

RESEARCH

Open Access



# Prevalence and predictors of condom use among people who inject drugs in Georgia

Maia Kajaia<sup>1,2\*</sup>, Maia Butsashvili<sup>2</sup>, Jack A. DeHovitz<sup>3</sup>, George Kamkamidze<sup>2</sup>, Lasha Gulbiani<sup>2</sup>, Tinatin Abzianidze<sup>2</sup> and Mamuka Djibuti<sup>4</sup>

## Abstract

**Background** People who inject drugs (PWID) are more likely to engage in unsafe sexual behavior placing them at high risk of acquiring HIV and other STIs. This study aims to assess the prevalence and predictors of inconsistent condom use with casual and/or paid sexual partners among PWID in Georgia.

**Methods** Integrated Bio-Behavioral Surveillance Survey was conducted among PWID in seven major cities of Georgia. Study design was cross-sectional with respondent-driven sampling (RDS) methodology. Data collection was carried out through individual face-to-face interviews. Of the 2005 PWID who participated in the study, we analyzed a subsample of 619 (30.9%) who reported having casual and/or paid sexual partners during the last 12 months and described prevalence and predictors of consistent condom use.

**Results** Consistent condom use during casual and/or paid sex in past 12 months was reported by 49.4% of respondents. The likelihood of consistent use with casual and/or paid sexual partners was statistically significantly associated with residence, family income, drug use frequency, drug dependence and HIV risk self-perceptions. In multivariable analysis independent predictors of always using condom at casual/paid sex during the last 12 months were place of residence (aOR=6.4; 95% CI: 3.2–12.7), family income (aOR=2.1; 95% CI: 1.3–3.5) and drug use frequency (aOR=0.6; 95% CI: 0.4–0.9).

**Conclusion** The study revealed low prevalence of consistent condom use with casual and/or paid sexual partners among PWID in Georgia. Integration of safe sex educational interventions in harm reduction services may improve the rates of condom use among PWID and should focus PWID with lower socio-economic status and residing outside capital city.

**Keywords** Condom, PWID, HIV, Unsafe, Behavior, Consistent

\*Correspondence:

Maia Kajaia  
maiko.kajaia@gmail.com

<sup>1</sup>Ivane Javakhishvili Tbilisi State University, 1 Chavchavadze Ave,  
Tbilisi 0179, Georgia

<sup>2</sup>Health Research Union (HRU), 8 Nutsubidze Street, Tbilisi 0177, Georgia

<sup>3</sup>SUNY Downstate Health Sciences University, 450 Clarkson Ave, Brooklyn,  
NY 11203, USA

<sup>4</sup>Partnership Research Action Health (PRAH), 3 B. Zghenti Street, Tbilisi,  
Georgia



This is a U.S. Government work and not under copyright protection in the US; foreign copyright protection may apply 2025. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## Introduction

Georgia is considered a low HIV prevalence country (estimated 0.4% HIV prevalence in the adult population) with cases of HIV infection concentrated among key affected populations including people who inject drugs (PWID) [1]. The country has one of the highest rates of injection drug use in the world [2]. National prevalence estimates for injection drug use are 2.23% in 18–64 years old population, and 1.39% in general population [3]. According to Georgian AIDS and Clinical Immunology Research Center 32.6% of HIV cases are among PWID [4].

Although parenteral exposure resulting from unsafe injection behavior is the main cause of HIV infection in people who inject drugs (PWID) [5, 6], a significant proportion of HIV infection in this population is sexually transmitted [7, 8]. In recent years, sexual transmission has become the predominant mode of HIV spread in Georgia. Initially, injection drug use was the primary route; however, since 2012, sexual transmission has surpassed it. In 2024, heterosexual transmission accounted for 52.4% of all cases, and heterosexual transmission among MSM constituted 13.7% of total cases identified that year [4]. PWID are more likely to engage in unsafe sexual behavior, placing them at high risk of acquiring HIV and other sexually transmitted infections (STIs), as well as subsequent transmission to non-drug-using sexual partners [9–13]. Correct and consistent use of condoms is an effective measure of preventing transmission of STIs including HIV [14–16]. While, condom use is one of the main interventions to prevent HIV infection for key affected populations and general public [17–19], interventions among PWID are mainly focused on reduction of injection risk behaviors [20, 21]. Unsafe injection practices can be significantly reduced with such interventions, but unsafe sexual behavior among PWID is difficult to modify [22, 23] and multiple studies show high rates of unprotected sex among PWID [10, 24–27]. Although biomedical prevention strategies such as pre-exposure prophylaxis (PrEP) and treatment as prevention (TasP) have been shown to be highly effective in preventing HIV transmission [28, 29], these approaches are not widely utilized among PWID in Georgia. PrEP is not commonly accessed by PWID, and existing data suggest that ART coverage and viral suppression rates among this population remain low, limiting the protective effects of TasP [30, 31]. Given this context, condom use remains the primary and most accessible method of HIV and STI prevention for PWID in Georgia. Therefore, addressing barriers to consistent condom use remains an urgent public health priority.

