Cohort profile: the Kyrgyzstan InterSectional Stigma (KISS) injection drug use cohort study

Laramie R. Smith1*, Natalia Shumskαιa2, Ainura Kurmanalieva2, Thomas L. Patterson3, Dan Werb1,4, Anna Blyum1, Angel B. Algarin1, Samantha Yeager1 and Javier Cepeda5

Abstract

Background: In Kyrgyzstan and other Eastern European and Central Asian countries, injection drug use and HIV-related intersectional stigma undermines HIV prevention efforts, fueling a rapidly expanding HIV epidemic. The Kyrgyzstan InterSectional Stigma (KISS) Injection Drug Use Cohort is the first study designed to assess the impact of drug use, methadone maintenance treatment (MMT) and HIV stigma experiences among people who inject drugs (PWID) on HIV prevention service utilization.

Methods: Adult PWID were recruited from Bishkek city and the surrounding rural Chuy Oblast region in northern Kyrgyzstan via modified time location sampling and snowball sampling. All participants completed a baseline rapid HIV test and interviewer-administered survey. A subsample of participants were prospectively followed for three months and surveyed to establish retention rates for future work in the region. Internal reliability of three parallel stigma measures (drug use, MMT, HIV) was evaluated. Descriptive statistics characterize baseline experiences across these three stigma types and HIV prevention service utilization, and assess differences in these experiences by urbanicity.

Results: The KISS cohort (N = 279, 50.5% Bishkek, 49.5% Chuy Oblast) was mostly male (75.3%), ethnically Russian (53.8%), median age was 40 years old (IQR 35–46). Of the 204 eligible participants, 84.9% were surveyed at month 3. At baseline, 23.6% had a seropositive rapid HIV test. HIV prevention service utilization did not differ by urbanicity. Overall, we found 65.9% ever utilized syringe service programs in the past 6 months, 8.2% were utilizing MMT, and 60.8% met HIV testing guidelines. No participants reported PrEP use, but 18.5% had heard of PrEP. On average participants reported moderate levels of drug use (mean [M] = 3.25; α = 0.80), MMT (M = 3.24; α = 0.80), and HIV stigma (M = 2.94; α = 0.80). Anticipated drug use stigma from healthcare workers and internalized drug use stigma were significantly higher among PWID from Bishkek (p < 0.05), while internalized HIV stigma among PWID living with HIV was significantly greater among PWID from Chuy Oblast (p = 0.03).

Conclusion: The KISS cohort documents moderate levels of HIV-related intersectional stigma and suboptimal engagement in HIV prevention services among PWID in Kyrgyzstan. Future work will aim identify priority stigma reduction intervention targets to optimize HIV prevention efforts in the region.

Keywords: People who inject drugs, HIV, Stigma, Eastern Europe and Central Asia

© The Author(s) 2022. Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated in a credit line to the data.
who inject drugs (PWID) comprise 51% of all people living with HIV in Kyrgyzstan, a mostly rural country of 
6 million people [3]. HIV prevalence among PWID is approximately 14% in Kyrgyzstan, 70 times higher than in 
the general population (0.2%) and 45 times higher than in rural regions (0.31%) [4]. Of concern, HIV incidence 
is increasing in rural settings [5], while the lack of decentralized HIV prevention services for PWID in rural areas 
remains a key barrier to progress [6].

The Kyrgyz government is the regional vanguard of HIV prevention for PWID, implementing antiretroviral 
therapy (ART), syringe service programs (SSP) and methadone maintenance treatment (MMT) services 
within community and prison settings [7, 8]. Yet, success is limited by suboptimal availability and low uptake 
of these critical services with only 4% of PWID engaged in MMT [4], and among those living with HIV, less than 
one-third are on ART [4]. Low engagement of PWID in these preventive services is a concern and is believed to 
be the primary driver of growing HIV incidence among heterosexual (non-injecting) partners, bridging the 
epidemic from PWID to the general population [9].

Stigma remains a pervasive barrier to HIV prevention efforts across EECA [10, 11]. In Kyrgyzstan, PWID 
cited stigma and discrimination, including fear of police encounters, as a primary barrier to SSP use [12]. PWID 
reported avoiding HIV testing due to fears of having one’s HIV status disclosed if they tested HIV-positive, 
while discriminatory treatment from service providers and fear of having one’s drug use status disclosed by 
staff or if one was seen within the vicinity of drug treatment centers was a barrier to accessing drug treatment 
[6, 10]. A study with recently incarcerated PWID in the EECA observed that MMT was viewed by PWID in Kyr-
gyzstan as a ‘treatment of last resort’ for PWID that are very sick [13]. Such findings suggest that MMT use may 
confer its own stigma and amplify experiences of drug use stigma among PWID. Further, disparities in ability to 
access basic HIV prevention services exist between urban and rural areas in Kyrgyzstan and other EECA countries, 
which may lead to greater anticipated stigma in rural areas where anonymity is more limited [6, 10].

First operationalized by Michele Tracey Berger [14], intersectional HIV-related stigma research is grounded in intersectionality, an analytical lens originating from Black feminist theory [15, 16]. Applied to PWID in the EECA region, this approach underscores the importance of examining multilevel experiences of interlocking status-based oppression related to drug use, MMT, and HIV, as well as contexts, such as urbanicity among others, that may further influence how these stigmas are experienced. To date, stigma research with PWID has been largely uni-dimensional, examining drug use, MMT, and HIV stigma in the region independent of one another [17–21]. To our knowledge, two studies have examined the intersection of 
drug use and HIV stigma in the EECA region with mixed findings. Among PWID living with HIV in Russia, Calab-
rese and colleagues (2016) observed high levels of internalized drug use and HIV stigmas were associated with 
poorer physical health and HIV care utilization, whereas Vetrova and colleagues (2021) observed only high levels 
of drug use stigma associated with poor HIV care access [22, 23].

Qualitative stigma research in the region [9, 24, 25], as well as our own quantitative stigma research in the 
United States further suggest that different sources of stigma may uniquely impact health behaviors and out-
comes [26–28]. For example, healthcare workers may hold more stigmatizing beliefs toward drug use impeding 
healthcare access [29], while family members may be more likely to view MMT as replacing one drug for 
another restricting access to economic and social support that could facilitate sustained engagement in MMT 
[30, 31]. Likewise, anticipated HIV stigma may be greater among PWID given elevated risk of direct transmission 
through injection-related interactions reducing motivation to know one’s HIV status [32].

To address these gaps, the Kyrgyzstan InterSectional Stigma (KISS) Injection Drug Use Cohort study aims to 
assess the impact of HIV-related intersecting stigmas among PWID on HIV prevention service utilization 
using parallel stigma measures designed to capture multilevel stigma mechanisms and distinguish between 
key stigma sources. This paper aims to describe the study methods, measures, and baseline characteristics of the 
KISS Cohort, and assess differences in HIV-related intersectional stigma by urbanicity and key stigma sources.

