

Regular article

Methamphetamine dependence and human immunodeficiency virus risk behavior

Richard A. Rawson, (Ph.D.)^{a,*}, Rachel Gonzales, (Ph.D.)^a, Valerie Pearce, (M.P.H.)^a,
Alfonso Ang, (Ph.D.)^b, Patricia Marinelli-Casey, (Ph.D.)^a, Julie Brummer, (B.A.)^a
Methamphetamine Treatment Project Corporate Authors

^aUniversity of California Los Angeles (UCLA) Integrated Substance Abuse Programs, Los Angeles, CA 90025, USA

^bUCLA School of Medicine, Los Angeles, CA 90024, USA

Received 5 September 2007; received in revised form 5 November 2007; accepted 19 November 2007

Abstract

We examined human immunodeficiency virus (HIV)-related risk behaviors among methamphetamine (MA)-dependent users. Secondary data analysis was performed on data from a large clinical trial: The Methamphetamine Treatment Project ($N = 784$). All MA-dependent participants were enrolled in an outpatient treatment program, receiving either a standardized psychosocial protocol (Matrix model) or treatment-as-usual. HIV-related risk behavior, including injection and unsafe sexual practices, was assessed using the AIDS Risk Assessment at baseline, treatment discharge, and 6, 12, and 36 months following treatment participation. Results indicated that HIV risk behaviors substantially decreased over time. Treatment factors (retention and completion) and frequency of MA use were both positively associated with increased reduction of HIV risk behaviors. The findings suggested that treatment of MA dependence is promising for reducing behaviors that have been shown to transmit HIV. © 2008 Elsevier Inc. All rights reserved.

Keywords: HIV risk; Methamphetamine; Injection use; Unsafe sexual behaviors

1. Introduction

National epidemiological data indicate that roughly 1 million individuals in the United States are infected with human immunodeficiency virus (HIV), with rates on the rise since 2001 (Centers for Disease Control and Prevention [CDC], 2005). Injection practices (CDC, 2003) and risky sexual behaviors (Leigh & Stall, 1993) among illicit drug abusing populations have greatly contributed to the rapid growth and spread of HIV in the United States. Much attention regarding high rates of HIV among illicit drug users in the United States has centered on heroin and cocaine or crack users (Gyarmathy, Neaigus, Miller, Friedman, & Des Jarlais, 2002; Neaigus, Miller, Friedman, & Des Jarlais,

2001). However, a growing number of studies have identified methamphetamine (MA) use as a significant cofactor associated with increased HIV infection (Buchacz et al., 2005; Colfax et al., 2001, 2004, 2005; Schwarcz et al., 2007). Most of this work to date has been on men who have sex with men (MSM) populations (Frosch, Shoptaw, Huber, Rawson, & Ling, 1996; Gorman, Morgan, & Lambert, 1995; Halkitis, Parsons, & Stirratt, 2001; Paul, Stall, & Davis, 1993; Peck, Shoptaw, Rotheram-Fuller, Reback, & Bierman, 2005; Reback, Larkins, & Shoptaw, 2004; Semple, Patterson, & Grant, 2002; Shoptaw, Reback, Frosch, & Rawson, 1998). Very little HIV risk-related literature exists among non-MSM identified MA users (Semple, Patterson, & Grant, 2004; Semple, Grant, & Patterson, 2006).

Studies of MA users, not specifically selected as MSMs, reported that MA use is associated with numerous HIV-related risk factors. Rawson, Washton, Domier, and Reiber (2002) observed that MA-dependent users engage in a higher frequency of sexual activity, have more sexual partners, and

* Corresponding author. UCLA Integrated Substance Abuse Programs, Los Angeles, CA 90025, USA. Tel.: +1 310 267 5311; fax: +1 310 312 0538.

