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ORIGINAL PAPER

HIV Among Injection Drug Users and Their Intimate Partners in Almaty, Kazakhstan

Nabila El-Bassel · Louisa Gilbert · Assel Terlikbayeva · Elwin Wu · Chris Beyrer · Stacey Shaw · Tim Hunt · Xin Ma · Mingway Chang · Leyla Ismayilova · Marat Tukeyev · Baurzhan Zhussupov · Yelena Rozental

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Abstract This paper examines prevalence rates of HIV, HCV, and syphilis among a sample of injecting drug users (IDUs) and their heterosexual intimate partners ($N = 728$) from Almaty, Kazakhstan. The study uses baseline data from Project Renaissance, a couple-based HIV prevention intervention delivered to a couple where one or both partners are IDUs. HIV prevalence rates among female and male IDUs were 28 %. Among the full sample, 75 % had HCV, and 13 % tested positive for the syphilis antibody test. Only 10 % of the sample ever visited a needle exchange program. One-fourth (25.3 %) had never been tested for HIV. One-quarter of those who tested positive were unaware of their status. Being HIV positive was associated with a history of incarceration, being an IDU, and having access to needle exchange programs. The findings call for increasing efforts to improve access to HIV testing, prevention, treatment, and care for IDUs in Almaty, Kazakhstan.

N. El-Bassel (✉) · L. Gilbert · A. Terlikbayeva · E. Wu · S. Shaw · T. Hunt · X. Ma · M. Chang · B. Zhussupov · Y. Rozental
Global Health Research Center of Central Asia, Columbia University, 1255 Amsterdam Ave, Room 814, New York, NY 10027, USA
e-mail: ne5@columbia.edu

C. Beyrer
Center for Public Health and Human Rights, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

L. Ismayilova
School of Social Service Administration, University of Chicago, Chicago, IL, USA

M. Tukeyev
Kazakhstan National AIDS Center, Almaty, Kazakhstan

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Introduction

An estimated one percent of adults in Kazakhstan inject drugs [1]. However, in towns along major drug trafficking routes in Kazakhstan, the proportion of adults who inject drugs exceeds 10 percent, representing some of the highest rates of injection drug use in the world [1]. Official government estimates have stated that there were approximately 122,850 injection drug users (IDUs) in Kazakhstan in 2011, including approximately 17,000 living in the nation's largest city, Almaty [2].

Along with a burgeoning drug epidemic, Central Asia has one of the fastest growing HIV epidemics in the world [3–5]. Historically driven by injection drug use, the past few years have witnessed a steady rise in the incidence of sexual transmission as HIV has spread to the heterosexual partners of IDUs. In 2011, official data showed that heterosexual transmission, which represented 50.7 % of new cases, surpassed injection drug use, which represented 47 % of new cases, as the primary mode of transmission [2]. However, the number and proportion of HIV cases attributed to injection drug use is most likely underreported due to lower rates of HIV testing among IDUs than non-IDUs. Prevalence rates of HIV among IDUs in Kazakhstan have relied on data from governmental surveillance studies, which tend to exclude IDUs who are not covered by syringe exchange programs or receiving drug treatment. Although the surveillance reports indicate relatively high rates of HIV testing and access to HIV care and antiretroviral therapy (ART) among IDUs, the HIV cascade from testing to treatment among the wider population of IDUs in Kazakhstan remains poorly understood.

According to 2011 surveillance reports, elevated prevalence rates of the hepatitis C virus (HCV) and sexually transmitted infections (STIs) among IDUs have been found throughout Kazakhstan, especially in Almaty [2]. Research suggests high rates of sharing syringes and drug equipment as well as high rates of multiple sexual partnerships and low rates of condom use among IDUs in Kazakhstan [2, 6–12]. Research to date has yet to examine how HIV status is associated with these sexual and drug risk behaviors among IDUs in Kazakhstan. Research outside of Central Asia has demonstrated that HIV serostatus is associated with engaging in a range of drug and sexual risks among men and women [13, 14]. Multiple structural factors have been found to contribute to HIV risk in different IDU populations including lack of access to sterile needles, fear of harassment, discrimination [15–18], poverty, arrest and incarceration [19–22], and barriers to HIV services and drug treatment [23–25]. Nevertheless, this issue has rarely been studied among IDUs in Kazakhstan and other Central Asian countries, and to date, there have been no prospective studies of these associations in the region.

As in other Central Asia countries, IDUs face a number of governmental policies and structural barriers that prevent them from accessing harm reduction services and HIV care. While access to syringes and needles is legal and Kazakhstan currently has over 150 syringe/needle exchange programs, only 10–14 % of IDUs utilize them [3]. The majority of IDUs receive their syringes/needles from pharmacies. Methadone maintenance treatment was initiated in Kazakhstan in October 2008 as a pilot intervention for HIV positive IDUs within the national multi-component HIV treatment project funded by the Global Fund to Fight AIDS, Tuberculosis, and Malaria (GFATM). Recently, three new pilot sites (Pavlodar, Temirtau, and Ust-Kamenogorsk) were added, but progress has been hampered by active political opposition [26].

