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Prevalence and Factors Associated With Sexually Transmitted Infections Among People who Inject Drugs in the San Diego–Tijuana Border Region

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Background. Few estimates exist of the prevalence of sexually transmitted infections (STIs) and associated risk factors among people who inject drugs (PWID) in the San Diego–Tijuana border region, despite the high prevalence of HIV.

Methods. PWID living in San Diego or Tijuana underwent testing for bacterial STIs between December 2022 and February 2024. Urogenital gonorrhea and chlamydia infections were assessed using a urine test, the Aptima CT/GC assay. Syphilis was assessed using the treponemal Syphilis Health Check Rapid Point-of-Care assay and nontreponemal rapid plasma reagin *Treponema pallidum* Particle Agglutination test. HIV was tested using the fingerstick tests Miriad HCV/HIV POU+ Test and Oraquick HIV-1. Bacterial STI prevalence was calculated, and logistic regression was conducted to identify correlates of bacterial STI prevalence.

Results. Of 519 participants, 6.0% (95% CI, 3.9%–8.0%) tested positive for 1 or more bacterial STIs. Despite higher HIV prevalence in Tijuana, bacterial STIs were more prevalent in San Diego. Unstable housing, female birth, and US residency were associated with significantly higher adjusted odds of a bacterial STI compared with the reference groups (aOR, 2.61; 95% CI, 1.09–6.27; aOR, 2.41; 95% CI, 1.15–5.08; and OR, 2.79; 95% CI, 1.03–7.53; respectively).

Conclusions. Overall prevalence of bacterial STIs was consistent with other estimates of STIs among PWID in the United States. STI screening guidelines should recommend PWID for routine testing at least annually. Point-of-care testing should be expanded to increase access to STI screening and treatment for marginalized populations.

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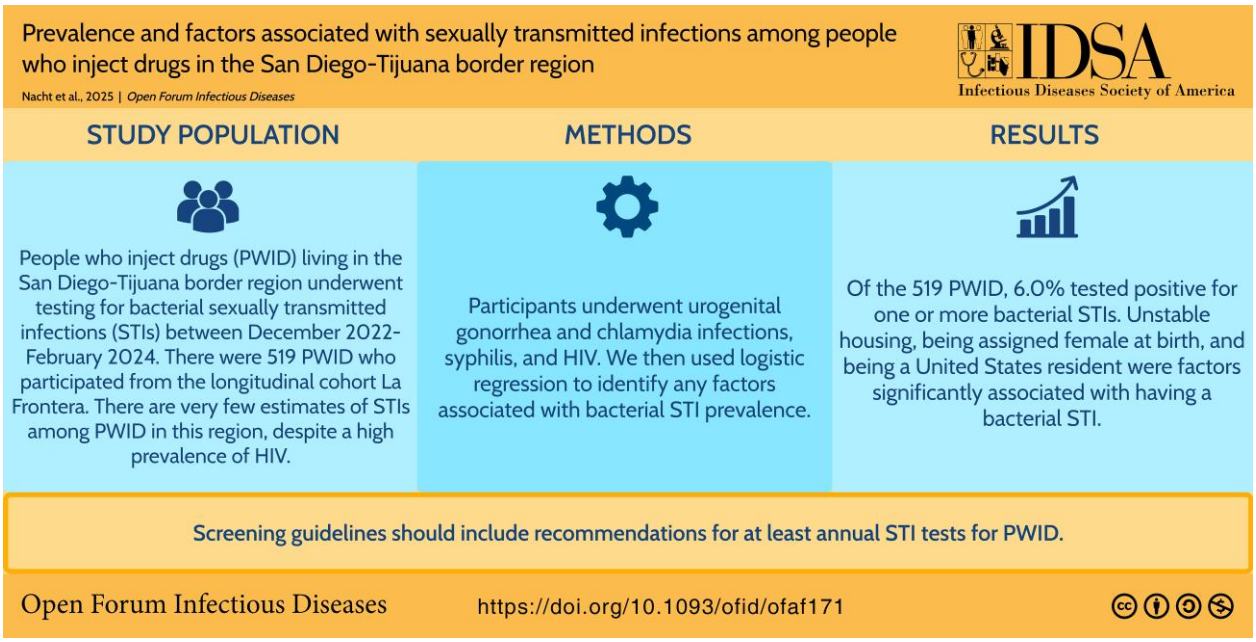
Graphical Abstract



This graphical abstract is also available at Tidbit: https://tidbitapp.io/tidbits/prevalence-and-factors-associated-with-sexually-transmitted-infections-among-people-who-inject-drugs-in-the-san-diego-tijuana-border-region?utm_campaign=tidbitlinkshare&utm_source=ITP

Keywords. border health; Mexico; people who inject drugs; sexually transmitted infections; United States.