E-mail address: rrawson@mednet.ucla.edu (R.A. Rawson).

participate in more risky sexual behavior (i.e., no condom use and anal sex) than users of other types of drugs. Molitor, Truax, Ruiz, and Sun (1998) found that heterosexual MA users are likely to have more sex partners, higher rates of unprotected anal and vaginal sex, and lower rates of condom use when compared with non-MA users. Semple, Grant, and Patterson (2004) observed a similar trend among MA-using women, who reported multiple partners, many anonymous sex partners, infrequent condom use, and frequent unprotected anal intercourse. Other studies have found that MA-injecting non-MSM users are also at great risk of HIV infection because they tend to report increased sexual desires compared with noninjecting MA users (Hall & Hando, 1994; Klee, 1993).

Research has shown that behavioral-based treatments for drug abuse can be effective vehicles for reducing HIV infection among illicit drug abusers (Metzger, Navaline, & Woody, 1998). Studies among heroin and cocaine users receiving treatment show that risky drug use injection and unsafe sexual practices greatly reduce or cease after treatment (Schroeder, Epstein, Umbricht, & Preston, 2006; Woody et al., 2003). Similar treatment effects have been observed among MA-dependent MSM users (Reback et al., 2004).

With HIV rapidly expanding among illicit drug abusers, this article contributes to this body of knowledge by examining HIV risk behavior among an adult MA-dependent sample who participated in a multisite, randomized behavioral intervention trial not specific to MSM populations. Although all participants received psychosocial treatment, the trial was not a controlled comparison of treatment versus no treatment; hence, this study only serves to provide some preliminary information on the changes in HIV risk behavior associated with behavioral treatment participation.

2. Methods

2.1. Sample

Analyses are based on secondary data from a multisite clinical trial called the Methamphetamine Treatment Project (MTP) comparing a standard psychosocial-based treatment (Matrix model) to treatment-as-usual in eight treatment programs located in Montana, Hawaii, and California between 1999 and 2002 (Elkashef et al., 2007; Rawson et al., 2004). Funded by the Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Substance Abuse Treatment (CSAT), the trial included 978 MA-dependent adults who were eligible for study participation if they met *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, criteria for MA dependence, used MA in the month before treatment entry, were proficient in the English language, were 18 years or older, and resided in the same geographical location as the treatment facility as defined by city and zip code.

2.1.1. The Matrix model is a manualized multicomponent psychosocial treatment

The model consists of 16 weeks of thrice-weekly group sessions, including cognitive-behavioral, family education, social support, and individual counseling combined with urine drug testing (Obert et al., 2000).

2.1.2. Treatment-as-usual conditions followed no standard treatment guidelines

Interventions represented eight diverse treatment approaches, including individual or group-based counseling sessions that were of different intensities (i.e., once per week vs. thrice weekly) and ranged from 8 to 16 weeks in duration (Galloway et al., 2000).

2.2. Study variables and measures

The data examined included participant sociodemographic (gender, age, and ethnicity), and treatment characteristics (condition, retention, and completion), and current (past 30-day use at admission) and lifetime MA use collected at baseline and follow-up periods using the Addiction Severity Index (McLellan et al., 1992).

Treatment characteristics, including study condition (Matrix vs. treatment-as-usual), retention, and completion status, were obtained from treatment records. The length of treatment (retention) was measured by weeks in treatment based on the first day of admission to the last day of treatment discharge, and treatment completion was defined as those who completed the prescribed treatment regimen with no more than 2 consecutive missed weeks of treatment versus those who did not complete treatment.

Risky behaviors, as measured by self-reported injection and high-risk sexual practices, were collected from the Texas Christian University AIDS Risk Assessment (Simpson et al., 1994) at baseline and follow-up periods. This measure is an 18-item inventory assessing high-risk sexual and drug use behaviors commonly associated with exposure to HIV. Most items require an answer specifying the number of times or number of people involved in the behavior being assessed. A sexual risk behavior composite was calculated, summing individual sexual risk items, with a higher score indicative of engaging in more risky sexual activities. For logistic regression purposes, sexual risk composite scores were coded to 0 (if no risky behaviors) or 1 (if they engaged in risky behavior, regardless of the number of times).

