



Published in final edited form as:

*J Psychoactive Drugs*. 2010 March ; 42(1): 11–18.

## Increased Drug Use and STI Risk with Injection Drug Use Among HIV-Seronegative Heterosexual Methamphetamine Users†

W. Susan Cheng, Ph.D.<sup>\*</sup>, Richard S. Garfein, Ph.D.<sup>\*\*</sup>, Shirley J. Semple, Ph.D.<sup>\*\*\*</sup>, Steffanie A. Strathdee, Ph.D.<sup>\*\*</sup>, James K. Zians, Ph.D.<sup>\*\*\*</sup>, and Thomas L. Patterson, Ph.D.<sup>\*\*\*\*</sup>

<sup>\*</sup>Consultant/PI, Native American Alliance for Emergency Preparedness (NAAEP); Environmental Health and Safety Specialist, Indian Health Program, California Department of Health Care Services, Davis, CA

<sup>\*\*</sup>Professor and Associate Dean, Division of Global Public Health, Department of Medicine, University of California, San Diego

<sup>\*\*\*</sup>Project Scientist, Department of Psychiatry, University of California, San Diego

<sup>\*\*\*\*</sup>Professor, Department of Psychiatry, University of California, San Diego; Research Psychologist, Department of Veteran's Affairs Medical Center, San Diego, CA

### Abstract

Methamphetamine (MA) use has been found to be associated with increased risk of HIV and sexually transmitted infections (STI) among men having sex with men, but it is unknown whether those who inject MA are at greater risk for these infections than those who administer MA by other routes. Furthermore, comparable data from heterosexual MA users are lacking. We investigated whether the HIV and STI risks of male and female heterosexual MA users who inject MA differ from those of comparable users who do not inject. Between 2001 and 2005, we interviewed 452 HIV-negative men and women aged 18 and older who had recently used MA and engaged in unprotected sex. Their mean age was 36.6 years; 68% were male; ethnicity was 49.4% Caucasian, 26.8% African-American, and 12.8% Hispanic. Logistic regression identified factors associated with injecting MA. Compared to non-IDU, IDU were more likely to: be Caucasian; be homeless; have used MA for a longer period and used more grams of MA in the last 30 days; have a history of felony conviction; and report a recent STI. HIV and STI prevention interventions should be tailored according to MA users' method of administration.

### Keywords

depression; injection drug use; methamphetamine; motivations; polydrug; sexually transmitted infections

---

A highly addictive and potent stimulant, methamphetamine (MA) was used by an estimated 529,000 individuals aged 12 and older in the US in 2007 (SAMHSA 2007). Although the drug has become common throughout the US, in many western US cities use of MA by injection is on the rise (NIDA 2008; Case et al. 2008; SAMHSA 2007; Pollini & Strathdee

---

†Funding for this study was granted by the National Institute of Mental Health (R01 MH61146), the Department of Veterans Affairs, and the State of California's Universitywide AIDS Research Program (IS02-SD-701). The authors also wish to thank Brian R. Kelly for his editorial assistance.

Please address correspondence and reprint requests to Thomas L. Patterson, Ph.D., UCSD Department of Psychiatry, 9500 Gilman Dr, Mail Code 0680, La Jolla, CA 92093-0680. Phone: (858) 534-3354, fax (858) 534-7723, tpatterson@ucsd.edu.

2007; Brouwer et al. 2006; Bucardo et al. 2005; Banken 2004; Gibson, Leamon & Flynn 2002).

Although MA use has been associated in the literature with risk behaviors for the acquisition of HIV and sexually transmitted infections (STI), few studies have examined injection use of MA among heterosexuals. Two studies, one conducted in San Bernardino, California, and the other in Yokohama City, Kanagawa, Japan, examined MA injection among heterosexual MA users entering treatment for MA abuse, and found that MA injection was associated with increased years of MA use, concurrent use of other drugs, and a history of felony convictions. The authors also reported multiple negative consequences of MA use, including depression, psychological manifestations (e.g., auditory hallucinations), and such physical effects as impaired sexual functioning, HIV infection, and loss of consciousness (Matsumoto et al. 2002; Domier et al. 2000). Neither study examined HIV sex risk behaviors or motivations for MA use. A different study, which to our knowledge is the only one to have examined motivations for MA use, focused on a sample of men who have sex with men (MSM). That study reported injection of MA to be associated with being Caucasian, homeless, and unmarried, and with having lower educational attainment (Semple, Patterson & Grant 2004). Injection drug use in this population was also associated with greater number of years of MA use, greater amount and frequency of MA use, and greater consequences from MA use; in addition, injection drug users (IDU) reported more HIV-seropositive partners, more incident STIs, and trading sex for money. Compared to noninjection drug users (NIDU), IDU were more likely to have initiated MA use in order to get high, to escape, and to cope with mood. IDU were also more likely to report the desire “to cope with mood” and “to feel self-confident” as reasons for their current MA use.