The 2011 HIV Integrated Bio-behavioral Surveillance Report found that only 20 % of IDUs in Kazakhstan reported receiving an HIV test in the past year [2]. Almost 80 % of IDUs in Almaty are estimated to be infected with HCV [2]. The requirement to register as a drug user as well as pervasive stigma, discrimination, harsh treatment by the police, and fear of imprisonment prevent IDUs from accessing HIV prevention, testing, and treatment services.

The study aims to address important gaps in research on the HIV epidemic among IDUs in Kazakhstan. This paper describes the prevalence rates of HIV, HCV, and syphilis, as well as drug-related and sexual risk behaviors by gender and IDU status among a sample of 364 IDUs and their heterosexual intimate partners ($N = 728$) in Almaty, Kazakhstan. This article also examines: (1) the associations between prevalent HIV serostatus, socio-demographic, and selected structural factors (incarceration, access to syringe exchange programs, homelessness, and food insecurity); (2) the associations between HIV serostatus and sexual and drug risk behaviors after adjusting for socio-demographic characteristics; and (3) engagement/progression of the sample in the HIV treatment cascade.

Methods

Data Source

NIDA-funded Project Renaissance is a randomized controlled trial conducted between 2009 and 2012 in Almaty, Kazakhstan to test the efficacy of a couple-based HIV prevention intervention for couples where one or both partners report injecting drugs in the past 90 days ($N = 728$ individuals or 364 couples). Couples were randomized into one of two arms: (1) a 5-session HIV/STI prevention intervention or (2) a 5-session Wellness Promotion intervention. Participants completed a baseline pre-intervention assessment and repeated assessments at 3, 6, and 12 months post-intervention. Baseline data are used in this paper. The Columbia University Institutional Review Board and the Kazakhstan School of Public Health Institutional Review Board approved the study.

Recruitment Strategies

The study employed a number of recruitment strategies. Trained research assistants recruited potential study participants from several different governmental, non-governmental, and community centers serving IDUs. Participants were also recruited via (1) word-of-mouth from participants to their injecting friends and network members, and (2) targeted outreach. Several times a week, trained research staff members, who were former drug users, visited known neighborhood locations where IDUs gather as well as HIV care clinics and needle exchange programs. Potential participants who indicated that they were over the age of 18 and had a main intimate partner of the opposite sex were asked to complete a face-to-face brief screening interview. Once the potential participant's eligibility had been established during the individual interview, s/he was asked to invite his or her intimate partner to participate in a second screening interview.

Eligibility Criteria

Couples were eligible to participate if they met the following criteria: (1) both partners were aged 18 or older; (2) both partners identified each other as their main partner of the opposite sex and someone whom the participant considered a boy/girlfriend, spouse, lover and/or parent of his/

her child; (3) the relationship had existed for at least 6 months; (4) both partners reported intending to remain together for at least 12 months; (5) at least one partner reported having had unprotected vaginal or anal intercourse with the other partner in the previous 90 days; and (6) at least one partner reported injecting drugs in the past 90 days.

Couples were excluded if they met any of the following criteria: (1) either partner showed evidence of significant psychiatric, physical, or neurological impairment that would limit effective participation confirmed during informed consent; (2) either partner reported severe physical or sexual violence perpetrated by the other partner in the past year on a Revised Conflict Tactics Scale; (3) either partner reported that the couple was planning a pregnancy within the next 18 months; or (4) either partner was not fluent in Russian as determined during the informed consent process. We excluded couples who are trying to get pregnant because the intervention was designed to increase condom use and couples trying to become pregnant in the next 18 months would not be using condoms.

In total, 971 individuals completed the screening interview. Of these, 728 people ($N = 364$ couples) met the study eligibility criteria and completed the baseline interview. The main reasons for ineligibility included both partners reporting no unprotected sex in the past 90 days (84 participants), attempting to get pregnant (77), being in the relationship for <6 months (30), reporting severe intimate partner violence (27), reporting no injecting drug use in the past 90 days (21), planning to relocate (15), or either partner not speaking Russian (1) or not being above the age of 18 (1). Some participants were ineligible for multiple reasons. Of the 971 people who were screened, 33 were eligible but did not return to participate in the baseline.

Data Collection

Data collection included both self-reported data and objective biological assays. During the baseline visit participants completed a 1.5-h Audio Computer Assisted Self-Interview (ACASI) conducted in Russian in a private room. After the interview was completed, a Clinical Research Coordinator (CRC) conducted individual pre-test counseling related to HIV, HCV, and other STIs with each participant in a gender-specific testing room. Within 2 weeks from the baseline interview, the CRC notified each participant privately of his or her HIV, HCV, and STI test results, conducted post-test counseling, and provided referrals and navigation to STI treatment when applicable. Participants received $10 USD for completing the baseline ACASI interview and biotesting for HIV, HCV, and three other STIs.