2.3. Data analysis

Chi-square and independent samples *t* tests were used to examine the associations between the study variables. Linear and logistic regression modeling were used to assess factors that contributed to change in risky behaviors (injection and unsafe sexual practices) over time at follow-

up periods: discharge and 6, 12, and 36 months after treatment participation. To reduce potential reporting bias associated with demand characteristics, an interviewer who did not have any relationship to the Matrix or treatment-as-usual interventions that clients received performed the assessments.

Follow-up response rates for the MTP project were high. Of the 978 participants randomly assigned at baseline to the two different treatment conditions, 787 completed discharge interviews, 871 completed the 6-month follow-up interview, 880 completed the 12-month follow-up interview, and 587 were recruited to participate in a 3-year follow-up interview (Marinelli-Casey et al., manuscript in preparation). All analyses were performed using the Statistical Package for Social Sciences for Windows (Version 13.0, Chicago, IL). *p* values less than .05 indicate statistical significance.

3. Results

3.1. Participant characteristics

At baseline, roughly half of the participants were female (51.1%); most were Caucasian (65.5%); the average age was 32.8 ± 7.8 years (range = 18–60 years); and most participants had an average of 12.2 years of education ($SD = 1.7$). At the 3-year follow-up, 67.6% of the sample were Caucasian; 59.8% were female; and the mean age was 36.2 years ($SD = 8.0$; range = 21–59). Current MA use in the past month averaged 11.4 ± 9.5 days at baseline, 4.4 ± 7.9 days at discharge, 4.2 ± 8.2 days at 6-month follow-up, 3.4 ± 7.5 days at 12-month follow-up, and 3.7 ± 7.9 days at the 3-year follow-up. Lifetime MA use averaged 7.5 years ($SD = 6.0$) at baseline. Treatment duration for the total sample ranged from 8 to 16 weeks, with retention averaging 6.8 weeks ($SD = 6.0$), and 31.0% completing treatment, regardless of treatment condition.

3.2. Change in risky behaviors (baseline to treatment discharge)

Change in HIV risk behavior (injection and unsafe sexual practices) was examined from baseline to treatment discharge. The proportion of the sample who injected MA within the previous 30 days significantly reduced from baseline to treatment discharge (14.6% to 5.4%, based on a matched baseline to discharge sample of 784). Subanalysis of high-risk injection practices (injectors only; $n = 128$ from baseline to discharge) showed that high-risk practices were significantly reduced (Table 1). Analyses on sexual risk behavior indicated that high-risk sexual practices substantially reduced after treatment participation (baseline to treatment discharge), including having sex without condoms in general, with IV users, or with MA users, or having sex while high on drugs (Table 2).

Table 1

High-risk drug use activities—comparison of baseline to discharge ($n = 128$)

High-risk drug use activities	Baseline	Discharge
Mean times injected ***	19.7	7.8
Mean times used dirty needles ***	3.9	0.91
Mean times shared cooker, cotton, etc. **	6.5	1.4

** $p < .01$.

*** $p < .001$.

3.3. Treatment impact on risky behaviors (baseline to treatment discharge)

We examined the extent to which treatment participation, measured via retention, completion, and treatment condition, was associated with a reduction in high-risk HIV practices (injection and unsafe sexual behaviors). Results did not show any significant differences in HIV risk practices (injection or unsafe sexual practices) by treatment condition (Matrix vs. treatment-as-usual).

There were significant associations between retention and HIV risk outcomes: For those with retention rates greater than the mean (6.79 weeks), the injection behavior (measured as days of injecting in the past month) dropped substantially from 16.0 days at baseline to 5.6 days at discharge as compared with those with retention rates lower than the mean (16.0 at baseline to 8.92 at discharge). Regression modeling confirmed these associations after controlling for sociodemographic factors and MA use (past 30 days) at baseline: There was a substantial reduction in injection behavior for those who stayed in treatment for longer periods (regression coefficient, $B = -.18$, $p < .05$) as well as for completers (15.8 days at baseline to 1.6 days at discharge) than noncompleters (16.1 at baseline to 8.5 at discharge; odds ratio = .64; 95% confidence interval = 0.4102201–0.9946447).

