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ORIGINAL PAPER

Methamphetamine Use, Transmission Risk Behavior and Internet Use Among HIV-Infected Patients in Medical Care, San Francisco, 2008

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Abstract Methamphetamine use is associated with adverse health outcomes and HIV incidence. Few studies have assessed methamphetamine use, sexual behavior and Internet use among HIV-infected patients. Surveys were administered to a sample of HIV-infected patients seeking medical care in a San Francisco county hospital and university-based clinic. In 2008, 35% of homosexual participants, 26% of heterosexual participants and 11% of female participants reported methamphetamine use in the past year. Of participants, 29% reported using the Internet to find sex partners; Internet-users versus non-Internet-users reported a higher median number of sex partners in 6 months (4 vs. 1), were more likely to report unprotected sex (32 vs. 10%), and higher rates of methamphetamine use in the past 12 months (48 vs. 24%). Given the association among methamphetamine use, increased sex partners and Internet use, the Internet may present a new and effective medium for interventions to reduce methamphetamine-associated sexual risk behavior.

Keywords Methamphetamine · HIV · MSM · Internet

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Introduction

Methamphetamine is an addictive stimulant whose use in the United States has increased greatly over the past decade [1]. Methamphetamine is associated with medical complications and sexually transmitted disease (STD) and human immunodeficiency virus (HIV) transmission risk behavior in all users [2–5], but presents special problems in HIV-infected users. Methamphetamine use is more common among HIV-infected men who have sex with men (MSM) [6] and is associated with increased HIV transmission risk behavior, progression to AIDS [7] and decreased adherence to antiretroviral (ARV) therapy [8, 9].

Many of the successful efforts to decrease the use of methamphetamine and its associated sexual risk behavior have focused primarily on screening and counseling in the clinical setting. Routine screening and counseling about risky sexual behaviors has been shown to decrease risky behavior [10–13]. Behavioral interventions, contingency management programs and referral to outpatient treatment programs have shown promise in decreasing methamphetamine use and reducing risk behaviors associated with the spread of HIV infection [12, 14–17]. While interventions in the clinical setting have been shown to be effective, there are fewer studies on the role the Internet plays in methamphetamine use and risky sexual behaviors. The use of the Internet to find sex partners on sexual networking sites has been associated with methamphetamine use and sexual risk behavior [18–23]. Better characterizing the role

that the Internet plays in methamphetamine use and transmission risk behavior may lead to new opportunities for methamphetamine use and risky sexual behavior screening, counseling and referral to treatment. The Internet may be a powerful means to increase the availability of those and new interventions.

Our study examined methamphetamine use, sexual behavior and Internet use among HIV-infected patients seeking care in two San Francisco clinics. In prior surveys in 2004 and 2006 we demonstrated that methamphetamine use was associated with an increased number of sex partners and decreased adherence to antiretroviral therapy [9, 24]. We repeated the survey in 2008 to reassess the prevalence of methamphetamine use among different demographic groups, its association with sexual risk behavior, and also to expand our understanding of the potential role of the Internet in the HIV-infected population which had not been specifically addressed in previous studies. We expected that the use of the Internet to find sex partners would be common among this population, and that this practice would be associated with both methamphetamine use and risky sexual behavior.

Methods

Survey Methods

Between May and July 2008 we systematically distributed a brief self-administered anonymous survey to patients seeking care at two University of California, San Francisco (UCSF) outpatient HIV clinics: one at San Francisco General Hospital, a county hospital serving a largely low-income, publicly insured population (County), and one at Moffitt Hospital, a university-based clinic that serves a larger proportion of patients with private insurance (University). At the County clinic, a staff person from the San Francisco Department of Public Health offered the survey to patients in the waiting room and kept a tally of the number of patients who declined to complete the survey and reasons why; at the University clinic, a nurse offered the survey to patients as she conducted patient intake, and kept a similar tally. Duplicate surveys were excluded. The response rate at the County was 71% and the response rate at the University was 72%.

