CRYSTAL METHAMPHETAMINE USE AMONG FEMALE STREET-BASED SEX WORKERS: MOVING BEYOND INDIVIDUAL-FOCUSED INTERVENTIONS

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Abstract

Given growing concern of the sexual risks associated with crystal methamphetamine use and the dearth of research characterizing the use of methamphetamine among street-based sex workers (FSWs), this study aimed to characterize the prevalence and individual, social, and structural contexts of crystal methamphetamine use among FSWs in a Canadian setting. Drawing on data from a prospective cohort, we constructed multivariate logistic models to examine independent correlates of crystal methamphetamine among FSWs over a two-year follow-up period using generalized estimating equations. Of a total of 255 street-based FSWs, 78 (32%) reported lifetime crystal methamphetamine use and 24% used crystal methamphetamine during the two-year follow-up period, with no significant associations between methamphetamine use and sexual risk patterns. In a final multivariate GEE model, FSWs who used crystal methamphetamine had a higher proportional odds of dual heroin injection (adjOR = 2.98, 95%CI: 1.35–5.22), having a primary male sex partner who procures drugs for them (adjOR = 1.79, 95%CI: 1.02–3.14), and working (adjOR = 1.62, 95%CI: 1.04–2.65) and living (adjOR = 1.41, 95%CI: 1.07–1.99) in marginalized public spaces. The findings highlight the crucial need to move beyond the individual to gender-focused safer environment interventions that mediate the physical and social risk environment of crystal methamphetamine use among FSWs.

Keywords

methamphetamine use; gender inequities; street-based sex workers; risk environment; safer environment interventions

1. INTRODUCTION

Close to 25 million people worldwide are estimated to use methamphetamine and amphetamine (United Nations Office of Drugs and Crime, 2007) and many urban centres across North America are experiencing a significant increase in use of crystal methamphetamine (CM) (Buxton and Dove, 2008). Methamphetamine use has been associated with multiple adverse health outcomes, and interpersonal risks such as self- harm and violence (Boddiger, 2005; Buxton et al., 2008; Newman et al., 2004 and Semple et al., 2004b), which represent a heavy social burden to communities (Brouwer et al., 2006 and Swanson et al., 2007). Unlike other illicit drugs, such as cocaine or heroin that are produced and/or refined outside North America, CM can be produced locally and inexpensively using easy-to-access precursor chemicals. Due to the widespread availability of crystal methamphetamine, it has been suggested that conventional drug control strategies will likely prove ineffective at curbing its widespread use (Wood and Kerr, 2008). As such, evidence is urgently needed to help characterize the social context and risk environment of CM use in an effort to design tailored policies and interventions.

Importantly, while CM use has been well described among men who have sex with men (MSM) and lesbian, gay, bisexual and transgendered (LGBT) populations, less attention has been paid to female heterosexual users of crystal methamphetamine, particularly female sex workers (FSWs). Two recent reviews of methamphetamine use have documented a more equal sex ratio of female to male users as compared to other illicit drugs, as well as significant gender differences in the social context of methamphetamine use (Cohen et al., 2007 and Dluzen and Liu, 2008). A few studies among women who use drugs have shown CM use to be associated with elevated concomitant sexual risks, including greater number of sexual partners, unprotected vaginal and/or anal sex, and exchanging sex for money or drugs (Lorvick et al., 2006, Semple et al., 2004a and Weiser et al., 2006).

The effects of CM have been shown to increase sexual desire, arousal, and pleasure (Patterson et al., 2005, Case et al., 2008 and Cohen et al., 2007; Dluxen et al., 2008). CM used has been linked to heightened sexual performance, particularly among MSM populations. Dependent CM use is commonly associated with loss of inhibitory control of sexual behaviour and sexually compulsive behaviour, with increased risk for HIV and other sexually transmitted infections (STIs). Incidental or episodic psycho-stimulant methamphetamine use is also reportedly widespread among some populations and is frequently used to facilitate staying awake for extended periods of time and heightened periods of sexual activity and risk, including greater number of sexual partners and exchanges, risky sexual practices, and decreased condom use. Given the established links between CM use and sexual risk taking, it has been increasingly postulated that CM use may be an important and unique drug within sex work and client populations. A recent study in two Mexico–US border cities found a 3-fold elevated odds of HIV infection among FSWs who used methamphetamine, even after adjustment for direct injection risks (Patterson et al., 2008). The authors hypothesized that non-injection methamphetamine use was a proxy for increased HIV acquisition through unprotected sex. Qualitative work among the sex workers in these settings further suggested that CM use was used as an occupational stressor used to facilitate staying awake and to enhance sexual performance (Crux et al., 2006).

