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Intersecting epidemics of HIV, HCV, and syphilis among soon-to-be released prisoners in Kyrgyzstan: Implications for prevention and treatment

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Abstract

Background—Central Asia is plagued by increasing HIV incidence, low antiretroviral therapy (ART) coverage and increasing AIDS mortality, driven primarily by people who inject drugs (PWID). Reliable data about HIV, other infectious diseases, and substance use disorders in prisoners in this region is lacking and could provide important insights into how to improve HIV prevention and treatment efforts in the region.

Methods—A randomly sampled, nationwide biobehavioral health survey was conducted in 8 prisons in Kyrgyzstan among all soon-to-be-released prisoners; women were oversampled. Consented participants underwent computer-assisted, standardized behavioral health assessment surveys and testing for HIV, HCV, HBV, and syphilis. Prevalence and means were computed, and generalized linear modeling was conducted, with all analyses using weights to account for disproportionate sampling by strata.

Results—Among 381 prisoners who underwent consent procedures, 368 (96.6%) were enrolled in the study. Women were significantly older than men (40.6 vs. 36.5; p=0.004). Weighted

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prevalence (%), with confidence interval (CI), for each infection was high: HCV (49.7%; CI: 44.8-54.6%), syphilis (19.2%; CI: 15.1-23.5%), HIV (10.3%; CI: 6.9-13.8%), and HBV (6.2%; CI: 3.6-8.9%). Among the 31 people with HIV, 46.5% were aware of being HIV-infected. Men, compared to women, were significantly more likely to have injected drugs (38.3% vs.16.0%; p=0.001). Pre-incarceration and within-prison drug injection, primarily of opioids, was 35.4% and 30.8%, respectively. Independent correlates of HIV infection included lifetime drug injection (adjusted odds ratio [AOR]=38.75; p=0.001), mean number of years injecting (AOR=0.93; p=0.018), mean number of days experiencing drug problems (AOR=1.09; p=0.025), increasing duration of imprisonment (AOR=1.08; p=0.02 for each year) and having syphilis (AOR=3.51; p=0.003), while being female (AOR=3.06; p=0.004) and being a recidivist offender (AOR=2.67; p=0.008) were independently correlated with syphilis infection.

Conclusion—Drug injection, syphilis co-infection, and exposure to increased risk during incarceration are likely to be important contributors to HIV transmission among prisoners in Kyrgyzstan. Compared to the community, HIV is concentrated 34-fold higher in prisoners. A high proportion of undiagnosed syphilis and HIV infections presents a significant gap in the HIV care continuum. Findings highlight the critical importance of evidence-based responses within prison, including enhanced testing for HIV and sexually transmitted infections, to stem the evolving HIV epidemic in the region.

Keywords

Prisons; Kyrgyzstan; HIV prevalence; syphilis; opioid use disorders; people who inject drugs (PWID)

1. Introduction

Dramatic shifts in the political and economic landscape of Central Asia after dissolution of the Soviet Union have left a public health catastrophe in its wake. The weakened healthcare infrastructure, increased drug and sexual HIV risk behavior, co-infection with sexually transmitted infections (STIs), and rising numbers of opioid injectors by virtue of the region's geographic proximity to drug-trafficking routes, have collectively fueled the intersecting epidemics of HIV and STIs (Thorne et al., 2010). Despite a 33% reduction in the number of new HIV infections worldwide since 2001, incidence continues to increase in EECA (Beyrer & Abdool Karim, 2013; DeHovitz, Uuskula, & El-Bassel, 2014; Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014; Thorne et al., 2010), primarily among people who inject drugs (PWID), who account for 50-70% of total HIV infections in the region (Joint United Nations Programme on HIV/AIDS, 2012; Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014). Kyrgyzstan has an estimated 25,500 PWID with an HIV prevalence among them that is 20-fold higher than in the general population (Walsh & Maher, 2013). To a lesser extent, heterosexual transmission is also on the rise with recent increases in the proportion of incident HIV cases attributed to this mode of transmission (Boltaev et al., 2013; DeHovitz et al., 2014).

Central Asia markedly lags behind scale-up of recommended HIV risk-reduction strategies, like expansion of opioid agonist therapies (OAT) with methadone or buprenorphine and needle/syringe programs (NSP), which hampers HIV prevention efforts in the region (Joint

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United Nations Programme on HIV/AIDS, 2012). Significant barriers to curbing the HIV epidemic, stemming from Russia's continued influence in the region, include proscriptive and punitive drug policies (El-Bassel, Strathdee, & El Sadr, 2013), stigmatization of individuals with substance use disorders (SUDs) (Spicer et al., 2011), commercial sex workers (CSW), (Baral et al., 2013) and men who have sex with men (MSM) (Latypov, Rhodes, & Reynolds, 2013), hardline policing (Beletsky et al., 2013) suboptimal political will, and the absence of a legal framework to support such initiatives (Thorne et al., 2010).

Incarceration disproportionately affects individuals with or at risk for HIV (Fu et al., 2013), interrupts care for HIV and SUDs (Kamarulzaman et al., 2015; Springer et al., 2011) and fuels HIV transmission through the disruption of social and injection networks (Maru et al., 2007). When society favors incarceration over community rehabilitation of PWID, the criminal justice system (CJS) has been underutilized as a crucial platform for HIV prevention and treatment efforts (Flanigan et al., 2010). This is especially true since the CJS is a structured setting where the related epidemics of SUDs and incarceration intertwine to drive the spread of infectious diseases (Jurgens et al., 2009). In Central Asia, socially marginalized individuals are incarcerated for crimes associated with increased HIV and STI risk, including CSW and drug trafficking (Vagenas et al., 2013a). Incarceration is a common occurrence in the lives of PWID, with up to 90% of PWID in the region being estimated to have been incarcerated (World Health Organization, 2012). Kyrgyzstan has been a regional leader in HIV prevention and harm reduction efforts, bolstered by political and legal support from NGOs, international donors and several state agencies (Ancker & Rechel, 2015; Schonning & Stuikyte, 2009). It is the only country in Central Asia and one of only seven countries worldwide that integrates both OAT and NSP into its nationwide HIV prevention strategy for both communities and prisons, albeit with suboptimal coverage (Boltaev et al., 2012; Degenhardt et al., 2010; International AIDS Society, 2011). High OAT coverage is effective for both primary (Altice et al., 2010) and secondary HIV prevention by increasing antiretroviral therapy (ART) utilization (Altice, et al., 2011; Lucas et al., 2010; Uhlmann et al., 2010), improving HIV treatment outcomes (Altice, et al., 2011; Palepu et al., 2006) within prison (Haig, 2003) and during the post-release period, (Kinlock et al., 2012) as well as reducing HIV risk behaviors (Altice et al., 2006; Metzger et al., 1993).

