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# Sexual risk behaviors and STDs among persons who inject drugs: A national study

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## Abstract

Opioid use and the rising case reports of STDs represent co-occurring epidemics; research indicates that persons who inject drugs (PWID) may be at increased risk for acquiring STDs. We use the National Survey of Family Growth (NSFG, 2011–2015) to examine the prevalence of risky sexual behaviors and STD diagnoses among PWID. We describe demographic characteristics, sexual behaviors, and self-reported STD diagnoses of sexually active women and men, separately, by whether they had ever engaged in injection-related behaviors (age 15–44; N = 9006 women, N = 7210 men). Results indicate that in 2011–15, 1.4% of women and 2.6% of men reported ever engaging in injection-related behaviors. Examining the full logistic regression models indicate that for women, sex with a PWID in the past 12 months (AOR = 5.8, 95% CI: 2.9, 11.7), exchanging money/drugs for sex in the past 12 months (AOR = 3.6, 95% CI: 1.2, 10.9), chlamydia and/or gonorrhea diagnosis in the past 12 months (AOR = 2.6, 95% CI: 1.2, 5.3), ever having a syphilis diagnosis (AOR = 8.5, 95% CI: 3.1, 23.4), and ever having a herpes diagnosis (AOR = 3.3, 95% CI: 1.0, 10.3) were associated with increased odds of engaging in injection-related behaviors. For men, sex with a PWID in the past 12 months (AOR = 10.9, 95% CI: 4.3, 27.7), ever being diagnosed with syphilis (AOR = 5.8, 95% CI: 1.8, 18.0), and ever being diagnosed with herpes (AOR = 2.7, 95% CI: 1.0, 7.1) were significantly associated with increased odds of engaging in injection-related behaviors. Future research may examine critical intervention points, including co-occurring factors in both STD acquisition and injection drug use.

### Keywords

STDs; Opioids; Injection drug use; Nationally representative data; Chlamydia/gonorrhea; Syphilis; Sexual risk behavior

## 1. Introduction

The misuse of opioids, which includes prescription pain relievers, heroin and synthetic opioids, has become a national public health crisis (CDC, 2019; NIDA, 2018). Misusing physician-prescribed opioids can be pathways to injection drug use; of young adults who misused prescription opioids, over 60% began injecting heroin within four years (Guarino et

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al., 2018). The misuse of opioids has been linked to numerous adverse health outcomes, including the contraction and spread of infectious disease (CDC, 2018a). Data suggests that persons who inject drugs (PWID) have high levels of sexual risk behaviors, placing them at increased risk for sexually transmitted diseases (STDs) (CDC, 2019). STDs have reached historically high levels, with nearly 2.3 million cases of chlamydia, gonorrhea, and syphilis diagnosed in the U.S. in 2017, marking the fourth consecutive year of sharp STD increases (CDC, 2018b). However, few studies have examined sexual behaviors and STDs among PWID and compared the results to the U.S. population.

To date, infectious disease prevention efforts targeting PWID have focused primarily on the drug-related transmission risks of infectious disease, such as the reduction of HIV through the provision of clean syringes (Abdul-Quader et al., 2013; Aspinall et al., 2014; Crowley and Millett, 2017) and safe injection centers (Kral and Davidson, 2017). These efforts are critical, but less research has focused on sexual transmission, a pathway through which PWID are at risk for acquiring STDs and are an added risk for contracting HIV. Sexual transmission is also a mechanism by which non drug-using sex partners of PWID are at risk for acquiring HIV and STDs. Among HIV-negative PWID, approximately 67% had vaginal sex without a condom in the past year (Burnett et al., 2018). High numbers of concurrent sex partners, including sex with sex workers, having sex in exchange for money and having partners who inject drugs, compound the risk of sex without a condom among PWID (Conrad et al., 2015; Khan et al., 2013; Kral et al., 2001; Tran et al., 2018).

Such high-risk sex behaviors put PWID at elevated risk for acquiring and transmitting STDs via their sexual network and for transmitting HIV or STDs to their non-PWID sexual network. For example, in a community sample of young adult PWID in New York City, almost half of the sample reported having had sex with other PWID as well as infrequent condom use (Friedman et al., 2017). Although injecting drugs is thought to increase levels of risk-taking in itself, social and economic factors such as the need to trade sex for drugs or money may also play a critical role (e.g., Richardson et al., 2013; Strathdee et al., 2010). Among Puerto Rican migrants living in New York City, 28% reported multiple sex partners and 11% traded sex for money or drugs (Deren et al., 2010). In Vancouver, British Columbia, the concentration of female sex workers, large numbers of sex partners and sexual networks involving both PWID and non-PWID resulted in an HIV outbreak among female PWID who engage in sex work and a subsequent syphilis treatment campaign (Tyndall et al., 2002).

In this study, we investigate sexual risk behavior and STD outcomes among PWID. The increase in newly reported cases of STDs is especially critical as STDs can have severe health effects including infertility, ectopic pregnancy, stillbirth, and increased HIV risk (CDC, 2018b). Research that has examined STDs among PWIDs is limited by convenience sampling, biased sample estimates, small sample size and narrow geographic scope (e.g. Abdul-Quader et al., 2014; Benotsch et al., 2011). PWID may be at high-risk for both acquiring and transmitting STDs; therefore, we seek to investigate sexual risk behaviors and STDs among PWID on a national level. We use national data (the National Survey of Family Growth: NSFG, 2011–2015) to examine the prevalence of high-risk sexual behaviors and

STD diagnoses among PWID and compare estimates from PWID to people not injecting drugs.