**Methods**

**Study aims**

The primary aim of the KISS cohort study is to system-
atically assess and characterize potentially intersecting 
experiences of drug use, MMT, and HIV stigma among a 
diverse sample of urban and rural Kyrgyz PWID to iden-
tify optimal HIV prevention intervention strategies in 
subsequent analyses.

**Hypothesis 1** Total drug use, MMT, and HIV stigma 
experiences will be significantly higher among rural PWID compared to urban PWID.

**Hypothesis 2** Compared to other stigma sources across 
drug use, MMT, and HIV stigma types at baseline, (a) 
anticipated drug use stigma will be highest from health-
care workers, (b) anticipated MMT stigma will be highest
from family members, and (c) anticipated HIV stigma would be highest from other PWID.

The secondary aim of the KISS cohort study was to establish and refine retention protocols and obtain retention estimates to inform larger scale observational cohort and intervention research in the region.

**Study setting and population**

We conducted the KISS cohort study in the capital city of Bishkek and the surrounding rural province of Chuy Oblast in northern Kyrgyzstan (Fig. 1). We selected these two study sites because they are home to the highest proportion of PWID and new HIV diagnoses in Kyrgyzstan [4], and because these sites are reflective of both urban and rural settings, where HIV incidence continues to rise.

Eligibility criteria for all participants were: 1) 18 years of age or older, 2) injection drug use behavior in the past 30 days with visual confirmation of injection marks, 3) agree to a rapid HIV test, and 4) residing in either Bishkek or Chuy Oblast with no plans to relocate in the next 12 months. In addition, participants recruited via snowball sampling was restricted to PWID not actively engaged in SSP or MMT services.

**Study sampling and recruitment**

To ensure we reached a diverse sample of PWID, we applied two non-random purposive sampling frameworks (see Fig. 2). Our sample size target was 279 PWID with at least 50% of the sample residing in Chuy Oblast to be adequately powered to assess small effects in the total sample (σ=0.23), and medium effects by urbanicity (σ=0.31) in future analyses using latent variable structural equation modeling. We powered for these analyses to simultaneously test the relative contributions of HIV-related intersectional stigmas (HIV, drug use, MMT) and mechanisms (structural, interpersonal, individual); to identify which associations should be prioritized as intervention targets to improve engagement in HIV prevention services [33].

In response to COVID19 related restrictions limiting public social gatherings, we employed a modified venue-based time location sampling approach April 5, 2021 to May 6, 2021. Outreach workers of a local harm reduction agency partnered with study investigators to coordinate recruitment efforts. Study investigators randomly assigned 15 outreach workers in Bishkek and 17 outreach workers in Chuy Oblast different days of the week (time) to recruit from a specific neighborhood (venues) where they served PWID in Bishkek (15 neighborhoods) and Chuy Oblast (20 neighborhoods). Study investigators randomly assigned additional enrollment targets to each outreach worker with the aim of enrolling ≥50% PWID age 20–39 (among whom 67% of new HIV diagnoses occur [34], ≥20% female PWID, and ≥33% PWID living with HIV. Outreach workers reported the numbers and reasons for refusals to participate they encountered during their specified time location sampling block. In addition, we employed snowball sampling to enroll harder-to-reach PWID less engaged in HIV prevention services. From October 6, 2021 to October 28, 2021, study investigators invited PWID enrolled in the study and all outreach workers to refer other PWID they knew who reported they were not actively engaged in SSP or MMT services. Given the nature of this method, refusal data were not systematically collected. All respondents

---

*Fig. 1* Map of Bishkek City and surrounding Chuy Oblast recruitment regions in Northern Kyrgyzstan
who contacted study staff were eligible and agreed to participate.

**Study procedures**

Trained community-connected research assistants informed potential participants about study procedures and screened them for eligibility. Research assistants consented eligible PWID, completed a standard study locator form, and provided participants with a day and time to complete their baseline study visit (Visit 1). Study visits were conducted at a local harm reduction agency. We structured study visits to maximize COVID social distancing guidelines within the agency.

At Visit 1, participants initially underwent rapid HIV testing and then met with a trained interviewer to complete the baseline survey. Following the survey, participants received their HIV test results and posttest counseling. Certified HIV testers used OraQuick™ Rapid HIV antibody test to conduct all rapid HIV tests. Previously undiagnosed PWID were linked to the Republican AIDS Center in Bishkek for confirmatory testing per national protocol.

Visit 2 surveys were scheduled 3 months post-baseline for the 204 participants recruited via modified venue-based time location sampling due to funding and time restrictions. The goal of Visit 2 was to establish retention estimates for future observational and intervention research in the region. Using participant locator data, staff systematically contacted participants to schedule Visit 2 and document reasons participants could not be located or could not complete the follow-up survey. Participants were classified as retained on protocol if they completed surveys and remained on protocol.
if the participant completed the survey, staff spoke with the participant, or spoke with a contact provided by the participant at baseline who confirmed the participant was detained by police or confirmed the participant had passed. Cause of death was documented as reported by the participants’ contact. We classified participants not retained on protocol as lost to follow-up.

Baseline and follow-up surveys lasted approximately 45–60 min each. Both surveys captured the same questions described below, with the following exceptions. The follow-up survey excluded lifetime survey items asked at baseline and we changed all past 6 months reference periods to the past 3 months at follow-up. The follow-up survey also included brief measures assessing experiences of anxiety, depression, and resilience (data not shown). In response to field observations, on July 6, 2021 we added cross-sectional items to assess the following four domains to all follow-up surveys and to snowball sample baseline surveys. These items assessed (i) bath salt use, (ii) most recent MMT dose and duration (data not shown), (iii) initiation of diphenhydramine use in relation to participants’ MMT history (data not shown), and (iv) the acceptability of accessing HIV prevention services via alternative service delivery models (data not shown). Each survey question had response options that included ‘don’t know’ or ‘prefer not to answer.’ An answer was required for each question to advance to the next page. Trained interviewers administered the surveys in Russian and entered responses directly into Redcap through a secure survey link. Participants were compensated 300 mobile phone units (~$2.50 USD) for each study visit completed. We obtained ethics approval for all study activities from the University of California, San Diego Institutional Review Board (IRB) and GLObal Research Institute (GLORI) Foundation IRB, Kyrgyzstan.

**Baseline measures and variables of interest**

We coded all ‘don’t know’ and ‘prefer not to answer’ responses as missing. All lifetime and past 6 months measures were coded (0 = No, 1 = Yes), unless otherwise noted. Item-specific response categories are indented in Tables 1 and 2.

**Sociodemographic measures**

Urbanicity (residing in Bishkek or Chuy Oblast), baseline HIV status, age (continuous), gender identity, ethnicity, and education. We defined unstable housing as sleeping any place other than a house or apartment participants or someone they knew (i.e., partner, friend, relative) owned or rented in the past six months (e.g., sleeping in a hotel, shooting gallery, hospital, street, jail, boarding house, government shelter). Engaging in sex work reflects participants who were known to be HIV-seropositive at baseline who confirmed the participant at baseline who confirmed the participant, or spoke with a contact provided by the participant at baseline who confirmed the participant was detained by police or confirmed the participant had passed. Cause of death was documented as reported by the participants’ contact. We classified participants not retained on protocol as lost to follow-up.