Other studies comparing injection of MA to injection of other drugs report that MA use is associated with being Caucasian, homeless, bingeing on drugs, sharing of needles and other injection equipment, and HIV risk behaviors, including engaging in unprotected sex and having multiple sex partners (Corsi, Kwiatkowski & Booth 2009; Shaw et al. 2008; Inglez-Dias et al. 2008; Coady et al. 2007; Fairbairn et al. 2007; Fernando et al. 2003; Molitor et al. 1999). Studies of IDU have shown that compared to non-MA users, MA users were more likely to be HIV-infected and HCV-infected (Miller et al. 2009; Razak et al. 2003) and homeless (Nyamathi et al. 2008; Coady et al. 2007); however, these studies could not state conclusively whether the mode of MA administration was associated with increased risk of negative outcomes, since they lacked a comparison group of noninjection drug users.

MA use is growing among some U.S. heterosexual populations, and HIV-seronegative individuals in these populations constitute an important target for HIV prevention efforts. Given the highly addicting nature of MA and the need for behavioral modification programs for cessation of use, an understanding of the most common motivations for initiating and for continuing the use of MA may help researchers and clinicians to design more effective interventions. In this study, we identify differences between injecting drug users (IDU) and noninjection drug users (NIDU). We hypothesized that in terms of sociodemographic characteristics, IDU would be younger and more likely to be Caucasian or homeless. We further hypothesized that IDU would report greater drug use characteristics (e.g., years of use, amount, frequency), more STI-risk behaviors (e.g., more HIV-positive or serostatus-unknown partners, a greater number of recent STI diagnoses), and would experience more adverse consequences of MA use compared to NIDU. Finally, we examined whether IDU differ from NIDU in motivations for initiation and current use of MA, including the desires “to escape,” “to cope with mood,” “to feel more self-confident,” or “to meet more sex partners.”

## METHODS

Between June 2001 and August 2004, 452 HIV-negative, heterosexual, male and female MA users in San Diego, California were enrolled in a sexual risk reduction intervention trial and completed a baseline risk assessment interview that was developed by the authors. The 90-minute Audio Computer-Assisted Self-Interview (ACASI) covered sociodemographic characteristics, alcohol and other drug use, MA use patterns, sexual risk behaviors, social cognitive factors, social network factors, and physical and psychiatric health variables. Compensation of \$30 was provided for the baseline interview.

### Setting and Sample

**Recruitment and screening of participants**—Recruitment methods for the parent intervention trial are described in detail elsewhere (Semple et al. 2005). In brief, recruitment involved street outreach in areas identified during formative research to have high concentrations of MA users. Potential participants were approached by community outreach workers and invited to take part in the study. Other recruitment methods included social marketing; referrals by friends, family and previously enrolled participants; and targeted advertising using posters in public areas and ads in newspapers and magazines. Participants were recruited irrespective of their injection drug use status, which was determined in the baseline survey by self-report.

**Study population**—Participants in the study were: (1) self-identified heterosexuals; (2) HIV-seronegative; and (3) aged 18 years or older. Since the intervention was designed to reduce high-risk sex behaviors among MA users, participants were also required to have, in the 60 days prior to screening, used MA at least twice and engaged in unprotected vaginal, anal or oral sex with an opposite-sex partner at least once. Prior to enrollment, each prospective participant was tested using the OraSure<sup>®</sup> HIV-1 Oral Collection Specimen Device to confirm his or her HIV-seronegative status (Gallo et al. 1997).

### Measures

**Demographics**—We examined the following sociodemographic characteristics: age at baseline in years; gender (male vs. female); race or ethnicity (Caucasian, Asian American, African American, Native American, or Latino) educational attainment (no college vs. some college and beyond); and marital status (married, divorced, separated, or never married).

**Sexual behavior**—The following sexual behaviors in the last 60 days were examined: number of sex partners (continuous); number of unprotected vaginal sex acts (continuous); and self-reported diagnosis for any STI (yes vs. no). Sexual risk behavior data (i.e., number of nonprotected sex acts) was also collected for lifetime history of HIV-positive or serostatus-unknown partners falling into two different categories: (1) spouse or steady sex partner, and (2) casual or anonymous sex partner. Participants were also asked whether they ever engaged in sex marathons, defined as “prolonged sexual activity with genital contact for hours and hours,” with five response categories ranging from “always” to “never.” These categories were collapsed for analysis into “yes” (“some of the time,” “most of the time,” and “always”) and “no” (“never” or “rarely”).