## 2. Methods

Data are from the National Survey of Family Growth (NSFG), a nationally representative cross-sectional, household survey of non-institutionalized women and men in the United States, aged 15–44 years (NCHS, 2014, 2016). We used data from the publicly available 2011–2013 and 2013–2015 releases of the NSFG, then we combined the releases for a 2011–2015 data set. The 2011–15 interviews included 11,300 women with a response rate of 72% and 9321 men with a response rate of 70% (CDC, 2015). The NSFG collected demographics, health-related behaviors, and sexual behaviors. African Americans, Hispanics, and teenagers were oversampled to produce reliable estimates for those groups. Trained female interviewers conducted in-person interviews in the respondent's homes with Computer Assisted Personal Interview (CAPI) and sensitive survey questions related to substance use and sexual behaviors were collected through Audio Computer Assisted Self-Interviewing (ACASI) to allow respondents privacy when reporting that information. A four-year case weight was used for the 2011–2015 data that represents the population totals at the midpoint of data collection in July 13. The NSFG was approved by the Centers for Disease Control and Prevention's National Center for Health Statistics Ethics Review Board. Participants provided informed consent, and subsequent to parental consent, adolescent respondents (15–17 years old) provided assent. More detailed information about the study design, sampling frame, recruitment, weighting methodology, and variance estimation have been previously published (NCHS, 2014, 2016).

We analyzed the demographic characteristics, sexual behaviors, and self-reported STD diagnoses of sexually active women and men, separately, by whether they had ever engaged in injection-related behaviors. The analysis was restricted to sexually active respondents, defined here as those who reported at least one opposite-sex partner in the past 12 months (in the ACASI), for a sample size of 9006 women and 7210 men. Although there existed a small subgroup of women and men who reported both opposite-sex and same-sex partners, these groups were too small to conduct analyses around injection behavior. Injection-related behaviors, collected via ACASI, included two NSFG survey questions combined into one dichotomous variable (yes or no): 1) During the past 12 months, have you shot up or injected drugs other than those prescribed for you? By shooting up, we mean anytime you might have used drugs with a needle, mainlining, skin-popping, or muscling; (if no, respondents were asked) 2) At any time in your life, have you ever shot up or injected drugs other than those prescribed for you? A response of "yes" to either of the injection-related survey questions was coded as "yes" for the combined injection-related variable.

The demographic characteristics included in analysis were age (15–24 or 25–44 years), race/ethnicity (Hispanic, non-Hispanic white, or non-Hispanic Black), poverty-income ratio from the household income as a percentage of the federal poverty level (0–133% or 134% or higher), education (less than high school, high school graduate/GED, or more than high school), current health insurance (private, public, or uninsured), and marital status with an opposite-sex partner (married, cohabiting, formerly married, or never been married).

Formerly married individuals include widowed, divorced or annulled, and separated for reasons of marital discord. Marital or cohabiting status reflects the respondent's status at the time of the interview and was defined by NSFG in relation to opposite-sex spouses or partners. Given the differences in STD screening recommendations for women and men (Workowski and Bolan, 2015), we analyzed the two groups separately. The poverty-income ratio cut point was used because it is the income limit used to expand Medicaid to adults in states that opted into Medicaid expansion.

Sexual risk behaviors, collected via ACASI, included having sex with a PWID in the past 12 months, two or more sex partners in the past 12 months, condom use at last vaginal sex, giving and/or taking money or drugs for sex in the past 12 months, and ever having forced vaginal sex. The STD diagnoses included chlamydia and/or gonorrhea diagnosis in the past 12 months (composite variable), ever having been diagnosed with syphilis, and ever having a diagnosis of herpes. In terms of variable composition, we combined CT and GC diagnoses into a single variable due to the small sample sizes among PWID and because there was a significant overlap for PWID being diagnosed with CT and/or GC in the past 12 months. Regarding STD variable timeframes, NSFG only collects past 12-month data. In contrast, NSFG collects data on lifetime diagnosis of syphilis and herpes, but not past 12-month reports. The sexual behaviors and STD diagnoses all had dichotomized responses (yes or no). "Don't know", "refused", and "not ascertained" were reported for < 1% of responses and recoded as missing.

Analyses were conducted using SAS-callable SUDAAN 11.0.1 (Research Institute, Research Triangle Park, NC) to account for the complex sample design and sampling weights used in NSFG. The NSFG weights are representative of the US population of women and men, aged 15–44 years. Chi-square analyses were conducted to compare sexually active women and men, separately, who reported ever engaging in injection-related behaviors by demographic characteristics, sexual behaviors, and STD diagnoses. Variables with a chi-square p-value < 0.250 were included in the regression analyses. Logistic regression analyses were conducted to produce adjusted odds ratios and 95% confidence intervals for sexually active women and men who ever engaged in injection-related behaviors by the demographic characteristics (model 1), then with the addition of sexual behaviors (model 2), and finally with the addition of STD diagnoses (model 3). Statistical significance is indicated when $p < 0.05$.

## 3. Results

### 3.1. Demographic characteristics

In 2011–15, 1.4% of sexually active women and 2.6% of sexually active men reported ever engaging in injection-related behaviors (Table 1). There were significantly more sexually active women who had engaged in injection-related behaviors who were non-Hispanic white (1.7%) compared to Hispanic (1.0%) and non-Hispanic black women (0.8%); living below the federal poverty level (2.6%) compared to women living above the federal poverty level (0.8%); were a high school graduate (2.4%) or had more than a high school-level education (2.8%) compared to women with less than a high school education (1.6%); did not have health insurance (2.8%) or had public insurance (2.5%) compared to women with private

insurance (0.6%); and were formerly married (3.9%) compared to cohabiting (2.0%), never been married (1.5%), and married women (0.6%). Similarly, there were significantly more sexually active men who had engaged in injection-related behaviors who were non-Hispanic white (3.3%) compared to Hispanic (2.0%) and non-Hispanic black men (0.7%); high school graduate (4.2%) compared to less than a high school education (2.3%) and more than high school education (1.8%); uninsured (4.3%) compared to public insurance (3.7%) and private insurance (1.7%); and cohabiting (4.1%) compared to formerly married (3.7%), never been married (3.1%), and married (1.6%). Age was not statistically significant for women or men in the bivariate analyses of injection-related behaviors and living below the federal poverty level was not significant for men.

### 3.2. Sexual risk and STDs

Except for condom use at last sex, self-reported sexual risk behaviors were significantly higher among women and men who reported injection-related behaviors than among other women and men (Table 2). Among women, 17.5% of those who reported injection-related behaviors had sex with a male PWID versus only 1.0% of those not engaging in injection-related behaviors, 38.8% versus 17.3% reported two or more partners in the past year, and 8.7% versus 0.6% had exchanged money or drugs for sex. Figures for men were similar, with 17.3% versus 0.9% having sex with a female PWID, 38.5% versus 22.5% reporting two or more partners in the past year, and 10.1% versus 1.4% reporting exchanging money or drugs for sex. Both women (36.1% versus 19.5%) and men (11.2% versus 4.6%) who reported injection-related behaviors were more likely than others to have experienced forced sex.