We collected information on demographics (age, race, gender, gender of sex partners, and monthly income), sexual activity (number of sex partners in last 4 weeks and 6 months, use of Internet sites to find sex partners, frequency of unprotected sex), frequency of methamphetamine use (prior 12 months, prior 4 weeks, and if the patient used in the prior 4 weeks they were asked if their use was less than weekly or more than weekly), route of use, patient-provider communication about methamphetamine use (e.g. "Has your doctor asked if you use Meth?"), utilization of and referral to methamphetamine treatment programs, and utilization of the Internet to obtain methamphetamine. Respondents who used methamphetamine in the last 12 months were asked to complete five additional methamphetamine dependency screening questions [25, 26]. In addition questions on monthly income ("Monthly Income: Less than $2,000; More than $2,000") and the use of the Internet—both for finding sex partners and obtaining methamphetamine—were included. Lastly, we asked about unprotected sex ("Preventing the spread of HIV is hard. In the past 6 months, how often did you have anal or vaginal sex without a condom with someone who was HIV-negative or whose HIV status you did not know?"), and about treatment for methamphetamine use and referral to treatment programs. On average it took the participants less than 5 min to complete the survey, and they received a snack bar in exchange for their time.

Data Analysis

Using STATA SE 7.0 [27], we compared two or more categorical variables using a percent prevalence and *P*-value using the Chi-square test, with $P < 0.05$ as the criterion for statistical significance. The Student's *t*-test was used to compare means for parametric data and the Wilcoxon Rank Sum Test was used to compare medians for non-parametric data.

For the analyses, four gender/orientation groups were constructed based on each respondent's gender and the gender of their sex partners: MSM (including bisexual men), heterosexual men, transgender (male-to-female and female-to-male), and women. Women who had sex with women ($N = 15$) and heterosexual women were combined given the small sample sizes. We did not measure associations between methamphetamine and other factors for non-MSM given small sample sizes.

Human Subjects Review

The survey was reviewed by the Centers for Disease Control and Prevention (Human Subjects Review numbers 2004-00133 and 2004-00195) and designated as non-research public health practice in accordance with the Code of Federal Regulations, Title 45, Part 46: The Public Service Act.

Results

Participation

Of the 893 returned surveys, 236 (26%) were excluded because those were duplicate (107), incomplete (48) or

Table 1 Characteristics of HIV-infected participants in San Francisco by survey site, 2008

Clinic site	SFGH $N = 504$ (%)	Moffitt $N = 153$ (%)	Total $N = 657$ (%)	
Age				
Median (IQR)	45 (39–51)	45 (40–54)	45 (39–51)	$z = -1.72$, $P > \|z\| = 0.08$
Race/ethnicity				
White	222 (44)	88 (58)	310 (47)	$\chi^2 = 10.09$, $P = 0.02$
Black	133 (27)	25 (16)	158 (24)	
Latino	65 (13)	16 (11)	81 (12)	
Other	81 (16)	23 (15)	104 (16)	
Gender/sexual orientation				
MSM	319 (70)	116 (79)	435 (72)	$\chi^2 = 9.90$, $P = 0.02$
Heterosexual men	64 (14)	8(5)	72 (12)	
Women	53 (12)	19 (13)	72 (12)	
Transgender	20 (4)	3 (2)	23 (4)	
Monthly income				
Less than $2,000/month	420 (86)	70 (46)	490 (77)	$\chi^2 = 101.69$, $P < 0.001$
More than $2,000/month	68 (14)	81 (54)	149 (23)	

from HIV-uninfected respondents (81) leaving 657 surveys for analysis: 77% (504) were from the County and 23% (153) were from the University. The demographics of survey participants varied between the two sites (see Table 1).

