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ORIGINAL PAPER

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Abstract Injection risk practices and risky sexual behaviors place injection drug users (IDUs) and their sexual partners particularly vulnerable to HIV. The purpose of the study was to describe and understand determinants of high-risk sexual behavior among IDUs in Georgia. A cross-sectional, anonymous survey assessed knowledge, behavior and HIV status in IDUs in five Georgian cities (Tbilisi, Gori, Telavi, Zugdidi, Batumi) in 2009. The study enrolled in total 1,127 (1,112 males, 15 females) IDUs. Results indicate that occasional sexual relationships are common among male IDUs, including married ones. A subsample of 661 male IDUs who reported having occasional and paid sex partners during the last 12 months was analyzed. Multivariate analysis shows that not having a regular partner in the last 12 month (adjusted odds ratio (aOR) 1.57, 95 % CI 1.04 2.37), and using previously used needles/syringes at last injecting (aOR 2.37, 95 % I 1.10–5.11) are independent correlates of inconsistent condom use with occasional and paid sexual partners among IDUs. Buprenorphine injectors have lower odds of inconsistent condom use with occasional and paid sexual partners compared to heroin injectors (aOR 0.47, 95 % CI 0.27–0.80), and IDUs who live in Telavi are twice more likely to engage in such risky sexual behavior than capital city residents (aOR 2.55, 95 % CI 1.46–4.48). More effective programs focused on sexual risk behavior reduction strategies should be designed and implemented.

Keywords Injection drug users · Sexual behavior · HIV · Respondent driven sampling · Georgia

Introduction

Injecting drug users (IDUs) are identified as a group at increased risk of HIV acquisition and transmission due to both the practice of injection itself and high risk sexual behavior. Sexual contact with IDUs is widely recognized as a primary source of HIV infection among non-drug using heterosexuals in Eastern Europe [1, 2]. Sexual risky behavior including multiple partners, sex work and unprotected intercourse are common among IDUs [3–5]. Several predictors of IDUs high risk sexual behavior have been identified, such as HIV positivity, type of drug used and category of partners, however, the major pieces of the evidence has been collected from the studies in the United States and Asia. There is a dearth of evidence specific to this topic for the Eastern European region, including Georgia.

Georgia, with the population of 4.3 million is among the countries with low HIV prevalence but high potential for the development of a widespread epidemic. The first HIV case in Georgia was detected in 1989, and a total of 2,164 cases had been reported to the national HIV surveillance system by the end of 2009. Injecting drug use had contributed to 60 % of all HIV cases reported since 1989, while heterosexual transmission had contributed to 34 % of all cases [6]. The patterns of HIV-related sexual risk behaviors among IDUs in Georgia are described in the study, specifically inconsistent condom use with non-regular sex partners and factors associated with this behavior.

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Methods

Study Design

Bio-behavioral surveys (Bio-BSS) among IDUs were conducted in five Georgian cities (Tbilisi, Gori, Telavi, Zugdidi and Batumi) from November 2008 to April 2009. The studies employed a cross-sectional design and respondent-driven sampling (RDS) methodology. The study methods have previously been described in detail [7].

In brief, RDS is a chain referral method which has been used in various settings in recruiting hard-to-reach populations. Its methodology has been described in detail in the literature [8–10]. Inclusion criteria for participation in the studies included the following: (1) an age of 18 years or older, (2) drug injection in the month prior to the survey, (3) being a resident of one of the sample selected cities. The biological component of the study included testing for HIV by collecting venous blood.

The sample size was as follows: 300 in the capital city (Tbilisi) and 200 in each of the other four above- mentioned cities. The survey instrument used was a standardized behavioral questionnaire for IDUs published by Family Health International [11] with slight modification and adaption to the country's context. After obtaining written consent, participants were interviewed with a closed-ended questionnaire which assessed: (1) demographic profile; (2) injection practices; (3) sexual behaviour; (4) self-reporting of sexually transmitted infections (STIs); (5) knowledge of HIV transmission; (6) awareness and utilization of HIV-related prevention services.

The study procedures were reviewed and approved by the Ethical Committee of the HIV/AIDS Patients Support Foundation in Tbilisi. All data collection has remained anonymous and confidential.

Measures

Sexual behavior was assessed in terms of number of sexual partners and how consistent was condom use with different types of partners. Regular sexual partners were defined as being spouses or live-in partners with whom relations had continued for more than 1 year. Occasional partners were defined as those who were not spouses or co-habitants or those who were not paid money in exchange for sex. Paid sex partners were defined as those providing sexual contact in exchange for money or drugs. Participants were asked separately about the number of regular, occasional and paid sexual partners they had during the previous 12 months.