**Substance use measures**

Participants’ reported age at first injection (in years), how often they typically injected drugs in the past 6 months, and drug types injected in the past 6 months. Poly-drug use reflects the number of drug types injected in the past 6 months. This includes injection of diphenhydramine an antihistamine akin to Benadryl frequently used in the region [35]. Notably, salt use (i.e., bath salts) was added to the baseline and follow-up surveys beginning July 6, 2021 following observations by outreach workers that more clients were reporting salt use. Thus, ‘baseline’ salt use is only available for participants who were recruited via time location sampling that attended Visit 2 and all participants recruited via snowball sampling. Lifetime and past 6 months overdose (defined as having lost consciousness or stopped breathing as a result of taking narcotics by injection or any other route of administration). We summed responses to the AUDIT (10 items; range: 0–40) to classify participants as having hazardous (score 8–40) or non-hazardous drinking (score 0–8) using standardized cutoffs [36].

**HIV transmission risk measures**

Past 6 months engagement in high-risk injection behaviors (e.g., sharing injection equipment, reusing a cooker or filter) and injecting in context associated with higher HIV transmission (i.e., injecting in public spaces, having drugs to inject but did not knowing where to get a sterile syringes). Past 6 months sexual HIV transmission risk was computed among participants who engaged in any anal or vaginal sex to classify high-risk sexual behaviors (i.e., condom-less sex, multiple partners) and partner types that may increase potential exposure to HIV (e.g., partners who inject drugs). Engaging in sex work reflects participants who indicated that they earned income via sex work or reported engaging in sex in exchange for money, drugs, or other goods in the past 6 months.

**HIV prevention service utilization measures**

Frequency of accessing SSP services in the past six months, history of engaging in MMT (currently on MMT, previously used MMT, never used MMT). Among participants who were HIV-seronegative (or newly diagnosed) at baseline, we assessed whether they met local HIV testing guidelines (i.e., ≥1 HIV test every 12 months) by calculating time since the month and year of their last HIV test prior to baseline. We coded participants who had never previously tested as having not tested in the past 12 months. Participants also indicated whether they had ever heard of or taken pre-exposure prophylaxis (PrEP) which became available in Kyrgyzstan in 2020. Participants who were known to be HIV-seropositive at baseline self-reported the number of HIV care appointments attended in the past 6 months, if they were currently
taking ART, and what proportion of their ART they took as prescribed in the past 30 days on a single visual analogue scale (range: 0–100%) [37].

**HIV-related intersectional stigma measures** We used three parallel drug use, MMT, and HIV stigma measures (18 items each) first validated in the United States. Aligned with work by Earnshaw (2009) and Gamarel (2018), stigma items were framed to capture stigma toward current drug use, or expectations of future rejection/self-devaluation whether one were to test HIV-positive or initiate MMT [38–40]. Informed by local qualitative stigma research with PWID [17, 25, 41, 42], three items were developed for this study to capture anticipated

**Table 1** Baseline characteristics of study participants overall and by urbanicity (N = 279)

|                      | Total N = 279 | Bishkek N = 141 | Chuy Oblast N = 138 | p-value   |
|----------------------|---------------|-----------------|---------------------|-----------|
| **Sociodemographics** |               |                 |                     |           |
| Median age (IQR)     | 279           | 40 (35–46)      | 39 (35–44)          | 40 (34–47) | .340<sup>a</sup> |
| Gender               | 279           |                 | Men                 | 100 (72.5%) | .283     |
|                      |               |                 | Women               | 38 (27.5%)  |           |
| Ethnicity            | 279           |                 | Kyrgyz             | 16 (11.6%) | .096     |
|                      |               |                 | Russian            | 74 (53.6%) |           |
|                      |               |                 | Another ethnicity   | 48 (34.8%) |           |
| Education            | 279           |                 | < High school       | 55 (39.9%)  | .260     |
|                      |               |                 | High school         | 51 (37.0%)  |           |
|                      |               |                 | > High school       | 32 (23.2%)  |           |
| Any unstable housing past 6 months | 279 | 124 (44.4%) | 73 (51.8%) | 51 (37.0%) | .013     |
| HIV status           | 279           |                 | HIV-negative        | 118 (85.5%) | .002     |
|                      |               |                 | Known HIV-positive  | 19 (13.8%) |           |
|                      |               |                 | Newly diagnosed HIV-positive | 1 (0.7%) |           |
| **Substance use characteristics** | | | | | |
| Median age at first injection (IQR) | 279 | 20 (17–24) | 20 (17–25) | 20 (17–23) | .550<sup>a</sup> |
| Injection frequency past 6 months | 279 | 23 (10.0%) | 14 (9.9%) | 14 (10.1%) | .544<sup>a</sup> |
| Daily                | 279           |                 | 23 (10.0%)          | 14 (10.1%) |           |
| More than once a week | 279           |                 | 76 (27.2%)          | 38 (27.5%) |           |
| Once a week          | 279           |                 | 64 (22.9%)          | 35 (25.4%) |           |
| 1–3 times a month    | 279           |                 | 111 (39.8%)         | 51 (37.0%) |           |
| Heroin               | 266           | 240 (90.2%)     | 124 (93.2%)         | 116 (87.2%) | 1.00     |
| Diphenhydramine      | 234           | 142 (60.7%)     | 70 (60.3%)          | 72 (61.0%) | .485     |
| Stimulants           | 205           | 15 (7.3%)       | 10 (9.3%)           | 5 (5.2%) | .635     |
| Benzodiazepines      | 204           | 24 (11.8%)      | 18 (12.8%)          | 6 (6.1%) | .019<sup>b</sup> |
| Bath salts           | 181           | 39 (21.5%)      | 15 (17.0%)          | 24 (25.8%) | .196     |
| Poly-injection drug use past 6 months | 279 | 98 (35.1%) | 50 (35.5%) | 48 (34.8%) | .957<sup>a</sup> |
| Injected 1 drug type | 279           | 108 (38.7%)     | 53 (37.6%)          | 55 (39.9%) |           |
| Injected ≥ 3 drug types | 277 | 73 (26.2%) | 38 (27.0%) | 35 (25.4%) |           |
| Hazardous drinking   | 277           | 94 (33.9%)      | 49 (34.8%)          | 45 (33.1%) | .770     |