People who inject drugs (PWID) are disproportionately impacted by sexually transmitted infections (STIs) compared with the general population [1]. Nationally representative surveys of adults in the United States showed that PWID were more likely to report ever having syphilis, chlamydia, or gonorrhea in the past year than people who do not inject drugs and that the odds of contracting STIs in the preceding year were >3 times higher among those who reported use of illicit drugs compared with those who did not [1, 2]. STI estimates among PWID are often limited by small sample sizes, sampling bias, and specific geographic areas [3, 4].

The San Diego–Tijuana metropolitan area has a high prevalence of illicit drug use; the 2 cities are connected by one of the busiest land border crossings in the world and are situated on a major drug trafficking corridor [5]. There were an estimated 10 000 PWID in Tijuana in 2010 and an estimated 25 000–28 000 PWID in San Diego in 2018 [6–8]. PWID in this region are disproportionately impacted by several risk factors for STIs, including low access to health care, limited STI knowledge, and high prevalence of condomless sex [9–11]. To date, estimates on the prevalence of STIs in the US–Mexico border region have been largely focused on specific subgroups, and there are no estimates among PWID overall. The incidence of bacterial STIs (ie, gonorrhea, chlamydia, and early syphilis) among the general population in San Diego in 2021 was 27 221 cases, or around 821.1 cases per 100 000 [12].

The incidence of STIs in Tijuana is largely understudied, although there have been estimates of STIs among several key populations such as female sex workers. One study showed that 36.4% of FSWs had at least 1 bacterial STI [13], and another study showed that the prevalence rates of syphilis, gonorrhea, and chlamydia were 22.7%, 15.2%, and 21.2%, respectively [14]. The prevalence of chlamydia, gonorrhea, and syphilis among cisgender sexual minority men and transgender women in Tijuana was 39.6% in a 2021 study [15]. The estimated incidence of syphilis among PWID in Tijuana from 2006 to 2007 was 1.6 per 100 person-years [16]. Among a sample of 924 female sex workers in Tijuana and Ciudad Juarez in 2008, 18.0% reported injecting drugs; among those who reported injection drug use, there was a prevalence of 22.7% for syphilis, 15.2% for gonorrhea, and 21.2% for chlamydia [14].

There were 3 objectives of this study. The first objective was to assess the prevalence of syphilis, chlamydia, and gonorrhea infections among PWID in a nonclinical setting along the San Diego/Tijuana border. The second objective was to compare STI prevalence, demographics, and other potential STI risk factors between San Diego and Tijuana participants. The final objective was to identify factors associated with having a bacterial STI. Our hypothesis was that sexual behaviors including engaging in sex in exchange for money or goods, not using a condom, a higher number of sexual partners, recent sexual activity, forced sexual encounters, drug or alcohol use during sex, and structural barriers (eg, lack of health insurance) would be associated with STI diagnosis and that STI prevalence would be higher in Tijuana than San Diego.

METHODS

Study Setting

Data for this analysis come from a longitudinal cohort study, *La Frontera*, which assesses drug use, health care and harm reduction service utilization, and infectious diseases among PWID living along the San Diego–Tijuana border region. The study took place in San Diego County, California, USA (population ~3 million people), and Tijuana Municipality, Baja California, Mexico (population ~1.9 million) [17, 18]. In both cities, 612 participants were recruited between October 2020 and October 2021 via street outreach as previously described [19]. An additional 108 participants were recruited between February 2022 and June 2022 for a supplementary substudy [20].

A short screener was used to identify participants who were eligible for study participation. Eligible participants were required to be aged ≥18 years or older, to report injecting drugs within the last month (as evidenced through injection stigmata), and to report living in San Diego County or Tijuana. As the overall goal of the parent study was to study cross-border infectious disease transmission, San Diego participants were purposively recruited to include those who reported crossing the border to inject drugs in Tijuana within the past 2 years (n = 200), as well as those who did not cross the border to inject drugs (n = 200) [19]. Tijuana participants were required to be residents of Tijuana and to not have crossed the border to the United States.

Measures

Baseline data were collected using a computer-assisted, interviewer-administered survey. A supplemental visit among willing participants included a 1-time assessment of sexually transmitted infections between December 2022 and February 2024 through the study cohort.

HIV/STIs. Gonorrhea and chlamydia were tested with a urine sample using Everlywell's (Austin, TX, USA) Aptima CT/GC assay, which uses nucleic acid amplification testing [21]. This test has been validated using 112 samples of known *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infection, resulting in 98% agreement for chlamydia and 100% agreement for gonorrhea [22]. Several third-party studies have demonstrated high positive and negative agreement for chlamydia and gonorrhea infections in both male and female urine samples [23, 24]. Syphilis was assessed first by collecting a blood sample and testing with the treponemal test Syphilis Health Check Rapid Point-of-Care Syphilis Test, which uses a qualitative rapid membrane immunochromatographic assay [25]. In a validation study at 5 different study sites, this assay had a positive agreement of 94.9% and 98.2% vs the nontreponemal test and treponemal test and a negative agreement of 93.3% and 97.3%, respectively. If participants tested positive using the treponemal test, confirmatory syphilis testing was conducted at LabCorp using the nontreponemal rapid plasma reagin *Treponema pallidum* Particle Agglutination test [26]. All participants who tested positive for an STI were directed to treatment; in Tijuana, participants received treatment on site by a medical provider, while those in San Diego were referred to care and offered free transportation to receive care.