In terms of sexual risk behaviors, we found a similar trend—higher retention rates above the mean (6.79 or higher) were associated with reduced risky sexual behaviors (sex risk composite score at baseline mean = 2.32; discharge mean = 1.87; $p < .01$). Similarly, less risky sexual behavior was significantly related to treatment completion among MA users (mean risk behavior completers = 1.6 vs. mean risk behavior noncompleters = 2.2; $p < .001$). Regression models, controlling for sociodemographic characteristics and MA use in the past month at baseline, confirmed that longer treatment retention ($B = -.043$, $p < .001$) and treatment completion ($B = -.565$, $p < .001$) are significantly associated with less risky behavior based on the sex risk composite score at discharge. Results also indicated that persons using MA more frequently in the past month at discharge were more likely to engage in HIV risk behaviors than those using MA less frequently at discharge ($B = 1.21$, $p < .001$).

Table 2
High-risk sexual behaviors—comparison of baseline to discharge ($N = 784$)

High-risk drug use activities	Baseline	Discharge
Mean times had sex without condoms *	14.7	13.2
Mean times had sex without condom with IV user **	2.3	1.4
Mean times had sex without condom with MA user **	6.5	1.4
Mean times had sex while high ***	9.1	4.9
Mean times had sex without condom for trading sex for drugs or money	0.14	0.12
Mean times had sex without condom involving anal sex	0.27	0.19

* $p < .05$.

** $p < .01$.

*** $p < .001$.

3.4. Long-term treatment association with risky behaviors: 3-year follow-up

Controlling for treatment participation factors (completion and condition), current MA use in the past month, and sociodemographic characteristics, we examined change in HIV risk behaviors at the 3-year follow-up. Results showed that injection practices significantly reduced from baseline to the 3-year follow-up (17.1%–4.4%, on a matched 569 baseline to follow-up sample). Furthermore, analyses indicated that high-risk sexual practices (as measured by sexual risk composite) substantially reduced from baseline to 3-year follow-up: 24.46 ($SD = 14.9$) to the 3-year follow-up 12.75 ($SD = 7.2$; $p < .05$; Fig. 1).

Linear regression results indicated a significant association between the frequency of MA use at follow-up and HIV risk behavior, such that frequent MA use (in the past month) is associated with increased HIV risk behaviors compared to less frequent MA use at follow-up ($B = 3.37$, $p < .001$), controlling for baseline MA use, sociodemographic factors, and treatment factors.

4. Discussion

Results from this article support previous research showing that treatment for MA dependence appears to be associated with significant reductions in HIV risk behavior. The findings add to the large base of studies, mostly MSM related, showing that MA use is highly associated with high-risk sexual and drug use practices among a nonidentified MSM MA-dependent sample.

Results highlight that treatment participation is important in the reduction of HIV risk behaviors. We found that longer treatment retention and treatment completion were significantly related to greater reductions in risky sexual behavior and injection practices among MA users. Longer retention and completion status were also associated with greater reductions in HIV risk behaviors 3 years after treatment.

These results suggest that successful treatment participation may be an effective approach to decreasing HIV risk injection and unsafe sexual practices among MA-dependent users. Although specific HIV risk reduction interventions were not part of MTP interventions, it may be likely that the reduced injection and sexual risk practices observed in this study could be optimized if such interventions were integrated into treatment programs for MA users.

This study highlights important areas of clinical concern with regard to the unique risks associated with HIV risk among MA-dependent users. As indicated by the results, participants using MA more frequently were more likely to engage in high-risk HIV-related behaviors than those using MA less frequently. Understanding this association can provide clinicians with useful insight for tailoring treatment strategies more appropriately among MA users reporting frequent MA use in conjunction with high-risk behaviors.