Women reporting injection-related behaviors were significantly more likely to report a chlamydia or gonorrhea diagnosis in the past 12 months (9.3% versus 1.8%), a syphilis diagnosis ever (7.0% versus 0.4%) or a herpes diagnosis ever (16.6% versus 4.0%) than women not reporting injection-related behaviors. Compared to other men, men reporting injection-related behaviors were significantly more likely to report a chlamydia or gonorrhea diagnosis in the past 12 months (2.8% versus 1.0%), or a syphilis diagnosis ever (3.3% versus 0.3%), but not herpes ever (3.6% versus 1.2%).

### 3.3. Adjusted analyses

In this section, we emphasize the full logistic regression models (model 3 in Tables 3 and 4) that include demographics characteristics, sexual behaviors, and STD diagnoses. For women (Table 3), younger age (AOR = 0.3, 95% CI: 0.2, 0.6) and being non-Hispanic black (AOR = 0.2, 95% CI: 0.1, 0.4) were protective while public health insurance (AOR = 2.5, 95% CI: 1.1, 5.6) or being uninsured (AOR = 3.3, 95% CI: 1.4, 7.8), sex with a PWID in the past 12 months (AOR = 5.8, 95% CI: 2.9, 11.7), exchanging money or drugs for sex in the past 12 months (AOR = 3.6, 95% CI: 1.2, 10.9), chlamydia and/or gonorrhea diagnosis in the past 12 months (AOR = 2.6, 95% CI: 1.2, 5.3), ever having a syphilis diagnosis (AOR = 8.5, 95% CI: 3.1, 23.4), and ever having a herpes diagnosis (AOR = 3.3, 95% CI: 1.0, 10.3) were associated with increased odds of having engaged in injection-related behaviors.

For men (Table 4), Hispanic (AOR = 0.4, 95% CI: 0.2, 0.8) and non-Hispanic black race/ethnicity (AOR = 0.1, 95% CI: 0.1, 0.3) were protective while having a high school degree (AOR = 1.8, 95% CI: 1.1, 3.0), having public health insurance (AOR = 2.2, 95% CI: 1.3, 3.8), no health insurance (AOR = 2.0, 95% CI: 1.1, 3.9), sex with a PWID in the past 12 months (AOR = 10.9, 95% CI: 4.3, 27.7), ever being diagnosed with syphilis (AOR = 5.8, 95% CI: 1.8, 18.0), and ever being diagnosed with herpes (AOR = 2.7, 95% CI: 1.0, 7.1) were significantly associated with increased odds of having engaged in injection-related behaviors.

## 4. Discussion

### 4.1. Characterizing PWID in a national sample

We found that 1.4% of sexually active women and 2.6% of sexually active men aged 15–44 years in the U.S. reported ever engaging in injection-related behaviors in 2011–15. Our findings are similar to results from a previous meta-analysis of U.S. studies from 1999 to 2009 that found that 2.6% (95% CI: 1.8%–3.3%) of persons over the age of 12 years had ever injected drugs (Lansky et al., 2014). To our knowledge, this represents the first U.S. national study to examine sexual risk behaviors and self-reported STDs among PWID. Consistent with previous research (e.g., Kral et al., 2001; Flom et al., 2001; Rietmeijer et al., 1998; Jenness et al., 2011), we found elevated rates of some sexual risk behaviors among PWID, particularly sex with another person who injects drugs and exchanging sex for money or drugs in the past year. A study of PWID in 20 U.S. cities found that 26% exchanged sex for money or drugs in the same timeframe (CDC, 2018a). We found no significant difference in condom use between those who injected drugs versus those who did not, in contrast to prior research which indicates that PWID had low rates of condom use when engaging in vaginal sex (e.g., Burnett et al., 2018). This finding bears further research exploration; it is possible that factors such as the accessibility of medical care, including condom access, and whether PWID were currently in treatment for substance use disorder could all shed further light on this finding (e.g., El-Bassel et al., 2014; Des Jarlais et al., 2014).

We found that STD diagnoses were associated with injection-related behaviors among women and men in the US from 2011 to 15. Consistent with research from other countries, our work indicates that both men and women who reported injection-related behaviors were significantly more likely to report ever having syphilis or having chlamydia or gonorrhea in the past year. Women who reported injection-related behaviors were also significantly more likely to have ever had genital herpes. For women who injected drugs, 7.0% reported a syphilis diagnosis, 9.3% reported a chlamydia or gonorrhea diagnosis, and 16.6% reported a herpes diagnosis. For men who injected drugs, we found that 3.3% reported a syphilis diagnosis, 2.8% reported a chlamydia or gonorrhea diagnosis, and 3.6% reported a herpes diagnosis. One study of PWID in 20 US cities found that self-reported STD prevalence among PWID was 1.6% for syphilis in the past 12 months and 4.3% for receiving a herpes simplex virus (HSV) diagnosis in their lifetimes (CDC, 2018a).

We also identified several demographic factors associated with injection related behaviors. Our data indicated that, overall, PWID tended to be male, older, poorer, uninsured or on

public health insurance, and non-Hispanic white compared to those who did not inject drugs. A previous study found that PWID were less likely to have received a routine physical exam than persons who did not use drugs, and those who had a physical were more likely to have health insurance (Chitwood et al., 1999). Contrary to previous research, however, in metropolitan statistical areas (MSAs) from 1992 to 2007 (Tempalski and McQuie, 2009), our study, which included MSAs and non-MSAs, found that non-Hispanic black persons were less likely to report injection-related behaviors than non-Hispanic white persons.

