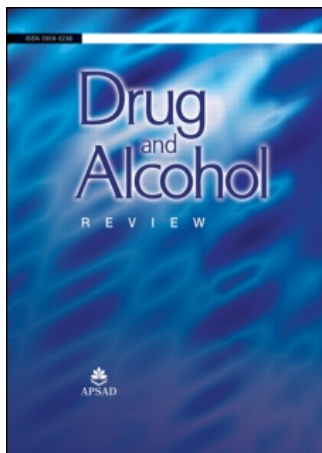


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Circumstances of first crystal methamphetamine use and initiation of injection drug use among high-risk youth

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Abstract

Background. Despite the widely noted increase in crystal methamphetamine (CM) use, there are few studies on circumstances of first CM use or correlates of use among high-risk populations (e.g. street-involved youth). **Methods.** Street-involved youth in Vancouver, Canada, were enrolled in the At-Risk Youth Study (ARYS) prospective cohort. Extensive outreach produced a representative sample of Vancouver street youth who use illicit drugs. We examined circumstances of first CM use and factors associated with CM use among the cohort. **Results.** Among 478 participants, 339 (70.9%) had used CM previously. Despite intensive covariate adjustment, a history of CM use was associated independently with having initiated injection drug use [OR = 3.15 (95% CI: 1.89–5.2); $p < 0.001$]. Among those who had used CM, route of first administration included: 11 (3.2%) oral ingestion; 25 (7.4%) injected; 105 (31.0%) snorted; 231 (68.1%) smoked. The proportion of respondents reporting current CM injection was significantly greater than the proportion reporting injection as the route for first CM use (18.3% vs. 7.4%; McNemar's test $p < 0.001$). Ability to obtain CM the first time was reported as 'very easy' or 'easy' by 93.5% and 5.3% of participants, respectively. **Conclusions.** Crystal methamphetamine use was independently associated with injection drug use, and significant increases in injecting as the primary mode of administration were observed when patterns of use were considered longitudinally. The easy accessibility of CM and its common use during transition into injection drug use demonstrate the need for innovative drug policy to address this growing concern. [Wood E, Stoltz J-A, Zhang R, Strathdee SA, Montaner JSG, Kerr T. Circumstances of first crystal methamphetamine use and initiation of injection drug use among high-risk youth. *Drug Alcohol Rev* 2008;27:270–276]

Key words: crystal methamphetamine, initiation, injection drug use, youth.

Introduction

In recent years, public health experts have begun to acknowledge the need for early intervention in the natural history of illicit drug use [1]. In particular, the challenges stemming from the prevention among injection drug users (IDU) of infectious diseases, such as HIV, have led to the recommendation that greater emphasis should be placed on the prevention of high-risk drug use, particularly injection drug use,

before it begins [1]. In recognition of this need, significant study has gone into the evaluation of the epidemiology of first injecting experiences [2–9]. Virtually all these studies have investigated primarily the initiation of heroin injection, while a smaller number of studies have evaluated initiation of cocaine injection [2–9].

A number of North American cities, particularly certain West Coast cities, have experienced a large increase in the use of crystal methamphetamine [10].

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Unfortunately, at present there is a dearth of evidence regarding the epidemiology of crystal methamphetamine use among certain high-risk populations. In particular, although there is a growing literature regarding the patterns of use and associated risks related to the use of crystal methamphetamine among gay and bisexual men [11–13], there are few evaluations of other populations, such as street-involved youth. This is of particular concern, given reports of rising rates of crystal methamphetamine use among this population [14].

Vancouver, Canada, has recently experienced a significant increase in the use of crystal methamphetamine among street-involved youth, with anecdotal reports that the drug may be fuelling a resurgence in the popularity of injection drug use [14]. Unfortunately, as with other settings experiencing this problem, there are virtually no studies on the prevalence and sequelae of crystal methamphetamine use among high-risk youth, and to our knowledge there are currently no investigations that have evaluated the circumstances of first crystal methamphetamine use among this population or its potential role in fuelling rates of injection drug use. Therefore, the present study was conducted to investigate patterns and circumstances of first crystal methamphetamine use and to investigate crystal methamphetamine's possible role in fuelling rates of injection drug use among a cohort of high-risk youth in Vancouver.