PWID can access HIV preventive services at Georgian Harm Reduction Network (GHRN) centers, which provide free services such as screening for HIV, hepatitis

B and C, syphilis, and tuberculosis, as well as sterile paraphernalia (various size syringes, needles, butterfly needles, alcohol pads, tourniquets, Naloxone, injection solutions), and sexual health supplies including condoms and lubricants. Additionally, educational materials (flyers, brochures, booklets) on HIV/AIDS and informational sessions are available. Despite the availability of harm reduction services, there are gaps in addressing sexual risk behaviors among PWID. While condoms and sexual health information are provided, data on their coverage and usage trends remain limited. Moreover, sexual risk behavior reduction counseling is not part of the existing harm reduction services, meaning that while condoms are distributed, there is no structured guidance on their consistent and effective use.

Given that PWID are at higher risk of HIV and other STIs compared to the general population they represent a vulnerable population who need specific approach addressing not only drug-related but also sexual risk behaviors. This study aims to assess the prevalence and predictors of inconsistent condom use with casual and/or paid sexual partners among PWID in Georgia.

## Methods

An Integrated Bio-Behavioral Surveillance Survey (IBSS) was conducted among PWID in seven major cities of Georgia: Tbilisi (capital city), Gori, Rustavi, Telavi, Batumi, Zugdidi, and Kutaisi. Study design was cross-sectional. Study participants were recruited by respondent-driven sampling (RDS) utilizing recruitment of research participants by other participants. The RDS method is based on social network theory and includes non-probability “snowball sampling” with mathematical modeling, which allows weighing the sample [32]. While respondent-driven sampling (RDS) was initially developed to generate population-based estimates, studies have shown that it often fails to achieve this goal, leading to biased estimates. Factors such as the influence of the initial seed sample, network homophily, and preferential recruitment contribute to these biases, limiting the accuracy of RDS-derived estimates. Despite these methodological challenges, RDS remains widely used worldwide as it provides a practical means to include hard-to-reach populations in research, particularly in epidemiologic studies on key populations at high risk for HIV and other infectious diseases [33–35].

The recruitment of study participants included a double incentive system: a primary reward for participating in the study and a secondary reward for recruiting other PWID into the study. The primary reward was 20 GEL (approximately 7 USD), and the secondary reward was 10 GEL (approximately 3.5 USD) for the inclusion of each new respondent in the study. Study participants were selected according to the following inclusion

criteria: age  $\geq 18$  years, drug injection practice at least once in the 30 days prior to the survey, residence in the selected cities where the survey was conducted, willingness and ability to give informed consent for study participation. The assessment of potential study participants for being PWID was done by informal interview addressing drug prices, slang names, preparation, and injection techniques. In addition, we assessed injecting drug use through visual inspection of objective signs, such as track marks, skin changes, or other physical indicators commonly associated with injection. Each eligible potential study participant was informed about the purpose, objectives, methods, procedures, risks, and benefits of the study. All individuals who agreed to participate in the study signed an informed consent form and then were enrolled in the study. We started RDS sampling by purposive selection of “seeds”—initial study subjects representing target population. Besides the study inclusion and exclusion criteria, additional factors were considered during the selection of “seeds”. Namely, “seeds” should have access to different groups of PWID, which ensured a diversity of the sample. Different ages, social and geographical characteristics were also considered during the selection of “seeds”.

The study included behavioral and biomarker components. The behavioral component data collection was carried out through individual, face-to-face interviews. The survey tool was a structured questionnaire collecting the following information: socio-demographic characteristics, injection practices, sexual behavior, use of HIV-preventive programs, and social factors related to drug use. The biomarker component of the study included testing of blood samples for HIV infection, hepatitis B and hepatitis C (the results of this component will be reported elsewhere).

Before initiation of field work, the study protocol and instruments were reviewed and approved by Institutional Review Board of Health Research Union (IRB00009520; IORG005619).

In total 2005 PWID participated in the study. In this paper we analysed a subsample of 619 PWID who reported having casual and/or paid sexual partners during the last 12 months and described prevalence and predictors of consistent condom use. “Casual sexual partner” was defined as a sexual partner who is not a regular partner and with whom a sexual relationship is established without financial compensation. “Paid sexual partner” was defined as a sexual partner with whom a sexual relationship is established in exchange for material remuneration (pays the partner or receives remuneration from the partner). “Consistent condom use” was defined as self-reported “always using condom” with casual and/or paid sexual partners during the last 12 months. Descriptive statistical methods were used to characterize

socio-demographics, sexual behavior and condom use of study population. In bivariate analysis study variables were compared between different study groups (participants who consistently used condoms and those who did not) using chi-square test for categorized data. Logistic regression model was used for multivariable analysis to identify independent predictors of consistent condom use. To construct the model, we employed stepwise regression. Initially, we assessed each variable for its unique contribution to the model. Variables that did not contribute were removed but were later reintroduced if they demonstrated a greater ability to explain variance in the dependent variable than during their initial inclusion. The criteria for including or excluding variables were determined based on p-value. We report unadjusted and adjusted odd ratios (aORs) with 95% Confidence Intervals (CIs). The p-value of  $<0.05$  was considered significant.

