



Violence, HIV Risks, and Polysubstance Use Among HIV-Positive People Who Inject Drugs in Ukraine

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Accepted: 16 December 2020 / Published online: 1 January 2021

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Abstract

Violence experience has been consistently associated with HIV risks and substance use behaviors. Although many studies have focused on intimate partner violence (IPV), the role of violence at a structural level (i.e., police abuse) remains relevant for people who inject drugs. This study evaluated the association of IPV and police-perpetrated violence experiences with HIV risk behaviors and substance use in a cohort of HIV-positive people who inject drugs in Ukraine. We also evaluated possible moderation effects of gender and socioeconomic status in the links between violence exposure and HIV risk and polysubstance use behaviors. Data came from the Providence/Boston-CFAR-Ukraine Study involving 191 HIV-positive people who inject drugs conducted at seven addiction treatment facilities in Ukraine. Results from logistic regressions suggest that people who inject drugs and experienced IPV had higher odds of polysubstance use than those who did not experience IPV. Verbal violence and sexual violence perpetrated by police were associated with increased odds of inconsistent condom use. The odds of engaging in polysubstance use were lower for women in relation to police physical abuse. We found no evidence supporting socioeconomic status moderations. Violence experiences were associated with substance use and sexual HIV risk behaviors in this cohort of HIV-positive people who inject drugs in Ukraine. Trauma-informed prevention approaches that consider both individual and structural violence could improve this population's HIV risks.

Keywords Intimate partner violence · Police violence · Polysubstance use · HIV risk

Resumen

La experiencia de violencia se ha asociado sistemáticamente con las conductas de riesgo para la adquisición o transmisión del VIH y con el uso de sustancias. Aunque muchos estudios se han centrado en la violencia infligida por la pareja íntima

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(VPI), el papel de la violencia estructural (es decir, el abuso policial) sigue siendo relevante para las personas que se inyectan drogas. Este estudio evaluó la asociación entre las experiencias de violencia perpetrada por la policía y la pareja íntima con los conductas de riesgo para la adquisición o transmisión del VIH y el uso de sustancias en una cohorte de personas VIH positivas que se inyectan drogas en Ucrania. También evaluamos los posibles efectos de moderación del género y el estatus socioeconómico entre la exposición a la violencia y los comportamientos de riesgo para la transmisión del VIH y uso de múltiples sustancias. Los datos provienen del estudio Providence / Boston-CFAR-Ucrania en el que participaron 191 personas infectadas por el VIH que se inyectan drogas, realizado en siete centros de tratamiento de adicciones en Ucrania. Los resultados de las regresiones logísticas sugieren que, en comparación con las personas que se inyectan drogas que no experimentaron IPV, las que experimentaron IPV tenían mayor probabilidad de uso de múltiples sustancias. La violencia sexual perpetrada por la policía se asoció con mayores probabilidades de un uso inconsistente del condón. No encontramos evidencia que apoye las moderaciones de género o estatus socioeconómico. Las experiencias de violencia se asociaron con el uso de sustancias y las conductas sexuales de riesgo para la transmisión del VIH en esta cohorte de personas VIH positivas que se inyectan drogas en Ucrania. Los enfoques de prevención basados en las experiencias traumáticas que tienen en cuenta tanto la violencia individual como la estructural podrían mejorar las conductas de riesgo para la transmisión del VIH de esta población.

Introduction

Ukraine faces one of the fastest-growing HIV/AIDS epidemics in Europe [1]. An estimated 240,000 persons, about 1% of the adult population, live with HIV in Ukraine [2]. At 0.29 new HIV infections per 1000 uninfected people each year, it has the second-highest HIV incidence rate in Europe [3, 4]. Globally [5–7] and in Ukraine [8], HIV transmission disproportionately occurs among key populations, particularly people who inject drugs and their sex partners. Unsafe drug use [9] and sexual transmission [7, 10] are two primary routes of HIV transmission in Eastern Europe in this population, underscoring the importance of identifying correlates of these two HIV risk categories to disrupt further spread of HIV.