HIV testing was completed using the Miriad HCV/HIV POU+ Test, which has a sensitivity and specificity of 79.1% and 100%, respectively [27]. Samples that received positive or indeterminate results underwent a second rapid test with Oraquick HIV-1, which has a sensitivity and specificity of 92% and 99.98%, respectively [28, 29]. All participants who tested positive for HIV were referred to the participant's community center of preference for care and were offered free transportation to receive treatment. Dual rapid tests are recommended for both HIV and syphilis by the World Health Organization [30].

Demographics. Age, ethnicity, sex assigned at birth, sexual orientation, marital status, highest level of education, average monthly income, housing in the past 6 months, involvement in the criminal legal system, study group, city of interview, and country of residence were collected at baseline using computer-assisted interviewer-administered surveys. Race was not included as it is not regularly collected in Mexico, and we consequently had 16.6% missing data. Sex assigned at birth was used instead of gender identity due to 10.4% missing data. Due to the different schooling systems in the United States and Mexico, education was dichotomized into less than secondary school or completed secondary school or more. Monthly income was dichotomized into less than the federal poverty line or at or above the federal poverty line. The federal poverty line was determined by the city of residence of the participant (ie, San Diego or Tijuana) during the year of baseline data collection; in 2021, the monthly poverty income level in urban areas of Mexico and the United States was US$170 and US$1000, respectively [31]. Housing was dichotomized into unstable and stable housing. Stable housing was defined as living or sleeping in your own, a parent's, a partner's, or a family member's house or apartment. Reporting living or sleeping anywhere else in the past 6 months was defined as unstable housing, such as a migrant workers' camp, shooting gallery, a vehicle, or the streets. Drug/alcohol use before sex was defined as using drugs or alcohol within 2 hours before or during sex. Criminal justice involvement included those who reported ever being in jail, prison, or a detention center.

Risk Behaviors. Recent (in the past 6 months) substance use, sexual activity (in the past 6 months), previous STI and HIV testing behaviors, age at sexual debut, condom use at last sexual

Table 1. Participant Demographics of PWID in the San Diego–Tijuana Border Region and a Comparison of Demographics by City of Residence, n = 519

Characteristic	Total n = 519, No. (%)	San Diego Resident n = 352, No. (%)	Tijuana Resident n = 167, No. (%)	Chi-square *P* Value
Age, mean (SD), y	43.3 (10.7)	42.8 (11.0)	44.4 (10.0)	.16
Ethnicity				
Hispanic or Latinx	345 (66.5)	185 (52.6)	160 (95.8)	<.001*
Not Hispanic or Latinx	174 (33.5)	167 (47.4)	7 (4.2)	
Sex assigned at birth				
Male	374 (72.1)	251 (71.3)	123 (73.7)	.58
Female	145 (27.9)	101 (28.7)	44 (26.4)	
Sexual orientation				
Heterosexual	475 (91.5)	324 (92.1)	151 (90.4)	.47
Other	43 (8.3)	27 (7.7)	16 (9.6)	
Marital status				
Single (including divorced, separated, widowed)	426 (82.1)	301 (85.5)	125 (74.9)	.01*
Married/common law	93 (17.9)	51 (14.5)	42 (25.2)	
Highest level of education				
Uncompleted secondary school or less	215 (41.4)	118 (33.5)	97 (58.1)	<.001*
Completed secondary school or more	304 (58.6)	234 (66.5)	70 (41.9)	
Average monthly income				
Less than the federal poverty line	304 (58.9)	188 (53.9)	116 (69.5)	.01*
At or above the federal poverty line	212 (41.1)	161 (46.1)	51 (30.5)	
Housing in the past 6 mo				
Stable housing	205 (39.5)	162 (46.0)	43 (25.8)	<.001*
Unstable housing	314 (60.5)	190 (54.0)	124 (74.3)	
Criminal legal system involvement	305 (58.9)	204 (58.1)	101 (60.5)	.61

Abbreviation: PWID, people who inject drugs.

*Statistical significance.

encounter, number of recent sex partners (in the past 6 months), drug or alcohol use at last sexual encounter, ever trading sex in exchange for money, drugs, or goods, and ever being forced to have sex were collected at baseline.