There are limitations associated with this study. Study findings are limited to self-report and do not provide any detailed information about actual HIV infection rates. Because data are based on self-report, memory or recall of behaviors may be problematic for sexual or injection-related events that occurred during the month prior to the interview. Although the data capture reductions in self-reported injection and high-risk sexual behaviors, there are no data on the reasons for why such behaviors were stopped; hence, there may be other possibilities, besides treatment, that account for such reductions. Our analyses of such factors associated with reductions in sexual behaviors and injection practices are limited to a few variables and should thus be

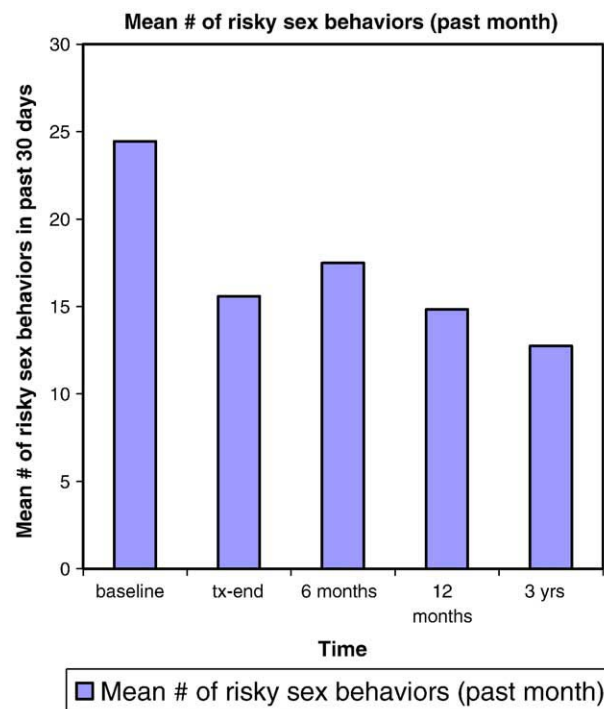


Fig. 1. Change in high-risk sexual behavior composite from baseline to 3-year follow-up ($n = 569$).

interpreted as simply relational in nature. More data on other variables would obviously contribute to a better understanding of how MA users reduce high-risk behaviors. Past research indicates that communication about safer sex between partners, HIV-related knowledge, and favorable condom use attitudes are important variables to examine when assessing HIV risk behaviors among drug users (Carey et al., 2004). Lastly, reductions in HIV risk behavior can only be generalized among individuals more likely to be retained for follow-up interviews.

Overall, this study makes an important contribution to the literature, given the limited information available on HIV risk behaviors among MA users who seek treatment not specific to MSM populations. To extend on this research, future studies can look into integrating specific risk reduction strategies for drug-abusing populations into behavioral treatment interventions. For example, one promising approach is to focus on a user's "sense of responsibility to protect a partner" by way of engaging in safer practices such as condom use (Ross et al., 2007). Preliminary research shows that this strategy serves as an important predictor of HIV risk reduction behavior among drug-using populations.

Acknowledgments

The authors wish to thank the treatment, research, and statistical staff who participated in the studies presented in this article. The MTP study was supported by Grants TI 11440-01, TI 11427-01, TI 11425-01, TI 11443-01, TI 11484-01, TI 11441-01, TI 11410-01, and TI 11411-01 provided by the CSAT, SAMHSA, and the U.S. Department of Health and Human Services.