Violence Exposure as a Factor for HIV Risk Behaviors

The risk environment framework [11] suggests that interpersonal and broader socioenvironmental contexts generate barriers to and facilitators of individual HIV risk behaviors [12–15]. Violence exposure, such as intimate partner violence (IPV), may represent a key risk factor embedded in social contexts that shape individuals' HIV risk behaviors. IPV refers to physical, sexual, and psychological aggression and abuse that intimidates or controls another in an intimate relationship [16, 17]. Problematic substance use behaviors have been frequently reported as a maladaptive coping mechanism in response to distress associated with IPV exposure [18, 19]. Consistently, higher rates of unhealthy alcohol use and unsafe substance use, such as binge drinking in the general population [18, 20] and the use of contaminated needles among people who inject drugs [21], have been reported among IPV survivors compared to those without IPV exposure. Similarly, IPV survivors may have less control over sexual activities and be less empowered to promote healthy

sexual practices [22], such as negotiating condom use with partners [18]. Consistently, IPV exposure has been linked to increased sex risk behaviors in general populations [23].

Importantly, from an ecological perspective [24], violence at a structural level can contribute to the HIV risk environment [11, 25], particularly among people who inject drugs. Violence at a structural level refers to the socioenvironmental context that is beyond individuals' direct control such as police violence [11, 25]. Studies from Eastern Europe have documented that people who inject drugs frequently encounter punitive police practices [26], including physical, verbal, and sexual violence [27–29]. The prevalence of police violence is elevated in Ukraine, triggered by overall socioeconomic instability and its induced aggression, violence, and war in the region [30]. Consistent with findings from studies in Eastern Europe [26], police violence disproportionately affects people who inject drugs, particularly those who are HIV positive in Ukraine. They are often confronted with police violence on their way to or from service venues, including syringe-exchange sites, pharmacies legally selling sterile injection equipment [31], and HIV and addiction clinics [25, 32, 33]. In an earlier study of people who inject drugs in Odesa, Ukraine, 86% reported coercive experiences with police, including paying police to avoid arrest and being threatened by police to provide information on other people who inject drugs [29]. Another study showed that 58.5% of HIV-positive people who were recently released from prison have been detained without charges and 85.2% of those in addiction care clinics were detained on their way to or from a care site in Ukraine [32].

As is the case with exposure to IPV, experiences or expectations of police violence may generate substantial distress among violence survivors, which may trigger substance use and sexual risk behaviors. Empirical studies have consistently reported that police violence is associated with increased rates of binge drinking [34], needle sharing [28],

and inconsistent condom use or coercion into unprotected sex [35, 36]. However, limited recent data are available concerning the potential role of IPV and police violence in HIV risk behaviors and polysubstance use among people who inject drugs in Ukraine. Polysubstance use, the concurrent or sequential use of more than one drug or type of drug [37], is particularly relevant to HIV harm reduction efforts among people who inject drugs, considering that polysubstance use has been associated with adverse outcomes regarding the treatment of substance use disorders [38, 39] and with sexual risk behaviors [40].

Moderating Effects: Socioeconomic Status and Gender

Holding a social status of less power and fewer resources in a given society may exacerbate the association between violence exposure and HIV risk behaviors [41]. Gender and socioeconomic status (SES), for example, fundamentally shape the probability of risk exposure of any type [42–44]. Further, consequences of exposure might be worse for those who hold less privileged status, because access to personal and social resources are often structured unfavorably for those who hold a less privileged position in these two potent social status markers [45–48].

Consistently, empirical studies have reported that female gender and lower economic resources are associated with elevated violence exposure and vulnerability globally [49, 50] and in this region [51]. In Ukraine, 33% of women experience IPV, compared to 23% of men [52]. Similarly, in Ukraine, sexual violence perpetrated by police almost exclusively affects women who inject drugs (13.1% vs. 1.4% of their male counterparts) [53]. Further, women may suffer more consequences subsequent to violence exposure [41], as evidenced by increased rates of alcohol use disorders [54] and marijuana use [55] than male IPV survivors. Similarly, violence survival has been recognized as a critical factor for HIV risks, particularly among women [56, 57]. As such, it is plausible that associations of violence with HIV risk and its related problematic substance use might be more evident among HIV-positive women who inject drugs than their male counterparts. Gender differences may emerge even more prominently in cultural contexts that hold strong patriarchal values at a societal level, such as Ukraine [58, 59].