Statistical Analysis

The prevalence of any bacterial STI (gonorrhea, chlamydia, or syphilis) and respective 95% CIs were calculated assuming an exact binomial distribution, given the small sample sizes. Bivariate analyses (Pearson's chi-square test, Fisher exact test, *t* test) were used to compare characteristics (eg, demographics, substance use, and sexual behaviors) between participants from San Diego and Tijuana. Bivariate logistic regression of any bacterial STI prevalence on demographics, substance use, and sexual behaviors was used to estimate unadjusted odds ratios and 95% CIs. We assessed collinearity between independent variables, excluding any variables that were conceptually collinear and/or had moderate correlations ($r > |0.4|$).

Finally, we conducted multiple logistic regression to identify factors independently associated with being diagnosed with any bacterial STI, adjusting for relevant confounders. Confounders were investigated a priori based on a previous literature review investigating predictors associated with STI risk, which found that age, ethnicity, multiple lifetime sexual partners, sex with symptomatic partners, socioeconomic status, transactional sex, alcohol and substance use, condom use, and previous STI diagnosis were associated with risk for STIs [32]. Therefore, we investigated age, ethnicity, number of recent sex partners, housing, exchange sex, recent stimulant use, condomless sex at last encounter, and ever testing positive for a bacterial STI in the bivariate model.

Several decisions were made to create the final multivariable model. Housing was included as a proxy for socioeconomic status. Housing was chosen as a proxy for socioeconomic status because it was uniformly measured across countries, as opposed to education and income, which were measured differently in each region. Country of residence was selected rather than city where interview took place as it is more representative of potential access to social services. Previous STI testing was strongly collinear with country of residence and was thus excluded from the final model. An alpha level of .10 was used; all analyses were performed in SAS Studio 3.81 (SAS Institute, Cary, NC, USA).

Patient Consent

Protocols were approved by institutional review boards at the University of California San Diego and Xochicalco University. All participants provided written informed consent. Each participant received US$20 for participation in the baseline survey.

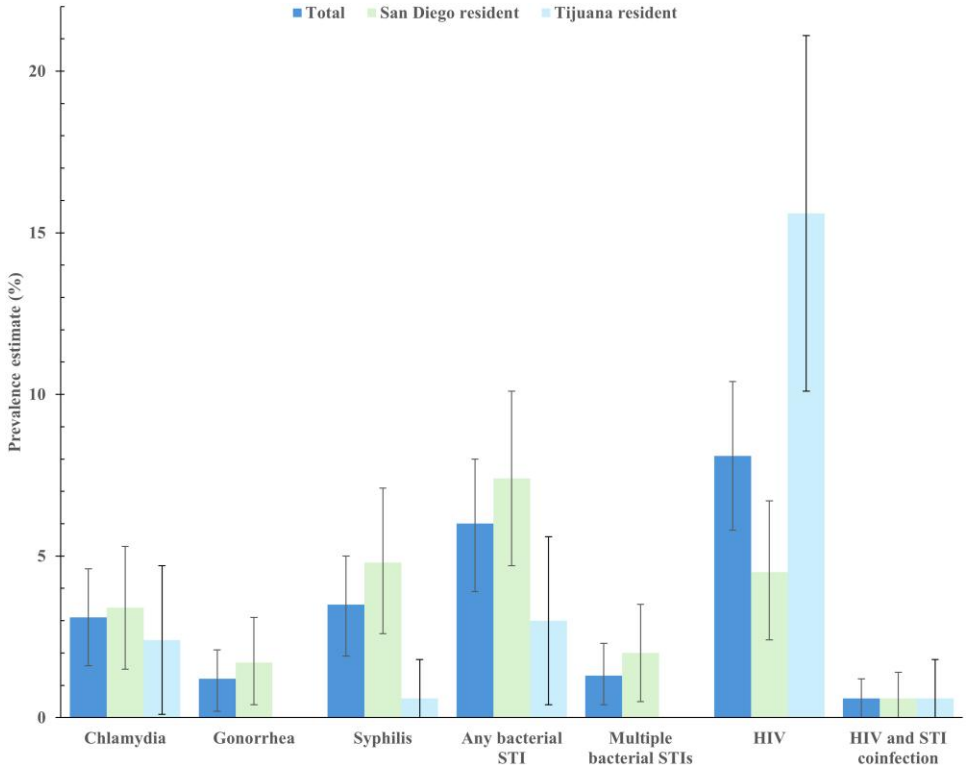


Figure 1. STI prevalence among PWID in the San Diego–Tijuana border region, n = 519. Abbreviations: PWID, people who inject drugs; STI, sexually transmitted infection.