Exposure to HIV preventive programs included under its definition receipt of condoms and booklets/leaflets or information on HIV from an NGO or health professional during the previous 12 months.

Dependent and Independent Variables

The primary outcome variable was inconsistent condom use with occasional and paid female sex partners. Participants were asked to recall the last 12 months preceding the interview and separately report the frequency of condom use with both occasional and paid sex partners. Answer options were "always", "almost always", "sometimes" or "never used". Condom use was dichotomized into "consistent use", meaning they were always used, and "inconsistent use", meaning "almost always", "sometimes" or "never used". Respondents who reported inconsistent condom use with occasional and/or paid sex partners were categorised as inconsistent condom users.

Independent variables included socio-demographic indicators, drug use and sexual behavior, exposure to HIV preventive programs and testing positive for HIV. Drugs used were classified into four categories: heroin, buprenorphine, ephedrine (a home-made amphetamine-type drug) and others/multiple (includes using more than one type of drug, other types such as morphine and methadone that were used less frequently, etc.). Injection risk was determined as injecting with a needle/syringe previously used by somebody else or with a syringe left at a place of gathering or with a prefilled syringe. Respondents were also asked whether their occasional or paid sexual partners had injected drugs.

Laboratory Procedures

HIV testing was undertaken by means of Genscreen Ultra HIV rapid tests. Reactive samples were re-tested using western blot assay HIV Blot 2.2 Genelabs Diagnostics. All testing was done at the Laboratory of Infectious Disease, AIDS and Clinical Immunology Research Center in Tbilisi.

Statistical Methods

RDS analysis tool (RDSAT) version 6.0.1 (Cornell University, 2004) was used to calculate population estimates of the most important survey indicators for each of the five sample cities. Data from all the cities were grouped together to carry out multivariate analysis of correlates of risky sexual behaviors as sample sizes per city were too small. The total combined sample comprised of 1,127 IDUs, of which 15 were women. The latter were excluded from the analysis. Consequently the sample of 1,112 male IDUs, which was then treated as a convenience sample, was analyzed. Bivariate and multivariate analyses were done using logistic regression. Bivariate logistic regression was conducted to compare risky sexual behavior across socio-demographic and behavioral categories. Results are presented as odds ratios (ORs) with 95 % confidence intervals (95 % CI). Variables significant in the bivariate analysis

($p < 0.05$), those not showing multicollinearity and age and education, were included in the multivariate logistic regression model. Variables that were used in the final model included: "age", "education", "having a regular partner in last 12 months", "number of sexual partners in last 12 months", "type of drug injected in last month", "injection risk at last injection", "received condoms for free during last 12 months", "received information on HIV during last 12 months", "ever tested for HIV" and "city of residence". Adjusted odds ratio (aORs) and 95 % CI are reported only for variables found to have a significant association ($p < 0.05$) with inconsistent condom use.

Analyses were performed by using Stata 8.0 (StataCorp, 2003). Missing values were excluded from the analyses.

Results

The main characteristics of IDUs across the five cities are given in Table 1. The median age per city varies from 32 to 40 years. The vast majority are Georgian males and almost half of them are married. The IDUs in Tbilisi have the highest education level, with just over two-thirds (67.6 %) having a university degree, compared to the lowest such analogous rate of 22.8 % in Batumi. Approximately half of the IDUs in Tbilisi and Batumi had been detained by administrative sentence and about a third in all cities had been imprisoned.

Having an occasional sexual relationship is common practice among the married IDUs. On average every second IDU who has occasional sex partners engages in unprotected sex with them. A diverse picture of IDUs coverage by preventive programs in the different cities is presented, and in each a different proportion of IDUs have benefited from program commodities/services such as free condoms, printed materials and information on HIV from a trained professional in the previous 12 months. The lowest coverage level in terms of all three program benefits was found in Telavi city. A small percentage of respondents from Zugdidi had received information on HIV from trained professional (11.8 %), although about a third (33.5 %) had received printed materials. In all the cities lower proportions of the IDUs had received condoms than printed materials and/or information on HIV.