SES might be another moderator of differential risk exposures and vulnerability for HIV-positive people who inject drugs. Food insecurity or living in poverty may function as an additional source of distress and risk for HIV-positive people who inject drugs [60]. With limited disposable economic resources among those with lower income, substance use may represent an option to cope with economic distress [61–63]. Moreover, economic vulnerability among IPV survivors with low SES may increase economic dependence

on their abusive partners [64] and further decrease negotiation power and control over sexual practices [65]. Possible contributions of SES to the linkage between violence and HIV risk behaviors might be particularly relevant to Ukraine, which has experienced drastic economic disruption and uncertainty [66].

Current Study

Few data from Ukraine are available on the relationships among IPV, police violence, HIV risk behaviors, and polysubstance use among HIV-positive people who inject drugs or the possible roles of gender and SES in these associations. To address these research gaps, the current study addressed the following research aims:

- (1) To assess the association of IPV and police violence with HIV risk behaviors (i.e., recent injection drug use and inconsistent condom use) and polysubstance use.
- (2) To explore female gender and low SES as potential moderators of the relation between violence exposure and HIV risk behaviors and polysubstance use.

Methods

Study Design, Setting, Participants, and Procedures

The Providence/Boston-CFAR-Ukraine study consecutively recruited and enrolled 191 HIV-positive people who inject drugs from July through September 2017 at seven health care facilities in six regions of Ukraine, including three facilities providing opioid agonist therapy only (two sites in the Kyiv region and one in the Mykolaiv region) and four facilities providing colocated opioid agonist therapy and HIV treatment services (in the Dnipro, Lviv, Odesa, and Cherkasy regions). Of note, possible site differences by the type of care provision (i.e., addiction treatment only vs. addiction treatment with colocated HIV care) were evaluated in a prior study and no systematic site differences were found [67]. An on-site research assistant screened patients referred by their health provider for eligibility, invited eligible patients to enroll in the study, obtained informed consent, and administered a face-to-face interview using Research Electronic Data Capture in a private and confidential location at the clinics. Eligibility criteria included: (a) 18 years or older; (b) lifetime history of injecting drugs; (c) HIV-positive status; (d) currently receiving opioid agonist treatment; (e) fluent in Russian or Ukrainian; and (f) able to provide informed consent. Researchers initially approached 198 potential participants. Of the 198 people, 191 met the eligibility criteria and agreed to participate in the study. Survey measures were administered in either Russian or Ukrainian, depending on

participants' preference. Participants received 200 Ukrainian hryvnia (\$8 U.S. dollars at the time of the study) in cash as compensation for their time and transportation costs. Further details on the study design, study sites, and sampling procedures can be found elsewhere [67]. The institutional review boards at the affiliated institutes approved all study procedures.

Measures

Outcome Measures

Polysubstance Use This measure [68, 69] was based on three dichotomized items assessing past-30-day injection substance use [heroin, opioids (codeine, street methadone, krokodil, shirka), or heroin mixed with stimulants (crack)]; past-12-month risky drinking (AUDIT-C score above four for men and above three for women); and current cigarette use. We summed the resultant dichotomous outcomes into a composite variable and defined use of more than two types as polysubstance use.

HIV Risk Behaviors HIV risk behaviors were measured with two items [68, 69], recent injection drug use and inconsistent condom use. Injection drug use was assessed as number of days of reported injection drug use in the past 30 days (i.e., at least 1 day). Inconsistent condom use was assessed as having any sex without a condom in the past 12 months.