References

- Buchacz, K., McFarland, W., Kellogg, T., Loeb, L., Holmberg, S. D., Dilley, J., et al. (2005). Amphetamine use is associated with increased HIV incidence among men who have sex with men (MSM) in San Francisco. *AIDS*, 19, 1423–1424.
- Carey, M. P., Carey, K. B., Maisto, S. A., Gordon, C. M., Schroder, K. E. E., & Vanable, P. A. (2004). Reducing HIV-risk behavior among adults receiving outpatient psychiatric treatment: Results from a randomized controlled trial. *Journal of Consulting & Clinical Psychology*, 72, 252–268.
- Centers for Disease Control and Prevention. (2003). HIV diagnoses among injection-drug users in states with HIV surveillance—25 states, 1994–2000. *Morbidity and Mortality Weekly Report*, 52, 634–636.
- Centers for Disease Control and Prevention. (2005). *HIV/AIDS Surveillance Report*, 2004, 16, 12, CDC.
- Colfax, G., Coates, T. J., Husnik, M. J., Huang, Y., Buchbinder, S., Koblin, B., et al. (2005). Longitudinal patterns of methamphetamine, popper (amyl nitrite), and cocaine use and high-risk sexual behavior among a cohort of San Francisco men who have sex with men. *Journal of Urban Health*, 82(Suppl 1), i62–i70.
- Colfax, G. N., Mansergh, G., Guzman, R., Vittinghoff, E., Marks, G., Rader, M., et al. (2001). Drug use and sexual risk behavior among gay and bisexual men who attend circuit parties: A venue-based comparison. *Journal of Acquired Immune Deficiency Syndromes*, 28, 373–379.
- Colfax, G., Vittinghoff, E., Husnik, M. J., McKim, D., Buchbinder, S., Koblin, B., et al. (2004). Substance use and sexual risk: A participant- and episode-level analysis among a cohort of men who have sex with men. *American Journal of Epidemiology*, 159, 1002–1012.
- Elkashef, A., Rawson, R., Smith, E., Pearce, V., Flammino, F., Campbell, J., et al. (2007). The NIDA Methamphetamine Clinical Trials Group: A strategy to increase clinical trials research capacity. *Addiction*, 102 (Suppl 1), 107–113.
- Frosch, D., Shoptaw, S., Huber, A., Rawson, R. A., & Ling, W. (1996). Sexual HIV risk among gay and bisexual male methamphetamine abusers. *Journal of Substance Abuse Treatment*, 13, 483–486.
- Galloway, G. P., Marinelli-Casey, P., Stalcup, J., Lord, R., Christian, D., Cohen, J., et al. (2000). Treatment-as-usual in the Methamphetamine Treatment Project. *Journal of Psychoactive Drugs*, 32, 165–175.
- Gorman, E. M., Morgan, P., & Lambert, E. Y. (1995). Qualitative research considerations and other issues in the study of methamphetamine use among men who have sex with other men. *NIDA Research Monograph*, 157, 156–181.
- Gyarmathy, V., Neaigus, A., Miller, M., Friedman, S. R., & Des Jarlais, D. C. (2002). Risk correlates of prevalent HIV, hepatitis B virus, and hepatitis C virus infections among noninjecting heroin users. *Journal of Acquired Immune Deficiency Syndromes*, 30, 448–456.
- Halkitis, P. N., Parsons, J. T., & Stirratt, M. J. (2001). A double epidemic: Crystal methamphetamine drug use in relation to HIV transmission among gay men. *Journal of Homosexuality*, 41, 17–35.
- Hall, W., & Hando, J. (1994). Route of administration and adverse effects of amphetamine use among young adults in Sydney, Australia. *Drug and Alcohol Review*, 13, 277–284.
- Klee, H. (1993). HIV risks for women drug injectors: Heroin and amphetamine users compared. *Addiction*, 88, 1055–1062.
- Leigh, B. C., & Stall, R. (1993). Substance use and risky sexual behavior for exposure to HIV: Issues in methodology, interpretation, and prevention. *American Psychologist*, 48, 1035–1045.
- Marinelli-Casey, P., Gonzales, R., Hillhouse, M., Ang, A., Marcu, M., Rawson, R. (manuscript in preparation). Patterns of methamphetamine dependence: A 3-year follow-up.
- McLellan, A. T., Kushner, H., Metzger, D., Peters, R., Smith, I., Grissom, G., et al. (1992). The fifth edition of the Addiction Severity Index. *Journal of Substance Abuse Treatment*, 9, 199–213.
- Metzger, D. S., Navaline, H., & Woody, G. E. (1998). Drug abuse treatment as AIDS prevention. *Public Health Reports*, 113(Suppl 1), 97–106.
- Molitor, F., Truax, S. R., Ruiz, J. D., & Sun, R. K. (1998). Association of methamphetamine use during sex with risky sexual behaviors and HIV infection among noninjection drug users. *Western Journal of Medicine*, 168, 93–97.
- Neaigus, A., Miller, M., Friedman, S. R., & Des Jarlais, D. C. (2001). Sexual transmission risk among noninjecting heroin users infected with human immunodeficiency virus or hepatitis C virus. *Journal of Infectious Diseases*, 184, 359–363.
- Obert, J. L., McCann, M. J., Marinelli-Casey, P., Weiner, A., Minsky, S., Brethen, P., et al. (2000). The Matrix Model of outpatient stimulant abuse treatment: History and description. *Journal of Psychoactive Drugs*, 32, 157–164.
- Paul, J. P., Stall, R., & Davis, F. (1993). Sexual risk for HIV transmission among gay/bisexual men in substance-abuse treatment. *AIDS Education and Prevention*, 5, 11–24.
- Peck, J. A., Shoptaw, S., Rotheram-Fuller, E., Reback, C. J., & Bierman, B. (2005). HIV-associated medical, behavioral, and psychiatric characteristics of treatment-seeking, methamphetamine-dependent men who have sex with men. *Journal of Addictive Diseases*, 24, 115–132.
- Rawson, R. A., Marinelli-Casey, P., Anglin, M. D., Dickow, A., Frazier, Y., Gallagher, C., et al. (2004). Methamphetamine Treatment Project Corporate Authors. (2004). A multi-site comparison of psychosocial approaches for the treatment of methamphetamine dependence. *Addiction*, 99, 708–717.