Associations between consistent condom use with occasional and paid sex partners were assessed among 661 sexually active male IDUs who reported having had such a category of partner in the preceding 12 months. The characteristics of this subsample are given in Table 2. The prevalence of inconsistent condom use with occasional and paid sex partners was 64.3 %. The majority of IDUs (75 %) who reported occasional and paid sexual relationships also reported having regular partners. More than half of the respondents (52.8 %) reported having five and more sexual partners in the preceding 12 months. In terms of the single most common type of drug injected in the past month, heroin was on the top of the list (35.7 %), followed by buprenorphine (17.8 %) and ephedrine (7.7 %). More than a third of the participants (39.2 %) had injected multiple or other types of drugs.

The vast majority of IDUs (92.3 %) did not practice high risk injection behavior during the last injection episode. Only 18.9 % reported receipt of condoms from preventive programs and just under one-third, (32.7 %) had received information on HIV from trusted sources such as a doctor or harm reduction specialist and printed material. The majority of the IDUs (72.3 %) who were inconsistent condom users had never been tested for HIV at any time. HIV prevalence in this group of non-consistent condom users with paid and/or occasional partners was 0.9 %.

The results of the multivariate analysis are shown in Table 2. Predictors of unprotected sex with occasional and paid sex partners were as follows: not having a regular sexual partner in the past 12 months (aOR 1.57 (1.04–2.37), injection risk behavior at last injection (aOR 2.37 (1.10–5.11)), residency in Telavi (aOR 2.55 (1.46–4.48) and type of drugs. Specifically, buprenorphine injectors were less likely to report inconsistent condom use than heroin injectors (aOR 0.47 (0.27–0.80)), while no significant difference was found among ephedrine users. In the bivariate analysis inconsistent condom use with regular partners was found to be positively associated with unprotected sex with occasional partners and female sex workers (OR 13.81), however, due to its multicollinearity this variable was not included in the multivariate model.

Discussion

The study findings demonstrate that the male IDUs in Georgia with multiple partner heterosexual relationships tend to engage in high risk sexual activity which increases the risk of HIV transmission to their regular partners. Only a third of the IDUs had used condoms consistently with occasional and paid sex partners in the 12 months prior to the interview. Seventy-five percent of these males also reported having regular partners during the same time period, but only 9.5 % consistently used condoms with their regular partners. Studies have shown that the IDUs are unlikely to use condoms in steady relationships [12, 13], and having sex with multiple individuals either simultaneously or within a short timeframe may be putting their steady sexual partners at risk [12].

Having a regular partner appeared to be a protective factor against risky sexual behavior with non-regular partners in bivariate analysis and after adjustment this association remained significant.