Predictors

Intimate Partner Violence IPV was measured with three dichotomized items [70]: “In the past 12 months, has a partner threatened you with violence, pushed or shoved you, or thrown something at you that could hurt?”; “Have you had an injury, such as a sprain, bruise, or cut because of a fight with a partner?”; and “Has a partner insisted on or made you have sexual relations with him/her when you didn't want to?” Any positive response was considered as having IPV experience.

Police Verbal Violence We assessed lifetime experience of verbal violence from police [71] with one item: “Has a police officer verbally abused you?” Any positive response was considered as experiencing police verbal violence.

Police Physical Violence Lifetime police physical violence was measured with one item: “Have you been beaten by a police officer?” Any positive response was considered as experiencing police physical violence.

Police Sexual Abuse Lifetime experience of sexual abuse perpetrated by police [71] was assessed with two items:

“Have you ever been forced to have sex with a police officer?” and “Have you been forced by a police officer to have sex with other people?” Any positive response was considered as having police sexual abuse exposure.

Moderators

Moderators included gender and per capita household income dichotomized at the sample median income (1,666 Ukrainian hryvnia) as a proxy variable for SES.

Covariates

Covariates in each model included age in years ($M=39.96$, $SD=6.93$). For the model predicting HIV risk behavior (i.e., injecting drugs or inconsistent condom use), we added the covariates of past-12-month risky drinking, assessed using AUDIT-C.

Analysis

We used logistic regression for models with dichotomous outcome variables. First, to evaluate the association of IPV, police verbal or physical violence, and police sexual violence with polydrug use and HIV risks, three logistic regressions were estimated for each outcome measure. Second, we evaluated possible gender moderation by testing interaction terms between gender and each violence measure (i.e., IPV \times gender; police verbal or physical violence \times gender; and police sexual violence \times gender). Finally, we evaluated possible SES moderation by testing interaction terms between income and each violence measure. All covariates were included in each model. For the HIV risk behavior variables, risky drinking was added as a covariate. We conducted all analyses using SPSS version 25.

Results

Table 1 presents descriptive statistics. In this sample, about three fourths of participants were male, reflecting the demographics of people who inject drugs in Ukraine. About one third reported using more than two drugs in the past 12 months, and more than half were engaged in HIV risk behaviors by either injecting drugs or inconsistently using condoms. Approximately 14% of both men and women experienced IPV. Most participants in this sample reported experiencing verbal (83.2%) or physical (77.4%) violence

Table 1 Descriptive statistics of study variables in overall sample and by gender and income level

	Full sample (<i>N</i> = 191) <i>n</i> (%) or <i>M</i> (<i>SD</i>)	Gender		Income	
		Male	Female	Above median ^a	Below median ^a
		(<i>n</i> = 143) <i>n</i> (%) or <i>M</i> (<i>SD</i>)	(<i>n</i> = 48) <i>n</i> (%) or <i>M</i> (<i>SD</i>)	(<i>n</i> = 97) <i>n</i> (%) or <i>M</i> (<i>SD</i>)	(<i>n</i> = 94) <i>n</i> (%) or <i>M</i> (<i>SD</i>)
Polysubstance use (≥ 2 substances)	61 (31.9)	48 (33.6)	13 (27.1)	28 (28.9)	33 (35.1)
HIV risks					
Injecting drugs	45 (23.7)	35 (24.6)	10 (20.8)	20 (20.6)	25 (26.9)
Inconsistent condom use ^a	73 (47.1)	54 (45.8)	19 (51.4)	37 (45.1)	36 (49.3)
IPV (ever during past 12 months) ^b	26 (13.7)	20 (14.1)	6 (12.5)	17 (17.5)	9 (9.7)
Police verbal violence (lifetime) ^b	158 (83.2)	123 (86.6)	35 (72.9)	81 (83.5)	77 (82.8)
Police physical violence (lifetime) ^b	147 (77.4)	122 (85.9)	25 (52.1)	76 (78.4)	71 (76.3)
Police sexual violence (lifetime) ^b	13 (6.8)	1 (0.7)	12 (25.0)	6 (6.2)	7 (7.0)
Age	39.96 (6.93)	39.95 (7.28)	40.00 (5.82)	38.84 (5.96)	41.13 (7.66)
Per capita household income (below median) ^c	94 (49.2)	71 (49.7)	23 (47.9)	–	–
Risky drinking ^{b,d}	46 (24.1)	35 (24.6)	11 (11.9)	24 (24.7)	22 (23.7)

^a*n* = 155^b*n* = 190^c 1666 Ukrainian hryvnia^d AUDIT-C score ≥ 3 for women, ≥ 4 for men

from police. Police sexual violence was almost exclusively reported by women.