- Rawson, R. A., Washton, A., Domier, C. P., & Reiber, C. (2002). Drugs and sexual effects: Role of drug type and gender. *Journal of Substance Abuse Treatment*, 22, 103–108.
- Reback, C. J., Larkins, S., & Shoptaw, S. (2004). Changes in the meaning of sexual risk behaviors among gay and bisexual male methamphetamine abusers before and after drug treatment. *AIDS and Behavior*, 8, 87–98.
- Ross, M. W., Timpson, S. C., Williams, M. L., Amos, C., McCurdy, S., Bowen, A. M., et al. (2007). Responsibility as a dimension of HIV prevention normative beliefs: Measurement in three drug-using samples. *AIDS Care*, 19, 403–409.
- Schroeder, J. R., Epstein, D. H., Umbricht, A., & Preston, K. L. (2006). Changes in HIV risk behaviors among patients receiving combined pharmacological and behavioral interventions for heroin and cocaine dependence. *Addictive Behaviors*, 31, 868–879.
- Schwarcz, S., Scheer, S., McFarland, W., Katz, M., Valleroy, L., Chen, S., et al. (2007). Prevalence of HIV infection and predictors of high-transmission sexual risk behaviors among men who have sex with men. *American Journal of Public Health* (electronic publication ahead of print).
- Semple, S. J., Grant, I., & Patterson, T. L. (2004). Female methamphetamine users: Social characteristics and sexual risk behavior. *Women & Health*, 40, 35–50.
- Semple, S. J., Grant, I., & Patterson, T. L. (2006). Perceived behavior of others and AIDS risk behavior among heterosexually-identified methamphetamine users. *Journal of Psychoactive Drugs*, (Suppl 3), 405–413.
- Semple, S. J., Patterson, T. L., & Grant, I. (2004). Determinants of condom use stage of change among heterosexually-identified methamphetamine users. *AIDS and Behavior*, 8, 391–400.
- Semple, S. J., Patterson, T. L., & Grant, I. (2002). Motivations associated with methamphetamine use among HIV+ men who have sex with men. *Journal of Substance Abuse Treatment*, 22, 149–156.
- Shoptaw, S., Reback, C. J., Frosch, D. L., & Rawson, R. A. (1998). Stimulant abuse treatment as HIV prevention. *Journal of Addictive Diseases*, 17, 19–32.
- Simpson, D. D., Camacho, L. M., Vogtsberger, K. N., Williams, M. L., Stephens, R. C., Jones, A., et al. (1994). Reducing AIDS risks through community outreach interventions for drug injectors. *Psychology of Addictive Behaviors*, 8, 86–101.
- Woody, G. E., Gallop, R., Luborsky, L., Blaine, J., Frank, A., Salloum, I. M., et al. (2003). HIV risk reduction in the National Institute on Drug Abuse Cocaine Collaborative Treatment study. *Journal of Acquired Immune Deficiency Syndromes*, 33, 82–87.