Measures

Socio-Demographic Variables

Self-reported information was collected about participant's socio-demographic characteristics including gender, age, ethnicity (Kazakh, Russian, or other), marital status (legally married and common-law marriage as "married," or divorced, separated, widowed, or never married as "unmarried"), and children (have children under 18 or not). Socio-economic variables included years of education, homelessness (having no place to sleep in the past 90 days), and food insecurity (having insufficient money for food in the past 90 days). Measures of legal history included a history of incarceration and arrests.

Current and Past Drug Use

The Risk Behavior Assessment (RBA) was used to assess HIV risk behaviors and past drug use. The RBA has demonstrated validity and good reliability with different populations of IDUs in low resource countries including with IDUs in the former Soviet Union [27]. The ACASI provided a calendar to improve recall using the timeline follow-back method. The interview assessed unsafe injection behaviors in the past 90 days, which included using unclean syringes or needles, sharing cookers, cotton, rinse water, and other paraphernalia; injecting using needles/syringes that had been used by someone else; injecting drugs using a syringe after someone else had squirted drugs into it from his/her used syringe; purchasing and using a heroin injection prepared by someone else; using a cooker/cotton/rinse water that had been used by another injector; splitting drug solutions with other injectors through use of the same cooker/spoon, front-loading, back-loading, drawing blood into the syringe before injecting (vein testing); or adding their own or someone's else blood into an injected drug. If participants reported engaging in one or more of these unsafe injection behaviors in the past 90 days, their responses were coded as 1 = Yes for "any unsafe injection act in the past 90 days."

Sexual Behaviors

Self-reported data on sexual behaviors with the study partner and with all other partners in the prior 90 days were collected using the RBA, including any unprotected anal or vaginal sex, the number and proportion of unprotected vaginal or anal intercourse acts, and having had sex with one or more partners.

HIV Treatment

Participants were asked whether or not they had ever received an HIV test, and if so, what the results of their HIV test were. If participants knew they were HIV positive, they were asked whether or not they had ever received medical care for HIV. They were also asked about their CD4 count and whether or not they were currently taking antiretroviral (ARV) medications.

Biological Testing

Biological assays were used to test for HIV, HCV, syphilis, gonorrhea, and Chlamydia. Urine specimens were collected from participants and shipped to the Almaty Oblast Skin and Venereal Disease Dispensary to be tested for Chlamydia trachomatis and Neisseria gonorrhea using molecular/DNA amplification assay (BD ProbeTec ET System) with a sensitivity >99.9 % and specificity >99.9 %. For HIV, HCV, and syphilis testing, a dried blood spot (DBS) technique was applied. A whole blood spot was obtained by a finger prick, applied to five printed circles on DBS filter paper cards, and sent to the reference laboratory at the Republican AIDS Center (RAC). For the serologic surveillance of HIV, HCV, and syphilis, a standard enzyme-linked immunosorbent assay (ELISA) was used [28]. Tests for all three biomarkers were conducted using a serial two-test strategy, as recommended by the World Health Organization and routinely used at the Kazakhstan RAC. U.S. manufactured Abbott Murex Biotech tests were used for the second test. According to the RAC Guidelines for Serological Surveillance, the Murex anti HIV ABBOTT, Murex anti HCV ABBOTT, and the ICE Syphilis Murex ABBOTT each have a reported sensitivity of >99.9 % and specificity of 99 %.

Statistical Analysis

Bivariate relationships between HIV test result and each of the socio-demographic characteristics, drug, and sexual risk behaviors were assessed by Chi square and *t* tests. Multivariate statistical analysis was performed to examine the relationship between HIV test result as the independent variable and HIV risk behaviors in the past 90 days as dependent variables. Non-independency of couple data in examining the association between HIV test result and each of drug and sexual risk behaviors were modeled as random effects in multilevel statistical models. Because participants were members of couples, the responses from each partner constituting a couple were not independent. Random-effects models, which accommodate within-group correlation, were incorporated into logistic regression models to allow responses within a couple to be correlated but assume independence across couples. Each regression model also included covariance adjustment of socio-demographic characteristics and injection drug use in the past 90 days. Unadjusted (OR) and adjusted odds ratios (aOR) and their associated 95 % confidence intervals are reported. All statistical analyses were performed in SAS 9.2.

Results

Socio-Demographic Characteristics

Table 1 reports socio-demographic characteristics of 728 participants. Participants' average age was 35.8 years ($SD = 7.8$), with men being significantly older on average than women. The majority of participants were Russian or Kazakh. Most participants reported being legally married or in a common law relationship and approximately half of participants had children under 18 (52.9 %). Over one-tenth of participants (13.5 %) had been homeless or without a regular place to sleep in the past 90 days, while nearly half (48.8 %) reported not having enough money to buy sufficient food. Approximately two-thirds of the participants (67.0 %) had ever been arrested and charged with a criminal offense.