Table 2. Participant Demographics of PWID in the San Diego–Tijuana Border Region With and Without Bacterial STI Diagnosis, n = 519

Characteristic	Total n = 519, No. (%)	Any Bacterial STI n = 31, No. (%)	No Bacterial STI n = 488, No. (%)	Chi-square *P* Value*
Age, mean (SD), y	43.3 (10.7)	41.3	43.4	.72
Ethnicity				
Hispanic or Latinx	345 (66.5)	11 (35.5)	344 (68.4)	.01*
Not Hispanic or Latinx	174 (33.5)	20 (64.5)	154 (31.6)	
Sex assigned at birth				
Male	374 (72.1)	16 (51.6)	358 (73.4)	.01*
Female	145 (27.9)	15 (48.4)	130 (26.6)	
Sexual orientation				
Heterosexual	475 (91.5)	27 (87.1)	448 (92.0)	.34
Other	43 (8.3)	4 (12.9)	39 (8.0)	
Marital status				
Single (including divorced, separated, widowed)	426 (82.1)	28 (90.3)	398 (81.6)	.22
Married/common law	93 (17.9)	3 (9.7)	90 (18.4)	
Highest level of education				
Uncompleted secondary school or less	215 (41.4)	16 (51.6)	199 (40.8)	.24
Completed secondary school or more	304 (58.6)	15 (48.4)	289 (59.2)	
Average monthly income				
Less than the federal poverty line	304 (58.9)	22 (71.0)	282 (58.1)	.16
At or above the federal poverty line	212 (41.1)	9 (29.0)	203 (41.9)	
Housing in the past 6 mo				
Stable housing	205 (39.5)	7 (22.6)	198 (40.6)	.05*
Unstable housing	314 (60.5)	24 (77.4)	290 (59.4)	
Criminal legal system involvement	305 (58.9)	17 (54.8)	288 (59.1)	.64

Abbreviations: PWID, people who inject drugs; STI, sexually transmitted infection.

*Statistical significance.

RESULTS

Participant Demographics

A total of 720 participants were enrolled in this study. Between December 2022 and February 2024, 519 (72.1%) underwent bacterial STI testing; these comprised the analytic sample. The participants who did not participate in the STI visit were in jail, lost to follow-up, did not feel comfortable providing a urine sample, already knew their STI status, reported being faithful to their partner and did not see a reason to get tested, or preferred to have it done in a clinic. Compared with participants who were tested for bacterial STIs, there was a higher proportion of US residents and participants who had completed more formal education among participants who were not tested for STIs.

Of the 519 participants tested for bacterial STIs, 352 (67.8%) were San Diego residents and 167 (32.2%) were Tijuana residents (Table 1). Participants were 43.3 years old on average (SD, 10.7) and were mostly male (72.1%), heterosexual (91.5%), and single (82.1%). More than half of participants had lived in unstable housing in the past 6 months (60.5%) and had been involved in the criminal legal system during their lifetime (58.9%).

STI Prevalence

Of the 519 participants tested for bacterial STIs, 31 participants or 6.0% (95% CI, 3.9%–8.0%) tested positive for 1 or more bacterial STIs. Of these, 7 or 1.3% (95% CI, 0.4–2.3) had >1 infection. At baseline, 42 or 8.1% (95% CI, 5.7%–10.4%) tested positive for HIV. There were 3 or 0.6% (95% CI, 0%–1.2%) cases of coinfection of bacterial STIs with HIV. Figure 1 shows the prevalence estimates of bacterial STIs and HIV in San Diego, Tijuana, and the entire sample. In the entire sample, 16 of the 519 participants (3.1%; 95% CI, 1.6%–4.6%) tested positive for urogenital chlamydia, 6 or 1.2% (95% CI, 0.2%–2.1%) tested positive for urogenital gonorrhea, and 18 or 3.5% (95% CI, 1.9%–5.0%) tested positive for syphilis. There were several significant differences between participants who tested positive for bacterial STIs and those who did not (Table 2). The group with a bacterial STI had a higher proportion of non-Hispanic/Latinx participants ($P = .01$), female participants ($P = .01$), and individuals with unstable housing ($P = .05$) compared with those who did not have a bacterial STI.

Among San Diego participants, 26 participants or 7.4% (95% CI, 4.7%–10.1%) had at least 1 bacterial STI. Seventeen or 4.8% (95% CI, 2.6%–7.1%) tested positive for syphilis, 6 participants or 1.7% (95% CI, 0.4%–3.1%) tested positive for urogenital gonorrhea, and 12 participants or 3.4% (95% CI, 1.5%–5.3%) tested positive for urogenital chlamydia. Seven participants or 2.0% (95% CI, 0.5%–3.4%) had multiple bacterial STIs. There were 16 participants, or 4.5% (95% CI, 2.4%–6.7%), who tested positive for HIV. Of these, 2 participants or 0.6% (95% CI, 0%–1.4%) had both HIV and a bacterial STI. In Tijuana, 5 people or 3.0% (95% CI, 0.4%–5.6%) had a bacterial STI. Of these, 1 participant or 0.6% (95% CI, 0%–1.8%) tested positive for syphilis, and 4 or 2.4% (95% CI, 0.1%–4.7%) tested positive for urogenital chlamydia. There were no cases of urogenital gonorrhea or people with multiple bacterial STIs. Twenty-six participants or 15.6% (95% CI, 10.1%–21.2%) tested positive for HIV, and 1 person or 0.6% (95% CI, 0%–1.8%) had both HIV and a bacterial STI.