Methamphetamine Use, 2008

Prevalence of reported methamphetamine use ranged from 11% among women to 35% among MSM in 2008 (Fig. 1a). The mean (±SD) age of methamphetamine users was 42.7 ± 8.7 vs. 46.1 ± 9.3 years in non-users ($t = 4.304$, $P < 0.001$). Methamphetamine users versus non-users were more likely to be MSM (75 vs. 62%, $\chi^2 = 10.65$, $P < 0.001$), white (56 vs. 43%, $\chi^2 = 8.97$, $P < 0.01$), and earn less than $2,000/month (90 vs. 71%, $\chi^2 = 27.16$, $P < 0.001$) (Fig. 1b, c). For MSM, further subgroup analysis revealed that methamphetamine use was higher at the County than at the University (40 vs. 22%, $\chi^2 = 10.92$, $P = 0.001$), though this difference was not significant within similar income groups. For white participants, methamphetamine use was also higher at the County than at the University (83 vs. 17%, $\chi^2 = 11.72$, $P = 0.001$), but again this difference was not significant when stratified by income group. There was no significant difference in methamphetamine use between clinic sites in any other gender/orientation group or race/ethnicity group. Of those who reported using methamphetamine in the past 12 months in 2008, 53% met criteria for dependency on the Substance Dependence Scale (SDS, a screening tool developed to assess opiate dependence [25] and subsequently validated by the DSM III for assessing amphetamine dependence [26]).

Methamphetamine Use, 2004, 2006, 2008

Similar surveys were conducted in an identical manner in 2004 and 2006. This series of cross-sectional analyses provided an opportunity to assess the trends in the rate of methamphetamine use in three samples of the same underlying population over time. At the County clinic, the difference in methamphetamine use among MSM between 2004 and 2008 was not statistically significant ($\chi^2 = 0.03$, $P = 0.86$), and the difference between 2006 and 2008 was insignificant when controlled for age and race ($z = 1.61$, $P > |z| = 0.11$). At the University clinic, the difference in methamphetamine use between 2006 and 2008 was not statistically significant ($\chi^2 = 1.76$, $P = 0.19$), and the difference between 2004 and 2008 was insignificant ($z = 1.93$, $P > |z| = 0.053$) when controlled for age.

Methamphetamine Use and Sexual Behavior, 2008

MSM who reported methamphetamine use in the past 12 months reported a median of 3 sex partners (interquartile range (IQR): 1–7) in the past 6 months versus a median of 1 sex partner (IQR: 0–2) among those who denied using methamphetamine in the past 12 months ($z = -6.51$, $P > |z| = 0.00$). This trend was less pronounced among women, as both those who reported and denied methamphetamine use in the past 12 months had a median of 1 sex partner in the past 6 months, though the ranges varied (IQR: 1–3 vs. IQR: 0–1, $z = -2.32$, $P > |z| = 0.02$). Among MSM who reported methamphetamine use in the past 12 months, 27% reported having had unprotected sex sometimes, often or always in the past 6 months vs. 10% of MSM who denied methamphetamine