Drug Use

Nearly 80 % of the sample reported that they had ever injected drugs, of whom 87.9 % had injected in the past 90 days with 15.6 average number of years of injection (SD = 7.8). Men were more likely than women to report ever injecting drugs. On average, men reported injecting for a higher number of years than women. Of the total sample, only 11.1 % reported ever accessing a needle exchange program.

Prevalence of HIV and Other Co-infections

Table 2 presents bio-testing results and describes participants' HIV test results and access to HIV treatment and care. Among the total sample, the HIV prevalence rate was 25.1 % ($n = 183$), the HCV prevalence rate was 75.0 % ($n = 546$), and the syphilis rate was 12.6 % ($n = 92$). Men were more likely than women to be HIV positive, and HCV positive. However, when restricting the sample to only consider IDUs, differences in HIV and HCV status between men and women were not significant. Among IDUs, the HIV prevalence rate was 28.8 %. Nearly one-fourth ($n = 42$, 23.0 %) of the participants who tested positive for HIV at baseline were unaware of their HIV status and newly diagnosed. Of participants who were newly

Table 1 Socio-demographic characteristics and drug use ($N = 728$)

	Total sample	Female	Male
Age in years, mean (SD)	35.8 (7.8)	34.8 (7.7)**	36.8 (7.8)**
Ethnicity, n (%)			
Kazakh	85 (11.7)	40 (11.0)	45 (12.4)
Russian	478 (65.7)	231 (63.5)	247 (67.9)
Others	165 (22.7)	93 (25.6)	72 (19.8)
Years of education, mean (SD)	11.4, 3.3	11.6, 3.0	11.2, 3.5
Marital status, n (%)			
Married	629 (86.4)	321 (88.2)	308 (84.6)
Unmarried	99 (13.6)	43 (11.8)	56 (15.4)
Homelessness in the past 90 days, *n* (%)	98 (13.5)	38 (10.4)*	60 (16.5)*
Food insecurity in the past 90 days, *n* (%)	355 (48.8)	170 (46.7)	185 (50.8)
Ever incarcerated, *n* (%)	488 (67.0)	177 (48.6)**	311 (85.4)**
Ever injected drugs, *n* (%)	580 (79.7)	229 (62.9)**	351 (96.4)**
Injected drugs in the past 90 days[a], *n* (%)	510 (87.9)	189 (51.9)**	321 (88.2)**
Used heroin in the past 90 days, *n* (%)	531 (72.9)	201 (55.2)**	330 (90.7)**
Used marijuana in the past 90 days, *n* (%)	368 (50.6)	109 (30.0)**	259 (71.2)**
Used methamphetamines in the past 90 days, *n* (%)	13 (1.8)	7 (1.9)	6 (1.7)
Ever had access to needle exchange program, *n* (%)	81 (11.1)	37 (10.2)	44 (12.1)
Had access to needle exchange program in the past 90 days, *n* (%)	38 (5.2)	14 (3.9)	24 (6.6)

[a] There are missing data for 20 IDU cases (11 males, 9 females)

* $p < 0.05$; ** $p < 0.01$ for significant differences between genders as determined using a *t* test

diagnosed as HIV positive, 40.5 % were in a serodiscordant relationship. The prevalence rate of HCV was 90.2 % among IDUs. Among women who reported never injecting drugs, the prevalence rate of HIV was 10.4 %. In these cases, we assume that HIV transmission occurred heterosexually. The prevalence rate of co-infection of HIV with HCV was 20.7 %, HIV with syphilis was 2.2 %, and 1.7 % had co-infection with all three (HIV, HCV, syphilis). Participants who were HIV positive were more likely to be HCV positive than those who were HIV negative.

Self-Reported CD4 Count and HIV Treatment

Of HIV seropositive participants who knew they were infected prior to baseline ($n = 141$), only half (49.7 %) reported ever having access to any HIV services and care, and of seropositive participants who knew their CD4 count ($n = 53$), 56.6 % reported having a CD4 count of 350 or below. Among the 141 HIV seropositive participants, 15.6 % were currently taking ARV medications. Among those who knew their CD4 count was below 200 ($n = 13$), 46.2 % were currently taking ARV medications. Of participants who were positive and not on HIV treatment, 37.0 % had a seronegative partner (Fig. 1).

Data on the 364 couples showed that 18 % ($n = 69$) were HIV serodiscordant, of which the male member of the dyad was seropositive in most instances (46 couples). In 15 % ($n = 57$) of the couples, both the male and female partners were HIV positive. In the remaining 238 partnerships (65.4 %), both partners were HIV negative.