## Results

As noted above 619 PWID (30.7%) reported having casual and/or paid sex during the last 12 months. Almost all participants ( $n=612$ , 98.9%) were males. The age of the respondents ranged from 18 to 67 years (median age 39 years). The vast majority of the study participants were ethnically Georgian ( $n=605$ , 97.7%). 30.7% ( $n=190$ ) held a university degree. 33.6% ( $n=208$ ) of the surveyed PWID were married and almost two thirds ( $n=384$ , 62.0%) were unemployed. Most of the respondents ( $n=491$ , 79.4%) lived with their spouse/partner, parents, or relatives. Most of the study participants’ family income ( $n=210$ , 55.9%) was less than 700 GEL (270 USD) per month.

Table 1 describes sexual behavior and condom use with casual and paid sexual partners. Most of the respondents ( $n=491$ , 79.9%) had their first sexual intercourse before the age of 18. The median age of sexual debut was 16 years. The majority of surveyed individuals ( $n=396$ , 64.9%) had three or more sexual partners during the last 12 months. 329 (54.5%) of the study subjects reported using a condom during the last sexual intercourse with any sexual partner and 460 (74.3%) with casual and/or paid sex partner. Nearly two thirds of the interviewed PWID ( $n=375$ , 61.8%) indicated that were under the influence of drugs during the last sexual contact. Most of the study subjects ( $n=517$ , 83.5%) did not have any problems with obtaining condoms. Condom use during the last sexual intercourse was the result of a shared decision with the partner among 98 (46.4%) of PWID, in 68 (32.2%) - only the respondent’s decision, and in 29 (13.7%) - only the partner’s decision. The main reasons for not using a condom at last sexual contact were: “not considering necessary to use condoms” ( $n=9$ , 42.9%) and “not liking to use condoms” ( $n=5$ , 23.8%). Consistent condom use with casual and/or paid sex during the

**Table 1** Sexual behavior and condom use

Characteristics	Descriptive statistics		RDS estimates		
	N	%	%	95%CI	
				Lower	Upper
How old were you when you had the first sexual intercourse?					
< 18 years old	491	79.9	77.9	65.9	86.5
≥ 18 years old	112	18.1	18.8	11.0	30.1
Don't know	16	2.5	3.2	1.6	6.4
Median age of beginning sexual life (min-max)	16 (13–24)				
In total, with how many sexual partners have you had during the last 12 months?					
1	43	7.0	6.3	3.8	10.1
2	126	20.7	21.4	17.4	25.9
≥ 3	396	64.9	64.6	58.4	70.3
Don't know/ No response	45	7.4	7.8	4.9	12.0
Did you use a condom during the last sexual intercourse?					
Yes	329	54.5			
No	263	43.5			
Don't know/No response	12	2			
Did you use condom during the last casual and/or paid sexual intercourse?					
Yes	460	74.3	74.8	68.1	77.4
No	159	25.7	25.2	31.9	22.6
Were you or your sexual partner under the influence of drugs during the last sexual intercourse?					
Yes, I was	375	61.8	63.5	55.6	70.7
Yes, my sexual partner was	3	0.5	0.5	0.2	1.7
Yes, both me and my sexual partner were	32	5.3	5.5	3.5	8.7
No	153	25.2	22.4	15.8	30.7
Don't know/No response	44	7.2	7.9	3.9	14.8
Have you had any problem(s) obtaining condoms during the last month?					
Yes	21	3.4	3.3	2.0	5.5
No	517	83.5	83.9	77.0	89.0
Don't know	5	0.8	0.6	0.2	1.8
No response	76	12.3	12.1	7.4	19.1
Whose decision was to use condom during the last sex?					
My decision	68	32.2	27.7	16.1	43.4
Partner's decision	29	13.7	15.7	10.3	23.3
Shared decision	98	46.4	47.4	39.3	55.6
Don't know	16	7.6	9.1	4.6	17.1
Why you didn't use condom during the last sex?					
The partner refused	1	4.8	1.6	0.1	13.5
Don't like it	5	23.8	19.4	5.9	48.1
Don't think it was necessary	9	42.9	48.8	25.4	72.7
Didn't think of that	4	19	26.5	9.0	56.8
Other	1	4.8	3.4	0.4	22.3
Frequency of condom use with casual and/or paid sex partner(s) in last 12 months					
Always	306	49.4	48.0	38.7	57.5
Not always	313	50.6	51.9	42.4	61.3

last 12 months was reported by only 306 (49.4%) of the respondents.

By bivariate analysis the likelihood of consistent condom use with casual and/or paid sexual partner was statistically significantly associated with residence, family income, drug use frequency, drug dependence and HIV risk self-perceptions. The probability of always using condom during casual/paid sex was higher among the respondents residing in Tbilisi (73.2%) compared to those living in other regional cities (43.3%) (OR = 3.5; CI: 2.3–5.5). PWID with family income ≥ 500 GEL (approximately 200 USD) were more likely to use condoms consistently with casual/paid sexual partners than those with lower income (57.3% vs. 41.5%, OR = 1.8; 95% CI: 1.2–2.9). A lower proportion of the respondents who injected drugs frequently (once a week or more) always used condom at casual/paid sex compared to more rare injectors (once or several times per month) (46.7% vs. 56.5%; OR = 0.6; 95% CI: 0.4–0.9). PWID who didn't perceive themselves as drug dependent (56.0%) were more likely to report consistent condom use at casual/paid sex, than those who did (45.8%) (OR = 1.5; 95% CI: 1.1–2.1). HIV risk self-perception was also associated with consistent condom use, as higher percentage of the respondents who thought that they were under the risk of contracting HIV were always using condom with casual/paid sexual partners, compared to those who didn't consider themselves at risk of HIV (50.8% vs. 35.7%; OR = 1.8; 95% CI: 1.1–3.2) (Table 2).