### 4.2. Links between PWID, sexual risk and STDs

Although our study is not causal, it does provide possible insight into the higher prevalence of some STDs for PWID as compared to those who do not inject drugs. In our sample, women in particular who exchanged money or drugs for sex were over three times more likely to inject drugs; which places them at increased risk for HIV/STDs (Rietmeijer et al., 1998; Jenness et al., 2011). Social and economic factors, along with stigmatization, may also play a role in sexual risk among PWID. The study of a local sexual network in New York found that persons who inject drugs – which incur high levels of stigma - had elevated levels of sexual risk taking (Flom et al., 2001). Olaiya et al. (2018) work indicates that persons living with HIV who exchanged sex for money or drugs were more likely to lack housing and have unmet social service, substance use and medical service needs. Our study points to the need to more fully understand the link between exchanging sex for money and drugs and injecting drugs, especially among women. Women who exchanged money or drugs for sex in the past year were significantly more likely to engage in injection behaviors, an association which was not present for men.

### 4.3. Limitations, strengths and future directions

Our study has some limitations. First, it should be noted that the NSFG does not include a specific measure focusing on opioid use or misuse but rather focuses on injection drug-related behaviors, which can include methamphetamine, for example. In addition, given that opioid usage is not limited to injection, and that the NSFG measures did not list the full spectrum of opioid types, our study is not generalizable to the larger associations between opioids and sexual risk and STDs. Analyses with a substance use centered dataset may be able to more fully disentangle how injection drug use may be linked to sexual behavior and STDs by type of drug injected, and context of injection behaviors. We limited our analyses to sexual risk behaviors with opposite sex partners. Findings may differ for men who have sex with men and for persons who identify as transgender. STD diagnoses were self-reported and were not based on specimen collection and testing. Thus, STD diagnoses may be under- or over-reported. HIV and antiretroviral status of the sample was unknown, which could have the ability to offer additional insights on sexual behavior (e.g., Vu et al., 2018). Because NSFG is designed as a household survey, some populations that may have been overrepresented with respect to drug use behaviors (e.g., homeless or incarcerated persons) were not included. Finally, small numbers in some categories of injection drug use occasionally yielded wide confidence intervals around the estimates.

Despite these limitations, our analyses provide nationally representative estimates of sexual behaviors and STD diagnoses among sexually active women and men who engaged in

injection-related behaviors in the U.S. Since 2000, reportable STDs, such as syphilis and chlamydia, have largely been increasing while opioid use was also increasing and deaths from opioids sharply increased (CDC, 2018a, b; Dart et al., 2015; O'Donnell et al., 2017). Our study made use of nationally representative data and was one of the first to look at PWID and STD diagnoses. Our findings suggest overlap in these epidemics, and further study combining the scale of our data with questions directly addressing drug use and sexual network ties could advance understanding in the roles of behavior and network structure as related to STD transmission patterns.

Future research could also focus on identifying intervention points, including co-occurring factors in both STD acquisition and transmission and drug use. Such research may also lead to interventions that may be useful for both STD and drug use. For example, health providers who provide services to PWID, such as those in treatment centers or syringe service programs, may want to consider sexual risk assessment, STD testing for PWID as well as providing services to sex partners. Likewise, STD clinics and family planning clinics may seek to offer their clients screening for drug use disorder and connection to treatment, a practice that been shown to be promising (e.g., Rogers et al., 2015). Such integrated services hold promise for efficiently and effectively leveraging limited resources while combating both the drug use and STD epidemics.

## References


Abdul-Quader AS, Feelemyer J, Modi S, et al., 2013 Effectiveness of structural-level needle/syringe programs to reduce HCV and HIV infection among people who inject drugs: a systematic review. AIDS Behav. 17 (9), 2878–2892. [PubMed: 23975473]

Abdul-Quader AS, Baughman AL, Hladik W, 2014 Estimating the size of key populations: current status and future possibilities. Curr. Opin. HIV AIDS 9 (2), 107–114. [PubMed: 24393694]

Aspinall EJ, Nambiar D, Goldberg DJ, et al., 2014 Are needle and syringe programmes associated with a reduction in HIV transmission among people who inject drugs: a systematic review and meta-analysis. Int. J. Epidemiol 43 (1), 235–248. [PubMed: 24374889]

Benotsch EG, Koester S, Luckman D, Martin AM, Cejka A, 2011 Non-medical use of prescription drugs and sexual risk behavior in young adults. Addict. Behav 36, 152–155. [PubMed: 20863626]

Burnett JC, Broz D, Spiller MW, Wejnert C, Paz-Bailey G, 2018 HIV infection and HIV-associated behaviors among persons who inject drugs — 20 cities, United States, 2015. MMWR Morb. Mortal. Wkly Rep 67, 23–28. [PubMed: 29324726]

Centers for Disease Control and Prevention. 2011–2015 NSFG: selected data and documentation. https://www.cdc.gov/nchs/nsfg/nsfg_2011_2015_puf.htm. Published 2015. Accessed August 2, 2018.

Centers for Disease Control and Prevention. HIV infection, risk, prevention, and testing behaviors among persons who inject drugs—national HIV behavioral surveillance: injection drug use, 20 U.S. cities, 2015. http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html. Published May, 2018a. Accessed Sept 12, 2018.

Centers for Disease Control and Prevention, 2018b Sexually Transmitted Disease Surveillance 2017. U.S. Department of Health and Human Services, Atlanta.

Centers for Disease Control and Prevention. Addressing the Infectious Disease Consequences of the U.S. Opioid Crisis. Atlanta: U.S. Department of Health and Human Services; 2019 https://www.cdc.gov/nchhstp/budget/infographics/docs/NCHHSTP-opioids-P.pdf Published March, 2019. Accessed May 1, 2019.

Chitwood DD, McBride DC, French MT, Comerford M, 1999 Health care need and utilization: a preliminary comparison of injection drug users, other illicit drug users, and nonusers. Drug Use Misuse 34, 727–746.

Conrad C, Bradley HM, Broz D, et al., 2015 Community outbreak of HIV infection linked to injection drug use of Oxymorphone — Indiana, 2015. MMWR Morb. Mortal. Wkly Rep 64 (16), 443–444. [PubMed: 25928470]

Crowley JS, Millett GA, 2017 Preventing HIV and hepatitis infections among people who inject drugs: leveraging an Indiana outbreak response to break the impasse. AIDS Behav. 21 (4), 968–972. [PubMed: 28220312]

Dart RC, Surratt HL, Cicero TJ, et al., 2015 Trends in opioid analgesic abuse and mortality in the United States. N. Engl. J. Med 372, 241–248. [PubMed: 25587948]

Deren S, Kang S, Milton M, Guarino H, 2010 Migrant drug users: predictors of HIV-related sexual and injection risk behaviors. Immigr. Minor. Health 12, 179–186.