<sup>a</sup> Mann–Whitney U test.
<sup>b</sup> Fishers exact test.
<sup>c</sup> Baseline salt use assessed among 248 participants surveyed after July 6, 2021. Statistically significant differences are in bold.
### Table 2  Baseline HIV risk and prevention behaviors of study participants overall and by urbanity (N = 279)

| HIV transmission risk behaviors                                  | N with response n | Total N = 279 n (%) | Bishkek N = 141 n (%) | Chuy Oblast N = 138 n (%) | p-value |
|------------------------------------------------------------------|-------------------|----------------------|------------------------|---------------------------|---------|
| **Injection risk past 6 months (Y/N)**                           |                   |                      |                        |                           |         |
| Inject in public                                                 | 276               | 99 (35.9%)           | 53 (38.1%)             | 46 (33.6%)                | .430    |
| Prepared drug with unsafe water source                          | 279               | 37 (13.3%)           | 17 (12.1%)             | 20 (14.5%)                | .549    |
| Shared injection equipment                                       | 279               | 46 (16.5%)           | 24 (17.0%)             | 22 (15.9%)                | .808    |
| Reused cooker or filter                                         | 276               | 95 (34.4%)           | 51 (36.7%)             | 44 (32.1%)                | .424    |
| Frontload/backload syringe with others                           | 278               | 28 (10.1%)           | 18 (12.9%)             | 10 (7.2%)                 | .120    |
| Injected with a used needle                                      | 278               | 27 (9.7%)            | 16 (11.4%)             | 11 (8.0%)                 | .330    |
| Had drugs to inject but no sterile syringe                      | 279               | 89 (31.9%)           | 45 (31.9%)             | 44 (31.9%)                | .996    |
| **Accidental overdose**                                         |                   |                      |                        |                           |         |
| Lifetime                                                        | 279               | 188 (67.4%)          | 93 (66.0%)             | 95 (68.8%)                | .608    |
| Past 6 months                                                   | 28 (10.0%)        | 15 (10.6%)           | 13 (9.4%)              |                           | .735    |
| **Sexual behaviors past 6 months**                              |                   |                      |                        |                           |         |
| Any vaginal or anal sex                                          | 279               | 218 (78.1%)          | 108 (76.6%)            | 110 (68.8%)               | .529    |
| Any condomless sex                                               | 218               | 149 (68.3%)          | 73 (67.6%)             | 76 (69.1%)                | .812    |
| Multiple partners (≥ 1)                                          | 218               | 154 (70.6%)          | 80 (74.1%)             | 74 (67.3%)                | .270    |
| Partner is HIV-seropositive                                      | 193               | 17 (8.8%)            | 12 (12.2%)             | 5 (5.3%)                  | .087    |
| Partner is PWID                                                  | 216               | 60 (27.8%)           | 29 (27.1%)             | 31 (28.4%)                | .826    |
| Male PWID with male partner                                      | 218               | 3 (1.4%)             | 2 (1.9%)               | 1 (0.9%)                  | .620    |
| Engaged in sex work                                             | 210               | 17 (8.1%)            | 14 (13.9%)             | 3 (2.8%)                  | .003    |
| **HIV prevention service utilization**                           |                   |                      |                        |                           |         |
| **SSP use past 6 months**                                       | 279               | 95 (34.1%)           | 48 (34.0%)             | 47 (34.1%)                | .308    |
| Never accessed SSP                                              | 279               | 10 (3.6%)            | 8 (5.7%)               | 2 (1.4%)                  | .087    |
| Accessed SSP < once a month                                     | 218               | 81 (29.0%)           | 28 (19.9%)             | 53 (38.4%)                | .527    |
| Accessed SSP 1–3 times a month                                  | 218               | 82 (29.4%)           | 52 (36.9%)             | 30 (21.7%)                | .650    |
| Accessed SSP once a week                                         | 218               | 11 (3.9%)            | 5 (3.5%)               | 6 (4.3%)                  | .735    |
| **Methadone maintenance treatment (MMT)**                       | 279               | 23 (8.2%)            | 11 (7.8%)              | 12 (8.7%)                 | .786    |
| Currently on MMT                                                 | 279               | 94 (33.7%)           | 50 (35.5%)             | 44 (31.9%)                | .527    |
| Previously used MMT                                              | 279               | 162 (58.1%)          | 80 (56.7%)             | 82 (59.4%)                | .650    |
| **HIV-negative/newly diagnosed serostatus (n = 218)**            |                   |                      |                        |                           |         |
| HIV testing past 12 months                                       | 218               | 133 (61.0%)          | 60 (60.6%)             | 73 (61.3%)                | .777    |
| Heard of PrEP                                                   | 218               | 41 (18.8%)           | 18 (18.2%)             | 23 (19.3%)                | .771    |
| **Known HIV-positive serostatus (n = 57)**                      |                   |                      |                        |                           |         |
| Had ≥ 1 HIV care visit past 6 months                            | 57                | 53 (93.0%)           | 37 (94.9%)             | 16 (88.9%)                | .777    |
| Currently taking ART Adherence                                  | 56                | 56 (98.2%)           | 38 (97.4%)             | 18 (100.0%)               | 1.00    |
| Past 30 days ART adherence                                       | 57                | 52 (91.2%)           | 35 (89.7%)             | 17 (94.4%)                | .808    |
| ≥ 80% ART adherence                                             | 57                | 42 (73.7%)           | 26 (66.7%)             | 16 (88.9%)                | .109    |
| ≥ 95% ART adherence                                             | 57                | 22 (38.6%)           | 15 (38.5%)             | 7 (38.9%)                 | .975    |

Statistically significant differences are in **bold.**

a Mann–Whitney U test  
b Fishers exact test
consequences of structural stigma (i.e., fear of police interactions, fear of being registered in government systems, fear of being denied housing or employment). Stigma sources most likely to influence HIV prevention behaviors among PWID (i.e., anticipated discrimination from family, healthcare workers, and other PWID) were assessed drawing from previously validated interpersonal stigma measures developed to capture anticipated stigma from three distinct stigma sources [26]. Previously validated individual-level stigma items assessed experiences of internalized drug use stigma, as well as stereotyped beliefs and prejudicial attitudes toward people on MMT and people living with HIV, respectively [27, 28, 43].

Each parallel stigma measure contained structural (3 items), interpersonal (9 items, 3 items per stigma source), and individual-level (6 items) stigma items (see Additional file 1, Additional file 2, Additional file 3 for measures). Responses were recorded using a 5-point Likert-type scale (1 = very low stigma, 5 = very high stigma). Intersectional HIV-related stigma scales were computed by taking the mean response for all 18 drug use, MMT, and HIV stigma items, respectively (i.e., total score), and computing mean scores for each stigma mechanism (i.e., structural, anticipated, individual) and stigma source (i.e., family, healthcare workers, other PWID) subscales. Mean stigma scores can be interpreted as 1 = very low stigma, 2 = low to moderate stigma, 3 = moderate stigma, 4 = moderate to high stigma, 5 = very high stigma.