In multivariable analysis independent predictors of always using condom at casual/paid sex during the last 12 months were place of residence (aOR = 6.4; 95% CI: 3.2–12.7), family income (aOR = 2.1; 95% CI: 1.3–3.5) and drug use frequency (aOR = 0.6; 95% CI: 0.4–0.9) (Table 2).

## Discussion

This study revealed high levels of unsafe sexual behavior among PWID in Georgia. The findings indicate that substantially higher proportion of the interviewed PWID had multiple sex partners (64.9% had ≥ 3 sexual partners) compared to other studies conducted in different countries where this indicator varied between 14 and 47% [36–40]. We also found a high prevalence of unprotected last sexual intercourse with any type of sexual partner among PWID, and this finding is consistent with other studies [41–44].

Consistent condom use during casual and/or paid sex was reported only by 49.4% of PWID. Other studies also showed the high rates of inconsistent condom use among PWID [24, 44–47]. Low rates of consistent condom use among PWID can be a consequence of sex under influence of drugs. Many PWID take drugs before sexual intercourse which can influence their decision and negotiation with partner on condom use. One important

**Table 2** Predictors of consistent condom use with casual and/or paid sexual partners

Characteristics	Consistent condom use with casual and/or paid sex partners		OR; 95% CI	P value	aOR; a95%CI	aP value
	N	%				
<b>Age</b>						
≤ 30 years	64	83.3	1.1 (0.7–1.6)	0.3		
> 30 years	242	48.9				
<b>Marital status</b>						
Married	103	49.5	1.0 (0.7–1.4)	0.9		
Other	203	49.4				
<b>Level of education</b>						
High school/Vocational college	169	46.7	1.3 (0.9–1.8)	0.9		
University	136	53.5				
<b>Residence</b>						
Tbilisi	93	73.2	3.5 (2.3–5.5)	<0.0001	6.4 (3.2–12.7)	<0.0001
Other	213	43.3				
<b>Family Income</b>						
< 500 GEL	81	41.5	1.8 (1.2–2.9)	0.02	2.1 (1.3–3.5)	0.002
≥ 500 GEL	86	57.3				
<b>Drug use frequency</b>						
Once or several times a month	121	56.5	0.6 (0.4–0.9)	0.02	0.6 (0.3–1.0)	0.07
Once a week or more	179	46.7				
<b>Alcohol consumption frequency</b>						
Never/Rarely	192	50.7	0.8 (0.6–1.2)	0.4		
Once a week or more	114	47.5				
<b>Drug dependence self-perception</b>						
Yes	202	45.8	1.5 (1.1–2.1)	0.02	1.5 (0.9–2.7)	0.9
No	89	56.0				
<b>HIV risk self-perception</b>						
Yes	280	50.8	1.8 (1.1–3.2)	0.03	2.2 (0.8–6.1)	0.1
No	20	35.7				
<b>Used preventive programs in last 1 year</b>						
Yes	168	56.4	1.3 (0.9–1.9)	0.9		
No	91	48.7				

finding was that the frequency of drug use showed a positive association with inconsistent condom use. This finding is in line with previous studies suggesting that substance use leads to unsafe sexual behaviors [48–51]. Drug use might decrease the perception of unsafe behaviors and capacity to control these behaviors among PWID and thus could facilitate the engagement into unsafe sexual behaviors. It underlies the importance of enrollment and adherence to opioid agonist therapy (OAT) among PWID, as being on OAT, adhering to treatment and terminating injection drug use could lead to safer sexual practices and decreased risk of HIV and other STI transmission [39, 52].

We found that the study participants who had higher family income were more likely to use condoms constantly with casual and/or paid sexual partners. It seems that PWID with low family income cannot afford to buy condoms, thus it is very important among key populations to enhance programs that promote condom use not only through education but also increase access to

condoms [53]. Our opinion is supported by a study conducted by Song YS et al. finding that taking condoms from clinic stocks was the best predictor of condom possession, which in turn was the best predictor of condom use among men enrolled in drug treatment programs [54].

Our study also showed that living in other cities was associated with higher odds of inconsistent condom use compared to living in Tbilisi (capital city). IBSS survey conducted in 2009 among PWID in Georgia showed similar association with place of residence regarding inconsistent condom use and “dual risk behavior” defined as both unsafe injecting behavior at last injection and not using condom at last casual and/or paid sex [55, 56]. This means that PWID from regional areas of the country are still more likely to practice unsafe sexual behaviors suggesting the need for additional behavioral health education about safe sex practices among PWID residing outside the capital city. Health education targeted at individual’s risk self-perception, behavioral and normative



beliefs would likely influence sexual risk behaviors among PWID. In addition, there must be increased efforts to reduce drug use as previous studies have shown that behavioral health education in combination with OAT have positive impact on reduction of HIV related risk behaviors [57, 58].

While Prevalence Ratios (PRs) are often preferred in cross-sectional studies, we chose to report Odds Ratios (ORs) due to the robustness and flexibility of logistic regression in assessing associations between predictors and binary outcomes. ORs facilitate comparability with previous studies on condom use among PWID and provide stable estimates even when convergence issues arise in log-binomial regression. Although ORs may overestimate the strength of association when the outcome is common, they remain widely accepted in epidemiological research.