**Drug use**—Participants were asked the amount of MA they had used (grams) in the last month and the number of days in the last month on which they had used MA. Self-reported binge use was assessed as “yes” or “no” depending on participant response to the question, “Are you a binge user? By binge user, I mean you keep using large quantities of meth for a period of time, until you run out or just can’t physically do it anymore.” Years of MA use was calculated as the difference between age at baseline interview and age at initiation of

MA use. “Injection drug users” were defined as those who reported ever having injected MA or any other drug. Among IDU, the following additional variables were assessed with response categories ever vs. never: sharing of syringes; using injection paraphernalia (other than syringes) used by others; and using MA in a shooting gallery.

**Psychosocial measures**—We also examined both consequences of and motivations for MA use. A list of 14 different consequences (physical, psychological, and social or legal) associated with MA use was used to create a score by summing the number of consequences reported. In addition, a number of motivations for either initiating MA use or for continuing to use MA were examined. These motivations, which have been cited in the literature in association with injection drug use, were as follows: to get high, to escape, to cope with mood, to feel more confident, and to meet sex partners. Each of these motivating factors was analyzed separately (yes vs. no). In addition, the Beck Depression Inventory (BDI; Beck 1976, 1967) was used to evaluate participants’ level of depressive symptoms (range = 0–63).

### Statistical Analysis

Variables were analyzed using means or medians for continuous measures and frequencies and percentages for categorical variables. Differences between IDU and NIDU groups were examined using chi-square tests for categorical variables and t-tests or Wilcoxon rank-sum tests for continuous variables, depending upon whether the data were normally distributed. Logistic regression was used to assess the bivariate and multivariate associations of factors with injection status. All variables found to be significant ( $P < 0.05$ ) through bivariate analysis were considered for inclusion in multivariate analysis. Backward stepwise regression was performed manually to produce the most parsimonious model. Factors that were independently associated with being an IDU ( $P < 0.05$ ) in multivariate analysis were retained in the final model, based on likelihood ratio tests comparing full to reduced models.

## RESULTS

Of the 452 participants, 133 (29.4%) were IDU and 319 (70.6%) were NIDU (Table 1). The participants were 36.6 years old (SD = 9.9 years) on average, 67.7% male, 49.3% Caucasian, 26.8% African American, and 12.8% Hispanic; 15.3% reported being homeless. More than half had never attended college (58%) and had never been married (54.8%). IDU were significantly more likely to be older (mean age 40.4 vs. 35.0 years,  $p < 0.05$ ), Caucasian (68.4% vs. 41.4%,  $p < 0.05$ ), and homeless (24.1% vs. 11.6%,  $p < 0.05$ ) compared to NIDU.

### Sexual Behavior

Overall, 20% of participants reported having had an STI in the prior 60 days, which was reported more often by IDU compared to NIDU (36.6% vs. 13%;  $p < 0.05$ ). No significant differences were observed between IDU and NIDU for number of sex partners in the last 60 days (mean = 4.7, SD = 6.1), number of unprotected vaginal sex acts in the last 60 days (mean = 19.6, SD = 24.7), or proportion engaging in marathon sex while high on MA (65%). The majority of participants also reported having had both steady (55.4%) and casual or anonymous (95.8%) sex partners whose HIV status was positive or unknown; no difference was noted by injection status for either of these variables.

### Drug Behavior

As shown in Table 2, IDU were significantly more likely to be initiated into MA use by a family member (16.7% vs. 9.7%,  $p < 0.05$ ); IDU also reported more years of MA use (mean years 17.8 vs. 11.9 years,  $p < 0.05$ ), used more grams of MA (mean amount 14.0 vs. 7.6 grams,  $p < 0.05$ ), used MA a greater number of days in the prior month (mean days 16.3 vs. 13.9,  $p < 0.05$ ), and were more likely to report binge MA use (51.9% vs. 35.8%,  $p < 0.05$ )

compared to NIDU. IDU also reported injection-related behaviors that could increase their risk for parenteral exposure to HIV and other blood-borne pathogens, including: syringe sharing (49.2%); sharing injection paraphernalia other than syringes (45.2%); and use of a shooting gallery (15.3%). IDU did not differ from NIDU by average age at MA initiation or in being initiated to MA by a friend (68.5%) or lover (23.3%).

### Consequences of MA Use

IDU were more likely than NIDU to report having a felony conviction (59.1% vs. 32.7%,  $p < 0.05$ ). Overall, participants had a mean of 6.2 (SD = 4.2) social, physical, or psychological consequences due to MA use, with a mean BDI score of 14.3 (SD = 10.3); neither differed by injection drug use status (Table 3).