Table 3 describes socio-demographic characteristics by HIV status. Respondents who were HIV positive were more likely to report the following characteristics when compared to participants who were HIV negative: having a history of incarceration (82.5 vs. 61.8 %), being an IDU (91.3 vs. 75.8 %), ever accessing a needle exchange program (16.4 vs. 9.4 %), and among those who ever accessed a needle exchange program, having accessed a needle exchange program in the past 90 days (63.3 vs. 37.3 %).

Sexual and Drug Risk Behaviors

Sexual and drug-related risk behaviors are described in Table 4. The majority of participants (87.6 %) reported having unprotected vaginal sex in the past 90 days. This rate is higher on average among males than among females. Nearly 20 % of participants reported having more than one sexual partner in the past 90 days, with men being more likely to report having more than one sexual partner than women.

Drug risk behaviors were considered only among participants who reported ever injecting drugs ($n = 580$). Among this group, 70.9 % reported experiencing unsafe injections in the past 90 days. In the previous 90 days, 41.9 % had injected with someone else, with 28.1 % reporting injecting with multiple partners. Over half

Table 2 Prevalence of HIV/STI and HIV characteristics ($N = 728$)

	Total sample	Female	Male
Prevalence of HIV/STI			
Prevalence of HIV, *n* (%)	183 (25.1)	80 (22.0)*	103 (28.3)*
Prevalence of HIV among IDUs ($n = 580$)	167 (28.8)	66 (28.8)	101 (28.8)
Prevalence of HCV, *n* (%)	546 (75.0)	225 (61.8)**	321 (88.2)**
Prevalence of HCV among IDUs ($n = 580$)	523 (90.2)	205 (89.5)	318 (90.6)
Prevalence of syphilis, *n* (%)	92 (12.6)	64 (17.6)**	28 (7.7)**
Prevalence of syphilis among IDUs ($n = 580$)	77 (13.3)	50 (21.8)**	27 (7.7)**
Prevalence of any STI, *n* (%)	53 (7.3)	27 (7.4)	26 (7.1)
Prevalence of any STI among IDUs ($n = 580$)	41 (7.1)	15 (6.6)	26 (7.4)
Prevalence of HIV + HCV, *n* (%)	151 (20.7)	59 (16.2)**	92 (25.3)**
Prevalence of HIV + HCV among IDUs ($n = 580$)	148 (25.5)	56 (24.5)	92 (26.2)
Prevalence of HIV + syphilis, *n* (%)	16 (2.2)	11 (3.0)	5 (1.4)
Prevalence of HIV + syphilis among IDUs ($n = 580$)	14 (2.4)	9 (3.9)	5 (1.4)
Prevalence of HIV + HCV + syphilis, *n* (%)	12 (1.7)	7 (1.9)	5 (1.4)
Prevalence of HIV + HCV + syphilis among IDUs ($n = 580$)	12 (2.1)	7 (3.1)	5 (1.4)
HIV characteristics			
Ever received an HIV test, *n* (%)	544 (74.7)	269 (73.9)	275 (75.6)
New detections of HIV, *n* (%)	42 (5.8)	19 (5.2)	23 (6.3)
New detections of HIV among IDUs ($n = 580$)	38 (6.6)	17 (7.4)	21 (6.0)
CD4 count (among those who previously tested positive for HIV and knew their CD4 count, n = 53)			
350 or below	30 (56.6)	9 (45.0)	21 (63.6)
Greater than 350	23 (43.4)	11 (55.0)	12 (36.4)
Ever received medical care for HIV (among those who previously tested positive for HIV, $n = 141$)	70 (49.7)	32 (52.5)	38 (47.5)
Currently take ARV medications (among those who previously tested positive for HIV, $n = 141$)	22 (15.6)	8 (13.1)	14 (17.5)
Currently take ARV medications (among those who previously tested positive for HIV and knew their CD4 count to be below 200, $n = 13$)	6 (46.2)	3 (75.0)	3 (33.3)

* $p < 0.05$; ** $p < 0.01$ for significant differences between genders as determined using a *t* test

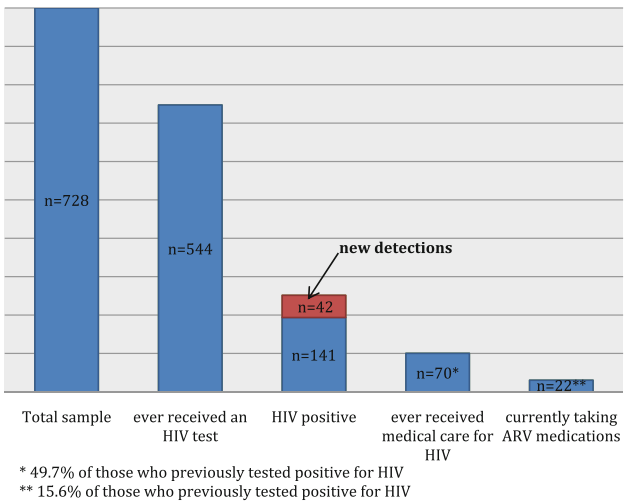

Fig. 1 HIV treatment cascade

(52.6 %) of those who had ever injected said they injected drugs with their main partners in the past 90 days, and 34.8 % reported engaging in one or more unsafe injections with their main partner in the past 90 days.