Table 1 Background characteristics of IDUs in five cities of Georgia, 2009

Characteristics	Tbilisi		Batumi		Zugdidi		Telavi		Gori	
	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*
Age										
18–24	7.6 (4.0–12.0)	21/307	12.5 (7.0–18.8)	25/206	15.4 (9.4–22.1)	27/204	18.3 (12.5–24.5)	34/205	23.1 (14.1–33)	35/205
25–30	16.8 (12.3–21.4)	51/307	24.6 (17.0–33.2)	47/206	22.6 (16.9–29.0)	45/204	29.5 (22.3–37.2)	55/205	20.0 (14.5–25.9)	38/205
31–40	26.5 (21.3–31.7)	80/307	37.5 (30.0–45.2)	78/206	37.9 (31.0–45.0)	78/204	35.8 (28.5–43.2)	76/205	33.6 (26.6–41.0)	74/205
41–50	38.8 (32.0–46.0)	122/307	22.1 (15.9–28.5)	48/206	18.0 (12.4–24.0)	40/204	14.9 (9.0–21.6)	36/205	18.4 (11.9–25.6)	50/205
50+	10.3 (7.0–14.0)	33/307	3.3 (1.0–6.0)	8/206	6.1 (3.0–09.6)	14/204	1.5 (0–4.0)	4/205	4.9 (2.0–8.4)	8/205
Median (interquartile range, IQR)[a]	40 (31–45)		35 (28–42)		35 (27–41)		32 (26–39)		34 (28–41)	
Gender										
Male	99.3 (98.1–99.7)	304/307	98.1 (95.5–100)	200/206	99.5 (98.5–100)	203/204	100	205/205	97.7 (95.0–99.5)	200/205
Educational status										
Primary/secondary	27.1 (22.0–32.7)	82/307	70.2 (63.0–77.0)	142/206	57.4 (49.6–64.5)	118/204	67.4 (60.5–75.0)	139/205	67.3 (59.5–74.5)	138/205
Incomplete higher	5.3 (3.0–8.0)	16/307	7.0 (3.5–10.9)	15/206	6.0 (3.0–9.5)	12/204	3.8 (0.5–4.5)	5/205	3.0 (1.0–5.5)	7/205
Higher	67.6 (62.0–73.0)	209/307	22.8 (16.5–29.5)	49/206	36.6 (30.0–43.5)	74/204	30.0 (22.0–36.5)	61/205	28.9 (22.1–36.0)	60/205
Ethnicity										
Georgian	94.7 (92.0–97.0)	291/307	90.8 (86.5–95.0)	188/206	99.5 (98.5–100)	203/204	96.6 (94.0–99.0)	198/205	95.0 (92.0–97.5)	194/205
Marital status										
Married	53.6 (47.0–60.3)	167/307	47.2 (39.5–54.7)	95/206	49.5 (43.0–57.5)	105/204	41.0 (33.5–49.6)	84/205	54.1 (47.5–61.0)	109/205
Divorced/widowed/separated	21.0 (16.3–25.7)	62/307	15.0 (7.5–17.6)	31/206	4.5 (1.5–8.3)	9/204	10.6 (6.0–15.0)	22/205	9.8 (5.5–13.5)	22/205
Single	25.4 (20.3–31.0)	78/307	38.5 (31.0–46.0)	80/206	45.2 (38.5–51.5)	90/204	47.9 (39.5–56.0)	99/205	36.2 (30.0–42.5)	74/205
Police and prison experience										
Ever detained in administrative sentence	50.9 (44.6–57.3)	160/307	50.9 (43.5–58.0)	106/206	33.5 (27.0–40.0)	69/204	30.4 (24.5–36.5)	63/205	27.5 (21.5–33.5)	57/205
Ever imprisoned before trial	30.5 (25.6–35.7)	94/307	37.9 (30.5–45.9)	79/206	37.8 (31.0–44.5)	77/204	35.7 (29.5–42.0)	73/205	27.0 (21.0–33.5)	58/205
Ever imprisoned	12.3 (8.7–16.0)	38/307	20.8 (15.0–27.0)	42/206	11.7 (7.5–16.5)	23/204	7.4 (4.0–11.0)	16/205	6.2 (3.0–10.3)	15/205
Sexual behaviors with regular partners in the last year										

Table 1 continued

Characteristics	Tbilisi		Batumi		Zugdidi		Telavi		Gori	
	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*	RDS population estimates, % (95 % Cl)	*n*/*N*
Had regular sex partner	80.7 (76.0–85.0)	249/307	78.1 (71.5–84.5)	160/206	74.2 (68.5–79.6)	151/204	74.2 (67.5–80.5)	151/205	77.5 (71.5–83.0)	159/205
Used condom at last intercourse	27.7 (21.8–34.0)	70/249	15.7 (10.2–21.7)	24/160	19.1 (11.8–26.9)	28/151	20.4 (11.9–30.3)	25/151	20.0 (12.5–28.6)	35/159
Sexual behaviors with occasional partners in the last year										
Had occasional sex partner	34.9 (29.1–40.7)	108/307	54.5 (47.5–61.5)	113/206	50.6 (42.5–58.6)	103/204	62.7 (55.5–70.0)	131/205	47.8 (40.0–55.5)	95/205
Used condom at last intercourse	52.4 (42.2–62.5)	58/108	45.3 (36.5–55.4)	53/113	48.8 (38.2–60.0)	52/103	43.7 (33.3–54.1)	60/131	47.7 (32.4–61.9)	44/95
Sexual behaviors with paid sex partners in the last year										
Had paid sex partner	21.5 (16.7–26.7)	65/307	41.3 (34.2–48.5)	85/203	29.7 (23.5–36.4)	60/204	25.1 (19.5–31.0)	52/205	26.0 (20.5–32.0)	55/150
Used condom at last intercourse[a]	87.7 (76.6–94.7)	57/65	69.4 (57.6–79.6)	59/85	85.0 (72.7–93.1)	51/60	69.2 (53.9–81.9)	36/52	79.6 (65.6–89.7)	43/54
Other partners of married IDUs in the last year[a]										
Had occasional sex partners	21.0 (14.6–28.6)	35/167	46.3 (35.2–57.7)	44/95	46.7 (36.0–57.5)	49/105	57.1 (44.9–68.7)	48/84	43.1 (32.9–53.8)	47/109
Had paid sex partners	10.8 (6.3–17.0)	18/167	27.4 (18.1–38.3)	26/95	24.8 (16.3–35.0)	26/105	13.1 (6.5–22.9)	11/84	19.3 (11.9–28.7)	21/109
Reached with HIV prevention programs in the last year										
Given condoms for free	8.9 (6.0–12.0)	27/307	25.6 (19.5–32.0)	57/206	16.1 (11.5–21.0)	33/204	6.0 (3.0–9.5)	14/205	20.3 (14.5–26.5)	47/205
Given brochures/booklets on HIV/AIDS	33.9 (29.0–39.0)	107/307	29.2 (22.5–36.0)	67/206	33.5 (27.3–40.0)	69/204	16.4 (11.0–22.0)	36/205	25.4 (18.5–32.5)	59/205
Given information on HIV/AIDS from a doctor/professional trained in harm reduction	19.6 (15.3–24.0)	63/307	21.5 (16.0–27.5)	48/206	11.8 (7.0–17.0)	24/204	6.6 (3.0–11.0)	18/205	20.6 (14.0–27.5)	48/205