Comparison of San Diego and Tijuana Participants

There were several significant differences between San Diego and Tijuana residents at baseline; Tijuana participants faced more socioeconomic and structural barriers compared with San Diego residents (Tables 1 and 2). Among Tijuana participants, nearly three-quarters of participants reported being single and 25.2% reported being married/common law, while San Diego participants reported 85.5% and 14.5%, respectively ($P = .003$). More participants in San Diego reported having completed secondary school or more compared with Tijuana residents ($P < .001$). There were more Tijuana residents who reported living under the federal poverty line compared with San Diego residents ($P < .001$). Further, nearly three-fourths of participants in Tijuana reported unstable housing compared with around half of participants in San Diego ($P < .001$).

Bivariate Logistic Regression of Factors Associated With Bacterial STI Diagnosis

Table 3 presents the results of unadjusted bivariate regression of the variables of interest selected a priori from previous literature on bacterial STI diagnosis among the total sample. Female participants had 2.58 (95% CI, 1.24–5.37) times higher odds of STI diagnosis compared with males ($P = .01$). Individuals who reported unstable housing had 2.34 (95% CI, 0.99–5.54) higher odds of STI diagnosis compared with those who only reported stable housing in the past year ($P = .05$). US residents had marginally higher odds (OR, 2.58; 95% CI, 0.97–6.85) of STIs than Mexican residents ($P = .06$). Hispanic/Latinx participants had significantly lower odds of STI diagnosis compared with non-Hispanic/Latinx participants (OR, 0.25; 95% CI, 0.12–0.54; $P = .01$).

Likewise, Table 4 presents the results of the unadjusted bivariate regression of all substance use variables. There were significantly higher odds of having a bacterial STI among participants who reported recent stimulant use (OR, 2.90; 95% CI, 0.87–9.71; $P = .08$) and those who reported having previously been diagnosed with a bacterial STI (OR, 4.46; 95% CI, 2.11–9.44; $P < .001$). Participants who reported recent methamphetamine use had 2.61 (95% CI, 0.90–7.59) times higher odds of any bacterial STI compared with those who did not ($P = .08$). No other substances were significantly associated with higher odds of having a bacterial STI.

Table 3. Bivariate Logistic Regression Analysis on Any Bacterial STI Among PWID in the San Diego–Tijuana Border Region, n = 519

Characteristic	Any Bacterial STI	
	OR (95% CI)	*P* Value
Age (per 1-y increase)	0.98 (0.95–1.02)	.27
Ethnicity		
Hispanic or Latinx	0.25 (0.12–0.54)	.01*
Not Hispanic or Latinx	Reference	-
Sex assigned at birth		
Female	2.58 (1.24–5.37)	.01*
Male	Reference	-
Sexual orientation[a]		
Other	1.66 (0.55–4.98)	.37
Heterosexual	Reference	-
Marital status		
Married/common law	0.47 (0.14–1.59)	.23
Single (including divorced, separated, widowed)	Reference	-
Highest level of education		
Uncompleted secondary school or less	1.55 (0.75–3.21)	.24
Completed secondary school or more	Reference	-
Average monthly income[a]		
Less than federal poverty line	1.76 (0.79–3.90)	.16
At or above federal poverty line	Reference	-
Housing in the past 6 mo		
Unstable housing	2.34 (0.99–5.54)	.05*
Stable housing	Reference	-
Criminal legal system involvement[a]		
Yes	0.84 (0.40–1.74)	.64
No	Reference	-
Study group		
San Diego CBDU	0.64 (0.15–2.70)	.54
San Diego non-CBDU	4.31 (1.6–11.60)	.01*
Tijuana non-CBDU	Reference	-
Country of residence		
United States	2.58 (0.97–6.85)	.06*
Mexico	Reference	-
Ever been tested for HIV		
Yes	0.94 (0.42–2.10)	.88
No	Reference	-
Ever been tested for bacterial STIs[a]		
Yes	1.22 (0.53–2.79)	.65
No	Reference	-
Ever tested positive for bacterial STI[a]		
Never been tested before	1.74 (0.64–4.72)	.28
Tested before, and have tested positive	5.92 (2.39–14.64)	.01*
Tested before but never tested positive	Reference	-
Age at sexual debut (per 1-y increase)[a]	1.05 (0.94–1.17)	.39
Recently sexually active[a,b]		
Yes	0.89 (0.43–1.83)	.74
No	Reference	-
Condomless sex at last encounter		
Yes	1.13 (0.52–2.45)	.76
No	Reference	-
Number of recent sex partners (per 1 additional partner)[a]	0.87 (0.67–1.14)	.32
Drug/alcohol use before last sexual encounter		
Yes	1.11 (0.53–2.31)	.78
No	Reference	-
Exchange sex ever		
Yes	0.90 (0.40–1.99)	.79
No	Reference	-

Table 3. Continued

Characteristic	Any Bacterial STI	
Ever forced to have sex[a]		
Yes	0.53 (0.12–2.27)	.39
No	Reference	-

Abbreviations: CBDU, cross-border drug use; OR, odds ratio; PWID, people who inject drugs; STI, sexually transmitted infection.