Table 5 presents the findings from random effects logistic regression models examining associations between biologically assayed HIV status and sexual and drug behaviors. After adjusting for socio-demographic characteristics, participants who tested positive for HIV were more likely than HIV negative participants to report injecting drugs in the past 90 days ($aOR = 2.07$, 95 % CI = 1.32–3.24) and engaging in unsafe injection acts ($aOR = 1.68$, 95 % CI = 1.15–2.44). However, HIV positive participants were less likely than HIV negative participants to report engaging in unprotected vaginal sex with the main partner ($aOR = 0.35$, 95 % CI = 0.21–0.61) and with any partner (including main partner and any other partners) ($aOR = 0.36$, 95 % CI = 0.21–0.61) in the past 90 days, and to

Table 3 Socio-demographic characteristics by HIV status ($N = 728$)

	HIV+	HIV−
Age in years, mean (SD)	36.4 (7.6)	35.5 (7.9)
Ethnicity, n (%)		
Kazakh	17 (9.3)	68 (12.5)
Russian	124 (67.8)	354 (65.0)
Others	42 (23.0)	123 (22.6)
Years of education, mean (SD)	11.1 (3.6)	11.5 (3.2)
Marital status, n (%)		
Married	160 (87.4)	469 (86.1)
Unmarried	23 (12.6)	76 (13.9)
Homelessness in the past 90 days, *n* (%)	25 (13.7)	73 (13.4)
Food insecurity in the past 90 days, *n* (%)	90 (49.2)	265 (48.6)
Ever incarcerated, *n* (%)	151 (82.5)**	337 (61.8)**
Ever injected drugs, *n* (%)	167 (91.3)**	413 (75.8)**
Injected drugs in the past 90 days[a]	148 (91.4)	362 (91.0)
Ever had access to needle exchange program, *n* (%)	30 (16.4)**	51 (9.4)**
Female	15 (18.8)**	22 (7.8)**
Male	15 (14.6)	29 (11.1)
Had access to needle exchange program in the past 90 days[b]	19 (63.3)*	19 (37.3)*
Female	7 (46.7)	7 (31.8)
Male	12 (80.0)*	12 (41.4)*
HCV positive, *n* (%)	151 (82.5)**	395 (72.5)**
Ever tested positive for syphilis	16 (8.7)	76 (13.9)

[a] There are missing data for 20 IDU cases (5 HIV positive, 15 HIV negative)

[b] Calculated out of those who ever had access to a needle exchange program

* $p < 0.05$; ** $p < 0.01$ for significant differences between genders as determined using a *t* test

Table 4 Sexual and drug-related risk behaviors

	Total	Female	Male
Sexual risk behaviors (N = 728)			
Had unprotected vaginal sex with main partner in the past 90 days, *n* (%)	633 (87.0)	308 (84.6)	325 (89.3)
Had unprotected vaginal sex with any partner in the past 90 days, *n* (%)	638 (87.6)	310 (85.2)*	328 (90.1)*
Had unprotected anal sex with main partner in the past 90 days, *n* (%)	47 (6.5)	26 (7.1)	21 (5.8)
Had unprotected anal sex with any partner in the past 90 days, *n* (%)	59 (8.1)	28 (7.7)	31 (8.5)
Had more than one sexual partner in the past 90 days, *n* (%)	139 (19.1)	48 (13.2)**	91 (25.0)**
Drug-related risk behaviors among IDUs (N = 580)			
Had injected drugs in the past 90 days[a]	510 (87.9)	189 (82.5)**	321 (91.5)**
Had unsafe injections in the past 90 days[a]	411 (70.9)	164 (71.6)	247 (70.4)
Had injecting partner(s) in the past 90 days[a]	243 (41.9)	102 (44.5)	141 (40.2)
Had more than one injecting partner in the past 90 days[a], *n* (%)	163 (28.1)	68 (29.7)	95 (27.1)
Had injected drugs with main partner in the past 90 days[a], *n* (%)	305 (52.6)	150 (65.5)**	155 (44.2)**
Had unsafe injections with main partner in the past 90 days[a], *n* (%)	202 (34.8)	93 (40.6)*	109 (31.1)*

[a] The analysis for drug-related risk behaviors only included those who had ever injected drugs. There are missing data for 20 IDU cases (11 males, 9 females)

* $p < 0.05$; ** $p < 0.01$ for significant differences between genders as determined using a *t* test

report having had more than one sexual partner in the past 90 days ($aOR = 0.40$, 95 % CI = 0.23–0.71). When running the regression model examining the associations between HIV test result and sexual risk behaviors among the subset of participants who were IDUs, the associations and odds ratios were similar to those found in the total sample. Similarly, associations between HIV test results and sexual and drug risk behaviors did not vary by whether or not participants were aware of their HIV status at baseline or were newly diagnosed cases.