### Motivations for Initiating and Currently Using MA

As seen in Table 3, IDU were significantly more likely than NIDU to report the following motivations to initiate MA use: “to get high” (55.6% vs. 43.4%,  $p < 0.05$ ); “to cope with mood” (25.6% vs. 16.0%,  $p < 0.05$ ); “to escape” (27.1% vs. 12.9%,  $p < 0.05$ ); “to feel more confident” (21.1% vs. 11.0%,  $p < 0.05$ ); and “to meet sex partners” (16.5% vs. 8.5%,  $p < 0.05$ ).

For current MA use, IDU were more likely than NIDU to report the motivations “to get high” (61.4% vs. 45.7%,  $p < 0.05$ ) and “to escape” (24.2% vs. 13.6%,  $p < 0.05$ ). No other current motivations differed by injection drug use status, including “to cope with mood” (17.6%), “to feel more confident” (9.1%), and “to meet sex partners” (7.6%).

### Factors Independently Associated with Injection of MA

The final multivariate model identified several factors independently associated with injection drug use ( $p < 0.05$ ), which included being Caucasian, being homeless, engaging in binge MA use, reporting more years of MA use and more grams of MA use in the last 30 days, having had an STI diagnosis in the last 60 days, and having a history of felony convictions (see Table 4). The full model explained 21.1% of the total variance (pseudo  $R^2 = 0.211$ ) (Kleinbaum et al. 1998).

## DISCUSSION

These findings indicate that the population of MA users is heterogeneous according to injection drug use status. Overall, IDU differed from NIDU in sociodemographic characteristics, drug use behaviors, self-reported STI diagnosis, and history of felony convictions. Given the increased risk for blood-borne infections due to sharing of syringes and cookers among IDU, the findings from this study highlight important targets for prevention interventions.

In terms of sociodemographic characteristics, IDU were older and reported greater number of years of MA use compared to NIDU, suggesting that the risk of injecting rises with increasing years of MA use. Interventions for methamphetamine cessation should target younger and newly initiated MA users before they transition from smoking or snorting to injecting (Wood et al. 2008; Miller et al. 2006; Matsumoto et al. 2002). Associations of injection drug use with MA initiation by family members suggest that MA use may be intergenerational or that increased availability at home may increase the risk of earlier MA initiation, a finding that has been observed among young heroin injectors (Sherman et al. 2005). Prevention programs may wish to address the increased risk of injection drug use among younger household members of current IDU.



In addition, increased injection drug use among the homeless and ex-convicts suggests that these populations are vulnerable to the STI risk behaviors associated with injection drug use, and special interventions may be warranted. Homelessness has been closely associated in other studies with injection drug use and higher risk of HIV and STIs (Nyamathi et al. 2008; Coady et al. 2007). Community-level risk-reduction programs may need to seek out these populations and provide onsite safer sex counseling as well as access to sterile syringes through mobile needle exchange programs.

Although STI risk behaviors in this population were not significantly higher among IDU, IDU were more likely to report a recent STI. Other researchers have reported associations between MA injection and increased STI risk: Miller and colleagues (2009) found elevated HIV infection rates among street-involved IDU youths in Vancouver, British Columbia, while Razak and colleagues (2003) found higher HCV rates among IDU who were admitted to drug treatment programs in Thailand. In addition, a San Diego-based study of 194 men who have sex with men reported similar sociodemographic characteristics, drug use and sex behaviors, and consequences of MA use to those of this study, suggesting that correlates of MA use may be similar between heterosexual and MSM populations. Taken together with the high percentage of participants who shared needles and other injection equipment, the risk for HIV and other blood-borne infections is high among IDU in this population. Interventions that increase knowledge and skills regarding needle exchange, sanitization of equipment, and safer injection practices are clearly warranted for MA injectors.

IDUs in this study also reported greater frequency of MA use, more years of MA use, and binge use of MA. In the literature, increased use of MA is associated with more physical and psychological consequences, including irreversible neurological damage (Havens et al. 2006; Meredith et al. 2005; Semple, Patterson & Grant 2004; Domier et al. 2000). Therefore, in addition to attempting to prevent transition to injection use of MA, intervention strategies should target reductions in the amounts and frequency of MA use. The combined effect of increased risk of STIs and injection initiation with greater age or years of use suggests that efforts to inhibit the progression from smoking or snorting to injection of MA may be more effective in preventing STI or HIV exposure than safer sex education alone.

This study, like many others, was limited in that both the IDU and NIDU groups included individuals who used MA exclusively and others who used multiple drugs; however the small number of polydrug users in the IDU group ( $n = 35$ ) limited our ability to conduct stratified analyses to identify differences. In a sub-analysis, we compared polydrug-injecting to MA-only injecting drug users and found that polydrug injectors were significantly more likely to engage in marathon sex compared to MA-only IDU, whereas MA-only IDU were significantly less likely to engage in marathon sex compared to NIDU (data not shown). Although the available data were insufficient to disentangle the association to explain differences in marathon sex behavior, the increased STI risk of engaging in marathon sex among polydrug IDU compared to MA-only IDU remains an area of concern for HIV prevention strategies. IDU in this study were a heterogeneous population, and these differences may affect the efficacy of intervention and prevention messages. Further research into event-level behaviors for IDU when injecting versus when smoking or snorting MA may further elucidate the relationship between injection drug use and sex behaviors. Finally, future studies should also include a control group of non-MA drug users (IDU and NIDU).