Statistical analyses
We computed Cronbach's alpha (α) and McDonald's omega (ω) for each stigma scale and subscale as a measure of internal reliability [44]. For scales with fewer than 10 items, McDonald's omega is the preferred measure of internal reliability; while the widespread use of Cronbach's facilitates comparisons across studies [45, 46]. Given MMT is used clinically to treat opioid dependence; we conducted a post hoc sensitivity analysis for the MMT stigma scale restricted to PWID who injected heroin in the past 6 months at baseline. Next, we calculated descriptive statistics (frequency, proportion; median interquartile range [IQR], mean, standard deviation [SD]) for all baseline study measures. We used independent t-test (continuous), Mann–Whitney U (ordinal), and Chi-square (categorical) test to assess whether the cohort significantly differed on study measures by urbanicity. We used Fisher's exact test for binary variables with observed small cell sizes (<5). Significance tests were set at p ≤ 0.05. We used two-tailed p-values on difference tests for participant characteristics (Table 1) and HIV risk and prevention behaviors (Table 2), and one-tailed p-values to test hypothesized differences in stigma experiences by urbanicity (Table 3).

Results
Study population
KISS successfully enrolled a geographically diverse cohort of 279 PWID (141 from Bishkek [50.5%], 138 from Chuy Oblast [49.5%]). We enrolled 204 (73.1%) PWID via modified time location sampling and 75 (26.9%) PWID not actively engaged in HIV prevention services via snowball sampling. Only 10 (8.9%) of the 112 PWID approached by outreach workers in Bishkek using our modified venue-based time location sampling method declined study participation. No PWID approached by outreach workers in Chuy Oblast declined participation.

Baseline demographics and substance use characteristics
As given in Table 1, the median age was 40 years old (IQR 35–46); 134 participants (48.0%) were age 20–39. The majority of the sample identified as men (75.3%, n = 210), ethnically Russian (53.8%, n = 150), most had a high school education (38.0%, n = 106) or less (35.5%, n = 99). Significantly more unstable housing was reported among PWID in Bishkek (51.8%, n = 73) compared to Chuy Oblast (37.0%, n = 51; p = 0.013). Sixty-six PWID had a seropositive rapid HIV test at baseline, among whom five were newly diagnosed. Of the 61 PWID previously diagnosed with HIV, 57 reported their serostatus in the baseline survey, while 4 disclosed their serostatus after the survey was completed meaning HIV care and treatment data were not collected. PWID recruited from Bishkek (69.7%, n = 46) were significantly more likely to be living with HIV compared to Chuy Oblast (30.3%, n = 20; p = 0.002).

Median age at first injection was 20 years old (IQR 17–24). In the past 6 months, most participants injected once a week (22.9%, n = 64) or more (27.2%, n = 76) with 10% (n = 23) of participants injecting daily. Drugs injected by most PWID in the past 6 months were heroin (90.2%, n = 240), diphenhydramine (60.7%, n = 142), and bath salts (21.5%, n = 39). Stimulant and benzodiazepine injection was less common, though significantly more PWID injected benzodiazepines in Bishkek (12.8%, n = 18) than Chuy Oblast (6.1%, n = 6; p = 0.019). Polydrug use was common with 181 participants (64.9%) reporting they injected more than one drug type in the past 6 months, and approximately one-third of the sample reported hazardous drinking (33.9%).

HIV risk and prevention service utilization
As shown in Table 2, 16.5% (n = 46) of the sample reported sharing injection equipment in the past
Table 3  Baseline experiences of drug use, MMT, and HIV stigma overall and by urbanicity (N = 279)

| Stigma type and mechanism               | Internal reliability | Total N = 279 | Bishkek N = 141 | Chuy Oblast N = 138 | t(df), p-value |
|-----------------------------------------|----------------------|---------------|------------------|---------------------|---------------|
|                                         | No. items | α  | ω   | n  | M (SD) | M (SD) | M (SD) |               |                       |
| Drug use stigma                         |           |    |     |    |        |        |        |               |                       |
| Total                                   | 18        | 0.81 | 0.77 | 271 | 3.25 (0.57) | 3.30 (0.54) | 3.19 (0.59) | t(df) = 1.691, p = 0.046 |
| Structural                              | 3         | 0.61 | 0.61 | 278 | 3.30 (1.10) | 3.33 (1.12) | 3.27 (1.08) | t(df) = 0.440, p = 0.330 |
| Anticipated                             | 9         | 0.73 | 0.70 | 272 | 3.12 (0.63) | 3.16 (0.64) | 3.08 (0.62) | t(df) = 1.151, p = 0.125 |
| Family                                  | 3         | 0.83 | 0.83 | 273 | 3.18 (1.03) | 3.18 (1.06) | 3.17 (1.00) | t(df) = 0.065, p = 0.474 |
| Healthcare workers                      | 3         | 0.69 | 0.69 | 278 | 3.24 (0.82) | 3.33 (0.79) | 3.15 (0.83) | t(df) = 1.758, p = 0.040 |
| Other PWID                              | 3         | 0.67 | 0.67 | 279 | 2.93 (0.88) | 2.96 (0.91) | 2.91 (0.86) | t(df) = 0.487, p = 0.313 |
| Internalized                            | 6         | 0.88 | 0.88 | 279 | 3.39 (0.82) | 3.48 (0.75) | 3.30 (0.88) | t(df) = 1.900, p = 0.029 |
| MMT stigma                              |           |    |     |    |        |        |        |               |                       |
| Total                                   | 18        | 0.80 | 0.80 | 253 | 3.24 (0.54) | 3.25 (0.55) | 3.23 (0.53) | t(df) = 0.321, p = 0.734 |
| Structural                              | 3         | 0.63 | 0.67 | 262 | 3.04 (1.14) | 3.01 (1.15) | 3.06 (1.14) | t(df) = -0.362, p = 0.359 |
| Anticipated                             | 9         | 0.78 | 0.78 | 264 | 3.35 (0.66) | 3.38 (0.68) | 3.33 (0.63) | t(df) = 0.574, p = 0.283 |
| Family                                  | 3         | 0.68 | 0.69 | 265 | 3.47 (0.86) | 3.51 (0.92) | 3.42 (0.79) | t(df) = 0.874, p = 0.191 |
| Healthcare workers                      | 3         | 0.65 | 0.72 | 270 | 3.35 (0.80) | 3.38 (0.80) | 3.32 (0.81) | t(df) = 0.617, p = 0.269 |
| Other PWID                              | 3         | 0.75 | 0.76 | 273 | 3.22 (0.92) | 3.19 (0.95) | 3.24 (0.90) | t(df) = -0.457, p = 0.324 |
| Stereotypes and prejudice               | 6         | 0.73 | 0.77 | 272 | 3.15 (0.64) | 3.14 (0.65) | 3.16 (0.64) | t(df) = -0.220, p = 0.413 |
| HIV stigma                              |           |    |     |    |        |        |        |               |                       |
| Total                                   | 18        | 0.80 | 0.75 | 261 | 2.94 (0.54) | 2.94 (0.55) | 2.94 (0.52) | t(df) = -0.043, p = 0.483 |
| Structural                              | 3         | 0.60 | 0.61 | 270 | 2.92 (1.12) | 2.94 (1.10) | 2.89 (1.14) | t(df) = 0.344, p = 0.365 |
| Anticipated                             | 9         | 0.81 | 0.78 | 272 | 3.11 (0.69) | 3.10 (0.72) | 3.12 (0.66) | t(df) = -0.026, p = 0.940 |
| Family                                  | 3         | 0.89 | 0.89 | 273 | 2.81 (1.07) | 2.85 (1.09) | 2.77 (1.05) | t(df) = 0.640, p = 0.261 |
| Healthcare workers                      | 3         | 0.79 | 0.80 | 278 | 3.08 (0.89) | 3.07 (0.91) | 3.10 (0.88) | t(df) = 0.336, p = 0.369 |
| Other PWID                              | 3         | 0.70 | 0.71 | 279 | 3.43 (0.84) | 3.40 (0.86) | 3.47 (0.82) | t(df) = -0.687, p = 0.246 |
| Stereotypes and prejudice               | 6         | 0.64 | 0.66 | 277 | 2.68 (0.56) | 2.67 (0.56) | 2.70 (0.57) | t(df) = -0.039, p = 0.963 |
| Internalized (n = 57)*                  | 6         | 0.88 | 0.89 | 57  | 2.78 (0.88) | 2.62 (0.85) | 3.15 (0.86) | t(df) = -2.188, p = 0.033 |