Des Jarlais DC, Arasteh K, Mcknight C, et al., 2014 Combined HIV prevention, the New York City condom distribution program, and the evolution of safer sex behavior among persons who inject drugs in New York City. AIDS Behav. 18, 443–451. [PubMed: 24271348]

El-Bassel N, Shaw SA, Dasgupta A, Strathdee SA, 2014 Drug use as a driver of HIV risks: re-emerging and emerging issues. Curr. Opin. HIV AIDS 9 (2), 150–155. [PubMed: 24406532]

Flom PL, Friedman SR, Kottiri BJ, et al., 2001 Stigmatized drug use, sexual partner concurrency, and other sex risk network and behavior characteristics of 18-to 24-year-old youth in a high-risk neighborhood. Sex. Transm. Dis 28, 598–607. [PubMed: 11689758]

Friedman SR, Mateu-Gelabert P, Ruggles KV, et al., 2017 Sexual risk and transmission behaviors, partnerships and settings among young adult nonmedical opioid users in New York City. AIDS Behav. 21, 994–1003. [PubMed: 28058567]

Guarino H, Mateu-Gelaberta P, Teubla J, Goodbodya E, 2018 Young adults' opioid use trajectories: from nonmedical prescription opioid use to heroin, drug injection, drug treatment and overdose. Addict. Behav 86, 118–123. [PubMed: 29747875]

Jenness SM, Kobrak P, Wendel T, Neaigus A, Murrill CS, Hagan H, 2011 Patterns of exchange sex and HIV infection in high-risk heterosexual men and women. J. Urban Health 88, 329–341. [PubMed: 21286827]

Khan MR, Berger A, Hemberg J, O'Neill A, Dyer TP, Smyrk K, 2013 Non-injection and injection drug use and STI/HIV risk in the United States: the degree to which sexual risk behaviors versus sex with an STI-infected partner account for infection transmission among drug users. AIDS Behav. 17, 1185–1194. [PubMed: 22890684]

Kral A, Davidson P, 2017 Addressing the nation's opioid epidemic: lessons from an unsanctioned supervised injection site in the. Am. J. Prev. Med 53, 919–922. [PubMed: 28801014]

Kral AH, Bluthenthal RN, Lorvick J, Gee L, Bacchetti P, Edlin BR, 2001 Sexual transmission of HIV-1 among injection drug users in San Francisco, USA: risk-factor analysis. Lancet 357, 1397–1401. [PubMed: 11356437]

Lansky A, Finlayson T, Johnson C, 2014 Estimating the number of persons who inject drugs in the United States by meta-analysis to calculate national rates of HIV and Hepatitis C virus infections. PLoS One 9, e97596. [PubMed: 24840662]

NCHS. 2011–2013 National Survey of Family Growth (NSFG): Summary of Design and Data Collection Methods. https://www.cdc.gov/nchs/data/nsfg/NSFG_2011_2013_DesignandDataCollectionMethods.pdf. Updated 2014. Accessed February 4, 2019.

NCHS. 2013–2015 National Survey of Family Growth (NSFG): Summary of Design and Data Collection Methods. https://www.cdc.gov/nchs/data/nsfg/NSFG_2013-2015_Summary_Design_Data_Collection.pdf. Updated 2016. Accessed February 4, 2019.

NIDA. Opioid Overdose Crisis. https://www.drugabuse.gov/drugs-abuse/opioids/opioidoverdose-crisis. Updated March, 2018. Accessed July 12, 2018.

O'Donnell JK, Gladden RM, Seth P, 2017 Trends in deaths involving heroin and synthetic opioids excluding methadone, and law enforcement drug product reports, by census region — United States, 2006–2015. MMWR Morb. Mortal. Wkly Rep 66, 897–903. [PubMed: 28859052]

Olaiya O, Nerlander L, Mattson CL, Beer L, 2018 Exchange sex among people receiving medical care for HIV in the United States – medical monitoring project 2009–2013. AIDS Care 30 (10), 1315–1321. [PubMed: 29678119]

Richardson L, Wood E, Kerr T, 2013 The impact of social, structural and physical environmental factors on transitions into employment among people who inject drugs. Soc. Sci. Med 76 (1), 126–133. [PubMed: 23157930]

Rietmeijer CA, Wolitski RJ, Fishbein M, Corby NH, Cohn DL, 1998 Sex hustling, injection drug use, and non-gay identification by men who have sex with men: associations with high-risk sexual behaviors and condom use. Sex. Transm. Dis 25, 353–360. [PubMed: 9713915]

Rogers M, Johnson K, Yu J, Cuoco L, Blank S, 2015 Impact of a brief intervention for substance use on acquisition of sexually transmitted diseases including HIV: findings from an urban sexually transmitted disease clinic population. Sex. Transm. Dis 42, 569–574. [PubMed: 26372929]

Strathdee SA, Hallett TB, Bobrova N, et al., 2010 HIV and risk environment for injecting drug users: the past, present, and future. Lancet 376, 268–284. [PubMed: 20650523]

Tempalski B, McQuie H, 2009 Drugscapes and the role of place and space in injection drug use-related HIV risk environments. Int. J. Drug Policy 20, 4–13. [PubMed: 18554896]

Tran BX, Mai HT, Fleming M, et al., 2018 Factors associated with substance use and sexual behavior among drug users in three mountainous provinces of Vietnam. Int. J. Environ. Res. Public Health 15 (9), 1885–1895 8 31.

Tyndall MW, Patrick D, Spittal P, Li K, O'Shaughnessy M, Schechter M, 2002 Risky sexual behaviours among injection drugs users with high HIV prevalence: implications for STD control. Sex. Transm. Infect 78, 170–175.