Despite the growing concerns of CM use among FSWs in many western cities across North America and the hypothesized links between CM use and sexual risk among FSWs who use drugs, there has been surprisingly limited attention paid to the use of CM among sex work populations. We therefore undertook this analysis to examine the prevalence and correlates of CM use among a prospective cohort of street-based FSWs. In doing so, we aimed to

investigate the hypotheses that CM use would be associated with both enhanced sexual risks with clients and specific environmental–structural contexts among street-based FSWs.

2. METHODS

2.1. Study population and sampling

Data are drawn from a community-based HIV prevention research partnership that has been described in detail elsewhere (Shannon et al., 2007a and Shannon et al., 2007b). Briefly, between 2006 and 2008, street-based FSWs were enrolled into an open prospective cohort and participated in baseline and six monthly follow-up visits, including an interview questionnaire and voluntary HIV screening. Based on previous research that identified 100% substance use among street-based FSWs in Vancouver (Shannon et al., 2007a and Shannon et al., 2007b), eligibility criteria was defined as being a woman (14 years) who used illicit drugs (excluding marijuana) and engaged in street-level sex work. Given the difficulties in accessing a representative sample of FSWs due to the unknown size and boundaries of this population, initial mapping of working areas with over 60 FSWs identified sex work 'strolls' for targeted outreach and recruitment. Time-space sampling (Stueve et al., 2001) has been developed as a recruitment strategy where the sampling unit is location and time where people congregate rather than individuals. Similar to earlier studies of time-space sampling among MSM in gay clubs, we systematically sampled all female sex workers (inclusive of transgender women) through outreach at staggered times and locations along the mapped sex work strolls over the baseline period.

2.2. Study instruments

At baseline and follow-up visits, a detailed semi-structured questionnaire administered by trained peer researchers (former/current FSWs) elicited responses related to demographics, health service use, working conditions, violence, and sexual and drug risk practices. In addition, voluntary HIV screening using the point of care rapid INSTI test (Biolytical, Vancouver, Canada, specificity 99.3%, sensitivity 99.6%) was conducted by the project nurse, supported by pre/post-test counseling. HIV-positive tests were confirmed by Western blot.

2.3. Measures

Since we had repeated measures available over a two-year period, we analyzed data longitudinally. The dependent variable for all analyses was derived to capture any use of CM in the past six months (injection/smoking/snorting or other). In sub-analyses, initial experiences of CM use were examined, including median age of first use, person with whom they first used CM (e.g., partner, client, friend, family, dealer, pimp, stranger) and mode of first administration (injection/smoking/snorting or other).

The covariates of CM use were categorized as: (a) individual (e.g., non-modifiable characteristics; current behaviour patterns); (b) interpersonal (e.g., social relations and interactions); and (c) environmental–structural (e.g., socio-spatial features; regulatory/legal factors). Individual variables included: age (youth 24 years), HIV serostatus, and use of other injection/non-injection drugs (cocaine or heroin injection, or crack cocaine smoking). Given prior evidence of enhanced sexual and drug-related harms among Aboriginal women and youth who use drugs in this setting, Aboriginal ethnicity (e.g., First Nations, Metis or Inuit ancestry) also was considered as a covariate.

Interpersonal sexual and drug-related risk practices included physical violence, sexual violence, being pressured into unprotected sex, and borrowing a used crack pipe and/or syringe. Based on previous qualitative research (Shannon, 2008), we also examined

correlates related to the interpersonal impacts of FSWs' intimate partners, including: having an intimate male partner who injects drugs; engaging in unprotected vaginal or anal sex with a primary partner; and having a male intimate partner procure drugs for FSWs. In addition, we examined risks specific to sex work transactions, including: median number of clients per week, unprotected sexual transactions, client-perpetrated violence, exchanging sex while high on drugs, and sharing drugs with clients.