Mean stigma scores can be interpreted as 1 = very low stigma, 2 = low to moderate stigma, 3 = moderate stigma, 4 = moderate to high stigma, 5 = very high stigma
Statistically significant differences are in bold

*Internalized stigma items were only asked of PWID who reported being diagnosed with HIV at baseline. Internalized HIV stigma items are not included in the total 18-item HIV stigma score

6 months, 35.9% (n = 99) injected in public, 34.4% (n = 95) reused a cooker or filter, and 31.9% (n = 89) had drugs to inject but could not access a sterile syringe. Self-reported lifetime (67.4%, n = 188) and past 6 months (10.0%, n = 28) accidental overdose was high. In the past 6 months, the majority of participants (n = 218, 78.1%) were sexually active, among whom 68.3% (n = 149) reported any condomless vaginal or anal sex and 70.6% (n = 154) reported having multiple sexual partners. Significantly more PWID in Bishkek (13.9%, n = 14) reported engaging in sex work in the past 6 months compared to Chuy Oblast (2.8%, n = 3; p = 0.003). Over one-third of the sample (34.1%, n = 95) reported not accessing SSP services in the past 6 months, and only 8.2% (n = 23) reported current MMT use. Among the 218 PWID who tested HIV-seronegative or who were newly diagnosed at baseline, 61.0% (n = 133) had an HIV test in the past 12 months and 18.8% (n = 41) had heard of PrEP. No PWID reported ever taking PrEP (data not shown). Among the 57 PWID living with HIV who reported knowing their HIV-positive serostatus at baseline, more than 90% self-reported having at least one HIV care visit in the past 6 months (n = 53), were taking ART (n = 56) and reported ≥ 80% ART adherence (n = 52). Only 38.6% (n = 22) reported perfect ART adherence.

HIV-related intersectional stigma
Measures of internal reliability was strong for the total mean drug use, MMT, and HIV stigma (≥ 0.80), and most anticipated and individual-level stigma mechanism and stigma source subscales (α = 0.73–0.89). Internal reliability was acceptable (α = 0.60–0.63) for structural stigma subscales (Table 3). We observed similar internal reliability estimates for MMT stigma when analyses were
restricted to the 240 PWID who injected heroin in the past 6 months (see Additional file 4).

On average, PWID enrolled in the KISS cohort reported moderate levels of HIV-related intersectional stigma, with participants having higher total mean stigma scores for drug use ($M = 3.25, SD = 0.057$) and MMT stigma ($M = 3.24, SD = 0.54$) than HIV stigma ($M = 2.94, SD = 0.055$). We observed similar levels of total mean MMT stigma ($M = 3.23, SD = 0.55$) in our sensitivity analyses restricted to the 240 PWID who injected heroin in the past 6 months. Contrary to our hypothesis, total mean stigma scores for drug use stigma were significantly higher among PWID from Bishkek ($M = 3.30, SD = 0.54$) compared to Chuy Oblast ($M = 3.19, SD = 0.59$; $t_{(269)} = 1.691, p = 0.046$). This difference was largely accounted for by significantly higher mean scores for anticipated drug use stigma from healthcare workers ($t_{(276)} = 1.758, p = 0.040$) and internalized drug use stigma ($t_{(277)} = 1.900, p = 0.029$) among PWID in Bishkek compared to Chuy Oblast (see Table 3). Counter to our hypotheses, significant differences by urbanicity were not observed for MMT ($t_{(251)} = 0.321, p = 0.374$) or HIV stigma ($t_{(259)} = -0.043, p = 0.483$) in this sample. While not hypothesized, internalized HIV stigma among the 57 PWID reporting their HIV-seropositive status at baseline was significantly higher among PWID from Chuy Oblast ($M = 3.15, SD = 0.86$) compared to Bishkek ($M = 2.62, SD = 0.85$; $t_{(55)} = -2.188, p = 0.033$).

All three stigma source hypotheses were supported. Mean anticipated drug use stigma scores was highest for healthcare workers ($M = 3.24, SD = 0.82$) than other stigma sources (family $M = 3.18, SD = 1.03$, other PWID $M = 2.93, SD = 0.88$). Mean anticipated MMT stigma scores was highest for family members ($M = 3.47, SD = 0.86$) than other stigma sources (healthcare workers $M = 3.35, SD = 0.80$, other PWID $M = 3.22, SD = 0.92$). Mean anticipated HIV stigma scores was highest for other PWID ($M = 3.43, SD = 0.84$) than other stigma sources (family $M = 2.81, SD = 1.07$, healthcare workers $M = 3.08, SD = 0.89$).

Retention rates for visit 2
Among the 204 participants eligible for a second study visit, 189 (92.6%) were retained on study protocol. Most completed the follow-up survey at month 3 ($n = 173, 84.9$%). Nine participants (4.4%) were located but did not complete a survey. Among whom, two participants’ survey data was not recorded due to technical issues with the survey link, two declined to complete the survey due to COVID, and five were detained by the police. Seven participants (3.4%) were confirmed deceased. Stated cause of death were overdose ($n = 2$), COVID-19 ($n = 2$), and health conditions likely exacerbated by drug use and related healthcare barriers (heart failure, pulmonary arrest, and brain aneurysm). Only 15 participants were lost to follow-up (7.4%), among whom eight had a disconnected phone, four had invalid contact information, and three were not located with valid contact information.