Vu TMT, Boggiano VL, Tran BX, et al., 2018 Sexual risk behaviors of patients with HIV/AIDS over the course of antiretroviral treatment in Northern Vietnam. Int. J. Environ. Res. Public Health 15 (6), 1106–1117.

Workowski K, Bolan G. Sexually Transmitted Diseases Treatment Guidelines, 2015 From MMWR Recommendations & Reports, Vol. 64, No. 3 https://www.cdc.gov/std/tg2015/tg-2015-print.pdf. Updated June 5, 2015. Accessed August 20, 2018.

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**Table 1**

The prevalence of sexually active females and males who engaged in injection-related behaviors by demographics, NSFG 2011–15.

| | Engaged in injection-related behaviors[a] | | | |
|---|---|---|---|---|
| | Females | | Males | |
| | n | % (95% CI) | n | % (95% CI) |
| Unweighted sample size | 142 | 1.37 (1.05, 1.78) | 181 | 2.61 (2.05, 3.31) |
| Population total estimate | 682,000 | | 1,287,000 | |
| Demographics | | | | |
| Age | | | | |
| 15–24 year olds | 28 | 0.98 (0.62, 1.54) | 41 | 2.65 (1.66, 4.19) |
| 25–44 year olds | 114 | 1.51 (1.14, 2.01) | 140 | 2.59 (1.98, 3.38) |
| Race/ethnicity[b] | | | | |
| Hispanic | 22 | 0.96 (0.47, 1.95) | 31 | 1.95 (1.06, 3.56) |
| Non-Hispanic white | 97 | 1.74 (1.26, 2.41) | 126 | 3.34 (2.55, 4.36) |
| Non-Hispanic black | 18 | 0.81 (0.47, 1.38) | 15 | 0.72 (0.29, 1.76) |
| Poverty-income ratio | | | | |
| 0–133% FPL | 85 | 2.60 (1.84, 3.68) | 69 | 3.12 (2.26, 4.29) |
| 134% or higher FPL | 57 | 0.76 (0.53, 1.09) | 112 | 2.44 (1.85, 3.21) |
| Education[c] | | | | |
| Less than high school | 29 | 1.59 (1.03, 2.45) | 37 | 2.34 (1.35, 4.02) |
| High school graduate or GED | 54 | 2.42 (1.65, 3.54) | 81 | 4.23 (3.09, 5.76) |
| More than high school | 59 | 2.76 (1.70, 4.47) | 63 | 1.83 (1.29, 2.58) |
| Current health insurance | | | | |
| Private | 36 | 0.55 (0.35, 0.87) | 60 | 1.71 (1.19, 2.46) |
| Public | 69 | 2.46 (1.75, 3.47) | 50 | 3.71 (2.48, 5.52) |
| Uninsured | 37 | 2.76 (1.70, 4.47) | 71 | 4.30 (2.92, 6.29) |
| Marital status[d] | | | | |
| Married | 26 | 0.64 (0.34, 1.20) | 42 | 1.55 (1.04, 2.31) |
| Cohabiting | 40 | 1.96 (1.26, 3.05) | 36 | 4.05 (2.51, 6.46) |
| Formerly married[e] | 28 | 3.88 (2.06, 7.19) | 20 | 3.65 (2.12, 6.22) |

| | Engaged in injection-related behaviors[a] | | | |
|---|---|---|---|---|
| | Females | | Males | |
| | n | % (95% CI) | n | % (95% CI) |
| Never been married | 48 | 1.52 (1.04, 2.21) | 83 | 3.12 (2.20, 4.41) |

[a] Injection-related behaviors include: 1) During the past 12 months, shot up or injected drugs other than those prescribed for you, or 2) Ever shot up or injected drugs other than those prescribed for you, and/or 3) Ever used a needle that you knew or suspected someone else had used before you.

[b] For race/ethnicity, respondents categorized as non-Hispanic other were included in analyses to use the entire sampling information and weights but were excluded from tables given small sample size.

[c] Education level is current and includes 15–21 year olds and others who may not have completed their education at the time of interview.

[d] Marital status refers to relationships with a person of the opposite sex.

[e] Formerly married includes widowed, divorced or annulled, and separated for reasons of marital discord.

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**Table 2**

Percentage of sexually active females and males who engaged in sexual risk behaviors or were diagnosed with STDs by injection-related behaviors, NSFG 2011–15.