Despite these policy initiatives, HIV prevalence continues to rise in Kyrgyzstan, especially among PWID (Thorne et al., 2010), and increasingly sexual transmission accounts for newly-reported cases (Ministry of Health of the Kyrgyz Republic, 2014a). Co-infection with syphilis exacerbates HIV transmission through increased genital ulcers (Lynn & Lightman, 2004) to bridge populations, which can spread HIV to the general population, enabling a generalizing HIV epidemic (Thorne et al., 2010). Previous studies have showed an association between syphilis and drug injection, suggesting a possible causal relationship between the two (Platt et al., 2007). Syphilis rates increased dramatically after the collapse of the Soviet Union (Uuskula et al., 2010), but national surveillance data is limited (Herbert & Middleton, 2012) and hampered by incomplete reporting (Riedner et al., 2000).

In settings where governments favor incarceration over community treatment, periods of imprisonment provides critical access to hard-to-reach populations, linked with opportunities for diagnosing, initiating and sustaining treatment. Consequently, it is crucial to obtain

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reliable and accurate information on the prevalence of SUDs, mental illness, and infectious diseases among prisoners, most of who will return to community settings. While there are recent HIV prevalence data (7.6%) from prisoners in Kyrgyzstan (Ministry of Health of the Kyrgyz Republic, 2014b), data on the health of prionsers in Central Asia is often inconsistent (Vagenas et al., 2013b) and most sentinel surveillance methods are fraught with considerable selection bias.(Nashkhoev & Sergeyev, 2008) Furthermore, there are no recent data on other transmissible infections in the region, specifically ones that are recommended to be addressed in prisons by international agencies such as STIs and viral hepatitis (United Nations Office on Drugs and Crime (UNODC), 2012; WHO/UNODC/UNAIDS, 2007, 2008; World Health Organization (WHO), 2015). Importantly, this study addresses gaps in data on prisoner health in Central Asia (Vagenas et al., 2013b) by providing the: 1) first comprehensive, scientifically rigorous biobehavioral and serosurvey among prisoners in the region and 2) independent correlates of HIV and syphilis and their inter-relationships with socio-demographic characteristics, structural factors (incarceration, access to harm reduction services), mental health, and substance use.

2. Methods

A comprehensive, nationally representative, bio-behavioral survey assessing health status, addiction, and infectious diseases (HIV, hepatitis C [HCV], hepatitis B [HBV], and syphilis) was conducted in all 8 of Kyrgyzstan's non-specialty prisons from July 15 to November 15 2014.

2.1 Setting

In Kyrgyzstan, the State Service for the Enforcement of Punishment (SSEP), operated under the auspices of the Ministry of Justice, oversees the CJS, including prisoner health. Kyrgyzstan's incarceration rate is 166 prisoners per 100,000 population (International Centre for Prison Studies, 2015), exceeding the world average of 146 prisoners per 100,000 population. At the time of this study, there were 9,248 prisoners in Kyrgyzstan. The CJS includes 6 pre-trial detention centers and 12 prison facilities for sentenced prisoners, including 3 medium- and 4 high-security male prisons, a female facility, and 4 specialty prisons: one for juveniles and 3 hospital prisons. Facilities are concentrated primarily in the capital, Bishkek. Inmates are housed in facilities of either medium or high security, depending on the severity of the crime committed.

2.2 Selection of prisons and sampling of participants

Participants were randomly selected from all sentenced prisoners within 6 months of release in non-specialized facilities in Kyrgyzstan using a stratified random sampling scheme (Suresh et al., 2011) previously validated in Eastern Europe and Central Asia (Azbel et al., 2013; Azbel et al., 2015). Inclusion criteria were: 1) ≥18 years; 2) currently serving a sentence in a non-specialized facility; and 3) scheduled release within six months. Specialized facilities (juvenile detention and hospital prisons) and pre-trial detention centers were excluded.

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Figure 1 illustrates the sampling scheme in Kyrgyzstan, including the total number of prisoners in each facility (N^P), number soon-to-be released (N^R), number randomly chosen for consent (N^C), and the number who gave consent and enrolled (N^E). From an estimated 938 inmates in non-specialized facilities meeting eligibility criteria, we aimed to enroll 40% in our study. This sample size ensured that our estimate of primary interest, HIV prevalence (roughly estimated to be 8%), was made with acceptable error (3% margin of error for 95% confidence intervals). The size was augmented through oversampling of prisoners from smaller facilities, including the women's facility, to improve precison for these strata. At each facility, prisoners were selected using a random assignment chart from a complete list of soon-to-be-released prisoners provided by the SSEP. Research assistants from a local NGO, AIDS Foundation East-West Kyrgyzstan, administered the interviews after undergoing extensive training on the research protocol and ethics.

2.3 Data collection

Data collection occurred over three days for each participant using previously described procedures (Azbel et al., 2013; Azbel et al., 2015). Day one, selected prisoners underwent voluntary, confidential, and anonymous consent procedures, followed by enrollment, assignment of an anonymous personal identification code, and pre-test counseling. Participants were informed that their results would remain confidential and they could opt-out of participation at any point throughout the study without any consequences. Reasons for non-participation were recorded without personal identifiers. Participants then underwent phlebotomy for serological testing, with specimen labeling including only the participant's anonymous identification code. The following tests were performed: MONOLISA™ Anti-HBs enzyme immunoassay (EIA; BioRad Laboratories, France) for HBV surface antigen (specificity: 99.28%; sensitivity: 100%) and Enzyme Immunoassay (ELISA; DIA.PRO Diagnostic, Milan, Italy) for HCV antibody (specificity: 100%; sensitivity: 99.8%). Syphilis testing was performed using the rapid plasma reagin (RPR: Organon Teknika, Durham, NC) with confirmatory MHA-TP (Organon Teknika, Durham, NC). Initially positive HIV ELISA tests using Diagnostic Kit for HIV (1+2) Antibody (specificity: 98.3%; sensitivity: 100%; Shanghai Kehua Bioengineering Co. Ltd, Shanghai, PR China) were reflexively followed by secondary testing with the Lucio – Sero ELISA HIV 1/2/0 Ab/Ag (specificity: 99.8%; sensitivity: >99.9%; nal von minden GmbH, Germany) and CD4 lymphocyte quantification using the HumaCount CD4. For participants unable to undergo phlebotomy (most commonly because of damaged veins), an oral HIV test using OraQuick ADVANCE™ Rapid HIV – ½ Antibody Test (specificity: 99.3%; sensitivity: 99.8%; OraSure Technologies, USA) was performed.

On day two, participants completed a structured behavioral survey using Audio-Computer-Assisted Self-Survey Instruments (ACASI) on touch-screen laptop computers. By ensuring anonymity, ACASI minimizes social desirability and reporting biases.(Ghanem et al., 2005) The survey was translated and back translated from English according to established methods (Brislin, 1970; Ware et al., 1995) and available in Russian or Kyrgyz. Although the adult literacy rate in Kyrgyzstan is 99.2%, survey questions were provided in written form and read aloud by research assistants in private for participants who did not have sufficient reading comprehension.