A number of other limitations may affect the interpretation of these findings. The parent study excluded individuals who did not report sex with an opposite-sex partner in the prior 60 days; thus, the sample may not be representative of HIV-negative, heterosexual MA-

users with lower sexual risk. However, our results are consistent with existing literature on MSM and other drug-using populations. Studies have reported associations of injection MA use with race (Corsi, Kwiatkowski & Booth 2009; Nyamathi et al. 2008; Fairbairn et al. 2007; Semple, Patterson & Grant 2004), homelessness (Nyamathi et al. 2008; Coady et al. 2007; Semple, Patterson & Grant 2004), years of MA used (Semple, Patterson & Grant 2004; Razak et al. 2003; Domier et al. 2000), amount of MA used (Semple, Patterson & Grant 2004), STI diagnosis (Miller et al. 2009), and felony convictions (Semple, Patterson & Grant 2004; Razak et al. 2003; Domier et al. 2000). Another potential limitation is that the self-reported nature of our data may have introduced bias due to underreporting of STI-risk behaviors. We guarded against this by using ACASI, which has been shown to decrease the likelihood of socially desirable responses during collection of personally sensitive data (Des Jarlais et al. 1999). The cross-sectional nature of the data also leads to difficulties in determining causal relationships between MA injection, risk behaviors, and psychosocial variables.

This study suggests that significant differences exist between MA users depending on route of drug administration and that interventions targeting MA users for prevention of HIV or STIs should consider these differences.

## REFERENCES

- Banken JA. Drug abuse trends among youth in the United States. *Annals of the New York Academy of Sciences* 2004;1025:465–471. [PubMed: 15542750]
- Beck, AT. *Cognitive Therapy and Emotional Disorder*. New York: Hoeber; 1976.
- Beck, AT. *Depression: Clinical, Experimental and Theoretical Aspects*. New York: Harper & Row; 1967.
- Brouwer KC, Case P, Ramos R, Magis-Rodriguez C, Bucardo J, Patterson TL, Strathdee SA. Trends in production, trafficking, and consumption of methamphetamine and cocaine in Mexico. *Substance Use & Misuse* 2006;41(5):707–727. [PubMed: 16603456]
- Bucardo J, Brouwer KC, Magis-Rodriguez C, Ramos R, Fraga M, Perez SG, Patterson TL, Strathdee SA. Historical trends in the production and consumption of illicit drugs in Mexico: Implications for the prevention of blood borne infections. *Drug and Alcohol Dependence* 2005;79(3):281–293. [PubMed: 16102372]
- Case P, Ramos R, Brouwer KC, Firestone-Cruz M, Pollini RA, Fraga MA, Patterson TL, Strathdee SA. At the borders, on the edge: Use of injected methamphetamine in Tijuana and Ciudad Juarez, Mexico. *Journal of Immigrant and Minority Health* 2008;10(1):23–33. [PubMed: 17516170]
- Coady MH, Latka MH, Thiede H, Golub ET, Ouellet L, Hudson SM, Kapadia F, Garfein RS. Housing status and associated differences in HIV risk behaviors among young injection drug users (IDUs). *AIDS and Behavior* 2007;11(6):854–863. [PubMed: 17551825]
- Corsi KF, Kwiatkowski CF, Booth RE. Predictors of methamphetamine injection in out-of-treatment IDUs. *Substance Use & Misuse* 2009;44(3):332–342. [PubMed: 19212925]
- Des Jarlais D, Paone D, Milliken J, Turner CF, Miller H, Gribble J, Shi Q, Hagan H, Friedman SR. Audio-computer interviewing to measure risk behaviour for HIV among injecting drug users: A quasi-randomised Trial. *Lancet* 1999;353(9165):1657–1661. [PubMed: 10335785]
- Domier CP, Simon SL, Rawson RA, Huber A, Ling W. A comparison of injecting and noninjecting methamphetamine users. *Journal of Psychoactive Drugs* 2000;32(2):229–232. [PubMed: 10908012]
- Fairbairn N, Kerr T, Buxton JA, Li K, Montaner JS, Wood E. Increasing use and associated harms of crystal methamphetamine injection in a Canadian setting. *Drug and Alcohol Dependence* 2007;88(2–3):313–316. [PubMed: 17141427]
- Fernando D, Schilling RF, Fontdevila J, el-Bassel N. Predictors of sharing drugs among injection drug users in the South Bronx: Implications for HIV transmission. *Journal of Psychoactive Drugs* 2003;35(2):227–236. [PubMed: 12924745]