The study had some limitations. First, data was collected through face-to-face interviews, therefore may be subject to social desirability bias which is particularly problematic in studies involving sexual behavior, as respondents may not accurately answered some of the sensitive questions, either by underreporting stigmatized activities or by overreporting normative ones, if their actual behavior is considered socially unacceptable. Second, the findings rely on the study participants' self-reported data which can be accompanied by recall bias, as the study participants may have had difficulties in recalling information about their sexual behavior in the past 12 months. Third, because of cross-sectional study design, it is not possible to make causal inferences. Fourth, the study sample consisted predominantly of male participants, which reflects the actual gender distribution of PWID in Georgia. Since drug use is overwhelmingly male dominated in the country, this study accurately represents the population rather than being a result of recruitment bias. However, this gender imbalance may influence the generalizability of findings, as risk behaviors and prevention needs could differ among female PWID.

## Conclusion

The study highlights low prevalence of consistent condom use with casual and/or paid sexual partners among PWID in Georgia. Integration of education about safe sexual practices into harm reduction services is an important component to decrease unsafe sexual practices and improve the rates of condom use among PWID in Georgia. Safe sex educational interventions should focus PWID with lower socio-economic status and residing outside capital city.

## Acknowledgements

Research reported in this publication was supported by the Fogarty International Center and the National Institute of Alcohol Abuse and

Alcoholism of the National Institutes of Health under Award Number D43 TW011532. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

## Author contributions

MK– development of the research idea, data analysis, original drafting of the manuscript. MB– development of the research idea, supervision of the research, review and editing of the manuscript. JD – review and editing of the manuscript. GK– data analysis, review and editing of the manuscript. LG– data collection, data management. TA– data collection, administration of the project. MD – development of the research idea, supervision of the research, review and editing of the manuscript.

## Funding

No funding was received to assist with the preparation of this manuscript.

## Data availability

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request. Data are located in controlled access data storage at Health Research Union, Tbilisi, Georgia.

## Declarations

### Ethical 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.

### Informed consent

Informed consent was obtained from all individual participants included in the study.

### Competing interests

The authors declare no competing interests.

Received: 3 June 2024 / Accepted: 8 February 2025

Published online: 20 February 2025

## References

1. UNAIDS. Country progress report– Georgia. Global AIDS monitoring 2020. Available at: [https://www.unaids.org/sites/default/files/country/documents/GEO\\_2020\\_countryreport.pdf](https://www.unaids.org/sites/default/files/country/documents/GEO_2020_countryreport.pdf).
2. Degenhardt L, Peacock A, Colledge S, Leung J, Grebely J, Vickerman P, et al. Global prevalence of injecting drug use and sociodemographic characteristics and prevalence of HIV, HBV, and HCV in people who inject drugs: a multistage systematic review. *Lancet Glob Health*. 2017;5(12):e1192–207. [https://doi.org/10.1016/S2214-109X\(17\)30375-3](https://doi.org/10.1016/S2214-109X(17)30375-3).
3. Population size estimation of PWID in Georgia 2022. Study Report. Available at: [https://hru.ge/en/projects/6-aiv\\_shidsis-gavrtselebis-mkhriv-magali-riski-s-qtsevis-mqone-jgupshi-narkotikebis-ineqtsiuri-gzit-momkhmareblebis-sari-sko-qtsevebis-da-populatsiis-raodenobis-gansazgvra](https://hru.ge/en/projects/6-aiv_shidsis-gavrtselebis-mkhriv-magali-riski-s-qtsevis-mqone-jgupshi-narkotikebis-ineqtsiuri-gzit-momkhmareblebis-sari-sko-qtsevebis-da-populatsiis-raodenobis-gansazgvra).
4. Infectious Diseases, AIDS, and Clinical Immunology Research Center. HIV/ AIDS epidemiology in Georgia. Available at: [https://www.aidscenter.ge/epidstiuation\\_eng.html](https://www.aidscenter.ge/epidstiuation_eng.html).
5. Des Jarlais DC, Friedman SR. HIV infection among intravenous drug users: epidemiology and risk reduction. *AIDS*. 1987;1(2):67–76.
6. Schoenbaum EE, Hartel D, Selwyn PA, Klein RS, Davenny K, Rogers M, et al. Risk factors for human immunodeficiency virus infection in intravenous drug users. *N Engl J Med*. 1989;321(13):874–9. <https://doi.org/10.1056/NEJM198909283211306>. PMID: 2770823.
7. Celentano DD, Latimore AD, Mehta SH. Variations in sexual risks in drug users: emerging themes in a behavioral context. *Curr HIV/AIDS Rep*. 2008;5(4):212–8.
8. Strathdee SA, Sherman SG. The role of sexual transmission of HIV infection among injection and non-injection drug users. *J Urban Health: Bull New York Acad Med*. 2003;80(4 Suppl 3):iii7–14.