| | **Ever engaged in injection-related behaviors**[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Females** | | | | **Males** | | | |
| | **Yes** | | **No** | | **Yes** | | **No** | |
| | **n** | **% (95% CI)** | **n** | **% (95% CI)** | **n** | **% (95% CI)** | **n** | **% (95% CI)** |
| Unweighted sample size | 142 | | 8864 | | 181 | | 7029 | |
| Sexual behaviors[b] | | | | | | | | |
| Sex with PWID[c] | | | | | | | | |
| Yes | 28 | 17.46 (11.55, 25.53) | 105 | 0.99 (0.75, 1.32) | 34 | 17.29 (10.21, 27.76) | 95 | 0.94 (0.70, 1.25) |
| No | 113 | 82.54 (74.47, 88.45) | 8744 | 99.01 (98.68, 99.25) | 146 | 82.71 (72.24, 89.79) | 6921 | 99.06 (98.75, 99.30) |
| Two or more sex partners | | | | | | | | |
| Yes | 65 | 38.76 (29.28, 49.19) | 1825 | 17.28 (16.11, 18.51) | 71 | 38.52 (28.46, 49.67) | 2125 | 22.48 (21.06, 23.96) |
| No | 77 | 61.24 (50.81, 70.72) | 7039 | 82.72 (81.49, 83.89) | 110 | 61.48 (50.33, 71.54) | 4904 | 77.52 (76.04, 78.94) |
| Condom use, last vaginal sex | | | | | | | | |
| Yes | 30 | 26.45 (15.71, 40.97) | 2501 | 25.72 (24.38, 27.11) | 54 | 29.41 (20.45, 40.31) | 2819 | 35.92 (34.27, 37.60) |
| No | 110 | 73.55 (59.03, 84.29) | 6146 | 74.28 (72.89, 75.62) | 127 | 70.59 (59.69, 79.55) | 4017 | 64.08 (62.40, 65.73) |
| Exchanged money/drugs for sex | | | | | | | | |
| Yes | 19 | 8.68 (4.82, 15.14) | 65 | 0.58 (0.41, 0.82) | 28 | 10.09 (5.60, 17.52) | 153 | 1.37 (1.11, 1.69) |
| No | 123 | 91.32 (84.86, 95.18) | 8795 | 99.42 (99.18, 99.59) | 153 | 89.91 (82.48, 94.40) | 6873 | 98.63 (98.31, 98.89) |
| Forced sex, ever (vaginal) | | | | | | | | |
| Yes | 63 | 36.12 (25.00, 48.96) | 1798 | 19.45 (18.28, 20.68) | 22 | 11.21 (6.2, 19.56) | 366 | 4.64 (3.98, 5.40) |
| No | 73 | 63.88 (51.04, 75.00) | 6638 | 80.55 (79.32, 81.72) | 153 | 88.79 (80.44, 93.85) | 6128 | 95.36 (94.60, 96.02) |
| STD diagnoses | | | | | | | | |
| CT and/or GC diagnosis | | | | | | | | |
| Yes | 21 | 9.30 (5.24, 15.97) | 245 | 1.83 (1.54, 2.17) | 14 | 2.83 (1.49, 5.31) | 109 | 1.00 (0.79, 1.27) |
| No | 121 | 90.70 (84.03, 94.76) | 8610 | 98.17 (97.83, 98.46) | 167 | 97.17 (94.69, 98.51) | 6906 | 99.00 (98.73, 99.21) |
| Syphilis diagnosis, ever | | | | | | | | |
| Yes | 12 | 6.98 (3.47, 13.56) | 43 | 0.36 (0.24, 0.53) | 17 | 3.25 (1.69, 6.15) | 30 | 0.31 (0.20, 0.50) |
| No | 130 | 93.02 (86.44, 96.53) | 8813 | 99.64 (99.47, 99.76) | 164 | 96.75 (93.85, 98.31) | 6989 | 99.69 (99.50, 99.80) |

| | Ever engaged in injection-related behaviors[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Females | | | | Males | | | |
| | Yes | | No | | Yes | | No | |
| | n | % (95% CI) | n | % (95% CI) | n | % (95% CI) | n | % (95% CI) |
| Herpes diagnosis, ever | | | | | | | | |
| Yes | 21 | 16.64 (8.01, 31.41) | 376 | 3.95 (3.37, 4.62) | 15 | 3.61 (1.82, 7.01) | 94 | 1.17 (0.87, 1.56) |
| No | 121 | 83.36 (68.59, 91.99) | 8480 | 96.05 (95.38, 96.63) | 166 | 96.39 (92.99, 98.18) | 6927 | 98.83 (98.44, 99.13) |

[a] Injection-related behaviors include: 1) During the past 12 months, shot up or injected drugs other than those prescribed for you, or 2) Ever shot up or injected drugs other than those prescribed for you, and/or 3) Ever used a needle that you knew or suspected someone else had used before you.

[b] The following sexual behaviors and STD diagnoses are in the past 12 months: sex with PWID, two or more sex partners, gave or took money or drugs for sex, and CT and/or GC diagnosis.

[c] For female respondents, refers to sex with a male partner who took or shoots street drugs using a needle. For male respondents, refers to sex with female and/or male partner(s) who took or shoots street drugs using a needle.

**Table 3**

Logistic regression models (adjusted odds ratios and 95% confidence intervals) for injection-related behaviors among sexually active females by demographics, sexual behaviors, and STD diagnoses, NSFG 2011–15.

| | **Engaged in injection-related behaviors**[a] | | |
|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** |
| **Unweighted sample size (n)** | **9006** | **8558** | **8549** |
| | **AOR (95% CI)** | **AOR (95% CI)** | **AOR (95% CI)** |
| Demographics | | | |
| Age | | | |
| 15–24 year olds | 0.42 (0.27, 0.66) | 0.35 (0.21, 0.61) | 0.33 (0.20, 0.57) |
| 25–44 year olds | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Race/ethnicity[b] | | | |
| Hispanic | 0.31 (0.12, 0.80) | 0.39 (0.14, 1.04) | 0.40 (0.15, 1.09) |
| Non-Hispanic white | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Non-Hispanic black | 0.23 (0.11, 0.46) | 0.25 (0.12, 0.14) | 0.21 (0.10, 0.44) |
| Poverty-income ratio | | | |
| 0–133% FPL | 2.03 (1.11, 3.69) | 1.86 (0.92, 3.77) | 1.92 (0.95, 3.86) |
| 134% or higher FPL | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Education[c] | | | |
| Less than high school | 1.07 (0.60, 1.90) | 0.90 (0.48, 1.72) | 0.83 (0.41, 1.67) |
| High school graduate or GED | 1.55 (0.93, 2.58) | 1.47 (0.82, 2.62) | 1.51 (0.84, 2.73) |
| More than high school | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Current health insurance | | | |
| Private | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Private | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Public | 2.74 (1.42, 5.27) | 2.75 (1.24, 6.07) | 2.52 (1.14, 5.60) |
| Uninsured | 3.60 (1.73, 7.46) | 3.23 (1.39, 7.49) | 3.34 (1.43, 7.77) |
| Marital status[d] | | | |
| Married | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Cohabiting | 2.38 (0.96, 5.87) | 2.13 (0.83, 5.50) | 2.17 (0.89, 4.26) |

| | Engaged in injection-related behaviors[a] | | |
|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** |
| **Unweighted sample size (n)** | **9006** | **8558** | **8549** |
| | **AOR (95% CI)** | **AOR (95% CI)** | **AOR (95% CI)** |
| Formerly married[e] | 4.32 (1.57, 11.85) | 2.89 (0.92, 9.05) | 2.92 (0.93, 9.19) |
| Never been married | 3.12 (1.49, 6.54) | 1.96 (0.86, 4.47) | 1.88 (0.85, 4.19) |
| Sexual behaviors[g] | | | |
| Sex with PWID, past 12 months[f] | - | 6.53 (3.00, 14.20) | 5.80 (2.87, 11.69) |
| Two or more sex partners, past 12 months | - | 1.41 (0.81, 2.45) | 1.41 (0.80, 2.50) |
| Condom use at last vaginal sex | - | - | - |
| Gave or took money or drugs for sex, past 12 months | - | 4.63 (1.55, 13.86) | 3.57 (1.17, 10.90) |
| Forced sex, ever (vaginal) | - | 1.41 (0.78, 2.54) | 1.28 (0.67, 2.46) |
| STD diagnoses[g] | | | |
| Chlamydia and/or gonorrhea diagnosis, past 12 months | - | - | 2.56 (1.24, 5.30) |
| Syphilis diagnosis, ever | - | - | 8.46 (3.06, 23.44) |
| Herpes diagnosis, ever | - | - | 3.26 (1.03, 10.31) |