- Gallo D, George JR, Fitchen JH, Goldstein AS, Hindahl MS. OraSure HIV Clinical Trials Group. Evaluation of a system using Oral Mucosal Transudate for HIV-1 Antibody screening and confirmatory testing. *Journal of the American Medical Association* 1997;277(3):254–258. [PubMed: 9005276]
- Gibson DR, Leamon MH, Flynn N. Epidemiology and public health consequences of methamphetamine use in California's Central Valley. *Journal of Psychoactive Drugs* 2002;34(3): 313–319. [PubMed: 12422943]
- Havens JR, Sherman SG, Sapun M, Strathdee SA. Prevalence and correlates of suicidal ideation among young injection vs. noninjection drug users. *Substance Use & Misuse* 2006;41(2):245–254. [PubMed: 16393745]
- Inglez-Dias A, Hahn JA, Lum PJ, Evans J, Davidson P, Page-Shafer K. Trends in methamphetamine use in young injection drug users in San Francisco from 1998 to 2004: the UFO Study. *Drug and Alcohol Review* 2008;27(3):286–291. [PubMed: 18368610]
- Kleinbaum, DG.; Kupper, LL.; Muller, KE.; Nizam, A. Applied regression analysis and other multivariable methods. In: Kugushev, A., editor. *Multiple Regression Analysis: General Considerations*. Pacific Grove, CA: Duxbury Press; 1998.
- Matsumoto T, Kamijo A, Miyakawa T, Endo K, Yabana T, Kishimoto H, Okudaira K, Iseki E, Sakai T, Kosaka K. Methamphetamine in Japan: The consequences of methamphetamine abuse as a function of route of administration. *Addiction* 2002;97(7):809–817. [PubMed: 12133119]
- Meredith CW, Jaffe C, Ng-Lee K, Saxon AJ. Implications of chronic methamphetamine use: A literature review. *Harvard Review of Psychiatry* 2005;13(3):141–154. [PubMed: 16020027]
- Miller CL, Kerr T, Fischer B, Zhang R, Wood E. Methamphetamine injection independently predicts hepatitis C infection among street-involved youth in a Canadian setting. *Journal of Adolescent Health* 2009;44(3):302–304. [PubMed: 19237118]
- Miller CL, Strathdee SA, Kerr T, Li K, Wood E. Factors associated with early adolescent initiation into injection drug use: Implications for intervention programs. *Journal of Adolescent Health* 2006;38(4):462–464. [PubMed: 16549314]
- Molitor F, Ruiz JD, Flynn N, Mikanda JN, Sun RK, Anderson R. Methamphetamine use and sexual and injection risk behaviors among out-of-treatment injection drug users. *American Journal of Drug and Alcohol Abuse* 1999;25(3):475–493. [PubMed: 10473010]
- National Institute on Drug Abuse (NIDA). InfoFacts: Methamphetamine. 2008. Available at <http://www.Nida.Nih.Gov/Infofacts/Methamphetamine.Html>
- Nyamathi A, Dixon EL, Shoptaw S, Marfisee M, Gelberg L, Williams S, Dominick S, Leake B. Profile of lifetime methamphetamine use among homeless adults in Los Angeles. *Drug and Alcohol Dependence* 2008;92(1–3):277–281. [PubMed: 17681434]
- Pollini RA, Strathdee SA. Indicators of methamphetamine use and abuse in San Diego County, California: 2001–2005. *Journal of Psychoactive Drugs* 2007 Suppl 4:319–325. [PubMed: 18284098]
- Razak MH, Jittiwutikarn J, Suriyanon V, Vongchak T, Srirak N, Beyrer C, Kawichai S, Tovanabutra S, Rungruengthanakit K, Sawanpanyalert P, Celentano DD. HIV prevalence and risks among injection and noninjection drug users in Northern Thailand: Need for comprehensive HIV prevention programs. *Journal of Acquired Immune Deficiency Syndromes* 2003;33(2):259–266. [PubMed: 12794564]
- Semple SJ, Patterson TL, Grant I. A comparison of injection and non-injection methamphetamine-using HIV positive men who have sex with men. *Drug and Alcohol Dependence* 2004;76(2):203–212. [PubMed: 15488344]
- Semple SJ, Zians J, Grant I, Patterson TL. Impulsivity and methamphetamine use. *Journal of Substance Abuse Treatment* 2005;29(2):85–93. [PubMed: 16135337]
- Shaw SY, Shah L, Jolly AM, Wylie JL. Identifying heterogeneity among injection drug users: A cluster analysis approach. *American Journal of Public Health* 2008;98(8):1430–1437. [PubMed: 18556614]
- Sherman SG, Fuller CM, Shah N, Ompad DV, Vlahov D, Strathdee SA. Correlates of initiation of injection drug use among young drug users in Baltimore, Maryland: The need for early intervention. *Journal of Psychoactive Drugs* 2005;37(4):437–443. [PubMed: 16480171]