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On day three, participants underwent post-test counseling and received their confidential HIV (including CD4), HCV, HBV, and syphilis test results. All participants were offered voluntary referral to medical care within both the prison and/or in the community, and were directed to NGOs working with released prisoners. Each participant received a package of hygienic products totaling $7 USD for their participation.

2.4 Weighting

To account for the disproportionate allocation used in sampling (i.e. see N^R/N^E in Figure 1), we weighed observations in all analyses to ensure our estimates are representative of the population of Kyrgystani prisoners soon-to-be released. The weights for each observation are a product of two entities: (1) the proportion of those soon to be released for given facility (i.e. N^R for a given facility divided by the sum over all N^R) and (2) the inverse of the facility-specific sample size (N^E).

2.5 Variables

Self-reported survey items included: 1) socio-demographic characteristics; 2) criminal justice and detention history, with “lifetime years incarcerated” measured as a sum of lifetime years incarcerated; 3) major depression symptoms were defined dichotomously for scores ≥11 on the 10-item Clinical Epidemiological Survey of Depression CES-D 10 (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993); 4) anxiety criteria was met with scores ≥45 on the Zung anxiety scale (Zung, 1971); 5) health-related quality of life (HRQoL) was measured continuously using the Medical Outcomes Survey SF-36 (Ware & Sherbourne, 1992); 6) an alcohol use disorder was defined by scores ≥8 (men) or ≥4 (women) on the WHO’s Alcohol Use Disorders Inventory Test (AUDIT) (Saunders et al., 1993); 7) sexual and drug HIV risk behaviors; 8) self-reported history of chronic illnesses; 9) social support measured continuously using a standardized scale (Eaton WW MC, 2004); and 10) goals for re-entry into the community. HIV seropositivity was defined if the ELISA test was confirmed by Western Blot testing. Syphilis diagnosis was determined based on having an RPR titer ≥1:16 correlating with a >90% likelihood of having an active infection (Larsen et al., 1995).

Questions regarding drug and HIV risk behaviors were asked separately for the six months prior to arrest and the time of incarceration. Substance use was defined as having used one or more and use as two or more (multiple substance use) of the following substances: barbiturates, illegal opioids, sedatives, cocaine, hallucinogens, or amphetamines. Sexual risk behaviors included vaginal or anal intercourse without a condom with men and/or women.

2.6 Analysis

SPSS (version 21.0), and R (version 3.2.3) using Survey package (Lumley, 2004) were used for statistical analyses. Since fewer than 5% of variables were missing we used complete-case analyses. Estimates of prevalence and means for key variables, including 95% confidence intervals were computed. Bivariate and multivariable genalized linear modeling with quasibinomial distrbution and logit link was performed to determine the independent correlates of HIV and syphilis infections. Variables that were significantly associated with the outcome at the bivariate level ($p<0.05$) were included in the full multivariable model.

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Variables deemed collinear using the variation inflation factor (VIF ≥5) were removed to produce the final model. Only one variable, occuring in the HIV model, was excluded (denoted in table 2). Subgroup comparisons (i.e. by gender or by HIV status awareness) were made using a similar bivariable generalized linear model approach.

2.6 Ethics statement

The Institutional Review Boards at Yale University (Protocol Number 1304011761)and the Kyrgyzstan Ministry of Health approved the study. Further ethical assurances were provided by the U.S. Office for Human Research Protections (OHRP) in accordance with 45 CFR 46.305(c) “Prisoner Research Certification” requirements.

3. Results

3.1 Socio-demographic characteristics

Among 381 prisoners who underwent consent procedures, 368 (96.6%) consented and were enrolled in the study. Of these 368 participants, 13% were women. All further results reported, except where noted, have been weighted. Table 1 reports participants’ socio-demographic characteristics. The mean age was 37.4 years; women were significantly older than men (40.6 vs. 36.8; p=0.004). The mean duration of the current incarceration was 2.3 years and 70.5% were recidivists with an average of 3.6 previous incarcerations. The majority (58%) had completed high school and the most common criminal offenses were property-(32%) and drug-related (22.6%) crimes (see Table 1).

3.2 Weighted prevalence of infectious diseases

HCV was most prevalent (49.7%, confidence interval [CI]: 44.8%-54.6%), followed by syphilis (19.2%, CI: 15.1-23.5%), HIV (10.3%, CI: 6.9-13.8%), and HBV (6.2%, CI: 3.6-8.9%). The results of serological testing, stratified by gender, are presented in Figure 2. All infections were more prevalent among male participants, with the exception of syphilis, which was twice as prevalent among women. There was a strong overlap between infections: 40% of those with HIV also tested positive for syphilis, and 20.4% of those with HCV also had HIV (only one person diagnosed with HIV did not have HCV). Four people were unable to have a phlebotomy and were tested for HIV using saliva-based testing and were not tested for other infectious diseases.

While 74.7% of the sample had “ever” been tested for HIV, only 60% of these had received their results and 32% of the entire sample had been HIV tested in the previous year. More than half (53.5%) of those diagnosed with HIV were unaware of being infected. Of the 15 who were aware of being HIV-infected, 81.2% were prescribed ART. The mean CD4 count was 368.4 with no significant difference between those previously aware and unaware of their status. For those receiving ART (N=12), the mean CD4 count was 392. Of the 10 participants who had a CD4<350 *cells/mL* and were aware of their status, 8 were prescribed and currently taking ART. Only 7.1% of those infected with HCV and 4.2%of those infected with syphilis had reported every being informed of their diagnosis by a doctor.

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3.3 Substance use and mental illness

Figure 3 provides the self-reported prevalence of substance use, stratified by *lifetime* use, use in the 30 days before incarceration, and use *during* incarceration. In the 30 days prior to incarceration, 36.1% of the sample had used at least one illicit substance and 8.4% reported multiple-substance use. The most commonly used substance was opioids with 34% reporting lifetime use, primarily of heroin. Overall, more than a third (35.4%) had injected drugs at least once in their lives. Of those, 86.2% had injected within prison, or over 25% of the entire sample. Over 51.9% of the sample met criteria for having an alcohol use disorder (AUD). A third of the sample (32%) met screening criteria for moderate to severe depression and 5% met criteria for moderate to severe anxiety.

3.4 Drug and sex risk behaviors

Of those reporting having ever injecting drugs (N=109), 13 (11.2%) reported sharing injection equipment in the 30 days prior to incarceration. Moreover, an astounding 94 (86.2%) of the injectors had ever injected within prison where close to a third (N=35) had *initiated* drug injection for the first time there and 70 participants had shared injection equipment within prison. Men, compared to women, were significantly more likely to have injected drugs (38.3% vs.16.0%; p=0.001).

