	1(Ref)	6/22 [0.27]	1(Ref)	1/22 [0.05]	1(Ref)	1/22 [0.05]	1(Ref)
Active DU/ MMT	57/108 [0.53]	1.94 * [0.96, 3.92]	48/108 [0.44]	1.63 [0.8, 3.33]	22/108 [0.2]	4.48 [0.64, 31.53]	20/108 [0.19]	4.07 [0.58, 28.79]
Active DU/ No MMT	207/604 [0.34]	1.26 [0.63, 2.51]	174/604 [0.29]	1.06 [0.53, 2.11]	74/604 [0.12]	2.7 [0.39, 18.51]	53/604 [0.09]	1.93 [0.28, 13.33]
No active DU/ No MMT	13/30 [0.43]	1.59 [0.72, 3.52]	12/30 [0.4]	1.47 [0.65, 3.3]	4/30 [0.13]	2.93 [0.35, 24.47]	3/30 [0.1]	2.2 [0.24, 19.76]

* Significant at 0.05 alpha level (p value <0.05)

** Significant at 0.001 alpha level (p value <0.001)

Effect modification by Gender

According to the stratified analysis, there was strong evidence that the association between partner characteristics (region, employment, partner type) and experiencing violence among study participants was modified by their Gender status.

The data provided evidence that the magnitude of the effect of regional differences on experiencing violence among the participants was different depending on their gender status. The association between living on the coast and experiencing violence was stronger among the females (RR=2.04; 95%CI 1.75, 2.39) compared to males (RR=1.35; 95%CI 1.23, 1.48) ($p < 0.001$).

When looking at the association between employment type and experiencing violence, the crude analysis provided no significant association, and all the crude RRs were similar across different employment categories. However, when stratified by gender, stratum-specific RRs were significantly different. For informal employment (Vs formal employment), stratum-specific RR among males was 1.08 (95%CI 0.86, 1.36) while 0.59 (95%CI 0.35, 1.01) among female participants ($p=0.041$). For illegal employment (Vs formal employment), RR among males was 1.39 (95%CI 1.08, 1.77) while 0.90 (95%CI 0.66, 1.23) among female participants ($p=0.033$).

Regarding the type of partners, the crude analysis identified that participants who were both sexual and injecting partners were 1.16 times more likely to have experienced violence compared to the group of sexual partners. When stratified by gender, there was a significant difference in estimates between males (RR=1.01; 95%CI 0.86, 1.20) and females (RR=1.55, 95%CI 1.23, 1.94) ($p=0.003$).

Table 5: Stratified analysis by Gender on the association between partner characteristics and experiencing violence

Variable	Crude RR of experiencing Violence	RR of experiencing Violence among Male participants (n = 2336)	RR of experiencing Violence among Female participants (n = 966)	P value for interaction
Age				
18-30 years	1(Ref)	1(Ref)	1(Ref)	
31-40 years	1.08	1.02 [0.93-1.13]	1.14 [0.96-1.35]	0.287
>40 years	0.95	0.90 [0.79-1.01]	0.95 [0.72-1.26]	0.679