Methods

The At-Risk Youth Study (ARYS) is a prospective cohort study of Vancouver street-involved youth that has been described in detail previously [14]. In brief, snowball sampling and extensive street-based outreach methods were employed. Eligibility criteria for the study included age 14–26 years at baseline and use of illicit drugs other than marijuana in the past 30 days. For the present analyses, individuals who were recruited between September 2005 and October 2006 were included. The ARYS study has been approved ethically.

To address the study's aims, we used univariate and logistic regression analyses to compare those youth who reported a history of crystal methamphetamine use to those youth who had never used crystal methamphetamine. Variables considered included: gender, age, ethnicity (white vs. other), homelessness (yes vs. no), education (< high school vs. ≥ high school), hepatitis C positivity (yes vs. no), ever injected drugs (yes vs. no), history of any mental illness (yes vs. no), history of attention deficit hyperactivity disorder (ADHD) (yes vs. no), ever in detention or jail (yes vs. no), vaginal or anal sex without a condom (yes vs. no), stopped by police on the street (yes vs. no), history of

sex-trade involvement (yes vs. no), ever in addiction treatment (yes vs. no), having been a victim of street violence (yes vs. no), ever an aggressor in street violence (yes vs. no), emergency room visit (yes vs. no), history of sexual abuse (yes vs. no) and history of physical abuse (yes vs. no). Unless noted otherwise, all behavioural variables refer to the 6-month period prior to the interview, whereas 'history of' and 'ever' refer to any time in the past. All variable definitions have been used extensively and were identical to earlier reports.

For univariate analyses, those who did and did not report a history of crystal methamphetamine use were compared using Pearson's χ^2 test (dichotomous variables) and the Wilcoxon rank test (continuous variables). The multivariate model was prepared using backward selection, whereby all variables described above which were $p < 0.05$ in univariate analyses were eligible for the final model.

In addition, a detailed list of crystal-methamphetamine-specific questionnaire items was administered to those youth who reported having ever used crystal methamphetamine. These questions evaluated the first route and most common route of current crystal methamphetamine administration, location and environment of first use, difficulty obtaining the drug and mode of acquisition, as well as those substances that had been used in the month prior to first crystal methamphetamine use. Finally, we also examined the potential role of crystal methamphetamine on rates of initiation into injection drug use by comparing the rate of crystal methamphetamine injection in first injection experiences, and we also examined transitions from non-injection into injection crystal methamphetamine use by comparing route of initial use to route of most common current use. All statistical analyses were performed using SAS software version 8.0 (SAS, Cary, NC, USA). All p -values are two-sided. Additional detail about the above measures may be obtained from the corresponding author.

Results

Between September 2005 and October 2006, 478 street youth were recruited into the ARYS cohort. Among these individuals, the median age was 22.0 [interquartile range (IQR): 20.0–23.9], 132 (27.6%) were female, 120 (25.1%) were Aboriginal/American Indian and 329 (68.8%) were Caucasian.

Among the 478 participants recruited into ARYS, 339 (70.9%) had used crystal methamphetamine previously. As shown in Table 1, socio-demographic characteristics associated with a prior use of crystal methamphetamine included: Caucasian ethnicity, age, homelessness in the last 6 months, having ever injected drugs, a history of any mental illness and a history of incarceration. Gender, education, hepatitis C

Table 1. Socio-demographic characteristics associated with crystal methamphetamine use among street involved youth