Violence Exposure, Polysubstance Use, and HIV Risk Behaviors

Models 1, 4, and 7 focused on the main effect of IPV and police violence on outcome measures (Table 2). Compared to people who experienced no IPV, those who experienced IPV had almost three times higher odds of using more than two drugs (AOR 2.74, 95% CI 1.15, 6.51). IPV was not associated with HIV risk behaviors (i.e., injecting drugs or inconsistent condom use). Police verbal abuse was associated with inconsistent condom use (OR 2.71, 95% CI 1.10, 6.70). Sexual violence from police was associated with an almost sixfold increase in odds of inconsistent condom use (OR 5.88, 95% CI 1.23, 28.09).

Gender and SES Moderation

We assessed whether female gender and lower income moderated the detrimental impacts of violence exposure on outcome measures. We evaluated gender interaction terms first (Table 2, Model 2 for polysubstance use, Model 5 for injecting drugs, and Model 8 for inconsistent condom use). Next, income interaction terms were evaluated (Table 2, Model 3 for polysubstance use, Model 6 for injecting drugs, and Model 9 for inconsistent condom use). Gender differences emerged in relation to polysubstance use. The odds

of engaging in polysubstance use were lower for women in relation to police physical abuse (OR 0.27, 95% CI 0.07, 0.96). We found no evidence for SES differences.

Discussion

The current study evaluated the extent to which IPV and police violence experiences were associated with HIV risk behaviors—namely, injection drug use, unprotected sex, and polysubstance use. We also explored potential gender and SES differences in these associations.

Consistent with prior studies of violence and substance use in other contexts [18, 20, 21], this study's findings suggest that IPV experience is associated with increased odds of polysubstance use among HIV-positive people who inject drugs in Ukraine. Major stressors such as IPV may increase reliance on substance use for immediate relief to cope with distress triggered by IPV [18]. More adaptive options to address distress associated with IPV, such as seeking professional counseling or support from family and friends, might be perceived as financially expensive or socially challenging [72]. HIV-positive people who inject drugs have two highly stigmatized characteristics—substance use [73] and HIV-positive status [74]. Because HIV-positive people who inject drugs live at the intersection of these stigmata [67], they might be less likely to disclose their experience of IPV, another socially stigmatized experience [75], to others to seek help. Particularly, when IPV survivors live in a society

Table 2 Logistic regressions of IPV and police violence predicting polysubstance use and HIV risk behaviors