Variable	Crude RR of experiencing Violence	RR of experiencing Violence among Male participants (n = 2336)	RR of experiencing Violence among Female participants (n = 966)	P value for interaction
Region				
Nairobi	1(Ref)	1(Ref)	1(Ref)	
Coast	1.53	1.35 [1.23-1.48]	2.04 [1.75-2.39]	<0.001
Marital Status				
Single	1(Ref)	1(Ref)	1(Ref)	
Married	1.08	1.04 [0.93-1.17]	1.09 [0.86-1.37]	0.758
Partnered	1.39	1.36 [1.14-1.62]	1.57 [1.25-1.96]	0.319
Div/ Sep/ Widow	1.24	1.17 [1.05-1.31]	1.36 [1.11-1.66]	0.208
Employment				
Formal	1(Ref)	1(Ref)	1(Ref)	
Self-employ	0.89	1.00 [0.77-1.29]	0.69 [0.48-1.00]	0.106
Informal	0.99	1.08 [0.86-1.36]	0.59 [0.35-1.01]	0.041
Illegal	1.15	1.39 [1.08-1.77]	0.90 [0.66-1.23]	0.033
No income or partner family support	0.86	0.88 [0.61-1.26]	0.74 [0.52-1.04]	0.509
Housing				
Stable	1(Ref)	1(Ref)	1(Ref)	
Unstable	1.14	1.14 [1.01-1.28]	1.12 [0.87-1.42]	0.885
Partner type				
Sexual	1(Ref)	1(Ref)	1(Ref)	
Injecting	0.98	0.99 [0.88-1.12]	0.86 [0.71-1.05]	0.232
Both sex and inject	1.16	1.01 [0.86-1.20]	1.55 [1.23-1.94]	0.003
HIV status				
Negative	1(Ref)	1(Ref)	1(Ref)	
Positive	0.98	1.01 [0.89-1.16]	1.08 [0.91-1.28]	0.560
ART treatment				
On ART	1(Ref)	1(Ref)	1(Ref)	
Not on ART	0.98	0.98 [0.72-1.34]	0.98 [0.71-1.35]	0.992
Drug use and Methadone status				
No active DU/ MMT	1(Ref)	1(Ref)	1(Ref)	
Active DU/ MMT	1.75	1.69 [1.05-2.72]	1.94 [0.96-3.92]	0.754
Active DU/ No MMT	1.53	1.63 [1.02-2.60]	1.26 [0.63-2.51]	0.539
No active DU/ No MMT	1.66	1.74 [0.95-3.19]	1.59 [0.72-3.52]	0.858

Effect modification by HIV status

There was no strong evidence that the effect of partner characteristics on experiencing violence was modified by participants' HIV serostatus.

Table 6: Stratified analysis by HIV status on the association between partner characteristics and experiencing violence

Variable	Crude RR of experiencing Violence	RR of experiencing Violence among HIV (+) participants (n = 594)	RR of experiencing Violence among HIV (-) participants (n = 2697)	P value for interaction
Sex				
Male	1(Ref)	1(Ref)	1(Ref)	
Female	0.82	0.86 [0.71-1.03]	0.80 [0.72-0.90]	0.560
Age				
18-30 years	1(Ref)	1(Ref)	1(Ref)	
31-40 years	1.08	0.89 [0.71-1.11]	1.12 [1.02-1.23]	0.056
>40 years	0.95	0.81 [0.63-1.05]	0.98 [0.86-1.11]	0.199
Region				
Nairobi	1(Ref)	1(Ref)	1(Ref)	
Coast	1.53	1.75 [1.42-2.15]	1.50 [1.37-1.63]	0.179
Marital Status				
Single	1(Ref)	1(Ref)	1(Ref)	
Married	1.08	1.02 [0.79-1.33]	1.10 [0.98-1.22]	0.638
Partnered	1.39	1.45 [1.08-1.94]	1.38 [1.18-1.62]	0.776
Div/ Sep/ Widow	1.24	1.26 [1.00-1.59]	1.23 [1.11-1.37]	0.876
Employment				
Formal	1(Ref)	1(Ref)	1(Ref)	
Self-employ	0.89	0.67 [0.44-1.03]	0.96 [0.75-1.22]	0.158
Informal	0.98	0.76 [0.50-1.16]	1.05 [0.84-1.31]	0.189
Illegal	1.14	0.86 [0.60-1.23]	1.23 [0.99-1.54]	0.097
No income/ partner family support	0.86	0.93 [0.62-1.41]	0.82 [0.62-1.09]	0.619
Housing				
Stable	1(Ref)	1(Ref)	1(Ref)	
Unstable	1.15	1.19 [0.90-1.57]	1.14 [1.02-1.28]	0.807
Partner type				
Sexual	1(Ref)	1(Ref)	1(Ref)	
Injecting	0.98	0.94 [0.74-1.20]	0.98 [0.87-1.10]	0.770
Both sex and inject	1.16	1.22 [0.92-1.61]	1.14 [0.97-1.33]	0.689
Drug use and Methadone status				
No active DU/ MMT	1(Ref)	1(Ref)	1(Ref)	
Active DU/ MMT	1.75	1.57 [0.81-3.06]	1.84 [1.13-2.98]	0.715
Active DU/ No MMT	1.53	1.10 [0.57-2.13]	1.71 [1.06-2.74]	0.292