Sexual risk was reported in the 30 days before incarceration, with half (50%) of participants reporting vaginal or anal intercourse without a condom. Of these, 30% reporting having sex with more than one partner without a condom while 6 participants reported that they knew one of their partners to be HIV-positive.Transactional sex without a condom was reported by 6.5% (N=20 women and 1 man) in the 30 days before incarceration while no male participants reported unprotected sex with another man during this same period.

3.5 Correlates of HIV and syphilis infections

Tables 2 and 3 present the weighted bivariate and multivariable correlates of HIV and syphilis infection, respectively. After controlling for other variables, three drug-related factors, one criminal justice and syphilis were independently correlated with HIV. Lifetime drug injection was a significant independent correlate of HIV infection with nearly a forty-fold (adjusted odds ratio (AOR): 38.75; $p<0.001$) increased association. The mean number of years of injecting (AOR: 0.93, p=0.018), and mean days experiencing drug problems (AOR: 1.09, p=0.025) were also significant correlates of HIV. Moreover, duration of incarceration was associated with increased HIV risk (AOR: 1.08; p=0.02), with an 8% increase in risk for each year incarcerated. Though sexual risk behaviors, reported only for the month before incarceration, were not associated with HIV, syphilis infection was associated with more than a 3-fold (AOR: 3.51; p=0.003) increased odds of HIV infection. Since syphilis was most strongly associated with being HIV-infected, independent correlates of syphilis infection included being female (AOR: 3.06; p=0.004) and being a recidivist prisoner (AOR: 2.67; p=0.008); neither commercial sex work was nor drug and sex risk behaviors in the 30 days before incarceration were significantly correlated with syphilis infection. Finally, gender did not interact with multivariate predictors for either HIV or syphilis.

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4. Discussion

To our knowledge, this is the first comprehensive study documenting the health status of prisoners in Central Asia, a region where HIV incidence and mortality continue to rise (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014), driven primarily by PWID, a population that frequently interfaces with the CJS. This study found an extraordinarily high prevalence of infectious diseases, mental illness, and SUDs, suggesting the need to synergistically screen and treat prisoners for these often co-morbid conditions, and to substantially scale-up evidence-based HIV prevention and healthcare delivery services within prison. Compared to Kyrgyz adults age 15 to 49 years whose HIV prevalence is 0.3% (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014), prisoners carry a disproportionate burden of disease, with a 34-fold higher HIV prevalence, which is markedly higher than the fold-increase found in similar studies conducted in Azerbaijan (Azbel et al., 2015) and Ukraine (Azbel et al., 2013).

Our finding that increasing time incarcerated and drug injection are independent correlates of HIV infection point to the high-risk environment posed to individuals who are sentenced in prisons repeatedly over a lifetime. These data would suggest that each additional incarceration re-exposed individuals to an environment where highly risky behaviors, including injection and needle-sharing were common, increasing the likelihood of HIV infection. Drug injection and the increased HIV risk associated with incarceration are likely to be important contributors to HIV transmission among prisoners in Kyrgyzstan. These correlations call for three important strategies for intervention. First, measures that reduce the likelihood of incarceration are needed since incarceration contributes to ongoing HIV transmission through the disruption of social networks in communities, thereby increasing sexual- and injection-related (Maru et al., 2007). When a stable person within a risk network is removed from circulation through incarceration, others with unknown risk enter into the risk environment, augmenting risk (Golembeski & Fullilove, 2008). Alternatives to incarceration like probation for minor drug offenses, community policing and drug courts are effective ways to reduce incarceration of high risk individuals (United Nations Office on Drugs and Crime (UNODC), 2006). Expanded community treatment coverage with OAT similarly reduces drug-related crime and incarceration. Second, for those who do become incarcerated, it underscores the importance of ensuring wide-scale delivery of OAT and NSPs within the prison setting to reduce transmission of blood-borne viruses and within prison drug injection (Jurgens et al., 2009). While Kyrgyzstan is one of seven countries globally to provide both OAT and NSP within prisons, only 377 (11.6%) people are currently receiving OAT, which is far below the conservative number of injectors estimated in this study (N=3,246). Given the chronic relapsing nature of opioid use disorders, OAT should be offered to all prisoners with opioid use disorders entering prison and continued throughout imprisonment and after release. Consistent with the Fifth Version of the Diagnostic Statistical Manual (DSM-V), which qualifies that SUDs still need to be treated even within a controlled setting like prison. Third, for those who initiate OAT within prison, it is crucial to ensure that this treatment is maintained post-release, to not only engage PWID in effective addiction treatment (Rich et al., 2015b), but to prevent overdose (Rich et al., 2015a) and recidivism to prison (Kinlock et al., 2009) where they would be re-exposed to

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risk. Such transitional OAT programs are most effective when methadone is prescribed daily at doses exceeding 80mg (Wickersham et al., 2013).

Most HIV infections were undiagnosed and untreated, outlining new opportunities for improving the HIV continuum of care in order to meet WHO's 90-90-90 mandate to increase diagnosis, ART coverage, and viral suppression levels in order to reduce HIV incidence and mortality. With over half of HIV-infected prisoners not knowing their status, there is an urgent need invigorate HIV testing efforts to increase diagnosis. While international agencies recommend voluntary HIV testing and counseling (VTC) for prisoners within a human rights framework, routine HIV testing has been documented to be feasible (Kavasery, Maru, Cornman-Homonoff, et al., 2009; Kavasery, Maru, Sylla, Smith, & Altice, 2009), more effective in identifying new HIV cases in prisoners (Flanigan & Beckwith, 2008; MacGowan et al., 2009; Rosen et al., 2015; Shrestha et al., 2009; Zaller et al., 2007) and is often recommended where HIV testing is guaranteed to be linked to quality HIV treatment (Branson et al., 2006; Centers for Disease Control and Prevention, 2009). Since ART coverage was satisfactory among HIV-infected individuals who were previously diagnosed, routine HIV testing should be considered in this setting. While numerous reports recommend high levels of HIV testing within prisons, crucial to this step is "official" registration with the government-run AIDS Center, which is mandated in nearly all countries in Eastern Europe and Central Asia, which is required before receiving monitoring and treatment (Izenberg & Altice, 2010; Vagenas et al., 2013a). Consequently, abolition of these official names-based registries have been suggested in order to reduce stigma and discrimination and increase entry into ART treatment by people living with HIV (Bojko, Dvoriak, & Altice, 2013; Izenberg & Altice, 2010). Similar observations about being unaware of their status were found for both HCV and syphilis. International agencies recommend screening for these conditions, treatment of STIs, and vaccination for HBV (WHO/UNODC/UNAIDS, 2007; World Health Organization (WHO), 2014).