	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
<i>Polysubstance use</i>						
Main predictor = IPV						
IPV	2.74*	1.15, 6.51	3.41*	1.25, 9.25	2.36	0.57, 9.66
IPV × gender			0.38	0.04, 3.05		
IPV × income					1.40	0.23, 8.19
Main predictor = police verbal violence						
Police verbal abuse	1.17	0.50, 2.73	1.34	0.45, 4.03	1.58	0.46, 5.44
Police verbal abuse × gender			0.59	0.10, 3.57		
Police verbal abuse × income					0.55	0.10, 3.01
Main predictor = police physical violence						
Police physical abuse	0.83	0.40, 1.70	0.98	0.47, 2.04	0.54	0.20, 1.46
Police physical abuse × gender			0.27*	0.07, 0.96		
Police physical abuse × income					2.53	0.56, 11.30
Main predictor = police sexual violence						
Police sexual violence	0.38	0.08, 1.81	4.06E+09	0.00, –	0.29	0.03, 2.59
Police sexual violence × gender			0.00	0.00, –		
Police sexual violence × income					1.71	0.07, 37.70
	Model 4		Model 5		Model 6	
<i>Injecting drugs</i>						
Main predictor = IPV						
IPV	1.68	0.67, 4.22	1.71	0.60, 4.81	2.96	0.69, 12.56
IPV × gender			0.93	0.10, 7.99		
IPV × income					0.44	0.06, 2.93
Main predictor = police verbal abuse						
Police verbal abuse	1.03	0.40, 2.63	0.71	0.22, 2.25	1.41	0.35, 5.67
Police verbal abuse × gender			2.60	0.32, 20.97		
Police verbal abuse × income					0.52	0.07, 3.48
Main predictor = police physical abuse						
Police physical abuse	1.06	0.46, 2.43	0.87	0.27, 2.75	0.77	0.26, 2.32
Police physical abuse × gender			1.35	0.21, 8.66		
Police physical abuse × income					2.21	0.38, 12.64
Main predictor = police sexual violence						
Police sexual violence	0.66	0.13, 3.21	1.025E+10	0.00, –	0.49	0.05, 4.40
Police sexual violence × gender			0.00	0.00, –		
Police sexual violence × income					1.86	0.08, 42.99
	Model 7		Model 8		Model 9	
<i>Inconsistent condom use</i>						
Main predictor = IPV						
IPV	1.42	0.57, 3.52	2.34	0.83, 6.59	4.40 ⁺	0.82, 23.47
IPV × gender			0.08 ⁺	0.00, 1.08		
IPV × income					0.17 ⁺	0.02, 1.32
Main predictor = police verbal abuse						
Police verbal abuse	2.71*	1.10, 6.70	2.45	0.78, 7.62	2.10	0.61, 7.20
Police verbal abuse × gender			1.69	0.24, 11.58		
Police verbal abuse × income					1.75	0.27, 11.01

Table 2 (continued)

	Model 7		Model 8		Model 9	
Main predictor = police physical abuse						
Police physical abuse	1.36	0.61, 3.02	1.48	0.44, 4.93	2.60	0.79, 8.53
Police physical abuse × gender			1.28	0.21, 7.85		
Police physical abuse × income					0.29	0.05, 1.47
Main predictor = police sexual violence						
Police sexual violence	5.88*	1.23, 28.09	1.86E+09	0.00, –	6.28 ⁺	0.70, 55.84
Police sexual violence × gender			0.00	0.00, –		
Police sexual violence × income					0.84	0.03, 19.40

All covariates were controlled for in all models

⁺ $p < .10$, * $p < .05$, ** $p < .01$

with a more permissive attitude toward IPV, as seems the case in Ukraine [76], seeking professional counseling or support from families and friends can be challenging. Exploring intersectional stigma as a possible mechanism linking IPV and substance use might advance our understanding of the association between IPV and polysubstance use.

The current findings also suggest that police violence is associated with HIV risk behaviors, especially inconsistent condom use and polysubstance use. This study confirmed that sexual violence perpetrated by police in Ukraine primarily affects women who inject drugs (25% vs. 0.7% of men) [53]. This study's findings are also in line with prior studies reporting heightened sexual risk behaviors among those exposed to police violence [34–36, 77]. The police's authority to arrest people who inject drugs creates inequity in power that makes people who inject drugs vulnerable to various forms of abuse, including sexual violence. Experiencing sexual violence in such fundamentally power-imbalanced interactions may increase disempowerment and helplessness among violence survivors [27], which can further compromise their negotiation capacity with sexual partners regarding protective sexual practices [18, 22].

In this cohort, neither IPV nor police violence measures were associated with injection drug use, suggesting that violence exposure might be a particularly important risk factor for polysubstance use and inconsistent condom use. However, our violence measure only assessed any lifetime exposure to violence rather than severity or frequency. Because police violence against people who inject drugs, for example, is particularly prevalent, measures of any lifetime experience may need to be revisited. Rather, probing diverse dimensions of police violence exposure, such as timing, frequency, severity, or accumulation of exposure over time,

may be a fruitful direction in future studies to further clarify the role of violence in injection drug use in this specific population in Ukraine.