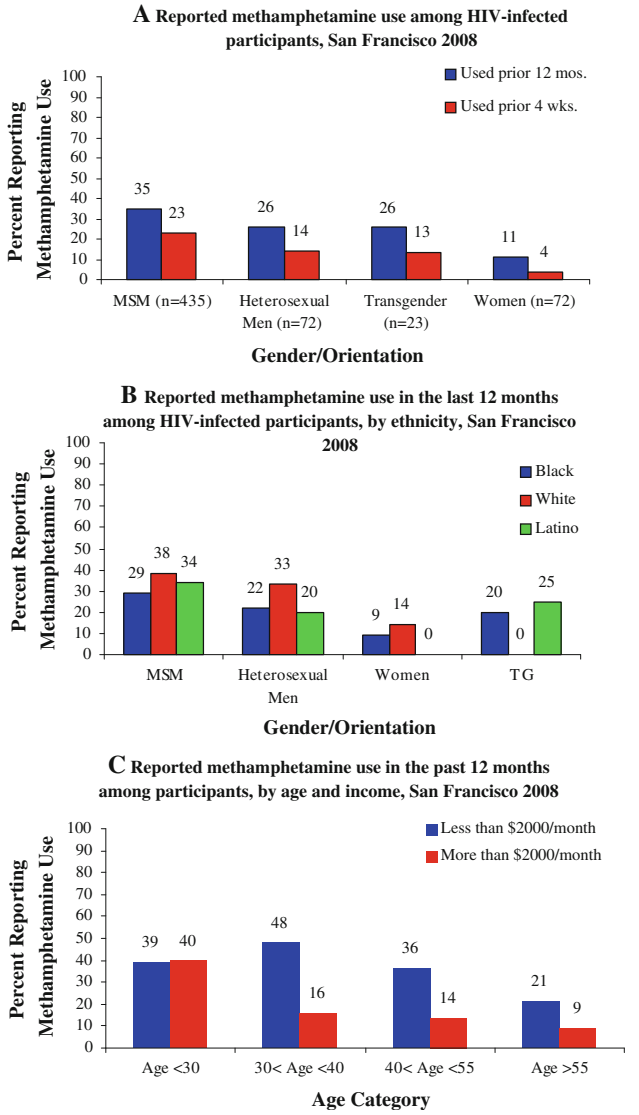

Fig. 1 Characteristics of methamphetamine use. **a** Characteristics of reported methamphetamine use by gender/sexual orientation subgroups (use in 12 months $\chi^2 = 17.52$, $P < 0.01$, use in 4 weeks $\chi^2 = 12.43$, $P = 0.05$). **b** Reported methamphetamine use is common throughout all race/ethnicity groups; across all participants except TG, reported methamphetamine use is more common among whites (all $P < 0.05$) but there is no statistically significant difference between race/ethnicity groups within in any gender/orientation group. **c** Reported methamphetamine use by age category and income level, 2008. Reported methamphetamine use is less common among older participants ($\chi^2 = 18.64$, $P < 0.001$), though this difference is not significant among participants earning more than $2,000/month. Reported methamphetamine use is more common among participants who earned less than $2,000/month ($\chi^2 = 27.16$, $P < 0.001$), though this difference is not significant among participants younger than 30 years old or older than 55 years old

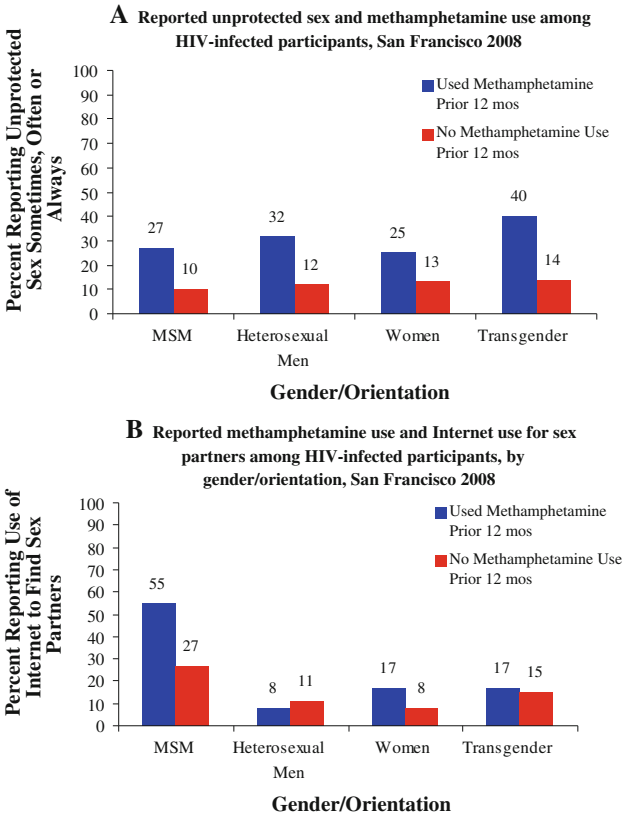

Fig. 2 **a** Reported methamphetamine use in the past 12 months and reporting of unprotected sex sometimes, often or always in the past 6 months, by gender/orientation group. Reported methamphetamine use is significantly associated with increased reporting of unprotected sex among MSM ($\chi^2 = 21.00$, $P < 0.001$) and heterosexual men ($\chi^2 = 3.83$, $P = 0.05$). Significance was not found among women and transgender participants, though sample sizes were small (8 women and 5 transgender participants who reported methamphetamine use in the past 12 months answered the question about unprotected sex). **b** Reported methamphetamine use in the past 12 months and Internet use to find sex partners in the past 6 months, by age category. Reported Internet use to find sex partners is more common among participants who reported methamphetamine use in the past 12 months ($\chi^2 = 35.53$, $P < 0.001$), though this difference remains significant only among participants between the ages of 30 and 55, and among MSM. Reporting using the Internet to find sex partners is more common among younger participants ($\chi^2 = 28.83$, $P < 0.001$), though this difference is not significant among those reporting methamphetamine use

use in the past 12 months ($\chi^2 = 21.00$, $P < 0.001$). A similar trend was seen among heterosexual men who reported methamphetamine use in the past 12 months: 32% reported having had unprotected sex sometimes, often or always in the past 6 months vs. 12% of heterosexual men who denied methamphetamine use in the past 12 months ($\chi^2 = 3.83$, $P = 0.05$) (Fig. 2a).