[a]Indicates that there are missing data; missing observations for each variable as follows: sexual orientation = 1, average monthly income = 3, criminal legal system involvement = 1, criminal justice system involvement = 18, ever been tested for bacterial STIs = 6, ever tested positive for bacterial STI = 8, age at sexual debut = 3, recently sexually active = 3, number of recent sex partners = 3, ever forced to have sex = 3, recent stimulant use = 3, recent fentanyl use = 2, recent ecstasy use = 9, recent opioid use = 6.

[b]Within the past 6 months.

*Statistical significance.

Table 4. Bivariate Logistic Regression Analysis of Drug Types on Any Bacterial STI Among PWID in the San Diego–Tijuana Border Region, n = 519

Characteristic	Any Bacterial STI	
	OR (95% CI)	*P* Value
Recent stimulant use[a,b]		
Yes	2.90 (0.87–9.71)	.08*
No	Reference	-
Recent heroin use[a]		
Yes	0.55 (0.26–1.17)	.12
No	Reference	-
Recent cocaine or crack use[a]		
Yes	0.92 (0.27–3.13)	.89
No	Reference	-
Recent methamphetamine use[a]		
Yes	2.61 (0.90–7.59)	.08*
No	Reference	-
Recent fentanyl use[a,b]		
Yes	1.73 (0.83–3.63)	.15
No	Reference	-
Recent ecstasy use[a,b]		
Yes	1.46 (0.61–3.49)	.40
No	Reference	-
Recent opioid use[a,b]		
Yes	0.75 (0.25–2.25)	.61
No	Reference	-
Recent polysubstance use		
Yes	1.36 (0.46–4.0)	.57
No	Reference	-

Abbreviations: OR, odds ratio; PWID, people who inject drugs; STI, sexually transmitted infection.

[a]Within the past 6 months.

[b]Indicates that there are missing data; missing observations for each variable as follows: sexual orientation = 1, average monthly income = 3, criminal legal system involvement = 1, criminal justice system involvement = 18, ever been tested for bacterial STIs = 6, ever tested positive for bacterial STI = 8, age at sexual debut = 3, recently sexually active = 3, number of recent sex partners = 3, ever forced to have sex = 3, recent stimulant use = 3, recent fentanyl use = 2, recent ecstasy use = 9, recent opioid use = 6.

*Statistical significance.

Table 5. Multivariable Logistic Regression Analysis for Any Bacterial STI Among PWID in the San Diego Tijuana Border Region, n = 511

Characteristic	Any Bacterial STI	
	Adjusted OR (95% CI)	*P* Value
Sex assigned at birth		
Female	2.41 (1.15–5.08)	.02*
Male	Reference	-
Housing status		
Unstable housing	2.61 (1.09–6.27)	.04*
Stable housing	Reference	-
Country of residence		
United States	2.79 (1.03–7.53)	.03*
Mexico	Reference	-
Recent methamphetamine use[a]		
Yes	2.04 (0.69–6.04)	.20
No	Reference	-

Abbreviations: OR, odds ratio; PWID, people who inject drugs; STI, sexually transmitted infection.

[a]Within the past 6 months.

*Statistical significance.

Multivariable Logistic Regression of Factors Associated With Bacterial STI Diagnosis

The final multivariable model included sex assigned at birth, housing status, country of residence, and recent methamphetamine use (Table 5). In the final model, the adjusted odds of having a bacterial STI among female participants were more than double that of males (aOR, 2.41; 95% CI, 1.15–5.08). The adjusted odds of having a bacterial STI among participants with unstable housing were >2 times greater than the odds of STI diagnosis among participants with stable housing (aOR, 2.61; 95% CI, 1.09–6.27). The adjusted odds of having any bacterial STI were significantly higher among participants living in the United States vs Mexico (aOR, 2.79; 95% CI, 1.03–7.53).

DISCUSSION

This analysis provides an estimate of STI prevalence among PWID along the San Diego–Tijuana border and an overview of risk and protective factors associated with bacterial STI diagnosis. Among PWID living in the San Diego–Tijuana border region, 31 of 519 participants tested positive for at least 1 bacterial STI. The STI prevalence estimates from this study lie within previous estimates. One study with a nationally representative sample showed a 7.0% prevalence of syphilis and 9.3% prevalence of chlamydia or gonorrhea among women who inject drugs, and 3.3% and 2.8% for men, respectively [1]. Another study of PWID from 20 different cities in the

United States had a self-reported prevalence of syphilis of 1.6% in the past 12 months [33].