9. Serraino D, Franceschi S, Vaccher E, Diodato S, Errante D, Crosato I, et al. Condom use and sexual habits of heterosexual intravenous drug users in northern Italy. *Eur J Epidemiol*. 1992;8(5):723–9. <https://doi.org/10.1007/BF00145390>. PMID: 1426173.
10. Booth RE, Kwiatkowski CF, Chitwood DD. Sex related HIV risk behaviors: differential risks among injection drug users, crack smokers, and injection drug users who smoke crack. *Drug Alcohol Depend*. 2000;58(3):219–26. [https://doi.org/10.1016/S0376-8716\(99\)00094-0](https://doi.org/10.1016/S0376-8716(99)00094-0). PMID: 10759032.
11. Hwang LY, Ross MW, Zack C, Bull L, Rickman K, Holleman M. Prevalence of sexually transmitted infections and associated risk factors among populations of drug abusers. *Clin Infect Dis*. 2000;31(4):920–6. <https://doi.org/10.1086/318131>. Epub 2000 Oct 25. PMID: 11049771.
12. van den Hoek A, van Haastrecht HJ, Coutinho RA. Heterosexual behaviour of intravenous drug users in Amsterdam: implications for the AIDS epidemic. *AIDS*. 1990;4(5):449–53. <https://doi.org/10.1097/00002030-199005000-00011>. PMID: 2372379.
13. Des Jarlais DC, Feelemyer JP, Modi SN, Arasteh K, Mathers BM, Degenhardt L, et al. Transitions from injection-drug-use-concentrated to self-sustaining heterosexual HIV epidemics: patterns in the international data. *PLoS ONE*. 2012;7(3):e31227. <https://doi.org/10.1371/journal.pone.0031227>. Epub 2012 Mar 1. PMID: 22396729; PMCID: PMC3291614.
14. WHO. Condoms. Fact Sheet. Updated 20 July 2023. Available at: <https://www.who.int/news-room/fact-sheets/detail/condoms>.
15. CDC. Condom fact sheet in brief. Updated September 14, 2021. Available at: <https://www.cdc.gov/condomeffectiveness/brief.html>.
16. Marfatia YS, Pandya I, Mehta K. Condoms: past, present, and future. *Indian J Sex Transm Dis AIDS*. 2015;36(2):133–9. <https://doi.org/10.4103/0253-7184.167135>. PMID: 26692603; PMCID: PMC4660551.
17. Bonell C, Imrie J. Behavioural interventions to prevent HIV infection: rapid evolution, increasing rigour, moderate success. *Br Med Bull*. 2001;58:155–70. <https://doi.org/10.1093/bmb/58.1.155>. PMID: 11714629.
18. Stover J, Teng Y. The impact of condom use on the HIV epidemic. *Gates Open Res*. 2022;5:91. <https://doi.org/10.12688/gatesopenres.13278.2>. PMCID: PMC8933340.
19. UNAIDS. Developing effective condom programs. Technical Brief 2020. Available at: [https://www.unfpa.org/sites/default/files/pub-pdf/UNFPA\\_UNAIDS\\_TechBrief.pdf](https://www.unfpa.org/sites/default/files/pub-pdf/UNFPA_UNAIDS_TechBrief.pdf).
20. Fernandes RM, Cary M, Duarte G, Jesus G, Alarcão J, Torre C, et al. Effectiveness of needle and syringe programmes in people who inject drugs - an overview of systematic reviews. *BMC Public Health*. 2017;17(1):309. <https://doi.org/10.1186/s12889-017-4210-2>. PMID: 28399843; PMCID: PMC5387338.
21. Palmateer N, Hamill V, Bergenstrom A, Bloomfield H, Gordon L, Stone J, et al. Interventions to prevent HIV and Hepatitis C among people who inject drugs: latest evidence of effectiveness from a systematic review (2011 to 2020). *Int J Drug Policy*. 2022;109:103872. <https://doi.org/10.1016/j.drugpo.2022.103872>. Epub 2022 Oct 3. PMID: 36202039.
22. Latkin CA, Donnell D, Metzger D, Sherman S, Aramratna A, Davis-Vogel A, et al. The efficacy of a network intervention to reduce HIV risk behaviors among drug users and risk partners in Chiang Mai, Thailand and Philadelphia, USA. *Soc Sci Med*. 2009;68(4):740–8. Epub 2008 Dec 13. PMID: 19070413; PMCID: PMC2724962.
23. Barry CDH, Carney T, Petersen Williams P. Reducing substance use and risky sexual behaviour among drug users in Durban, South Africa: assessing the impact of community-level risk-reduction interventions. *SAHARA J*. 2017;14(1):110–7. PMID: 28969490; PMCID: PMC5639608.
24. Sharma V, Tun W, Sarna A, Saraswati LR, Pham MD, Thior I, et al. Prevalence and determinants of unprotected sex in intimate partnerships of men who inject drugs: findings from a prospective intervention study. *Int J STD AIDS*. 2019;30(4):386–95. Epub 2018 Dec 12. PMID: 30541403; PMCID: PMC6446434.
25. Mishra RK, Ganju D, Ramesh S, Lalmanpuii M, Biantung L, Humtsoe C, et al. HIV risk behaviors of male injecting drug users and associated non-condom use with regular female sexual partners in north-east India. *Harm Reduct J*. 2014;11:5.
26. Broz D, Wejnert C, Pham HT, DiNenno E, Heffelfinger JD, Cribbin M, et al. HIV infection and risk, prevention, and testing behaviors among injecting drug users—national HIV behavioral surveillance system, 20 U.S. cities, 2009. *Morb Mortal Wkly Rep Surveill Summ*. 2014;63:1–51.
27. Amirkhanian YA. Review of HIV vulnerability and condom use in central and Eastern Europe. *Sex Health*. 2012;9:34.