We found evidence for gender moderation in the association of police physical violence with polysubstance use. Moderation analyses could identify subgroups of HIV-positive people who inject drugs, had violence exposure, and have particularly heightened vulnerabilities to polysubstance use and HIV transmission-related risk behaviors. In contrast to prior studies documenting heightened alcohol use disorders [54] or marijuana use [55] among female IPV survivors relative to male survivors, in this cohort, men who had experienced police physical violence had higher odds of polysubstance use. These findings may provide support for the gender socialization hypothesis [78] and gendered-strain theory [79], which postulate that women's maladjustment profiles tend to take an inward format (e.g., depression) rather than outward format (e.g., substance use), because externalizing behavior problems, such as substance use, are not aligned with gendered behavioral norms. Possible influences of gendered behavioral norms might be more prominent in cultural contexts where traditional gendered norms are strongly held at a societal level, such as Ukraine [58, 59].

Alternatively, our findings might be due to inadequate representation of women. Although this study reflects the gender distribution of people who inject drugs in Ukraine, women were relatively less represented in our study sample ($n = 48$; 25.1%), which is different than studies reporting worse consequences of violence exposure for women—those studies had either similar representation across genders [55] or overrepresentation of women [54]. Further, IPV, widely known to be higher among women in Ukraine [52], was higher among men in this cohort, which was unexpected.

Relatedly, our analyses of sexual violence perpetrated by police, which disproportionately affected women in this cohort and other settings [53], were limited by the smaller number of female participants, likely contributing to a very large confidence interval associated with police sexual violence. Because women are more likely to be exposed to IPV [52] and sexual police violence [53, 80–82], oversampling HIV-positive women who inject drugs and having a gender-balanced sample could further explicate these issues in cultural contexts such as Ukraine, where an IPV-permissive attitude toward women remains pervasive [58, 59].

We found no evidence for income moderation. The study's findings suggest that IPV victimization and police sexual violence might equally affect HIV-transmission behaviors regardless of income level. As such, intervention strategies in Ukraine may need to involve HIV-positive people who inject drugs across varying income levels.

Our study findings should be contextualized in light of their methodological limitations. First, this study used cross-sectional data, limiting our ability to rule out reverse causality. Prospectively evaluating violence exposure and its temporality in determining HIV risks will further clarify the role of violence. Specifically, a longitudinal framework can open an opportunity to evaluate joint and unique impacts of violence in varying developmental epochs. Childhood violence exposure—for example, child abuse—has been associated with increased substance use [83, 84] and risky HIV sexual behaviors [84, 85], and seems to intersect with IPV exposure during adulthood to increase the risk of unhealthy alcohol use [86]. Second, self-report surveys may introduce social desirability bias, due to the sensitive nature of and stigma associated with drug use and sex risk behaviors. Third, the clinic-based convenience sampling approach limited sample representativeness. Fourth, our polysubstance use measure specifically focused on the two most prevalent legal substances and those typically administered via injection, considering the importance of this type of substance administration among people who inject drugs. Expanding the measure of polysubstance use might be a fruitful future direction to advance our understanding of complex substance use behaviors among people who inject drugs. Fifth, due to the overall limited sample size, we evaluated each violence measure separately, rather than including all measures in one model. With our current modeling strategy, we couldn't delineate a unique association of each violence measure with polysubstance use and HIV risk behaviors. To address this concern, we estimated associations among the three violence measures (i.e., IPV and police verbal or physical abuse, IPV and police sexual abuse, and police verbal or physical abuse and police sexual abuse). None of the phi coefficients was statistically significant, suggesting no substantial overlap in associations between the three violence measures. Finally, we examined possible gender and SES moderation effects

separately, but could not explore the potential intersectionality of gender with SES. People typically identify with multiple categories of social disadvantage (e.g., low SES and female gender). A better understanding of the intersection of multiple socially disadvantaged statuses [87] could add to the analysis of violence exposure and HIV risk behaviors.