Table 5 Random effects logistic regression of sexual and drug-related risk behaviors on HIV status: unadjusted and adjusted odds ratios, 95 % confidence intervals (in braces) and p values (in parentheses)

Associations with HIV-positive status		
	Unadjusted	Adjusted
Had unprotected vaginal sex with main partner in the past 90 days	0.39**	0.35**
	[0.23, 0.65]	[0.21, 0.60]
	(<0.01)	(<0.01)
Had unprotected vaginal sex with any partner in the past 90 days	0.39**	0.36**
	[0.23, 0.66]	[0.21, 0.61]
	(<0.01)	(<0.01)
Had unprotected anal sex with main partner in the past 90 days	0.59	0.60
	[0.25, 1.38]	[0.25, 1.45]
	(0.22)	(0.26)
Had unprotected anal sex with any partner in the past 90 days	0.52	0.52
	[0.23, 1.14]	[0.23, 1.18]
	(0.10)	(0.12)
Had more than one sexual partner in the past 90 days	0.42**	0.40**
	[0.25, 0.73]	[0.23, 0.71]
	(<0.01)	(<0.01)
Had injected drugs in the past 90 days[a]	1.10	2.07**
	[0.62, 1.93]	[1.32, 3.24]
	(0.75)	(<0.01)
Had unsafe injections in the past 90 days[a]	1.13	1.68**
	[0.74, 1.71]	[1.15, 2.44]
	(0.57)	(<0.01)
Had injecting partner(s) in the past 90 days[a]	0.98	1.28
	[0.66, 1.45]	[0.87, 1.89]
	(0.91)	(0.21)
Had more than one injecting partner in the past 90 days[a]	1.11	1.35
	[0.73, 1.68]	[0.89, 2.05]
	(0.64)	(0.16)
Had injected drugs with main partner in the past 90 days[a]	1.23	1.62
	[0.79, 1.92]	[0.99, 2.67]
	(0.36)	(0.06)
Had unsafe injections with main partner in the past 90 days[a]	0.96	1.21
	[0.62, 1.50]	[0.75, 1.94]
	(0.87)	(0.44)

The adjusted covariates are gender age, marital status, years of education and ethnicity

* $p < 0.05$; ** $p < 0.01$

[a] The analysis for drug-related risk behaviors only included those who had ever injected drugs. There are missing data for 20 IDU cases (11 males, 9 females)

Discussion

The findings demonstrate that the HIV prevalence rates among participating IDUs (28 %) and non-IDU sex partners (10 %) are significantly higher than the HIV prevalence rates reported in the 2011 HIV Integrated Bio-behavioral Surveillance Report for IDUs in Almaty (2.9 %) and in Kazakhstan overall (2.8 %). Findings also show that only 10 % of the sample ever visited a needle exchange program. Even though attendance at needle exchange programs was low, we found that HIV prevalence was associated with the use of needle and syringe exchanges. This is likely because those whose drug dependency is more severe and whose injection behavior is more frequent tend to use needle exchange services more than lower risk drug users.

One-quarter of the sample (25.3 %) had never been tested for HIV. One-quarter of those who tested HIV positive claimed to be previously unaware of their status, with 5.8 % of the sample comprising cases in which HIV was detected for the first time at baseline. Qualitative research is needed to better understand the experiences of individuals newly diagnosed with HIV. Incarceration and poverty (e.g., not having enough money to buy food) were prevalent among the study sample. We also found that the majority of HIV positive participants (82.5 %) had been incarcerated and only half of those who knew of their seropositive status had ever received HIV care.

These findings have important prevention and policy implications. First, the government of Kazakhstan and international NGOs need to place more attention on the structural barriers that prevent IDUs from accessing needle exchange programs and HIV treatment and services. Policies need to be changed to stop the high level of arrests and discrimination against IDUs. Without addressing these barriers, access to needle exchange programs, HIV testing, and up-take of HIV services among IDUs will remain low. Other harm reduction options such as methadone treatment must be made available to IDUs in Almaty. Only a handful of pilot methadone maintenance programs exist in Kazakhstan, none of which are currently in Almaty. In order to shrink the rapidly accelerating HIV epidemic in Kazakhstan, funding must be increased for HIV harm reduction programs for IDUs.

Although Kazakhstan currently offers treatment to HIV infected people with CD4 counts of 350 or less, treatment coverage among IDUs remains very low. Our findings indicate that most participants did not know their CD4 count, and less than half (46.2 %) of those who knew that their CD4 counts were below 200 were currently receiving ARV. Such low coverage is alarming; ARV coverage for IDUs must be scaled up.