Overall syphilis prevalence was high, but especially high among women and in people living with HIV. The syphilis serology reported here is likely to represent untreated infection since only 4% of these prisoners with positive syphilis serology had ever diagnosed with any STI. Finding here support the need for syphilis testing and treatment upon entry especially women and people living with HIV (DiClemente et al., 2014; Wolitski, 2006). Syphilis in other settings has been associated with bridging HIV transmission to sexual partners (Lynn & Lightman, 2004; Pitpitan et al., 2015; Strathdee et al., 2011). The increasing numbers of individuals contracting HIV through heterosexual transmission has been reported across Central Asia (Boltaev et al., 2013), yet the finding of high prevalence of syphilis, which is, in turn, independently associated with HIV, provides insights into the importance of integrating HIV and STI prevention and treatment services (Dukers-Muijrers et al., 2012). Sexual risk reductions interventions should be adapted to the Kyrgyz context, particularly for women, to improve condom use skills, HIV/STI knowledge, and reduce sexual risk behaviors both during incarceration (DiClemente et al., 2014) and during community re-entry (Wolitski, 2006). Given the syndemic nature of drug injection, syphilis, and HIV (Gilbert et al., 2013; Singer & Clair, 2003) within Kyrgyz prisons, our results point to an urgent need for an integrated harm reduction approach which would incorporate STI testing

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and treatment. In the absence of effective screening and treatment of syphilis, HIV threatens to expand and bridge to sexual partners of PWID during the post-release period.

Taken together, these data belies an urgent need for implementation of routine screening for HIV, HCV, HBV, and syphilis within prison, including efforts to ensure receipt of test results and provision of post-test counseling and treatment. Additionally, modes of transmission that are more highly stigmatized are often underreported and undermine correlates of these infectious diseases. For example, although it is well-known that MSM and CSWs are imprisoned at higher rates than other populations and are at higher risk for HIV (Vitek et al., 2014), no participant reported MSM and few reported CSW despite all attempts to reduce stigma by using data collection using ACASI. Studies of HIV reporting from Ukraine using triagulation of data recently confirmed that while it was believed that the HIV epidemic was generalizing outside of key populations (e.g., PWID, MSM, CSW), findings confirm that HIV remained concentrated in these groups because people diagnosed with HIV were unlikley to report these behaviors due to high levels of stigma (Cakalo et al., 2015). Future qualitative studies with released prisoners should explore the motivations behind under-reporting within prison to better understand how to address these issues in future studies.

Despite the compelling findings from this study, it is not without limitations. First, as in all cross-sectional studies, only correlations can be drawn and causality cannot be established. Our focus on distinct time periods of risk, however, reduce some of these concerns. Second, recall bias for the period before incarceration, in some cases several years, may have decreased accuracy, but we would have anticipated under-reporting rather than over-reporting of risk. In the case of prior drug injection, under-reporting is likely because if conservatively HCV prevalence is 50.4% in PWIDs in the community (Ministry of Education and Science of the Kyrgyz Republic, 2011), prevalence of PWID would approach 100% of this sample unless there were other causes of HCV transmission. Third, given the stigmatizing conditions and health risk behaviors discussed, there is also potential for social-desirability bias, which typically manifests as underreporting of the given conditions or behaviors like CSW and MSM. Fourth, our sampling frame testing soon-to-be-released prisoners was purposeful in order to better understand the HIV treatment cascade during periods of imprisonment, but does limit the ability to guide prison health authorities on how to manage newly incarcerated prisoners. It does, however, provide important insights into how to improve transitional care for prisoners and may not generalize to the entire prison population in Kyrgyzstan, especially those in pre-trial detention who would be ideal targets for testing for HIV, STIs, and for initiation of OAT. Notwithstanding these limitations, findings here point to future strategies to improve both individual and public health of individuals who interface with the CJS.

5. Conclusions

This is the first systematic study to evaluate the health status of a prison population in Central Asia, a region where injection drug use drives HIV infection. In this analysis, we were able to focus on HIV and STIs, which contribute to onward transmission of HIV. We assessed the burden of infectious diseases and provided a description of harm-reduction and healthcare access among this population. Strengthened information about health

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determinants and factors for prisoners' vulnerability is needed to plan, implement and evaluate interventions targeted at curbing the spread of HIV among prisoners and their partners.

Important findings from this study suggest improved strategies to screen for HIV, other blood-borne and sexually transmitted infections, and opioid use disorders in order to improve detection and provision of treatment. Although drug injection, primarily of opioids, contributes greatly to these infections, findings here point to the need for expanded OAT within the community and alternatives to incarceration to reduce the likelihood that individuals will interface with a high-risk prison environment at all. For those who do become incarcerated, however, it suggests that wide-scale availability of OAT and NSP programs are fully available and a plan put in place to effectively transition these individuals to the community post-release. Similar experiences from other countries suggest the critical importance of evidence-based responses to these findings, including increases in monitoring and evaluation activities to ensure already available programs are meeting their promise.

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Highlights

- HIV prevalence in prisons in Kyrgyzstan is 42-fold higher than in the community.
- A high proportion of HIV and syphilis infections among prisoners are undiagnosed.
- HIV is correlated with syphilis and factors related to incarceration.

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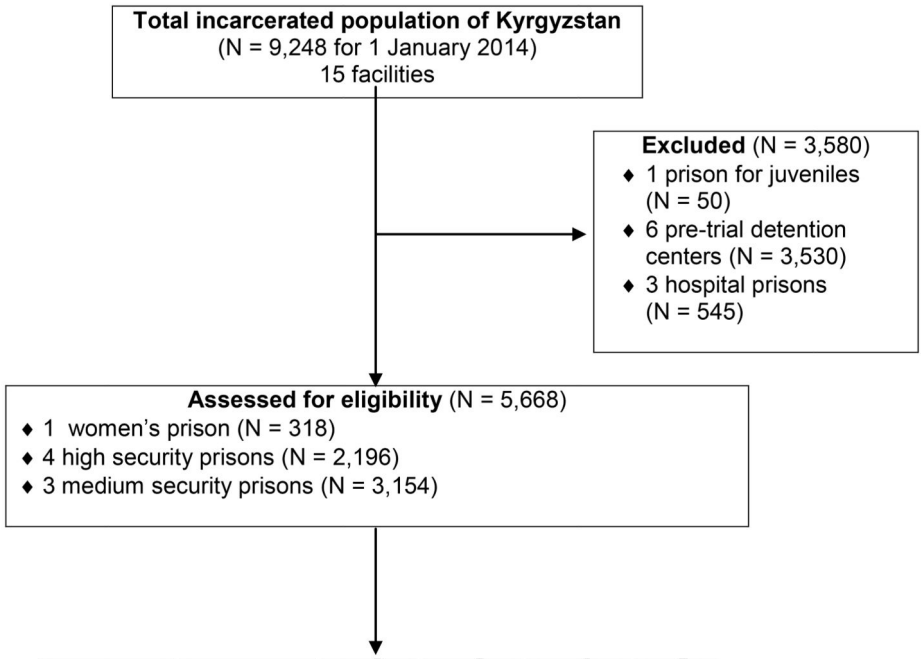