Characteristic	Crystal meth use		Odds ratio (95% CI)	p value
	No (%)	Yes (%)		
Gender				
Male	95 (68.35)	251 (74.04)		
Female	44 (31.65)	88 (25.96)	0.76 (0.49–1.17)	0.206
Age				
Median (IQR)	22 (19–24)	22 (20–24)	1.08 (1.00–1.16)	0.044
Ethnicity				
Other	60 (43.17)	89 (26.25)		
White	79 (56.83)	250 (73.75)	2.13 (1.41–3.23)	<0.001
Homeless*				
No	43 (30.94)	70 (20.65)		
Yes	96 (69.06)	269 (79.35)	1.72 (1.10–2.69)	0.016
Highest education				
≥High school	50 (35.97)	101 (29.79)		
<High school	89 (64.03)	238 (70.21)	1.32 (0.87–2.01)	0.187
Hepatitis C positive				
No	121 (89.63)	287 (85.67)		
Yes	14 (10.37)	48 (14.33)	1.45 (0.77–2.72)	0.251
Ever injected drugs				
No	112 (80.58)	165 (48.67)		
Yes	27 (19.42)	174 (51.33)	4.37 (2.73–7.01)	<0.001
History of mental illness				
No	96 (69.06)	188 (55.46)		
Yes	43 (30.94)	151 (44.54)	1.79 (1.18–2.73)	0.006
History of ADHD				
No	127 (91.37)	288 (84.96)		
Yes	12 (8.63)	51 (15.04)	1.87 (0.97–3.64)	0.060
Ever in prison				
No	42 (30.22)	51 (15.04)		
Yes	97 (69.78)	288 (84.96)	2.45 (1.53–3.91)	<0.001

Note: Eight individuals did not have data on HCV status. IQR = interquartile range; ADHD = attention deficit hyperactivity disorder. *Refers to situation in the previous 6 months.

serostatus and history of ADHD were not associated with crystal methamphetamine use.

As shown in Table 2, behavioural factors associated with crystal methamphetamine use included: having been stopped on the street by police in the last six months, sex trade involvement, having ever been in addiction treatment, having used the emergency room in the last 6 months, having been an aggressor in street violence, having a history of physical abuse at home, and having been sexually abused. Unsafe sexual activity and having been a victim of street violence were not associated with crystal methamphetamine use.

As shown in Table 3, factors that remained associated independently with crystal methamphetamine use in the final logistic regression model included: white ethnicity, having initiated injection drug use, having been incarcerated previously, having been stopped on the street by police, having been in the emergency room in the last 6 months and having been

sexually abused. Those whose first injection experience involved crystal methamphetamine had significantly shorter median years injecting (4.6 years) in comparison to those who initiated injecting with heroin (8.3 years) or cocaine (7.4 years; both $p < 0.05$).

When we examined patterns of crystal methamphetamine use among the 339 (70.9%) who had used crystal methamphetamine prior to the interview, we found that route of first crystal methamphetamine administration was distributed as follows: 11 (3.2%) oral ingestion, 25 (7.4%) injected, 105 (31.0%) snorted and 231 (68.1%) smoked. Environment of first use included 52 (15.3%) at a party, 129 (38.1%) on the street/in a park and 133 (39.2%) in a house, apartment or hotel room. With respect to first acquisition, 56 (16.5%) purchased it, whereas 271 (80.0%) received it as a gift. As for condition prior to use, 44 (13.0%) had been using alcohol, 80 (23.6%) had been using other illicit drugs and 218 (64.3%) were sober. In terms of

Table 2. Behavioural characteristics associated with crystal methamphetamine use among street-involved youth

Characteristic	Crystal meth use		Odds ratio (95% CI)	p value
	No (%)	Yes		
Unsafe sex*				
No	67 (48.20)	155 (45.72)		
Yes	72 (51.80)	184 (54.28)	1.10 (0.74–1.64)	0.622
Stopped by police*				
No	93 (66.91)	164 (48.38)		
Yes	46 (33.09)	175 (51.62)	2.16 (1.43–3.26)	<0.001
Sex-trade involved				
No	125 (89.93)	257 (75.81)		
Yes	14 (10.07)	82 (24.19)	2.85 (1.55–5.22)	<0.001
Ever in drug treatment				
No	85 (61.15)	150 (44.25)		
Yes	54 (38.85)	189 (55.75)	1.98 (1.33–2.97)	<0.001
Victim of violence				
No	71 (51.08)	177 (52.21)		
Yes	68 (48.92)	162 (47.79)	0.96 (0.64–1.42)	0.822
Committed Violence				
No	60 (43.17)	110 (32.45)		
Yes	79 (56.83)	229 (67.55)	1.58 (1.05–2.37)	0.026
Emergency room use*				
No	102 (73.38)	184 (54.28)		
Yes	37 (26.62)	155 (45.72)	2.32 (1.51–3.58)	<0.001
History of sexual abuse				
No	116 (83.45)	239 (70.50)		
Yes	23 (16.55)	100 (29.50)	2.11 (1.27–3.50)	0.003
History of physical abuse				
No	90 (64.75)	178 (52.51)		
Yes	49 (35.25)	161 (47.49)	1.66 (1.10–2.50)	0.014

*Where noted, variables refer to activities in the previous 6 months.