Variable	Crude RR of experiencing Violence	RR of experiencing Violence among HIV (+) participants (n = 594)	RR of experiencing Violence among HIV (-) participants (n = 2697)	P value for interaction
No active DU/ No MMT	1.66	1.42 [0.64-3.13]	1.74 [0.97-3.15]	0.680
Sexual Orientation				
MSW	1(Ref)	1(Ref)	1(Ref)	
MSM/MSMW	1.37	1.36 [1.00-1.85]	1.37 [1.20-1.56]	0.977

IV. DISCUSSION

In this study, we found the overall prevalence of violence among sexual and injecting partners of PWID enrolled in the study to be high at 43.6%. However, this is consistent with results from the 2018 NASCOP polling booth survey (the third National Behavioral Assessment of key populations in Kenya) showing that 44% of people who inject drugs in Kenya experienced violence in the past 6 months (7). Regarding regional difference, the prevalence of violence was higher among the participants living in Coastal Kenya compared to those who lived in Nairobi, especially threatened (2 times higher) and sexual violence (4 times higher). The economic difference (job opportunities) may have a lot of impact on this disparity. Compared to Nairobi region, coastal Kenya is characterized by poverty (20), higher prevalence of drug use and illegal drug dealing, prostitution and sex trafficking of children and young people (21). In addition, heroin use and sex trafficking among tourists are also common in coastal Kenya (22). All these factors may contribute to elevating the potential crime rates, and the tendency to expose to different forms of violence in the coastal community.

Furthermore, male participants reported higher experiences of violence than females, except for sexual violence which was more than two times higher among the female participants. The different nature between men and women, and exposures to risks including environmental, cultural, and socio-economic factors may explain these disparities. For instance, in Kenya, men are more likely to be employed than women (23), which may create more exposure to different communities and violence. Studies from the U.S, Canada, Ukraine, and Thailand showed that male PWID were more likely to have experienced physical police violence than female PWID (24–27), associated with being asked for bribes, pressured to

disclose information, and detained in prison without having an official charge (25). On the other hand, 2018 Kenya NASCOP Polling booth survey reported that 12% of PWID were forced to have sex in the past 6 months, and it was higher among the female PWID than male PWID (7). One Kenya study revealed that 80-100% of females who use drugs engaged in sex activities to earn money for drug use and also for their partners (28). The combined effects of being female and using drugs make them more vulnerable, power-imbalanced, fail to negotiate for safer sex, and increasing tendency to expose to sexual violence (29).

Participants who were in partnered, divorced, separated or widow categories had higher experiences of violence than participants who were Single (Table 2). However, when we did a sub-group analysis on each specific gender, males and females showed different magnitude and experiences of violence. For instance, while the risk of experiencing sexual violence among the divorced/ separated/ widowed females was 1.78 times significantly higher than females who were single (Table 4), there was no significant difference among the male participants (Table 3). This finding highlighted that being female, using drugs, and being divorced/ separated/ widow was more vulnerable and had a greater risk of sexual victimization than the remaining population, which was consistent with the finding from one study (30). Some literature and U.S national crime statistics reported that the risk of sexual victimization is higher among younger and unmarried women than those who are older and married (31).

Furthermore, the overall data revealed that there was no significant association between participants' employment type and experiencing violence (Table 2). However, as per the sub-group analysis, the risk of experiencing physical and threatened violence was significantly higher among the male participants who conducted illegal employment compared to those who worked for formal employment (Table 3). Additionally, male participants who had no stable housing had greater experiences of physical violence than those who had a stable place to live. Some studies reported that being male, homelessness, and involvement in the drug economies was dependently associated with experiencing violence perpetrated by police and strangers (7,32).