Prison	Security type	N^P	N^R	N^C	N^E
2	women	318	120	81	81
8	high	614	75	31	31
10	high	623	72	31	31
19	high	470	55	33	32
47	high	489	20	12	11
1	medium	998	214	67	66
16	medium	1,078	148	54	54
3	medium	1,078	234	72	62
Total		5,668	938	381	**368**

Figure 1. Flow of study participant selection among prisoners in the Kyrgyz criminal justice system

Key: N^P = number in prison population; N^R = number to be released in 6 months (men) or 1 year (women); N^C = randomly chosen for consent; N^E = number who gave consent and enrolled

Reasons for non-participation: Already knew their health status (N = 5); could not come to the interview (N = 5); did not provide a reason (N = 3); religious grounds (N = 1)

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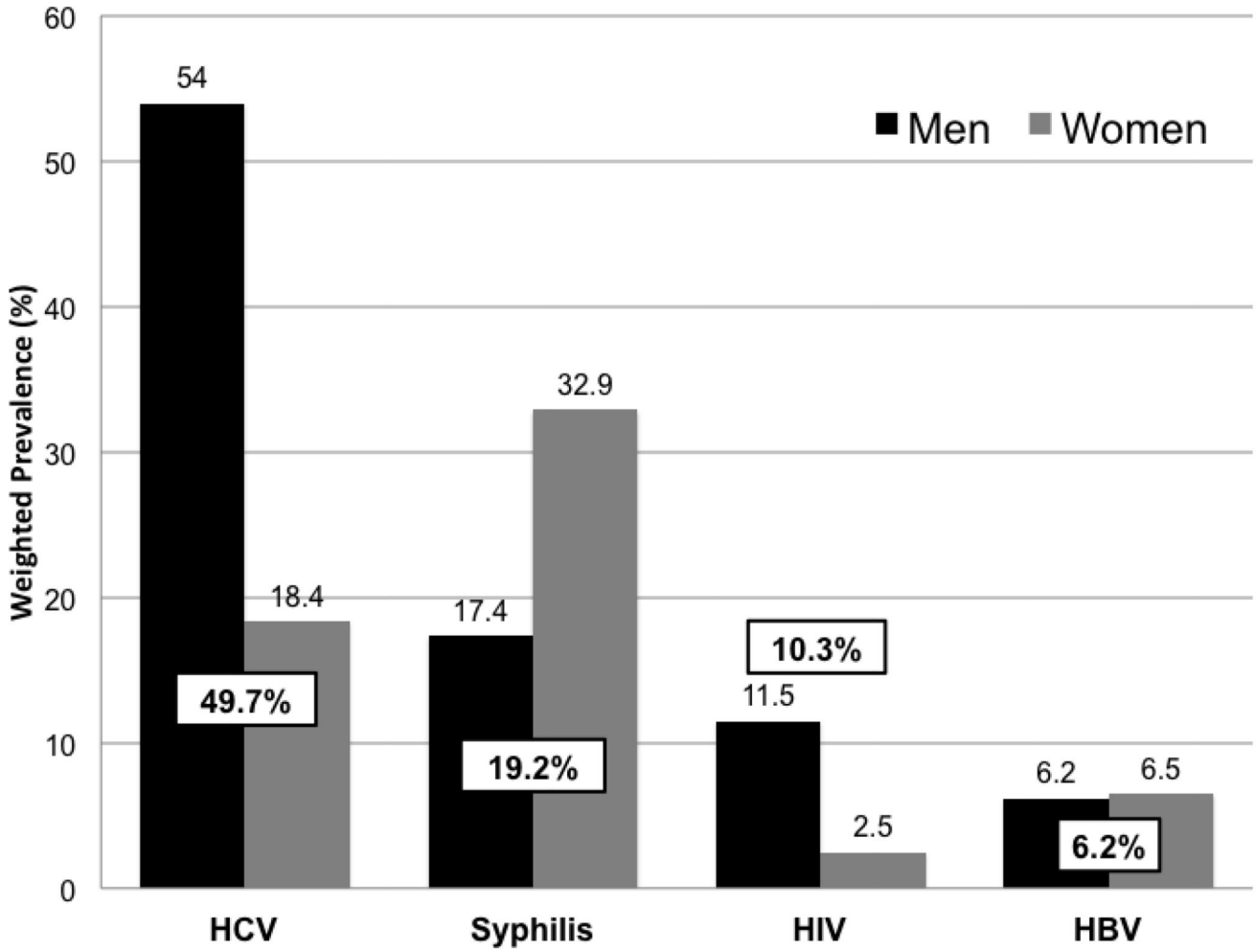

Figure 2. Prevalence of HCV, syphilis, HIV, and HBV among soon-to-be released prisoners in Kyrgyzstan (N=368)