Environmental–structural factors included: homelessness; working area (industrial area, main streets, residential setting); place of servicing client (car or outdoor public space as compared to indoor settings, including hourly rooms or saunas); harassment by police (reported as: 'jacked up' by police and/or confiscation of drug use paraphernalia without arrest); and displacement to outlying areas due to street policing (reported as: 'having moved working areas away from main streets due to policing').

2.4. Statistical analyses

Analyses included FSWs who completed baseline and at least one follow-up visit over the two-year period. Baseline variables considered included demographic variables (e.g., age, ethnicity). All other variables were treated as time-updated covariates that referred to experiences occurring during the previous six-month period. Fisher's exact test was also used to compute p-values when observations were   5.

We examined bivariate associations and tested for potential collinearity or effect-modification between individual, partner, environmental–structural variables and CM use using generalized estimating equations (GEE) and a working correlation matrix. We used GEE for binary outcomes with logit link for the analysis of correlated data since the factors potentially associated with CM use during follow-up were repeated (time-dependent) measures. GEE models account for the correlation between repeated measures for each subject, and data from every participant follow-up visit were considered in the analyses. We then fit multivariate logistic GEE models adjusting for known or potential confounders and variables that retained significance at $p < 0.01$ with CM use in bivariate analyses. The final multivariate model includes variables that retained significance at alpha level of $p < 0.05$. All reported p-values are two-sided, and are reported at 95% confidence intervals (CIs).

3. RESULTS

A total of 255 street-based FSWs completed at least one follow-up visit and were therefore included in the analyses (median visits = 2, interquartile range [IQR]: 1–3). Approximately half (48%) self-identified as Aboriginal as compared to 43% Caucasian, 9% other minority (Hispanic, Asian), with no statistically significant differences in odds of CM use by ethnicity ($p = 0.24$). The median age at baseline was 36 years (IQR: 25–41) and the median age of sex work initiation was 15 years (IQR: 13–21). Twenty percent were youth 24 years of age or less, with 30% of youth reporting current CM use as compared to 18% of FSWs   25 years ($p = 0.04$). HIV prevalence among FSWs was 23%, with no statistically significant difference in likelihood of CM use by HIV status ($p = 0.83$). FSWs reported a mean of 12 and a median of 6 clients per week (IQR = 3–15). There was no statistically significant difference in number of clients by CM use among FSWs ($p = 0.38$).

Of the 255 women, 78 (32%) reported lifetime CM use and 24% used CM over the two-year follow-up period (12% by injection only, 9% by both injection and non-injection, 3% by non-injection only). Table 1 describes the portion of individual, interpersonal and environmental/structural risk events reported by FSWs, stratified by CM use over the two-year follow-up period.

Injection was the primary mode of administration of CM use over the follow-up period (85%), in addition to non-injection (48%). However, only 40% (n = 31) first used CM by injection, while 47% (n = 37) first smoked and 13% (n = 10) first snorted ('bumped') crystal methamphetamine. The median age of initiation of CM use was 22 years (IQR: 16–34 years) while the median age of first injecting drugs was 17 years (IQR: 15–23 years), reflecting the relatively recent introduction of CM use in this setting. The most frequently reported person with whom FSWs first used CM was a primary non-commercial sex partner (51%), followed by friend/acquaintance (22%) (p < 0.001).

In univariate GEE analyses (Table 2), FSWs who used CM in the prior six months had a higher proportional odds of injecting heroin (unadjOR = 3.11, 95%CI: 1.65–5.98), having an intimate sex partner who injects drugs (unadjOR = 2.03, 95%CI: 1.20–3.42), injecting cocaine (unadjOR = 2.00, 95%CI: 1.06–3.18), being ≥ 24 years of age (unadjOR = 1.91, 95%CI: 1.01–3.61), working in an industrial area (unadjOR = 1.68, 95%CI: 1.06–2.67), and living on the street (unadjOR = 1.53, 95%CI: 1.15–2.15). FSWs who used CM had a lower proportional odds of smoking crack cocaine (unadjOR = 0.58, 95%CI: 0.33–1.03).