[a] Variables analyzed in SPSS

Table 2 Prevalence of inconsistent condom use with occasional and paid sex partners in the past 12 months among IDUs, and results of bivariate and multivariate logistic regression analysis, 2009

	Inconsistent condom use with occasional or paid sex partners (%)	Unadjusted OR (95 % CI)	Adjusted OR (95 % CI)
	$N = 661$		
	64.3		
Age	$N = 661$	$p = 0.478$*	$p = 0.13$
18–30	44.0	1.0	1.0
31–40	32.4	1.06 (0.72–1.49)	1.09 (0.74–1.62)
≥41	23.6	1.28 (0.85–1.94)	1.59 (1.01–2.52)
Education	$N = 661$	$p = 0.229$	$p = 0.54$
Incomplete higher or higher	41.6	1.0	1.0
Primary and/or secondary	58.4	1.22 (0.88–1.68)	0.89 (0.62–1.28)
Having a regular partner in last 12 months	$N = 661$	$p = 0.016$	$p = 0.030$
Yes	75.0	1.0	1.0
No	25.0	1.60 (1.09–2.36)	1.57 (1.04–2.37)
Consistent condom use in last 12 months with a regular sex partner	$N = 496$	$p < 0.0001$[a]	
Yes	9.5	1.0	
No	90.5	13.81 (5.73–33.25)	
Number of sexual partners in last 12 months	$N = 661$	$p = 0.095$	$p = 0.095$
1–2	19.1	1.0	1.0
3–4	28.1	1.22 (0.77–1.94)	1.30 (0.79–2.13)
≥5	52.8	1.56 (1.02–2.37)	1.64 (1.04–2.59)
Type of drug injected in last month	$N = 661$	$p = 0.008$	$p = 0.036$
Heroin	35.7	1.0	1.0
Buprenorphine	17.4	0.48 (0.32–.0.77)	0.47 (0.27–0.80)
Ephedrine	7.7	1.09 (0.56–2.15)	1.00 (0.46–2.16)
Other/multiple	39.2	0.66 (0.45–0.96)	0.80 (0.52–1.24)
Injection risk at last injection[b]	$N = 661$	$p = 0.007$	$p = 0.028$
No	92.3	1.0	1.0
Yes	7.7	2.76 (1.32–5.78)	2.37 (1.10–5.11)
Received condoms for free during last 12 months	$N = 661$	$p = 0.043$	$p = 0.43$
Yes	18.9	1.0	1.0
No	81.1	1.51(1.01–2.25)	1.23 (0.74–2.04)
Received information on HIV during last 12 months[c]	$N = 661$	$p = 0.008$	$p = 0.46$
Yes	32.7	1.0	1.0
No	67.3	1.57 (1.13–2.20)	1.18 (0.77–1.81)
Ever tested on HIV	$N = 661$	$p = 0.044$	$p = 0.20$
Yes	27.7	1.0	1.0
No	72.3	1.43 (1.01–2.04)	1.30 (0.87–1.93)
City of residence	$N = 661$	$p = 0.001$	$p = 0.029$
Tbilisi	20.6	1.0	1.0
Gori	17.1	1.53 (0.92–2.55)	1.46 (0.83–2.59)
Telavi	22.1	2.88 (1.74–4.77)	2.55 (1.46–4.48)
Zugdidi	18.7	1.71 (1.04–2.82)	1.52 (0.88–2.61)
Batumi	21.5	1.93 (1.18–3.14)	1.63 (0.85–2.95)
HIV status	$N = 650$	$p = 0.132$	
Negative	99.1	1.0	