Internet Use, 2008

The use of the Internet to find sex partners on sexual networking sites varied among all gender/orientation groups: 36% of MSM, 10% of heterosexual men, 9% of women and 16% of transgender participants reported going online to

find sex partners in the past 6 months; this difference was only statistically significant between MSM and heterosexual men and between MSM and women ($\chi^2 = 15.82$, $P < 0.001$ and $\chi^2 = 15.64$, $P < 0.001$, respectively). There were no differences in reported Internet use to find sex partners between participants based on clinic site or by income category in any gender/orientation group. Younger participants were more likely to report going online to find sex partners than older participants (51% of participants less than 30 years old vs. 18% of participants 55 years old or older, $\chi^2 = 28.83$, $P < 0.001$) (Fig. 2b). The most commonly used sexual networking sites were Craigslist.com (47%), Manhunt.net (41%), adam4adam.com (39%), men4now (33%), and gay.com (11%). Compared to participants who did not report going online to find sex partners, those who reported going online to find sex partners reported a higher median (IQR) number of sex partners in the past 6 months (4 (3–9) vs. 1 (0–1), $z = -11.47$, $P > |z| = 0.00$) and were more likely to report having unprotected sex sometimes, often or always (32 vs. 10%, $\chi^2 = 42.13$, $P < 0.001$). Among MSM, participants who reported methamphetamine use in the past 12 months were more likely to report going online to find sex partners in the past 6 months than those who denied methamphetamine use in the past 12 months (55 vs. 27%, $\chi^2 = 31.22$, $P < 0.001$). Of those who reported using methamphetamine in the past 12 months, 17.2% reported obtaining methamphetamine through persons met online sometimes, often or always. Of those who reported using methamphetamine in the past 12 months, and going online to find sex partners, 29.6% reported obtaining methamphetamine through persons met online.

Discussion

This study found that a substantial proportion of HIV-infected patients in medical care continue to use methamphetamine and methamphetamine use was associated with high-risk sexual behavior and the use of sexual networking sites on the Internet. As in our prior studies, methamphetamine use was the most common among white MSM and was more common among MSM at the County clinic than at the University clinic [9, 24]. However, that association appeared to be related to income status. The frequency of methamphetamine use in the past year among our study population in 2008 (31%) was similar to the frequency found among similar samples in 2004 (35%) and 2006 (33%), and was substantially higher than the reported frequency of methamphetamine use in the past year nationwide (0.6% in 2005) [1] and in community samples of MSM in San Francisco (i.e. 9.0% of HIV-uninfected MSM and 19.9% of HIV-infected MSM in 2006) [28]. We found that 11% of women and 26% of transgender participants reported methamphetamine use in the past 12 months. Those findings are limited by the small sample sizes of women and transgender participants; methamphetamine use within these subgroups may warrant further study.

Our results further confirmed the strong association between methamphetamine use and risky sexual behavior among MSM. We found that MSM who reported methamphetamine use in the past 12 months reported significantly increased numbers of sex partners and unprotected sex, which is consistent with other studies [3, 4, 29–32]. Interventions that target methamphetamine use in this population may be an important part of the effort to stem the ongoing transmission of HIV.

We found that among HIV-infected patients seeking care, reported use of sexual networking sites on the Internet to find sex partners was more common among MSM than non-MSM and among younger versus older participants, and that such behavior was associated with more reported sex partners, higher prevalence of reported unprotected sex, and higher prevalence of reported methamphetamine use. These findings are consistent with studies conducted in HIV-uninfected populations [18–22]. The frequency of reported use of sexual networking sites on the Internet among HIV-infected MSM in our study (36%) was similar to the frequency in another study among HIV-infected men in Atlanta, GA (37%) [33]. A larger study of men who use the Internet to seek sex with men found that HIV-infected men had a higher risk of unprotected anal intercourse with male partners than HIV-uninfected men [34] which may indicate that participants in our study who reported using sexual networking sites to find sex partners had an elevated risk of unprotected sex when compared to the general population.