Our study clearly demonstrates that participants were engaged in sexual and drug risk behaviors with each other and with other partners. Comparing male and female partners, findings show that more males than females reported having had unprotected sex with any partner, and that males were more likely to have had more than one concurrent partner. Among IDUs, males were also more likely to report recent injection drug use than women, however, female IDUs were more likely than male IDUs to report unsafe injection acts with their main partners. These findings are consistent with several studies that have shown that females who inject drugs tend to inject with their intimate sex partners, [17, 18, 29–31] which elevates their risk for HIV transmission. These findings underscore the need for innovative prevention strategies tailored to drug-involved couples that focus on reduction of both sexual and drug risks.

More than a third of the female sex partners of the IDU male partners had no history of injection drug use, yet the rate of HIV among this sub group of women remains high (10 %). This is consistent with recent UNAIDS reports [3, 5] showing that up until 2010, the HIV epidemic in Central Asia was mainly concentrated among IDUs, but more recently the epidemic has spread into other populations such as female partners of IDUs. It should be noted that about 20 % of the participants were in an HIV serodiscordant relationship with their partner, further highlighting the need for HIV prevention strategies that focus on reducing both sexual and drug-related risks in couples, as well as promoting joint HIV testing.

As in other studies among IDUs, the rates of HCV and co-infections of HIV and HCV were extremely high [7]. The high rates observed in this study and other studies among IDUs in Central Asia [6–10] can be attributed to the prevalence of risky behaviors such as syringe sharing and abysmally low rates of condom use. Discussion about the dangers of HCV, HIV, and other STI co-infections need to be included as a component of patient counseling for all drug users and specifically for HIV-infected men and women. Unfortunately, the co-infection of HIV and HCV receives little attention in Kazakhstan, despite the rapid increase of such co-infections and growing evidence on the impact of HCV on HIV progression [32].

Through examining the associations between HIV serostatus and sexual and drug risks, we found that being HIV positive was significantly associated with risky drug using behaviors, but the opposite was found regarding sexual risk behaviors (i.e., HIV-positive serostatus was associated with having less unprotected vaginal sex and having multiple partners in the past 90 days). The relationship between HIV serostatus and engaging in unsafe injection behaviors remained significant in the subgroup analysis among those who already knew that they were HIV positive at baseline as well as among those who found out about their HIV status at baseline. Research conducted outside of Central Asia has shown that IDUs may reduce sexual risk behavior after finding out that they are HIV positive, but they have less success in reducing drug risk behaviors [33]. These findings have important HIV prevention implications where strong emphasis should be placed on drug risk reduction not only among those who are HIV negative, but HIV positive people as well.

The study has a number of strengths. It targeted IDU couples, used biological assays to test for HIV, HCV, and syphilis, and enrolled a large sample of IDUs and their female intimate partners. However, it also has a number of limitations including that data was cross-sectional, which precludes us from determining the temporal relationships between risk behaviors and HIV infection. The sample is non-random; therefore, the study findings may not be representative of other injection drug users. Nevertheless, the study clearly reached a population of IDUs and their partners that have limited access to drug treatment and HIV services and care in this critical region of the world where concern about spread of the HIV epidemic is high. Despite limitations, the findings have important HIV treatment and prevention implications. Future research with more rigorous methods of respondent-driven or venue-based sampling is needed to obtain more accurate estimates of HIV prevalence and incidence rates in this population.

The findings call for efforts to improve access to HIV testing, treatment, care, and prevention for IDUs in Almaty, Kazakhstan. Effective HIV prevention strategies are urgently needed to reach IDUs and their IDU and non-IDU sex partners in this region, especially in light of new developments in "treatment as prevention" with antiretroviral drugs [34]. Promoting confidential testing as a routine practice, while protecting IDUs from discrimination, registration, and arrest, must be implemented to reduce the spread of HIV among IDUs and their partners. Moreover, regular HIV testing should be central to the prevention continuum. Study findings underscore the need for prevention strategies that focus on non-IDU female sex partners of IDUs, couples who engage in drug use, and HIV discordant couples. A couple-based HIV prevention modality can play a pivotal role in the fight against HIV transmission. Couple-based behavioral interventions combined with biomedical HIV prevention strategies for serodiscordant or at-risk couples have the potential to significantly reduce new incidence of HIV. Given that sexual and drug use behaviors occur in a dyadic context, involving both members of a couple jointly in an intervention to reduce transmission risk and support each other in adhering to ARV and other biomedical treatment is paramount to fighting an epidemic where no vaccine is available. A couple-based approach underscores the joint responsibility of both members of the dyad and, in particular, increases men's awareness of their responsibilities [29, 31].

In sum, the findings of this study demonstrate the urgent need for scaling up coverage of HIV testing, treatment and care for IDUs and their partners and for reducing the structural and sociopolitical barriers that prevent IDUs from accessing HIV prevention and treatment. Commitment and funding are necessary in order to reduce barriers and scale up coverage.

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