Conclusions

This study adds the following conclusions to the existing literature on violence and HIV risk. First, it focused on HIV-positive people who inject drugs in Ukraine and thus, provides empirical evidence supporting the risk environment framework [11] and ecological perspective [24] in prevention efforts to disrupt further spread from this high-risk group to the general population. Second, this study focused on polysubstance use, which is particularly relevant to people who inject drugs [38, 39], and their HIV risks, such as sexual risk behaviors [40]. Third, we tested gender and SES differences to further clarify the linkage between violence exposure and HIV risk transmission-related behaviors.

In conclusion, this study's findings support the link between violence experiences at both individual and structural levels with HIV risks among HIV-positive people who inject drugs in Ukraine. Consistent with prior studies [13, 88], our study findings might imply that the risk environment, specifically IPV and police sexual violence, is linked to HIV transmission from key populations and their sex partners to the general population in Ukraine. Consequently, efforts targeting this key population should aim to create enabling [89] or structural [90] HIV prevention strategies that account for social and environmental contexts that HIV-positive people face [12–14]. Primary prevention strategies to reduce IPV and police sexual violence [13, 88] could include public education regarding IPV to counter permissive attitudes toward IPV in Ukraine [81]. Further, police training with a focus on HIV prevention and occupational safety needs to be implemented for the benefit of people who inject drugs [91] and to increase police perpetrators' awareness of victims' traumatization and HIV risks [92, 93]. Relatedly, the globally and regionally pervasive stigma regarding substance use leads police to perceive people who inject drugs as potential criminals [94] and fuels a punitive policing approach to limiting drug use [95]. As such, coupled with effective police training, public health messaging about drug use as a chronic health condition [96] may be useful to improve attitudes of the general public and police together [97] and reduce police violence in Ukraine. Further, this study's findings indicate the need for trauma-informed HIV prevention. Routine screening for interpersonal and structural violence experiences of HIV-positive people who inject drugs could

increase health professionals' understanding of their risk environment and help providers further tailor needed mental health services for violence survivors. Taken together, a multipronged trauma-informed approach has the potential to reduce risks among HIV-positive people who inject drugs and protect their human rights.

Acknowledgements We would like to extend our gratitude to an associate professor of medicine at Universitat Autònoma de Barcelona, Dr. Daniel Fuster, MD, PhD, for his help with translating the abstract into Spanish. We would also like to extend our gratitude to study participants for their contribution to the study.

Author Contributions JOL originated the study, guided data analyses, led the writing of the article, and coordinated drafting of the manuscript among co-authors; YY finalized the literature review, conducted analyses, and drafted the method and result sections, including tables; BI contributed to the data collection, organized the database, and contributed to the analysis framework; TK, OM, YS, and SB designed and led implementation of data collection and management; KC conducted the literature search with a focus on intimate partner violence and outcome measures; SFS conducted the literature search with a focus on police violence and outcome measures; PSN, NH, TF, JHS, and JL contributed to the interpretation of the study findings and provided important intellectual input; KL contributed to the conceptualization of the study, secured the funding, led the data collection, and contributed to the interpretation of findings. In addition, all authors have been involved in drafting the manuscript and revising it critically for important intellectual content. All authors read and approved the final manuscript.

Funding This study was supported by National Institute of Allergy and Infectious Diseases (Grant No. P30AI042853) and National Institute on Drug Abuse (Grant Nos. K99DA041245, R00DA041245, and a NIDA INVEST fellowship). The funding agencies played no role in any aspects of the current study, including the design, data collection, data analysis, and interpretation of the study and the decision to submit this manuscript for publication.

Data Availability The datasets analyzed during the current study are not publicly available due to our compliance with the IRB regulations for the current study but are available from the corresponding author on reasonable request.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study procedures for the current study were approved by the Institutional Review Board at the affiliated institutes, Boston Medical Center, and the Ukrainian Institute on Public Health Policy.

Informed Consent All study participants provided informed consent.

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