Substance Abuse and Mental Health Services Administration (SAMHSA). National Survey on Drug Use and Health. 2007. Available at <http://www.oas.samhsa.gov/2k7/idu/idu.cfm>

Wood E, Stoltz JA, Zhang R, Strathdee SA, Montaner JS, Kerr T. Circumstances of first crystal methamphetamine use and initiation of injection drug use among high-risk youth. *Drug and Alcohol Review* 2008;27(3):270–276. [PubMed: 18368608]

Bivariate Associations of Sociodemographic Characteristics and Sex Behaviors comparing 319 NIDU to 133 IDU among 452 HIV-Negative MA Users in San Diego, CA, 2001 – 2005

TABLE 1

Characteristic	All (n=452)		NIDU (n=319)		IDU (n=133)		OR	95%CI
	%	(n)	%	(n)	%	(n)		
Mean Age in Years (SD) *	36.6	(9.9)	35.0	(9.8)	40.4	(9.1)	1.06	(1.04,1.08)
Gender: Female (vs. male)	32.3	(146)	33.2	(106)	30.1	(40)	0.86	(0.56,1.34)
Race							0.70	(0.61,0.81)
Caucasian	49.3	(223)	41.4	(132)	68.4	(91)		
Asian American	1.8	(8)	1.6	(5)	2.3	(3)		
African American	26.8	(121)	30.4	(97)	18.1	(24)		
Native American	2.2	(10)	2.5	(8)	1.5	(2)		
Latino (Hispanic)	12.8	(58)	15.7	(50)	6.0	(8)		
Other	7.1	(32)	8.5	(27)	3.8	(5)		
Education: > College (vs. < High School)	42.0	(188)	44.3	(140)	36.4	(48)	0.72	(0.47,1.09)
Homelessness: Yes (vs. No)	15.3	(69)	11.6	(37)	24.1	(32)	2.41	(1.42,4.07)
Marital Status							0.96	(0.80,1.16)
Married: Yes (vs. No)	8.2	(37)	9.6	(31)	4.5	(6)		
Divorced or Separated: Yes (vs. No)	35.3	(159)	32.1	(102)	43.6	(58)		
Never Married: Yes (vs. No)	54.8	(247)	56.0	(178)	51.9	(69)		
Mean # of Sex Partners in last 60 Days (SD) *	4.7	(6.1)	4.6	(5.4)	4.9	(7.5)	1.01	(0.98,1.04)
Mean # of Unprotected Vaginal Sex Acts in last 60 Days (SD) *	19.6	(24.7)	19.3	(23.8)	20.4	(26.9)	1.00	(0.99,1.01)
Sex with HIV(+) or Serostatus-Unknown Partner								
Spouse or Steady: Yes (vs. No)	55.4	(252)	54.2	(173)	58.1	(79)	1.17	(0.78,1.75)
Casual or Anonymous: Yes (vs. No)	95.8	(436)	96.9	(309)	93.4	(127)	0.46	(0.18,1.15)
Any STIs in last 60 Days: Yes (vs. No)	20.0	(89)	13.0	(41)	36.6	(48)	3.89	(2.39,6.27)
Marathon Sex while High on MA: Yes (vs. No)	65.1	(296)	66.8	(213)	61.0	(83)	0.78	(0.51,1.18)

\* Values for these characteristics are in the form of Mean (SD) instead of % (n).

Note: SD = standard deviation; OR = odds ratio; CI = confidence interval; MA = methamphetamine; IDU = injection drug user; NIDU = non-IDU; STI = sexually transmitted infection

Drug Use Characteristics Associated with 319 NIDU to 133 IDU among 452 Heterosexual, HIV-Negative MA Users in San Diego, CA, 2001 – 2005