Table 3. Multivariate logistic regression analysis of factors associated with crystal methamphetamine use history in ARYS

Characteristic	Adjusted odds ratio	95% CI	p-value
Ethnicity			
White vs. other	2.11	1.34–3.33	0.001
Ever injected drugs			
Yes vs. no	3.45	2.11–5.62	<0.001
Ever in prison			
Yes vs. no	1.93	1.15–3.24	0.013
Stopped by police*			
Yes vs. no	1.58	1.00–2.49	0.048
Emergency room use*			
Yes vs. no	1.66	1.04–2.66	0.033
History of sexual abuse			
Yes vs. no	1.92	1.11–3.33	0.020

*Where noted, variables refer to activities in the previous 6 months.

the social environment, 11 (3.2%) were with a stranger, 18 (5.3%) were with a sex partner, 21 (6.2%) were with a dealer, 52 (15.3%) were with acquaintances and 240 (70.8%) were with friends. Participants described the ages of those who were present at the time of first use as follows: 73 (21.5%) were younger than the participant and 192 (56.6%) were the same age, whereas 121 (35.7%) were 1–5 years older than the participant, 49 (14.5%) 5–10 years older and 33 (9.7%) more than 10 years older. When crystal methamphetamine was used the first time, 172 (50.7%) reported that the number of people present was between two and five. Drugs used in the month prior to first crystal methamphetamine use included marijuana (285; 84.1%), alcohol (210; 61.9%), lysergic acid diethylamide (LSD) (44; 13.0%), 3,4-methylenedioxymethamphetamine (MDMA) (72; 21.2%), mushrooms (59; 17.4%), heroin (37; 10.9%), crack cocaine (97; 28.6%) and powder cocaine (67; 19.8%). Ability to obtain crystal methamphetamine the first time was reported as 'very easy' by 317 (93.5%) and 'easy' by 18 (5.3%).

Among the 201 (42.1%) individuals who reported injecting drug use at baseline, 47 (23.4%) used crystal methamphetamine the first time they ever injected a drug, and 45 (95.7%) of these individuals had used crystal methamphetamine in another form (e.g. smoked, oral) prior to injecting it. In addition, among the 339 (70.9%) individuals who had used crystal methamphetamine at baseline, a significant increase in injecting as the route of crystal methamphetamine administration was observed when route of first use was compared to most common route of current use (7.4% vs. 18.3%; McNemar's test $p < 0.001$).

Discussion

In the present study, we found that almost three-quarters of participating street-involved youth had a history of crystal methamphetamine use, and that prior use of this drug was independently associated with having initiated injection drug use, white ethnicity, having been in prison, having been stopped on the street by police, having been to the emergency room recently and having a history of sexual abuse. Exploration of these data showed further that crystal methamphetamine was the drug used in approximately 25% of all injection initiation experiences and that almost all these individuals had prior non-injection experience with crystal methamphetamine prior to transitioning into injection drug use. We also found a significant increase in transition from non-injection (primarily smoking) to injection crystal methamphetamine use when patterns of administration were considered longitudinally. Given the importance of preventing injection drug use [1], and given the recently reported association between crystal methamphetamine use and syringe sharing among injection drug users [15], this finding has obvious public health implications.