Only 9% of women reported using sexual networking sites to find sex partners; this is significantly lower than the results of a 2004 online survey that found that 43% of female respondents used the Internet to find sex partners and this was associated with an increased incidence of STIs and unprotected sex [35]. While the two study populations clearly differed and our sample size was small, the use of the sexual networking sites by women may warrant further investigation. In addition, despite a small sample size, 16% of transgender participants in our survey reported using sexual networking sites to find sex partners; this too may be a population whose Internet use should be investigated further.

While we found that using sexual networking sites was associated with HIV-transmission risk behavior and methamphetamine use, the Internet also presents an important opportunity for risk-reduction interventions relating to methamphetamine use and sexual behavior. Only 3% ($N = 4$) of participants who reported having been in a methamphetamine treatment program reported referral to

treatment via the Internet. This may represent a missed opportunity for education and referral to treatment programs given the large proportion of participants who reported using methamphetamine in the past year and also reported using the Internet to find sex partners and/or methamphetamine.

In general, relevant online interventions seem to address three broad categories: STD/HIV testing, partner notification/treatment, and HIV transmission risk behavior modification [36]. However, validated online interventions are hard to find. The Smart Sex Quest Project was an online RCT designed to increase STD prevention among MSM; unfortunately loss to follow-up was so great that outcomes could not be assessed [37]. In a study of 8 US cities, online interventions ranging from banner advertisements for health promotion websites to using chat rooms to enhance partner notification are being implemented, though evaluation of these interventions is limited [38]. In a small pilot study, two PowerON (The Prevention Organization with Empowerment Resources on the Net) outreach counselors entered chatrooms on gay.com and engaged MSM in instant-message chats about HIV/STD education and prevention; the study found that most of the conversations were related to HIV/STD testing, though no outcome measures were recorded [39].

Despite the lack of validation, these types of online health interventions seem to have support from their target audience. An Internet-based survey of men who use the Internet to seek sex with men (MISM) found that a majority of MISM expressed interest in over 20 sexual health interventions, and most MISM endorsed highly explicit language, visual images, street language and sex stories in any online intervention [40]. Another online survey found that 61% of participants would visit a website, 45% would open an email and 30% would participate in a chat regarding STD/HIV prevention, though MSM or participants with a history of getting tested for an STD/HIV were more likely to endorse all three methods of online interventions [41]. So while further research into the structure and evaluation of online interventions is warranted, there seems to be a willing audience for such interventions.

This study had several limitations: the cross-sectional design cannot address causality; the small sample size of women and transgender patients limits the power of the analysis in these subgroups; the results in such a specific population (HIV-infected patients seeking medical care at two large clinics in San Francisco) may not be generalizable to other populations. Social desirability bias may have affected the observed frequency of methamphetamine use and may have had different effects at the two sites. This effect seems to have been limited, given the high frequency of reported methamphetamine use and its comparability to findings in other studies. Unlike 2004 and 2006, in 2008 we collected information about rates of unprotected sex and income, thereby strengthening the analysis of the association between HIV transmission risk behavior and methamphetamine use since both number of sex partners and rates of unprotected sex could be used as markers of risky sexual behavior.

Despite its limitations, this study demonstrates that methamphetamine use among HIV-infected patients in medical care in San Francisco continues across race/ethnicity and gender/orientation groups, and that the rates of methamphetamine use were steady compared with previous surveys of this same population in 2006 and 2008. The association between methamphetamine use, increased rates of unprotected sex and increased numbers of sex partners highlights the HIV transmission risk associated with methamphetamine use and the need for interventions to reduce methamphetamine use and the attendant sexual risk behavior. The common use of sexual networking sites on the Internet to find sex partners and its association with methamphetamine use and HIV transmission risk behavior indicates that additional attention should be focused on the role those sites might have in facilitating the continued spread of HIV infection in the U.S., and also the opportunities these sites might present for education and prevention.

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