[a] Injection-related behaviors include: 1) During the past 12 months, shot up or injected drugs other than those prescribed for you, or 2) Ever shot up or injected drugs other than those prescribed for you, and/or 3) Ever used a needle that you knew or suspected someone else had used before you.

[b] For race/ethnicity, respondents categorized as non-Hispanic other were included in analyses to use the entire sampling information and weights but were excluded from tables given small sample size.

[c] Education level is current and includes 15–21 year olds and others who may not have completed their education at the time of interview.

[d] Marital status refers to relationships with a person of the opposite sex.

[e] Formerly married includes widowed, divorced or annulled, and separated for reasons of marital discord.

[f] For female respondents, refers to sex with a male partner who took or shoots street drugs using a needle.

[g] The responses of “no” are the reference group for the sexual behaviors and STD diagnoses.

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**Table 4**

Logistic regression models (adjusted odds ratios and 95% confidence intervals) for injection-related behaviors among sexually active males by demographics, sexual behaviors, and STD diagnoses, NSFG 2011–15.

| | **Ever engaged in injection-related behaviors**[a] | | |
|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** |
| **Unweighted sample size (n)** | **7210** | **6656** | **6647** |
| | **AOR (95% CI)** | **AOR (95% CI)** | **AOR (95% CI)** |
| Demographics | | | |
| Age | | | |
| 15–24 year olds | - | - | - |
| 25–44 year olds | - | - | - |
| Race/ethnicity[b] | | | |
| Hispanic | 0.44 (0.22, 0.87) | 0.39 (0.21, 0.75) | 0.39 (0.20, 0.75) |
| Non-Hispanic white | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Non-Hispanic black | 0.15 (0.06, 0.40) | 0.13 (0.05, 0.33) | 0.12 (0.05, 0.30) |
| Non-Hispanic black | 0.15 (0.06, 0.40) | 0.13 (0.05, 0.33) | 0.12 (0.05, 0.30) |
| Poverty-income ratio | | | |
| 0–133% FPL | 0.98 (0.66, 1.45) | 0.82 (0.52, 1.29) | 0.82 (0.52, 1.29) |
| 134% or higher FPL | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Education[c] | | | |
| Less than high school | 1.04 (0.55, 1.97) | 1.38 (0.65, 2.91) | 1.42 (0.67, 3.01) |
| High school graduate or GED | 1.92 (1.16, 3.15) | 1.74 (1.08, 2.80) | 1.81 (1.10, 2.97) |
| More than high school | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Current health insurance | | | |
| Private | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Public | 2.16 (1.25, 3.73) | 2.21 (1.29, 3.78) | 2.18 (1.27, 3.75) |
| Uninsured | 2.45 (1.36, 4.43) | 2.05 (1.08, 3.91) | 2.03 (1.07, 3.87) |
| Marital status[d] | | | |
| Married | 1.00 (reference) | 1.00 (reference) | 1.00 (reference) |
| Cohabiting | 2.13 (1.04, 4.35) | 2.00 (0.97, 4.13) | 2.04 (0.98, 4.24) |

| | Ever engaged in injection-related behaviors[a] | | |
|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** |
| **Unweighted sample size (n)** | **7210** | **6656** | **6647** |
| | **AOR (95% CI)** | **AOR (95% CI)** | **AOR (95% CI)** |
| Formerly married[e] | 1.83 (0.93, 3.56) | 1.40 (0.67, 2.95) | 1.32 (0.62, 2.79) |
| Never been married | 1.87 (1.08, 3.26) | 1.58 (0.89, 2.81) | 1.56 (0.87, 2.78) |
| Sexual behaviors[g] | | | |
| Sex with PWID, past 12 months[f] | - | 10.63 (4.34, 26.04) | 10.87 (4.27, 27.68) |
| Two or more sex partners, past 12 months | - | 1.47 (0.93, 2.30) | 1.49 (0.95, 2.35) |
| Condom use at last vaginal sex | - | 0.71 (0.38, 1.34) | 0.72 (0.38, 1.36) |
| Gave or took money or drugs for sex, past 12 months | - | 2.11 (0.75, 5.92) | 2.03 (0.72, 5.72) |
| Forced sex, ever (vaginal) | - | 2.07 (0.84, 5.08) | 2.07 (0.83, 5.18) |
| STD diagnoses[g] | | | |
| Chlamydia and/or gonorrhea diagnosis, past 12 months | | - | 0.40 (0.10, 1.56) |
| Syphilis diagnosis, ever | - | - | 5.76 (1.84, 18.04) |
| Herpes diagnosis, ever | - | - | 2.68 (1.01, 7.09) |

[a] Injection-related behaviors include: 1) During the past 12 months, shot up or injected drugs other than those prescribed for you, or 2) Ever shot up or injected drugs other than those prescribed for you, and/or 3) Ever used a needle that you knew or suspected someone else had used before you.

[b] For race/ethnicity, respondents categorized as non-Hispanic other were included in analyses to use the entire sampling information and weights but were excluded from tables given small sample size.

[c] Education level is current and includes 15–21 year olds and others who may not have completed their education at the time of interview.

[d] Marital status refers to relationships with a person of the opposite sex.

[e] Formerly married includes widowed, divorced or annulled, and separated for reasons of marital discord.

[f] For male respondents, refers to sex with female and/or male partner(s) who took or shoots street drugs using a needle.

[g] The responses of “no” are the reference group for the sexual behaviors and STD diagnoses.