We were unable to demonstrate that the investigated sexual behaviors were associated with STI prevalence. However, this analysis found female sex, unstable housing, and Mexican residence to be independently associated with higher adjusted odds of having a bacterial STI. Structural barriers such as high costs, transportation, and decreased access may reduce initiation and retention in sexual health and substance use services among PWID in the San Diego–Tijuana border region, as many participants in this study are facing socioeconomic instability in housing status, low household income, and involvement in the criminal justice system [34]. Further, people who engage in substance use and sexual behaviors perceived to be high risk, promiscuous, or unsafe are traditionally at risk for stigma, a factor that has been associated with decreased utilization of care services. For example, a previous study found that residents in the San Diego–Tijuana border region are more likely to experience inconsistent access to HIV care, in part due to stigma [34].

Previous research has shown that stigma disproportionately impacts women and individuals assigned female at birth, which was a risk factor for having a bacterial STI in this analysis. Previous research has already established that PWID in the San Diego–Tijuana border region experience disproportionate levels of stigma due to their injection drug use [35]. Women who inject drugs likely face intersectional stigma and discrimination due to their gender identity [36]. Among PWID, experiences of stigma have been associated with negative outcomes in psychological well-being, including depression, self-esteem, and anxiety [37]. Such outcomes have further been associated with decreased access to health care utilization, including harm reduction screening and services, and overall well-being [35, 38–40].

In 2022 in San Diego County, there was an incidence rate of about 0.9% for gonorrhea, chlamydia, and syphilis among all individuals aged 35–44 [41]. The relatively high prevalence of STIs among PWID in this analysis compared with the general adult population suggests that PWID should be recommended for STI screening on a regular basis. Despite the disproportionate risk for STI among PWID and calls for the integration of substance use harm reduction with STI prevention [2, 42, 43], PWID are not included in chlamydia and gonorrhea screening recommendations by the US Preventive Services Task Force (USPSTF) or the Centers for Disease Control and Prevention STI screening guidelines [44, 45]. State screening guidelines such as those of the California Department of Public Health do recommend annual testing for HIV and hepatitis C for PWID, but bacterial STIs are not included in those recommendations [46]. Likewise, Mexico's Ministry of Health only recommends hepatitis B testing and vaccine and to consider infections transmissible by blood, but not STI screening specifically [47]. Recommendations should be adapted to screen PWID for STIs at least annually, similar to sexual minority men and other disproportionately affected populations [48]. Previous studies have estimated that the population of PWID is around 10 000 and 25 000–28 000 in Tijuana and San Diego County, respectively [6–8]. Adding PWID to screening recommendations may significantly reduce the burden of STIs in this sizeable marginalized population.

A strategy to mitigate these structural barriers to reduce the burden of STIs among PWID is to utilize point-of-care (POC) tests, medical diagnostic tests that can be done at the time and place of patient care. Previous studies have shown that POC tests are comparable to standard laboratory methods. For example, dual rapid POC tests had high sensitivity for HIV and acceptable sensitivity and specificity for syphilis [49]. By shortening the wait time between test and diagnosis, POC tests shorten the duration of infection, as the infection can be treated before leaving an encounter, which for may be particularly beneficial in low-resource settings or among populations that may not be able to attend repeated encounters [50]. POC tests may be most effective when implemented where substance use harm reduction services are offered. For example, self-test POC tests, such as the US Food and Drug Administration–approved Simple 2 Test by LetsGetChecked [51], could be integrated into syringe services programs and drug treatment programs or potentially be added to harm reduction vending machines, a relatively new community-based public health intervention that provides harm reduction materials. Bringing STI tests and harm reduction services to communities with lower socioeconomic status may be more equitable than the community having to seek out services themselves.

Of particular interest with these results is the relatively low coinfection prevalence of bacterial STI and HIV. Only 3 of the 42 individuals who tested positive for HIV at baseline also tested positive for a bacterial STI. A global estimate by the United Nations Office on Drugs and Crime found that ~1 in 8 PWID has HIV [52]. One could hypothesize that HIV infections are not attributed to sexual contact, but rather that HIV transmission may occur from sharing injection drug paraphernalia. Behaviors associated with stigma, such as substance use and sex without a condom, are at risk for social desirability bias and may therefore be underreported. Further, this is a cross-sectional analysis with small sample sizes, both of which limit the analysis techniques that may be utilized. This may also explain the relatively low prevalence of HIV and STIs. Regardless, the HIV epidemics between San Diego and Tijuana are intertwined due to cross-border drug use [53]; as such, collaboration between sexual health and substance use harm reduction services may be beneficial in this population.

CONCLUSIONS

This analysis presents a 6.0% prevalence estimate of bacterial STIs among PWID in the San Diego–Tijuana border region.

Several characteristics were significantly associated with having a bacterial STI in the adjusted model, including female sex, unstable housing, and previous STI diagnosis. Universal screening for PWID and point-of-care STI testing may be beneficial strategies to override structural barriers and poor access to STI screening and substance use harm reduction.

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