Table 2 continued

	Inconsistent condom use with occasional or paid sex partners (%)	Unadjusted OR (95 % CI)	Adjusted OR (95 % CI)
Positive	0.9	0.27 (0.05–1.48)	

* p value represents significance test across the variable

[a] The variable was not included in the multivariate model due to its multicollinearity

[b] Injecting with a syringe previously used by somebody else, or with a syringe left at a place of gathering, or with a prefilled syringe

[c] Information received from a doctor or a professional trained in harm reduction among IDUs, or information provided on printed materials (leaflets) produced by NGOs that work on harm reduction

The IDUs who inconsistently used condoms with the regular partners had higher odds of practicing the same risky behavior with the non-regular partners as well (OR 13.81), which indicates that the potential is high for these men to acquire and transmit infections to their regular partners. Although this factor was not analyzed in the multivariate model, it may suggest that their pattern of condom use is similar with different type of partners. Such a finding falls in line with a study demonstrating that male IDUs with multiple female partners exhibit similarly low levels of condom use with both their main and non-main partners [14]. Such a practice creates the conditions for the heterosexual transmission of HIV and other STIs, and highlights that it is crucial to put emphasis on sexually risky behavior among IDUs during preventive program design.

While heterosexual and homosexual male injecting drug users with multiple partners are more likely to use condoms compared with those in monogamous relationships [11, 12, 15, 16], the results of our data bivariate analysis indicate that those reporting five and more sexual partners during the past 12 months demonstrated a higher likelihood of not using condoms consistently. After adjustment, however, multiple partnerships did not show a significant association with not using condoms. A higher odds of inconsistent condom use was found among those who reported high risk injection related behavior. This finding is consistent with other research studies which demonstrate a correlation between needle/syringe sharing and not using condoms [11, 16–21].

Multivariate analysis indicated that the IDUs who injected only buprenorphine in the last month prior to the survey were less likely to engage in risky sexual behavior than heroin injectors. To our knowledge there is practically no evidence concerning how buprenorphine misuse influences injectors' sexual behavior. Numerous studies indicate that amphetamine injection is a key predictor of inconsistent condom use [11, 17]. Our results, however, did not demonstrate this association, which is most probably due to the small sample size—self-made amphetamine-type drug users comprised only 7.7 % of our respondents. It is interesting to note that the category "other/multiple type of drugs" included heroin, as well as buprenorphine and ephedrine. Hence it is difficult to make any judgment about this association. The less harmful role of buprenorphine in risky sexual behavior should be considered during the development of more expanded opioid substitution programs for IDUs.

Bivariate analyses of our study also demonstrated that the IDUs provided with condoms by preventive programs were less likely to engage in unprotected sex. However, the cross-sectional nature of this study makes it impossible to determine causality. Nonetheless, there is a strong evidence to demonstrate that condom provision combined with education can substantially decrease the practice of unprotected sex [22, 23] and condom use can substantially reduce HIV sexual transmission [24].

Local environmental factors also influence risky behavior, as demonstrated by the behavior of the IDUs living in Telavi. Considerably fewer IDUs were reached by preventive programs in Telavi during the year prior to the survey than the IDUs living in other cities. This could be explained by the fact that preventive programs were introduced later in this area.

This study is subject to several limitations. In order to obtain a high sample size and conduct multivariate analysis we combined the data from the five cities. Although the city level data were collected using the RDS methodology the total sample for this study was analyzed as a convenience sample, and thus its findings could not be generalized. The study is cross-sectional in design and it is not possible to establish a causal relationship between the main outcome variable and the correlates. In addition, injection behaviors were assessed over the previous month only and sexual behaviors over the previous 12 months, it is therefore impossible to conclude with certainty that injection and sexual behaviors overlap in time.

In light of the fact that the behavioral and other data were collected by face-to-face interviews the respondents may not have accurately answered some of the sensitive questions, or they may have had difficulty in recalling information. The survey was anonymous and personal

identification details were not collected, which might have contributed to better validity of self-reported behaviors and minimized reporting bias. However, given the high refusal rate (18.4 %) of participation in the study, it can be assumed that it did not reach the IDUs of higher socio-economic status.

Conclusion

Risky injection behavior is considered a leading pathway of HIV transmission in Georgia. While the majority of interventions targeted to the IDUs focus on minimizing the harm of unsafe injection, special attention should be paid to developing integrated programs which include interventions on reducing risky sexual behaviors. Well-designed and structured interventions, including condom distribution are needed to reduce unsafe sexual behavior among IDUs.

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