Regarding HIV and ART status, there was no evidence of significant association with experiencing violence among all study participants except the sexual violence which was higher among participants

living with HIV and not on ART (Table 2). When we did the sub-analysis among the female participants only (Table 4), no significant association was found although many literatures worldwide found the evidence of association between HIV status and risk of violence among women (33–35). Interestingly, when we did sub-analysis among male participants (Table 3), and triangulated all the outcomes from region, employment, sexual orientation, and ART status, there was strong evidence of higher sexual violence experiences within a sub-group of male participants. This sub-group was assumed to be MSM/MSMW who use drugs, engaging illegal employment (eg: sex work, drug trafficking), living in the Coast and not being on ART (RR for experiencing sexual violence among male participants was: 5.88 times higher in Coast than Nairobi; 1.14 times higher in illegal employment group than formal employment category; 3.75 times higher among MSM/MSMW than MSW; and 3.75 times higher among non-ART group than on-ART group). The physical and threatened violence were also significantly higher. Consistent with this finding, one study, conducted among MSM population in Kenya, reported that prevalence of physical, threatened and sexual violence was higher among MSM in Coastal region (36). Another study found that MSM who engaged with sex work for receiving gifts and materials were more than 2 times higher risk of victimizing sexual violence than those who did not (37). The combined effects of being MSM/MSMW, engaging drug use and sex work, criminalization by existing Kenya laws and regulations, and discrimination from community made this sub-population more vulnerable and stigmatized.

When comparing the risk of violence among participants depending on their drug use and methadone treatment status, active injecting drug users with or without taking methadone treatment were more likely to have experienced violence compared to those who were non-active injecting drug users who taking methadone (Table 2). Active injecting drug users have more chances to face with financial instability which may increase their social and structural vulnerability to violence (38). Furthermore, there was evidence that methadone maintenance treatment can reduce heroin use and subsequent crime and violence rates (39). Further studies are needed to confirm the analysis and identify the underlying factors.

Study Limitations

There were many limitations in this study. At first, the primary cohort study took the study sample through assisted partner service (APS), which may lead to selection bias for this secondary data analysis, and thus the results may not be generalized to other populations. Subsequently, as the collected data were self-reported by participants and contained sensitive information including violence, HIV, drug use, and sexual history, recall bias or desirability bias may be associated. In addition, as the analysis was conducted at single time point (baseline data) of the primary cohort study, causality cannot be inferred from this study. Moreover, as the primary data were collected focusing on APS, HIV, and HCV, there was a limitation to get complete violence data for this secondary data analysis (eg: no available data for violence among different tribes, etc.).

In addition, as the primary data was collected at the individual level and interpersonal experiences, the causes of violence and their complex interaction would not be clarified without having the information from the community and societal levels including different socio-cultural, economic, and political factors (4). We need more information to collect, analyze, and triangulate across different levels at the same time, according to the socio-ecological model. Although the results and associations from this study could not be inferred for causality and may not be generalizable, they underlined an important trend and distribution of violence patterns, potential correlates, and vulnerable sub-groups among the PWID population in Kenya.

V. CONCLUSION

The study showed that the prevalence and nature of violence among the partners of PWID enrolled in the SHARP study differ for different genders and regions in Kenya. Physical violence was the most common form of violence reported among all participants while being threatened violence was more likely to occur among male participants, and sexual violence was significantly higher among female respondents. Participants living in Coastal Kenya experienced a higher risk of violence compared to those from Nairobi. Furthermore, there was strong evidence of an association between partner characteristics and

experiencing violence. Being female, being divorced/ separated /widow, and living in the Coastal region showed a higher risk of experiencing sexual victimization. Being MSM/MSMW, living on the Coast, not having a stable place to live, involving in a form of illegal employment, and not being on ART were more likely to have experienced violence compared to their reference categories. At last, it was found that gender was an effect modifier on the effect of partner characteristics on experiencing violence while HIV status was not. This study has raised many questions in need to conduct further studies and investigations to clarify the disparities and expand the theory. By using that information, we will be able to formulate effective public health interventions and tools, evidence-based decision-making, and policy recommendations to increase HIV care services among key populations while preventing the potential risk of violence.

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