28. Huynh K, Vaqar S, Gulick PG. HIV prevention. 2024 Jan 10. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. PMID: 29261888.
29. Hallal RC, Raxach JC, Barcellos NT, Maksud I. Strategies to prevent HIV transmission to serodiscordant couples. *Rev Bras Epidemiol*. 2015;18 Suppl 1:169–82. English, Portuguese. <https://doi.org/10.1590/1809-450320150005013>. PMID: 26630306.
30. Feelemyer J, Des Jarlais D, Arasteh K, Uusküla A. Adherence to antiretroviral medications among persons who inject drugs in transitional, low and middle income countries: an international systematic review. *AIDS Behav*. 2015;19(4):575–83. <https://doi.org/10.1007/s10461-014-0928-3>. PMID: 25331268; PMCID: PMC4393761.
31. Uusküla A, Feelemyer J, Des Jarlais DC. HIV treatment, antiretroviral adherence and AIDS mortality in people who inject drugs: a scoping review. *Eur J Public Health*. 2023;33(3):381–8. <https://doi.org/10.1093/eurpub/ckad008>. PMID: 36723859; PMCID: PMC10234656.
32. Salganik MJ, Heckathorn DD. Sampling and estimation in hidden populations using respondent-driven sampling. *Sociol Methodol*. 2004;34(1):193–240.
33. Crawford FW, Aronow PM, Zeng L, Li J. Identification of Homophily and Preferential Recruitment in Respondent-Driven Sampling. *Am J Epidemiol*. 2018;187(1):153–60. <https://doi.org/10.1093/aje/kwx208>. PMID: 28605424; PMCID: PMC5860647.
34. Gile KJ, Handcock MS. Respondent-driven sampling: an Assessment of current methodology. *Sociol Methodol*. 2010;40(1):285–327. <https://doi.org/10.1111/j.1467-9531.2010.01223.x>. PMID: 22969167; PMCID: PMC3437336.
35. McCreesh N, Frost SD, Seeley J, Katongole J, Tarsh MN, Ndungu R, Jichi F, Lunel NL, Maher D, Johnston LG, Sonnenberg P, Copas AJ, Hayes RJ, White RG. Evaluation of respondent-driven sampling. *Epidemiology*. 2012;23(1):138–47. <https://doi.org/10.1097/EDE.0b013e31823ac17c>. PMID: 22157309; PMCID: PMC3277908.
36. Falck RS, Wang J, Carlson RG, Siegal HA. Factors influencing condom use among heterosexual users of injection drugs and crack cocaine. *Sex Transm Dis*. 1997;24(4):204–10. <https://doi.org/10.1097/00007435-199704000-00004>. PMID: 9101631.
37. Todd CS, Earhart KC, Botros BA, Khakimov MM, Giasova GM, Bautista CT, et al. Prevalence and correlates of risky sexual behaviors among injection drug users in Tashkent, Uzbekistan. *AIDS Care*. 2007;19(1):122–9. <https://doi.org/10.1080/09540120600852150>. PMID: 17129867.
38. Suohu K, Humtsoe C, Saggurti N, Sabarwal S, Mahapatra B, Kermode M. Understanding the association between injecting and sexual risk behaviors of injecting drug users in Manipur and Nagaland, India. *Harm Reduct J*. 2012;9:40. <https://doi.org/10.1186/1477-7517-9-40>. PMID: 23249619; PMCID: PMC3542100.
39. Boggiano VL, Nguyen HLT, Nguyen LH, Tran TD, Van Nguyen H, Le HT, et al. Sexual behaviors among methadone maintenance patients in a mountainous area in northern Vietnam. *Subst Abuse Treat Prev Policy*. 2017;12(1):39. <https://doi.org/10.1186/s13011-017-0123-4>. PMID: 28841918; PMCID: PMC5574107.
40. Abdala N, White E, Toussova OV, Krasnoselskikh TV, Verevchkin S, Kozlov AP, et al. Comparing sexual risks and patterns of alcohol and drug use between injection drug users (IDUs) and non-IDUs who report sexual partnerships with IDUs in St. Petersburg, Russia. *BMC Public Health*. 2010;10:676. <https://doi.org/10.1186/1471-2458-10-676>. PMID: 21054855; PMCID: PMC2988741.
41. Noroozi M, Sharifi H, Noroozi A, Rezaei F, Bazrafshan MR, Armoon B. Decomposing economic disparities in risky sexual behaviors among people who inject drugs in Tehran: Blinder-Oaxaca decomposition analysis. *Epidemiol Health*. 2017;39:e2017049. <https://doi.org/10.4178/epih.e2017049>. PMID: 29103277; PMCID: PMC5733389.
42. Khezri M, Shokoohi M, Mirzazadeh A, Tavakoli F, Ghalekhani N, Mousavian G, et al. HIV Prevalence and related behaviors among people who inject drugs in Iran from 2010 to 2020. *AIDS Behav*. 2022;26(9):2831–43. <https://doi.org/10.1007/s10461-022-03627-3>. Epub 2022 Feb 23. PMID: 35195820.
43. Su S, Zhang L, Cheng F, Li S, Li S, Jing J, et al. Association between recreational drug use and sexual practices among people who inject drugs in Southwest China: a cross-sectional study. *BMJ Open*. 2018;8(6):e019730. <https://doi.org/10.1136/bmjopen-2017-019730>. PMID: 29961003; PMCID: PMC6042564.
44. Perngmark P, Celentano DD, Kawichai S. Sexual risks among southern Thai drug injectors. *AIDS Behav*. 2004;8(1):63–72. <https://doi.org/10.1023/b:aibe.000017526.29653.a5>. PMID: 15146134.
45. Assari S, Yarmohammadi Vassel M, Tavakoli M, Sehat M, Jafari F, Narenjiha H, et al. Inconsistent condom use among Iranian male drug injectors. *Front Psychiatry*. 2014;4:181. <https://doi.org/10.3389/fpsy.2013.00181>. PMID: 24772093; PMCID: PMC3983495.