In a final multivariate GEE model (Table 3), FSWs who used CM in the prior six months had a higher proportional odds of being a heroin injector (adjOR = 2.98, 95%CI: 1.35–5.22), having a primary male sex partner who procured drugs for them (adjOR = 1.79, 95%CI: 1.02–3.14), working in industrial areas (adjOR=1.62, 95%CI: 1.04–2.65), and living on the street (adjOR=1.41, 95%CI: 1.07–1.99).

4. DISCUSSION

Close to one-third of our sample reported lifetime CM use, with one quarter using CM use over the two-year follow-up period. Over half of FSWs who use methamphetamine reported first using CM with a primary non-commercial sex partner, and we observed two fold increased odds of CM use among FSWs who had a primary sex partner who procured drugs for them. Further, CM use remained independently associated with working and living in marginalized public spaces.

Importantly, our findings contrast with earlier hypotheses that CM use among FSWs may facilitate enhanced sexual risks, with no statistically significant associations observed between CM use and number of clients, or unprotected sex with clients or non-commercial partners among FSWs. These findings however do not discount the potential use of methamphetamine as an occupational stressor among sex workers, as observed in northern Mexican border cities, where methamphetamine use among FSWs is associated with occupational stressors, such as the need to stay awake (Cruz et al., 2007).

Instead, in this study of street-based FSWs, CM use appears to be more important within the context of intimate drug-using sexual partnerships suggesting a gendered pattern of risk colliding along the intersections of street-based sex and drug markets. These findings accord with the limited qualitative research (Cruz et al., 2007) suggesting that CM use among FSWs may be most closely tied to use with spouses and other trusted, non-commercial sex partners, who may act as pimps. In this study, the particularly nuanced relationship of drug procurement by primary male sex partners of FSWs may confer a gendered risk environment of CM use within sexual partnerships, as previously described among crack users over the last two decades (Maher, 1997). In particular, qualitative accounts of crack-using primary partnerships have consistently documented gendered risk environments, including risk of infectious disease transmission, among younger FSWs who work to obtain the money for drugs for both themselves and their partner and rely on older male partners (often serving as pimps or sugar daddies) to procure drugs for them (Shannon et al., 2008; Maher 1997). This

emerging pattern of risk among FSWs who use CM rely on male sex partners to procure drugs for them extends earlier work suggesting that CM use may substitute cocaine as a cheaper or more easily accessible stimulant in settings with a proximal vulnerability to an established stimulant drug use pattern (Case et al., 2008). Further, though the results did not remain significant in multivariate analyses, FSWs who use CM in our study were marginally less likely to smoke crack cocaine suggesting a potential shift in stimulant use may be emerging in this population.

Qualitative research studies among heroin and cocaine-using couples have demonstrated how drug user's sexual relationships can act as key sites of risk management that directly modify individual drug use practices and facilitate positive social norms ([Rhodes et al., 1998] and [Simmons and Singer, 2006]). Specifically, the overtly gendered collusion among sexual partnerships to procure and use drugs was shown to reinforce and produce interpersonal risks, as well as protective mechanisms (Simmons and Singer, 2006). Among male-female intimate partners, drug involvement has been previously found to be directly associated with male psychological dominance, increased physical and sexual violence and concomitant sexual HIV risks (El-Bassel et al., 2005). Evidence also suggests that female IDUs tend to have greater overlap in their sexual and drug use networks relative to their male counterparts ([Sherman et al., 2001] and [Strathdee et al., 2008]), and drug sharing among IDU sexual partnerships has been shown to place women at increased risk of being "second on the needle" ([Cruz et al., 2007] and [Harvey et al., 1998]). Accordingly, women's lack of control over access and procurement of drugs, including cleaning of drug use paraphernalia and 'tasting' the strength of the drugs, may facilitate enhanced sexual and drug risk patterns. Women have also been shown to be more likely to: engage in syringe-mediating sharing processes such as frontloading (a method of distributing shared drugs through syringes); sharing other injection/non-injection paraphernalia (e.g., crack pipes); and trading unprotected sex directly for drugs ([Fernando et al., 2003], [Flinlinson et al., 2005], [Grund et al., 1996] and [Koester et al., 2005]). These findings underscore the need to scale up gender-sensitive and couple-focused harm reduction and treatment interventions, recognizing the nuanced importance of drug-using sexual partnerships in both maintaining risky and preventative practices.