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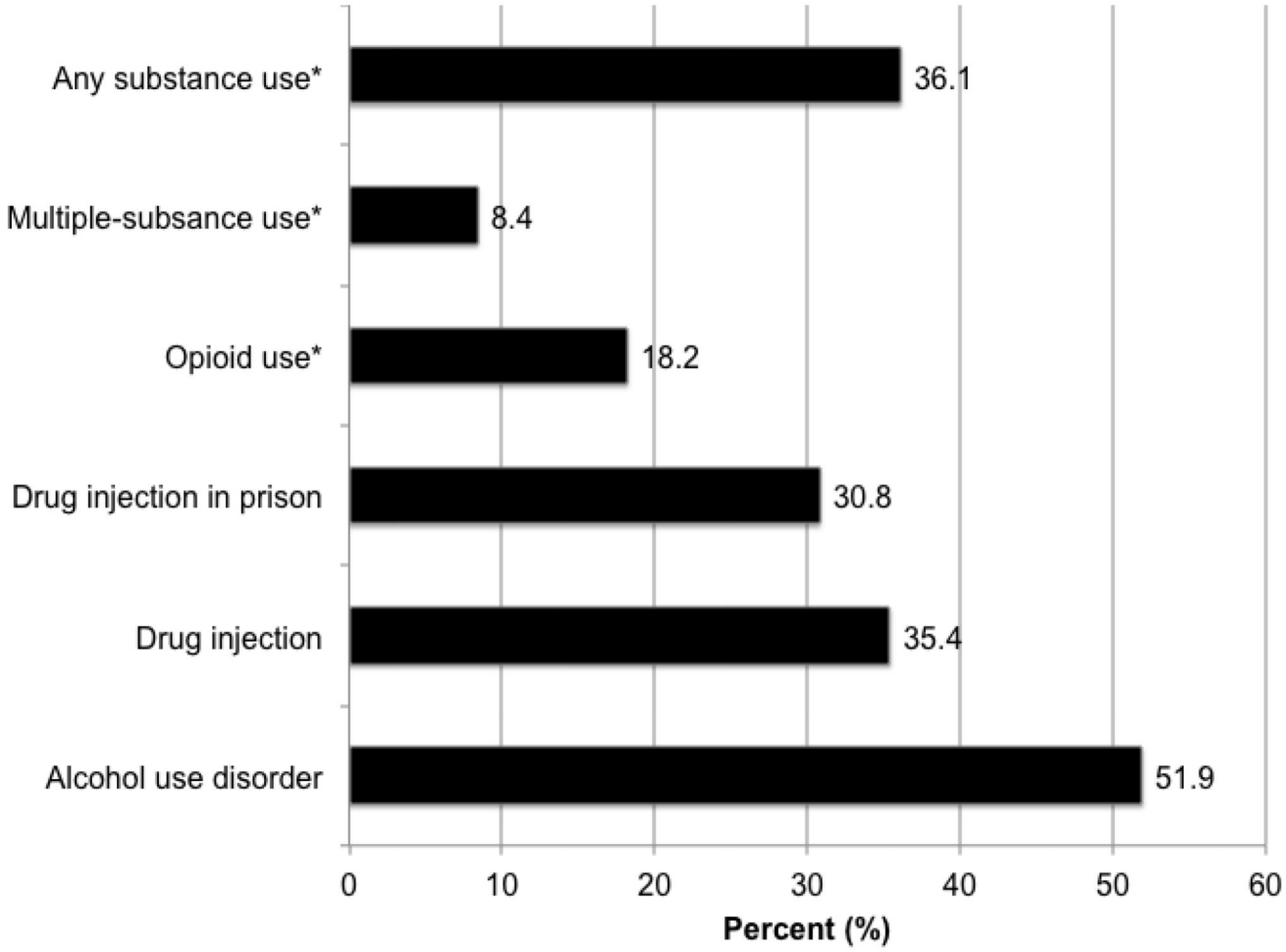

Figure 3. Prevelance of substance use among soon-to-be released prisoners in Kyrgyzstan (N=368)

* refers only to the 30 days prior to arrest and incarceration; otherwise, lifetime use.

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Table 1
Participant characteristics (N=368) for unweighted and weighted samples

Sample	Unweighted	Weighted
Demographics	**N (%)**[a]	**%**
Age, years, mean (range)	37.4(19-74)	37.4
Gender		
Male	287 (78.0)	87.0
Female	81 (22.0)	13.0
Ethnicity		
Kyrgyz	150 (41.0)	39.6
Russian	122 (33.3)	33.8
Uzbek	46 (12.6)	13.1
Criminal justice history		
Recidivists	228 (62.0)	70.5
Lifetime years incarcerated, mean (S.D.)	8.0 (6.7)	8.60 (7.0)
Previous incarcerations for recidivists, mean (S.D.)	3.4 (2.2)	3.59 (2.2)
Current incarceration duration, years, mean (S.D.)	2.4 (1.7)	2.29 (1.7)
Time before community release, months, mean (S.D.)	2.7 (1.7)	2.59 (1.6)
Type of offense		
Homicide	50 (13.8)	11.3
Violent crime	30 (8.3)	7.6
Property-related crime	98 (27.1)	32.0
Drug-related crime	86 (23.8)	22.6
Sexual related crime	9 (2.5)	2.30
Fraud	15 (4.1)	3.0
Other	68 (18.7)	19.0
Socioeconomic indicators		
In a sexual relationship	228 (62.0)	60.0
Completed high school	219 (59.8)	58.0
Below poverty line	119 (32.6)	31.0
Worked abroad (in Russia or Kazakhstan)	110 (30.1)	31.0
Health		
Mean CES-D score (S.D.)	8.23 (5.03)	8.12 (4.84)
Major Depression	122 (33.4)	32.0
Mild to severe anxiety	22 (6.0)	5.0
Social support scale score, mean (S.D.)	2.8 (1.0)	23.8 (12.6)
Health-related Quality of Life (SF-36)		
Mean Physical Composite Score (S.D.)	46.6 (5.8)	46.6 (5.8)
Mean Mental Composite Score (S.D.)	36.9 (8.2)	36.8 (8.1)

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Sample	Unweighted	Weighted
Demographics	**N (%)**[a]	**%**
Told by a doctor they had a sexually transmitted	36 (9.8)	10.0
HIV		
HIV-infected	31 (8.4)	10.3
CD4 count, cells/mL among 31 HIV-infected	374.1	368.4
CD4>350	12 (40.0)	39.0
CD4≤350	18 (60.0)	61.0
Currently prescribed antiretroviral therapy	12 (38.7)	37.7
Hepatitis C	156 (42.4)	49.7
Hepatitis B	22 (6.1)	6.2
Syphilis	73 (19.8)	19.2
Substance use		
Lifetime pre-incarceration opioid use	106 (29.4)	34.0
Ever injected drugs	109 (30.4)	35.4
Sedatives use in 30 days pre-incarceration	13 (3.5)	3.0

Key:

CES-D = Clinical Epidemiological Scale for Depression; S.D. = standard deviation

[a]Percent of those reporting

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Table 2

Unadjusted and adjusted correlates of HIV infection among soon-to-be-released prisoners in Kyrgyzstan (N=368)[a]

Covariate	Bivariate Analysis			Multivariable Analysis		
	Unadjusted Odds Ratio	95% C.I.	*p*-value	Adjusted Odds Ratio	95% C.I.	*p*-value
Age, mean (S.D.)						
37.4 (11.2)	0.98	0.96-1.01	0.604	—	—	—
Gender						
Women	0.194	0.04-0.84	0.028 *	**0.29**	**0.02-1.84**	**0.270**
Men	Referent	—	—			
Recidivist[d]						
Yes	13.96	1.88-103.84	0.011 *	**3.15**	**0.59-34.67**	**0.242**
No	Referent	—	—			
Lifetime years incarcerated, mean (S.D.)						
8.60 (7.00)	1.094	1.05-1.14	<0.001 *	**1.08**	**1.01-1.15**	**0.020***
Completed high school						
Yes	0.779	0.37-1.65	0.515	—	—	—
No	Referent	—	—			
Pre-incarceration income below poverty line						
Yes	1.29	0.59-2.83	0.528	—	—	—
No	Referent	—	—			
Meet CES-D criteria for major depression						
Yes	1.60	0.74-3.47	0.227	—	—	—
No	Referent	—	—			
Meet SAS critera for anxiety disorder						
Yes	1.63	0.43-6.26	0.473			
No	Referent	—	—			
Experienced negative health effects from detentions in the year pre-incarceration						
Yes	2.62	1.07-6.43	0.036 *	**0.87**	**0.29-2.41**	**0.794**
No	Referent	—	—			
Have worked abroad (in Russia or Kazakhstan)						
Yes	0.38	0.16-1.12	0.062	—	—	—
No	Referent	—	—			
Syphilis infected						
Yes	3.29	1.53-7.07	0.002 *	**3.51**	**1.50-8.20**	**0.003***
No	Referent	—	—			
Ever told by a doctor they had a sexually transmitted infection (STI)						