46. March JC, Oviedo-Joekes E, Romero M. Inconsistent condom use among socially excluded heroin users. *Gac Sanit*. 2007;21(4):321–8. <https://doi.org/10.1157/13108506>. PMID: 17663876.
47. Armoon B, Fleury MJ, Bayani A, Ahounbar E. Inconsistent condom use and risk taking among people who inject drugs in Saveh: finding from a cross-sectional study in Iran. *Sex Res Soc Policy*. 2023;20:993–9. <https://doi.org/10.1007/s13178-022-00776-x>.
48. Leigh BC, Stall R. Substance use and risky sexual behavior for exposure to HIV. Issues in methodology, interpretation, and prevention. *Am Psychol*. 1993;48(10):1035–45. <https://doi.org/10.1037//0003-066x.48.10.1035>. PMID: 8256876; PMCID: PMC2585544.
49. Ritchwood TD, Ford H, DeCOATER J, Sutton M, Lochman JE. Risky sexual behavior and substance use among adolescents: a Meta-analysis. *Child Youth Serv Rev*. 2015;52:74–88. PMID: 25825550; PMCID: PMC4375751.
50. Dallelucci CC, Bragiato EC, Areco KCN, Fidalgo TM, da Silveira DX. Sexual risky behavior, cocaine and alcohol use among substance users in an outpatient facility: a cross section study. *Subst Abuse Treat Prev Policy*. 2019;14(1):46. <https://doi.org/10.1186/s13011-019-0238-x>. PMID: 31694694; PMCID: PMC6836442.
51. Bosma-Bleeker MH, Blaauw E. Substance use disorders and sexual behavior; the effects of alcohol and drugs on patients' sexual thoughts, feelings and behavior. *Addict Behav*. 2018;87:231–7. <https://doi.org/10.1016/j.addbeh.2018.07.005>. Epub 2018 Jul 6. PMID: 30077915.
52. Nguemo Djiometio JB, Buzuayew A, Mohamud H, Njoroge I, Kahan M, Nelson LE. Effectiveness of opiate substitution treatment in reducing HIV risk behaviors among African, Caribbean, and Black people: a systematic review. *JBISynth*. 2021;19(8):1887–1914. <https://doi.org/10.11124/JBIES-20-00223>. PMID: 33851941.
53. Hearst N, Chen S. Condom promotion for AIDS prevention in the developing world: is it working? *Stud Fam Plann*. 2004;35(1):39–47. <https://doi.org/10.1111/j.1728-4465.2004.00004.x>. PMID: 15067787.
54. Song YS, Calsyn DA, Doyle SR, Dierst-Davies R, Chen T, Sorensen JL. Predictors of condom use among men enrolled in drug treatment programs. *AIDS Educ Prev*. 2009;21(5):460–73. PMID: 19842829; PMCID: PMC3689147.
55. Chikovani I, Goguadze K, Bozicevic I, Rukhadze N, Gotsadze G. Determinants of risky sexual behavior among injecting drug users (IDUs) in Georgia. *AIDS Behav*. 2013;17(5):1906–13. <https://doi.org/10.1007/s10461-012-0296-9>. PMID: 22968396.
56. Chikovani I, Bozicevic I, Goguadze K, Rukhadze N, Gotsadze G. Unsafe injection and sexual risk behavior among injecting drug users in Georgia. *J Urban Health*. 2011;88(4):736–48. <https://doi.org/10.1007/s11524-011-9571-8>. PMID: 21717253; PMCID: PMC3157497.
57. Chawarski MC, Zhou W, Schottenfeld RS. Behavioral drug and HIV risk reduction counseling (BDRC) in MMT programs in Wuhan, China: a pilot randomized clinical trial. *Drug Alcohol Depend*. 2011;115(3):237–9. <https://doi.org/10.1016/j.drugalcdep.2010.09.024>. Epub 2010 Dec 14. PMID: 21159452; PMCID: PMC3076517.
58. Chawarski MC, Mazlan M, Schottenfeld RS. Behavioral drug and HIV risk reduction counseling (BDRC) with abstinence-contingent take-home buprenorphine: a pilot randomized clinical trial. *Drug Alcohol Depend*. 2008;94(1–3):281–4. Epub 2007 Dec 27. PMID: 18164145.

## Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.