Additionally, given that the majority of FSWs who use methamphetamine in this study were poly users of heroin injection, interventions will need to account for dual opiate dependency in shaping risk patterns and environments. Evidence among methamphetamine-using MSM has shown CM to most be frequently used in combination with other drugs (Patterson et al., 2005), particularly heroin injection (Case et al., 2008). Users often combine drugs to minimize the adverse effects of a drug, such as countering the undesirable "crashing" effects of methamphetamine (Patterson et al., 2005). Anecdotal reports suggest that methamphetamine may be used to provide a 'kick' when heroin purity decreases. Poly-drug use has been shown to drastically elevate the potential for drug toxicity and overdose mortality, as well as transient immune suppression (Leri et al., 2003), which may help to further explain recent findings of elevated risk of non-fatal overdopes among CM injectors (Fairbairn et al., 2008).

Collectively, these findings suggest the potential for an emerging outbreak of a methamphetamine epidemic consistent with the "social equation of risk" of stimulant CM use previously conceptualized in other settings such as Tijuana, Mexico (Case et al., 2008). The established components of this social equation of risk have been postulated to include proximal vulnerability to established stimulant drug use patterns; social dislocation due to economic disparities, migration or poverty; an available supply and locally produced or manufactured drug; and geographic proximity to drug use environment (Case et al., 2008). Of particular importance, our findings suggest that CM use is closely linked to street-based

sex work in marginalized public spaces, suggesting social dislocation and features of the physical and social environment may shape access and availability of CM use or specific social networks and socio-spatial patterns of CM use. While further exploration is needed of the contexts of space that may shape CM patterns among FSWs, their partners and clients, these findings point to the critical need for policies and interventions that modify the risk environment (Rhodes, 2002) and ensure safer sex work spaces in proximity to harm reduction and treatment resources. While CM use in our study was not associated with specific sexual risk patterns, the use of CM by FSWs in more marginalized public spaces may point to potential pathways to sexual risk. For example, we have previously observed elevated rates of coercive unprotected sex by clients among street-based FSWs displaced to working in industrial settings (Shannon et al., 2008). As such, structural interventions that mitigate the risk environment of street-based sex work (such as safer sex work sites and scaled up mobile outreach interventions to outlying and isolated spaces) may help to neutralize the gendered nature of drug acquisition and co-dependence in these sexual partnerships.

Strengths and limitations: the self-reported nature of responses may have been subject to social desirability biases that could have underestimated risky sexual and drug use practices and attenuated results towards the null. Secondly, the observational nature of this research precludes determining causality, although the longitudinal analyses using GEE may account for the impact of repeated measures and temporal bias. Thirdly, the relatively small sample size may have diluted our ability to detect associations, such as the association between methamphetamine use and younger age. Finally, our results may not be generalizable to FSWs working in indoor venues, such as massage parlours or escort agencies.

In summary, our findings suggest the potential of an emerging CM epidemic among street-based FSWs and their non-commercial partners with the that the greatest concentration of harms among FSWs working and living in marginalized public spaces. As such, this research highlights the critical importance of safer environment interventions that mediate the risk environment and context of CM use in reducing harms, including gender-sensitive and couple-focused interventions that tailored to FSWs and their intimate drug-using partners.

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Table 1

Individual, interpersonal and contextual characteristics of street-based FSWs, stratified by crystal methamphetamine use over two-year follow-up.