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Covariate	Bivariate Analysis			Multivariable Analysis		
	Unadjusted Odds Ratio	**95% C.I.**	***p*-value**	**Adjusted Odds Ratio**	**95% C.I.**	***p*-value**
Yes	1.90	0.67-5.39	0.228	—	—	—
No	Referent	—	—			
In a sexual relationship						
Yes	1.38	0.65-2.95	0.401	—	—	—
No	Referent	—	—			
Lifetime substance use						
Injected drugs						
Yes	9.60	3.76-24.47	<0.001 *	**38.75**	**6.16-256.4**	<0.001 *
No	Referent	—	—			
Number of years of injection, mean (S.D.)						
5.36 (9.46)	1.05	1.02-1.08	0.001 *	**0.93**	**0.88-0.98**	**0.018***
Used opioids						
Yes	5.76	2.52-13.17	<0.001 *	—	—	—
No	Referent	—	—			
Risk behaviors in 30 days before incarceration						
Any substance use						
Yes	5.77	2.45-13.62	<0.001 *	**1.01**	**0.26-3.73**	**0.984**
No	Referent	—	—			
Number of days experienced drug problems, mean (S.D.)						
1.37 (5.40)	1.06	1.02-1.11	0.005 *	**1.09**	**1.01-1.19**	**0.025***
Opioid use[d]						
Yes	5.08	2.31-11.17	<0.001 *	**2.93**	**0.77-7.03**	**0.138**
No	Referent	—	—			
Sedatives use						
Yes	1.00	0.12-8.14	0.999	—	—	—
No	Referent	—	—			
Multiple-substance use						
Yes	4.43	1.66-11.77	0.003 *	**2.00**	**0.54-7.47**	**0.294**
No	Referent	—	—			
Shared injecting equipment						
Yes	2.68	0.65-11.12	0.175	—	—	—
No	Referent	—	—			
Sex without condom						

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Covariate	Bivariate Analysis			Multivariable Analysis		
	Unadjusted Odds Ratio	**95% C.I.**	***p*-value**	**Adjusted Odds Ratio**	**95% C.I.**	***p*-value**
Yes	1.11	0.53-2.36	0.778	—	—	—
No	Referent	—	—			
Number of unprotected sex acts, mean (S.D.)						
4.44 (7.96)	1.00	0.95-1.04	0.866	—	—	—
Unprotected sex under influence of drugs						
Yes	1.55	0.43-5.61	0.504	—	—	—
No	Referent	—	—			
Transactional sex						
Yes	1.73	0.47-6.39	0.409	—	—	—
No	Referent	—	—			
Alcohol use disorder						
Yes[c]	0.88	0.41-1.90	0.749			
No	Referent	—	—			
Within-prison risk behaviors						
Injected drugs in prison						
Yes	5.52	2.47-12.35	<0.001*	**0.28**	**0.05-1.39**	**0.120**
No	Referent	—	—			
Shared injecting equipment in prison						
Yes	3.98	1.83-8.64	<0.001*	**1.04**	**0.34-3.34**	**0.939**
No	Referent	—	—			
Got tattoo from non-professional						
Yes	1.65	0.76-3.56	0.206	—	—	—
No	Referent	—	—			

*Denotes a significant difference, defined as $p \leq 0.05$

[a]Percent of those reporting, <5% missingness on the presented variables.

[c]Refers to the year before arrest and incarceration.

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Table 3

Unadjusted and adjusted correlates of syphilis infection among soon-to-be-released prisoners in Kyrgyzstan (N=368)[a]

Covariate	Bivariate Analysis			Multivariable Analysis		
	Unadjusted Odds Ratio	95% C.I.	*p*-value	Adjusted Odds Ratio	95% C.I.	*p*-value
Age, mean (S.D.)						
37.4 (11.2)	1.02	1.00-1.04	0.02*	**1.02**	**0.99-1.04**	**0.121**
Gender						
Women	2.33	1.31-4.14	0.004*	**3.06**	**1.41-6.54**	**0.004***
Men	Referent	—	—			
Recidivist						
Yes	2.17	1.17-4.02	0.014*	**2.67**	**1.35-5.72**	**0.008***
No	Referent	—	—			
Lifetime years incarcerated, mean (S.D.)						
7.69 (6.71)	1.03	0.99-1.06	0.142	—	—	—
Completed high school						
Yes	1.44	0.81-2.58	0.218	—	—	—
No	Referent	—	—			
Income below poverty line						
Yes	1.12	0.62-2.02	0.703	—	—	—
No	Referent	—	—			
Meet CES-D criteria for major depression						
Yes	1.23	0.69-2.19	0.482	—	—	—
No	Referent	—	—			
Meet SAS critera for anxiety disorder						
Yes	1.06	0.35-3.20	0.914			
No	Referent	—	—			
Have worked abroad (in Russia or Kazakhstan)						
Yes	0.97	0.53-1.79	0.937	—	—	—
No	Referent	—	—			
In a sexual relationship						
Yes	1.66	0.95-2.88	0.07	—	—	—
No	Referent	—	—			
Lifetime substance use						
Injected drugs						
Yes	1.25	0.70-2.23	0.449	—	—	—
No	Referent	—	—			

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Covariate	Bivariate Analysis			Multivariable Analysis		
	Unadjusted Odds Ratio	95% C.I.	*p*-value	Adjusted Odds Ratio	95% C.I.	*p*-value
Alcohol use disorder						
Yes[c]	1.06	0.61-1.85	0.821	—	—	—
No	Referent	—	—			
Risk behavior in 30 days before incarceration						
Sex without condom						
Yes	0.66	0.38-1.16	0.150	—	—	—
No	Referent	—	—			
Number of unprotected sex acts, mean (S.D.)						
4.44 (7.96)	1.00	0.97-1.04	0.866	—	—	—
Number of unprotected sex partners, mean (S.D.)						
1.12 (2.05)	0.98	0.80-1.21	0.872	—	—	—
Transactional sex						
Yes	0.64	0.18-2.30	0.499	—	—	—
No	Referent	—	—			

[*] Denotes a significant difference, defined as $p \leq 0.05$

[a] Percent of those reporting, <5% missingness on the presented variables.

[c] Refers to the year before arrest and incarceration.

[d] Denotes multicollinearity, removed from the model.