**Discussion**

The KISS cohort successfully enrolled and retained a diverse sample of PWID, including harder-to-reach PWID not engaged in HIV prevention services. PWID from Bishkek and Chuy Oblast were generally similar, though higher rates of unstable housing, sex work, and stimulant use in Bishkek highlight important factors that may heighten vulnerability to HIV transmission and poorer health outcomes in an urban environment. Despite the availability of numerous HIV prevention services targeting PWID in Kyrgyzstan, we observed suboptimal rates of service utilization in the KISS cohort with approximately one-third of the sample not meeting HIV testing guidelines or accessing SSP services. Our data further highlight opportunities to improve low uptake and poor retention of PWID in MMT care, responding to a 21% national decline in MMT utilization since 2016 [47], despite similar rates of injection drug use in recent years [4]. Finally, opportunities to strengthen ART adherence among PWID living with HIV currently engaged in HIV care to prevent medication resistance, optimize health outcomes, and reduce onward transmission are warranted [48].

To our knowledge KISS is the first cohort study to systematically examine HIV-related intersectional stigma in relation to the health and HIV prevention needs of PWID, and it does so in a region disproportionately impacted by this phenomenon and burdened by an expanding HIV epidemic. Prior work observed lower access to HIV prevention services in rural areas in Kyrgyzstan and EECA regions which may lead to greater anticipated stigma in rural areas if such services were accessed [6, 10]. One plausible explanation why we observed similar levels of MMT and HIV stigma among urban and rural participants in the KISS cohort is that participants reported similarly low levels of engagement in SSP, MMT, and HIV testing services across urbanicity. Future work should assess whether higher rates of unstable housing, sex work, and stimulant use in the urban environment partially explain the significantly higher levels of drug use stigma observed among PWID from Bishkek. We observed higher engagement in HIV care in Bishkek and Chuy Oblast. Notably, Bishkek is home to the largest provider of HIV services in Kyrgyzstan, the Republican AIDS Center. Future work should explore whether factors such as lower access to high quality HIV care and more interconnected social networks in rural
settings account for higher levels of internalized HIV stigma among those living in Chuy Oblast.

Compared to our prior work examining HIV-related intersectional stigma via parallel measures among people who use drugs in the United States who are living with HIV or engaged in MMT [27], participants in the KISS cohort reported higher mean levels of anticipated drug use, MMT, and HIV stigma [26], but similar levels of internalized drug use stigma [28]. These data build on previous stigma research in the region by providing insights into how PWID experience intersectional HIV-related stigma. Notably, prior research emphasized structural manifestations of stigma such as police harassment, being registered in government systems, and being denied housing and employment as substantial barriers to engagement in HIV prevention services [17–19, 25, 42, 49]. Our data suggest that structural stigma concerns were on average higher for drug use and MMT than HIV among PWID in the KISS cohort. Similarly, our data reinforce previous observations that healthcare workers, family, and other PWID are important stigma reduction targets. Uniquely, findings from the KISS cohort help to identify which stigma sources may have greater impact on the health, treatment, and prevention needs of PWID. Through future work leveraging advanced quantitative techniques (e.g., latent profile analysis, moderated mediation) and KISS cohort data should facilitate a deeper understanding of how and among whom we can optimize stigma reduction interventions across multiple levels to improve engagement in HIV prevention services.

Strengths and weaknesses
The KISS cohort study demonstrated the capacity to reach, enroll, and retain, PWID in a high-risk international setting. Compared to other well-established PWID cohort studies, the KISS cohort is smaller in scope, and limited in the total time and proportion of participants that were followed prospectively. However, the cohort represents PWID in the EECA region where the HIV epidemic is rapidly expanding and efforts to improve the uptake of evidence-based HIV prevention services in urban and rural settings are urgently needed. By utilizing two non-random purposive sampling frameworks, we further enhance our understanding of PWID not engaged in existing HIV services. As with any study examining socially stigmatized behaviors via self-report, social desirability bias is a potential limitation. However, we observed high response rates on injection and sexual risk items, and variation in mean levels of stigma reported across stigma types, mechanisms, and sources strengthening our confidence in these data. Finally, data reported in this manuscript are cross-sectional and descriptive in nature, meaning causality cannot be inferred without future prospective analyses.

Conclusions
With an emphasis on evaluating the impact of HIV-related intersectional stigma on HIV risk and prevention service utilization among PWID in Kyrgyzstan, the KISS cohort responds to the need to expand our understanding of stigma as a fundamental driver of rising HIV transmission and AIDS mortality in the EECA region. This cohort provides the opportunity to evaluate multidimensional relationships between drug use, MMT, and HIV stigma among PWID in urban and rural environments. Ultimately, the KISS cohort provides a unique and timely opportunity to facilitate a deeper, multidimensional, understanding of how to optimize stigma reduction efforts to mitigate stigma-related harms and advance the utility of extant HIV prevention efforts in the region.

Abbreviations
AIDS: Acquired immunodeficiency syndrome; ART: Antiretroviral therapy; AUDIT: Alcohol use disorders identification test; COVID-19: Coronavirus disease 2019; EECA: Eastern Europe and Central Asia; GLORI: GLObal Research Institute; HIV: Human immunodeficiency virus; IRB: Institutional Review Board; IQR: Interquartile range; PrEP: Pre-exposure prophylaxis; KISS: Kyrgyzstan InterSector Stigma; MMT: Methadone maintenance treatment; PDW: People who inject drugs; SD: Standard deviation; SSP: Syringe service programs; WHO: World Health Organization.

Supplementary Information
The online version contains supplementary material available at https://doi.org/10.1186/s12954-022-00633-5.

Acknowledgements
The authors wish to thank the participants whose shared time and experiences with the study, as well as the study team, and collaborating partners at AIDS Foundation – East West and RANS+ in the Kyrgyz Republic.

Author contributions
LRS, DW, JC conceptualized the study design. NS and AK implemented study and data integrity activities. LRS led the analysis with collaborative feedback from NS, DW, TLP, and JC. LRS wrote the manuscript with support and interpretation provided from the full authorship team. ABA generated Fig. 1 in ArcGIS. All authors reviewed and approved the final version of the manuscript.

Funding
This work was supported by the National Institutes of Health and Canadian Institutes of Health Research. Award Numbers R21TW011785, K01DA043421, R32DA043236, R01DA049644-0251 from the National Institute on Drug Abuse and Fogarty International Center and CIHR PJH-175382 from the Canadian Institutes of Health Research. The San Diego Center for AIDS Research, Health Equity Sociobehavioral Science Core provided expert consultation on study.
design and recruitment strategies (P30 AI036214). The content is solely the responsibility of the authors and does not necessarily represent the views of the National Institutes of Health and Canadian Institutes of Health Research.

Availability of data and materials
The datasets analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
We obtained ethics approval for all study activities from the University of California, San Diego Institutional Review Board (IRB) and Global Research Institute (GLORI) Foundation IRB, Kyrgyzstan. Participants provided voluntary signed informed consent prior to participation in any study activities.

Consent for publication
Not applicable.

Competing interests
The authors declare they have no competing interests.

Author details
1. Division of Infectious Diseases and Global Public Health, Department of Medicine, University of California, San Diego, 9500 Gilman Drive, Mail Code 0507, La Jolla, CA 92037-0507, USA. 2. AIDS Foundation East-West in the Kyrgyz Republic, Bishkek, Kyrgyzstan. 3. Department of Psychiatry, University of California, San Diego, La Jolla, CA, USA. 4. Centre On Drug Policy Evaluation, St. Michael’s Hospital, Toronto, Canada. 5. Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA.