Characteristic	Crystal methamphetamine use		
	Yes (n = 105)[a] n (%)	No (n = 493)[a] n (%)	p-value
Individual factors			
Cocaine Injection	42 (40)	130 (26)	0.030
Heroin Injection	68 (65)	195 (39)	<0.001
Crack Smoking	66 (63)	425 (86)	0.063
Interpersonal factors			
Pressured into sex without a condom	30 (29)	115 (23)	0.968
Borrowed use crack pipe and/or syringe	62 (59)	301 (61)	0.275
Experienced physical violence	24 (22)	127 (26)	0.221
Experienced sexual violence	20 (19)	83 (17)	0.418
Intimate partner risk			
Intimate partner who injects drugs	31 (30)	111 (26)	0.141
Intimate partner who procures drugs	31 (30)	52 (11)	0.007
Unprotected sex with an intimate partner	25 (22)	95 (19)	0.945
Sexual transactions with clients			
Median number of clients/week (IQR)	6 (2–14)	6 (3–15)	0.382
Unprotected sexual transactions	27 (26)	99 (20)	0.645
Shared drugs with clients	45 (43)	187 (38)	0.578
Exchanged sex while high	45 (43)	260 (53)	0.391
Experienced client-perpetrated violence	19 (18)	93 (19)	0.178
Environmental–structural factors			
Absolute homelessness (lived on the street)	50 (48)	183 (37)	0.010
Worked in an industrial area	28 (27)	73 (14)	0.002
Serviced clients in cars or public spaces	62 (59)	264 (54)	0.493
Moved working areas to outlying spaces due to street-policing	36 (34)	203 (41)	0.726
Experienced police harassment/confiscation of drug use paraphernalia (without arrest)	44 (42)	172 (35)	0.493

[a]Refers to total number of reports over two-year follow-up period. Fisher's exact test was used to compare proportions if one or more counts was less than or equal to five.

Table 2

Bivariate GEE analyses for individual, interpersonal, and contextual factors correlated with crystal methamphetamine use among street-based FSWs (n = 255) over two-year follow-up.

Characteristics	Crystal methamphetamine use	
	Crude odds ratios	95% Confidence intervals
Individual factors		
Youth (24 years of age)	1.91	(1.01–3.61)
Aboriginal ethnicity	0.70	(0.38–1.27)
HIV seropositive	1.07	(0.55–2.09)
Cocaine injection	2.00	(1.06–3.18)
Heroin injection	3.11	(1.65–5.91)
Crack cocaine smoking	0.58	(0.33–1.03)
Interpersonal factors		
Pressured into sex without a condom	1.01	(0.65–1.58)
Borrowed use crack pipe and/or syringe	1.21	(0.86–1.71)
Experienced physical violence	1.03	(0.69–1.59)
Experienced sexual violence	1.36	(0.65–2.84)
Intimate partner risks		
Intimate sex partner who injects drugs	1.33	(0.91–1.97)
Intimate sex partner who procures drugs	2.03	(1.20–3.42)
Unprotected sex with intimate partner	0.99	(0.66–1.46)
Sexual transactions with clients		
Median number of clients/week	0.99	(0.97–1.01)
Unprotected sexual transactions	1.11	(0.72–1.72)
Shared drugs with clients	1.11	(0.72–1.61)
Exchanged sex while high	0.82	(0.52–1.29)
Experienced client-perpetrated violence	0.67	(0.38–1.19)
Environmental–structural factors		
Absolute homelessness (lived on the street)	1.53	(1.15–2.15)
Worked in industrial areas	1.68	(1.06–2.67)
Serviced clients in cars or public spaces	1.15	(0.78–1.70)
Moved working areas to outlying spaces due to street-policing	0.93	(0.61–1.42)
Experienced police harassment/confiscation of drug use paraphernalia	1.15	(0.77–1.71)

Table 3

Multivariate GEE analyses for individual, interpersonal, and contextual factors independently correlated with crystal methamphetamine use among street-based FSWs (n = 255) over two-year follow-up.

Characteristics	Crystal methamphetamine use	
	Adjusted odds ratios	**95% Confidence intervals**
Heroin injection[a]	2.98	1.35–5.22
Youth (24 years of age)	1.80	0.90–3.63
Intimate partner who procures drugs[a]	1.79	1.02–3.14
Worked in industrial areas[a]	1.62	1.04–2.65
Cocaine injection	1.50	0.87–2.51
'Absolute homelessness' (lived on the street)[a]	1.41	1.07–1.99
Crack cocaine smoking	0.67	0.40–1.15

[a]Variables that retained significance at $p < 0.05$ in the multivariate GEE model.