To our knowledge, this study also provides the first description of the circumstances of initiation into crystal methamphetamine use among street-involved youth. There are several subtle findings from these descriptive data that should be valuable for health policy makers. First, efforts to address the crystal methamphetamine problem have been devoted primarily to reducing the availability of this drug [16]. Unfortunately, the present study shows that approximately 95% of street-involved youth found obtaining crystal methamphetamine 'very easy'. Given that supply reduction efforts have consistently had a somewhat limited effectiveness at reducing the supply of illicit drugs [17–19], and that precursor regulation may have a limited ability to reduce the supply of crystal methamphetamine [16], the present study highlights the need for innovative programmes to reduce the harms of widespread crystal methamphetamine use. Specifically, as traditional supply reduction efforts have been unable to control

the supply of foreign-manufactured illicit drugs (e.g. heroin from Asia and cocaine from South America), policy makers must consider the danger of over-reliance on this approach in addressing a drug that can be made locally from inexpensive precursor chemicals [20]. It is interesting that crystal methamphetamine use was associated independently with being stopped by police on the street and having been incarcerated. Further research will be required to determine the impact of police contact and imprisonment on crystal methamphetamine users, and the explanations for the above associations will require further study.

These data also indicate that the majority of youth begin crystal methamphetamine use by snorting or smoking the drug and that this occurs commonly in diverse settings from public spaces to youth parties. Youth also reported diverse experiences with the nature of the peer group (older and younger peers) where crystal methamphetamine was first used. These findings imply that efforts to target specific environments or age groups with prevention strategies may be capturing only a fraction of the environments where transition into crystal methamphetamine use occurs. It is also noteworthy that approximately 60% of youth were sober at the time of first use and that approximately 80% were given the drug as a gift at the time of first use. Together, the above findings present significant challenges for policy makers and health care providers, especially given the known limitations of conventional drug use prevention programmes such as Drug Abuse Resistance Education [21]. We also found that a history of sexual abuse was associated with crystal methamphetamine use, a finding which is consistent with previous research showing that sexual abuse may predispose to subsequent experimentation with illicit drugs [3,7,22].

Because of the negative impact of crystal methamphetamine on the streets locally, Vancouver's mayor has recently proposed reorientating the local drug control strategy towards incorporating stimulant maintenance programmes rather than relying on enforcement approaches as an isolated intervention [23,24]. This proposal has been endorsed by the provincial Health Officer's Council, which has proposed moving independently towards the regulation of illicit drug markets [25]. The above findings regarding the link between crystal methamphetamine and injection initiation and the widespread availability of crystal methamphetamine suggest that efforts to control the growth of crystal methamphetamine use through conventional drug control strategies may be extremely difficult, if not impossible [17–20], and that a significant paradigm shift may be required to curb the growing use of the drug. While experience with stimulant maintenance trials is limited [26], innovation and expansion of addiction treatment options for methamphetamine is needed urgently.

This study has issues of generalisability. There are no voters' lists or other registries from which to draw a random sample. With respect to this concern, it is noteworthy that the cohort demographics are similar to other local studies of street-involved youth [5,27]. Secondly, in studies of marginalised populations, there are always issues of socially desirable responding [28]. Although confidentiality is reassured as part of the interview and interviewers make every effort to build trust with the participants, it is likely that we underestimated some behaviours in the present study. Lastly, the present study was based largely on a cross-sectional study design, and hence associations with crystal methamphetamine use must be interpreted with appropriate caution.

In summary, we found that almost three-quarters of participating street-involved youth had a history of crystal methamphetamine use. Crystal methamphetamine use was associated with probable sequelae of use, such as contact with law enforcement, as well as probable predisposing factors, such as prior sexual abuse. From a public health perspective, the most concerning finding was that prior use of crystal methamphetamine was associated independently with having initiated injection drug use. Crystal methamphetamine was the drug used in approximately 25% of first injection experiences, and we found an independent association between crystal methamphetamine use and injection drug use and a significant increase in transition from non-injection to injection crystal methamphetamine use when patterns of administration were considered longitudinally. The apparent relationship between crystal methamphetamine use and injection initiation indicates the significant and pressing public health challenges posed by crystal methamphetamine, and the widespread use and ease of availability of the drug, as well as the diverse settings and circumstances of first use, suggest that a significant paradigm shift may be required to curb the growing use of crystal methamphetamine among high-risk youth [23–25].

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