TABLE 2

Characteristic	All (n = 452)		NIDU (n = 319)		IDU (n = 133)		OR	95% CI
	%	(n)	%	(n)	%	(n)		
Mean Age of MA Initiation (SD)*	22.9	(9.2)	23.1	(9.0)	22.4	(9.7)	0.99	(0.97,1.01)
Initiated MA use by Friend: Yes (vs. No)	68.5	(309)	70.2	(224)	64.4	(85)	0.77	(0.50,1.18)
Initiated MA use by Family: Yes (vs. No)	11.8	(53)	9.7	(31)	16.5	(22)	1.86	(1.03,3.35)
Initiated MA use by Lover: Yes (vs. No)	23.3	(105)	22.9	(73)	24.2	(32)	1.08	(0.67,1.74)
Mean Years of MA Use (SD)*	13.6	(8.9)	11.9	(7.9)	17.8	(9.7)	1.08	(1.05,1.11)
Mean Grams of MA Used Last 30 days (SD)*	9.4	(17.4)	7.6	(13)	14.0	(24.8)	1.02	(1.01,1.03)
Mean # of Days of MA Use Last 30 days (SD)*	14.6	(9.1)	13.9	(9.1)	16.3	(8.8)	1.03	(1.01,1.05)
Binge Use: Ever (vs. Never)	40.6	(183)	35.8	(114)	51.9	(69)	1.93	(1.28,2.91)
Share Needles: Ever (vs. Never)					49.2	(63)	n/a	
Use Works of Others: Ever (vs. Never)					45.2	(57)	n/a	
Use in Shooting Gallery: Ever (vs. Never)					15.3	(19)	n/a	

\* Values for these characteristics are in the form of Mean (SD) instead of % (n).

Note: SD = standard deviation; OR = odds ratio; CI = confidence interval, MA = methamphetamine; IDU = injection drug user ; NIDU = non-IDU

Bivariate Associations of Consequences of Current MA Use and Motivations for Initiating and Current Use of MA Comparing 319 NIDA to 133 IDU Among 452 HIV-Negative MA Users in San Diego, CA, 2001 – 2005

TABLE 3

Characteristic	All (n = 452)		NIDU (n = 319)		IDU (n = 133)		OR	95%CI
	%	(n)	%	(n)	%	(n)		
Mean # of Consequences of MA Use (SD) *	6.2	(4.2)	6.4	(4.2)	5.8	(4.2)	0.97	(0.93,1.02)
Mean Beck Depression Inventory Score (SD) *	14.3	(10.3)	14.9	(10.1)	16.2	(10.6)	1.01	(0.99,1.03)
History of Felony: Yes (vs. No)	40.4	(182)	32.7	(104)	59.1	(78)	2.98	(1.96,4.52)
Motivations for Starting MA Use								
To Get High	47.0	(212)	43.4	(138)	55.6	(74)	1.63	(1.01,2.46)
To Escape	17.1	(77)	12.9	(41)	27.1	(36)	2.51	(1.51,4.15)
To Cope With Mood	18.8	(85)	16.0	(51)	25.6	(34)	1.80	(1.10,2.94)
To Feel More Confident	14.0	(63)	11.0	(35)	21.1	(28)	2.16	(1.25,3.72)
To Meet Sex Partners	10.9	(49)	8.5	(27)	16.5	(22)	2.14	(1.17,3.91)
Motivations for Current MA Use								
To Get High	50.3	(226)	45.7	(145)	61.4	(81)	1.88	(1.24,2.85)
To Escape	16.7	(75)	13.6	(43)	24.2	(32)	2.04	(1.22,3.40)
To Cope With Mood	17.6	(79)	17.0	(54)	18.9	(25)	1.14	(0.67,1.92)
To Feel More Confident	9.1	(41)	8.83	(28)	9.9	(13)	1.13	(0.56,2.25)
To Meet Sex Partners	7.6	(34)	7.3	(23)	8.3	(11)	1.16	(0.55,2.46)

\* Values for these characteristics are in the form of Mean (SD) instead of % (n).

Note: SD = standard deviation; OR = odds ratio; CI = confidence interval; MA = methamphetamine; IDU = injection drug user; NIDU = non-IDU



**TABLE 4**

Multivariate Logistic Regression Analysis of Sociodemographic, Drug Use and Sexual Behavior Characteristics, and Consequences of and Motivations for MA Use Factors Associated with Injection Drug Use Among 452 HIV-Negative Methamphetamine Users in San Diego, Ca, 2001 – 2005

Characteristic	IDU vs. NIDU (ref)	
	AOR	95% CI
Race : Caucasian (vs. Non-Caucasian)	1.41	(1.19,1.67)
Homeless: Yes (vs. No)	2.76	(1.47,5.16)
Binge MA Use: Ever (vs. Never)	1.68	(1.02,2.75)
Mean Years of MA Use (unit = 1 year increase)	1.05	(1.03,1.09)
Mean Grams of MA Used Last 30 Days (unit = 1 gram)	1.02	(1.00,1.03)
STI Diagnosis in last 60 days: Yes (vs. No)	2.69	(1.24,3.93)
History of Felony Charge: Yes (vs. No)	2.56	(1.56,4.19)

NOTE: AOR = adjusted odds ratio; CI = confidence interval; MA = methamphetamine; IDU = injection drug user; NIDU = non-IDU, STI = sexually transmitted infection