Received: 2 April 2022 Accepted: 12 May 2022 Published online: 25 May 2022

References
1. United Nations. Ending AIDS progress towards the 90–90–90 targets. Joint United Nations Programme on HIV/AIDS, 2017. (Global AIDS updated).
2. United Nations. World Drug Report 2021. [Internet]. 2021. [cited 2022 Mar 8]. Available from: //www.unodc.org/unodc/en/data-and-analysis/wdr2021.html
3. USAID. A study in the area of HIV in the Kyrgyz Republic. 2015. Available from: https://kyrgyzstanusaid.org/sites/default/files/2019-07/%20study%20in%20the%20area%20of%20HIV%20in%20the%20Kyrgyz%20Republic%202015%20EN.pdf
4. UNAIDS. Kyrgyzstan | UNAIDS [Internet]. [cited 2022 Mar 8]. Available from: https://www.unaids.org/en/regionscountries/countries/kyrgyzstan
5. UNDP Kyrgyzstan: reducing harm from HIV [Internet]. New York: United Nations development programme; 2018. Available from: //www.undp.org/undp/en/content/kyrgyzstan/en/home/ourwork/democraticgovernance/successstories/kyrgyzstan-reducing-harm-from-hiv.html
6. Mansfeld M, Ristola M, Lekatsavicius G. HIV programme review in Kyrgyzstan: evaluation report, December 2014. Regional Office for Europe: World Health Organization, 2015.
7. Azbel L, Wegman MP, Polonsky M, Bachредdy C, Meyer J, Shumskaya N, et al. Drug injection within prison in Kyrgyzstan: elevated HIV risk and implications for scaling up opioid agonist treatments. Int J Prison Health. 2018;14(3):173–87.
8. Gulguz Muzaleeva, Aleshkina J, Adyl Temirov, Arnd Samev, Nurzada Kartanbaeva, Jakab M, et al. Tracking global HIV/AIDS initiatives and their impact on the health system: the experience of the Kyrgyz Republic [Internet]. Royal College of Surgeons in Ireland, 2019. [cited 2022 Mar 8] [6681.26 Bytes.pdf]. Available from: https://repository.rcsi.ie/artic les/Tracking_Global_HIV/AIDS_Initiatives_and_their_Impact_on_the_Health_System_the_experience_of_the_Kyrgyz_Republic/10776524/1
9. Deryabina AP, Patnani E, El-Sadr WM. Underreported injection drug use and its potential contribution to reported increase in sexual transmission of HIV in Kazakhstan and Kyrgyzstan. Harm Reduct J. 2019;16(1):1.
30. Woo J, Bhalerao A, Bawor M, Meha B, Dennis B, Mouravskaya E, et al. “Don’t judge a book by its cover”: a qualitative study of methadone patients’ experiences of stigma. Subst Use Misuse. 2017 [cited 2022 Mar 8];11p. Available from: https://journals.sagepub.com/doi/full/https://doi.org/10.1177/1178221816685987

31. Earnshaw V, Smith L, Copenhaver M. Drug addiction stigma in the context of methadone maintenance therapy: an investigation into under-studied sources of stigma. Int J Ment Health Addict. 2013;11(1):110–22.

32. Nasaruddin AM, Safi RA, Othman S, Kamarulzaman A. Opening up the HIV epidemic: a review of HIV seropositive status disclosure among people who inject drugs. AIDS Care. 2017;29(S):533–40.

33. Christopher WJ. Lower bounds on sample size in structural equation modeling. Electron Commer Res Appl. 2010;9(6):476–87.

34. World Health Organization. HIV/AIDS Programme in Kyrgyzstan [Internet]. 2015 [cited 2019 Oct 22]. Available from: https://www.euro.who.int/__data/assets/pdf_file/0005/273308/HIV-Programme-Review-in-Kyrgyzstan.pdf

35. Meyer JP, Culbert GJ, Azbel L, Barchevedy C, Kurmanalieva A, Rhodes T, et al. A qualitative study of diphenhydramine injection in Kyrgyz prisons and implications for harm reduction. Harm Reduct J. 2020;17(1):86.

36. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption–II. Addict Abingdon Engl. 1993;88(6):791–804.

37. Amico KR, Fisher WA, Comman DH, Shuper PA, Redding CG, Konkle-Parker DJ, et al. Visual analog scale of ART adherence: association with 3-day self-report and adherence barriers. J Acquir Immune Defic Syndr. 2006;42(4):453–9.

38. Stangl AL, Earnshaw VA, Logie CH, van Brakel W, Simbayi LC, Barré I, et al. The health stigma and discrimination framework: a global, crosscutting framework to inform research, intervention development, and policy on health-related stigmas. BMC Med. 2019;17(1):31.

39. Earnshaw VA, Chaudoir SR. From conceptualizing to measuring HIV stigma: a review of HIV stigma mechanism measures. AIDS Behav. 2009;13(6):1160–77.

40. Gamarel KE, Nelson KM, Stephenson R, Santiago Rivera OJ, Chiaramonte D, Miller RL. Anticipated HIV stigma and delays in regular HIV testing among at-risk populations. AIDS Educ Prev Off Publ Int Soc AIDS Educ. 2012;24(6):574–81.

41. Parker DJ, et al. Visual analog scale of ART adherence: association with 3-day self-report and adherence barriers. J Acquir Immune Defic Syndr. 2006;42(4):453–9.

42. Earnshaw VA, Smith LR, Copenhaver MM. Stereotypes about people living with HIV: implications for perceptions of HIV risk and testing frequency among at-risk populations. AIDS Educ Prev Off Publ Int Soc AIDS Educ. 2012;24(6):574–81.

43. Hayes AF, Coutts JJ. Use omega rather than Cronbach’s alpha for estimating reliability. But…. Commun Methods Meas. 2020;14(1):1–24.

44. Dunn TJ, Baguley T, Brunsden V. From alpha to omega: a practical solution to the pervasive problem of internal consistency estimation. Br J Psychol Lond Engl. 2014;105(3):399–412.

45. Graham JM. Congeneric and (essentially) tau-equivalent estimates of score reliability: what they are and how to use them. Educ Psychol Meas. 2006;66(6):930–44.

46. Usenkakunova A. Overview of the methadone maintenance therapy in the Kyrgyz Republic. Bishkek: The Republic Narcology Center; 2021.

47. Davis A, McCormam T, Daugupta A, Gilbert L, Tenlikbayeva A, Hunt T, et al. Individual, social, and structural factors affecting antiretroviral therapy adherence among HIV-positive people who inject drugs in Kazakhstan. Int J Drug Policy. 2018;62:43–50.

48. Sarang A, Rhodes T, Sheen N, Page K. Policing drug users in Russia: risk, fear, and structural violence. Subst Use Misuse. 2010;45(6):813–64.

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