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NON-FATAL OVERDOSE AMONG A COHORT OF STREET-INVOLVED YOUTH

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Abstract

Limited data exist concerning patterns of non-fatal illicit drug overdoses among street-involved youth. We therefore evaluated factors associated with non-fatal overdose among a cohort of street-involved youth in Vancouver, Canada. Our findings indicate that non-fatal overdose was common among street-involved youth in our setting, and was associated with various forms of drug use, including methamphetamine use.

Keywords

Non-fatal overdose; street-involved youth; injection drug use; non-injection drug use; crystal methamphetamine

BACKGROUND

Non-fatal overdose has been identified as a major determinant of morbidity among IDU populations [1] and research has shown that those who have experienced non-fatal overdoses are at higher risk of experiencing fatal overdoses in the future [2]. One study from San Francisco reported that the prevalence of non-fatal overdose among young heroin injectors is as high as 22%, and that those youth who had a history of incarceration were at the highest risk of experiencing an overdose [3]. However, the majority of studies of overdose have focussed on adult drug users and there is consequently only limited data concerning overdose experiences among younger drug users, and particularly among poly- and non-injection drug users. We therefore sought to determine factors associated with non-fatal overdose among a cohort of street-involved youth in Vancouver, Canada.

METHODS

We evaluated factors associated with non-fatal overdose among participants enrolled in the At-Risk Youth Study (ARYS), a prospective cohort of street-involved youth in Vancouver, Canada, which has been described in detail previously [4]. Briefly, street-based outreach efforts were carried out in order to recruit street-involved youth into the study, and eligibility was restricted to youth aged 14 to 26 who reported using drugs other than marijuana in the last 30

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days. The study has been approved by the University of British Columbia/Providence Health Care Ethics Review Boards, and all study participants provide written informed consent prior to enrolment. The following socio-demographic, behavioural and drug use variables were explored as potential predictors of non-fatal overdose in the present study: age, gender, ethnicity (white vs. other), requiring help injecting, injecting in public, non-injection crystal methamphetamine use, injection heroin use, injection cocaine use, injection crystal methamphetamine use, non-injection heroin use, non-injection opiate use, and frequent alcohol use. All variable definitions were identical to earlier reports from our setting [5] and all behavioural variables refer to behaviours in the previous 6 months. Requiring help injecting and injecting in public have previously been identified as predictors of increased drug-related risk behaviours [5]. As in our previous reports [6], non-fatal overdose was defined as having a negative reaction as a result of drug over-consumption.

Pearson's Chi-square test and Fisher's exact test were used to determine factors associated with experiencing an overdose event in the previous six months in unadjusted analyses. In addition, we used a fixed multivariate logistic regression model in which we included all of the variables considered in univariate analysis and we also fit a stepwise forward selection model and a stepwise backward elimination model. The models' fit was assessed using log likelihood ratio tests. All tests were two-tailed and the significance level was set at $p < 0.05$. All statistical analyses were performed using SAS software version 9.0 (SAS, Cary, NC).

Participants that reported experiencing an overdose were also asked to identify the main drug consumed prior to the overdose. Finally, we investigated the actions taken by study participants or emergency personnel immediately following an overdose.

RESULTS

In total, 478 youth were recruited into the ARYS study between September 2005 and June 2006. Among this cohort, 132 (28%) were women, 120 (25%) were of Aboriginal ethnicity, and the median participant age was 22 years (Inter-quartile range [IQR]: 20.0 – 23.9). Overall, 54 (11%) individuals reported experiencing non-fatal overdose events in the previous 6 months.

Factors positively associated with non-fatal overdose in univariate analysis are shown in Table I. All three multivariate models produced similar results, with only very slight and non-significant statistical differences. In multivariate analyses, female gender, non-injection crystal methamphetamine, injection heroin and injection cocaine were associated with non-fatal overdose events among study participants. For reasons of simplicity, we present only the results from the backward elimination multivariate model in Table II.

Twenty-eight (52%) participants reported being aware of the potency of the drug they consumed prior to their most recent overdose. The highest number of participants (43%) reported that the main drug consumed prior to an overdose was injected heroin. Other participants identified the main drug consumed prior to their most recent overdose as non-injected heroin (35% of participants), non-injected cocaine (28% of participants), and non-injected crystal methamphetamine (13% of participants).

Fifty-two percent of overdoses involved assistance from ambulance personnel, 50% involved participants being taken to hospital, and 31% involved the administration of naloxone (an opiate antagonist).

CONCLUSION

Street-involved youth have often been characterized as hidden or hard to reach, and conventional or broadly-targeted health and educational interventions have had limited success

in serving the needs of street youth [7]. In line with past research [8], the results of our study indicate a continuing need for evidence-based harm reduction and preventive interventions targeted specifically toward this population, and towards polydrug users in particular. Of note, then, is the recent announcement of the 2007 Canadian federal budget, which contains no budgetary provision for structural interventions that aim to alter the risk environment of street-involved youth.

Additionally, non-injection stimulant use was reportedly involved in a large number of all overdose events in the previous 6 months among study participants. This highlights the need for interventions to address both injection and non-injection risks for overdose. As well, preventive interventions should target the varying behaviours and risks accompanying the consumption of different drugs as well as those that accompany polydrug use in order to account for unique risks that may result from the use of specific drugs. Given the dearth of research in this area, further exploration is required.

The high cost of medical intervention and emergency room visits for non-fatal overdoses is well documented [9]. Considering these costs, our findings that 52% of reported overdoses involved assistance by ambulance paramedics and that 50% resulted in the participant being taken to hospital suggest that evidence-based health and preventive interventions that reduce the high rate of overdose among this population such as take-home naloxone [10] will, if successful in reducing the incidence of overdose among street-involved youth, likely have cost-benefits as well. Given that 31% of overdoses among this cohort were treated with naloxone, the use of this drug in managing overdoses may have substantially reduced the number of overdose-related mortalities among participants.

Our study is limited by its cross sectional nature, and we therefore caution against inferring a direct causal relationship between overdose events and the independent variables in our analyses. As well, ARYS is not a random sample, much like other cohort studies involving illicit drug users, although significant efforts were undertaken in an effort to derive a representative sample [4]. Lastly, our data was based on self-report, and as such, socially desirable reporting may have lowered the reported rates of overdose and drug use among our study participants, as has been observed in past studies [11].

In summary, we found that a large proportion of study participants had experienced a non-fatal overdose event in the previous six months, and in multivariate logistic regression analysis, female gender, non-injection crystal methamphetamine, injection heroin and injection cocaine were associated with non-fatal overdose events among study participants. It is noteworthy that the above factors remained independently associated with overdose in multivariate analyses. This suggests that, even after adjustment for drug use patterns, female street youth remained at elevated risk of overdose. Additionally, just over half of participants reported being aware of the potency of the drugs consumed prior to their most recent overdose. These findings suggest that targeted and evidence-based interventions such as supervised injection sites and supportive housing, which may reduce the high rate of overdose by modifying the risk environment of street-involved youth, are urgently needed.

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References

1. Davidson PJ, McLean RL, Kral AH, et al. Fatal heroin-related overdose in San Francisco, 1997–2000: A case for targeted intervention. *J Urban Health* 2003;80:261–273. [PubMed: 12791802]
2. Powis B, Strang J, Griffiths P, et al. Self-reported overdose among injecting drug users in London: Extent and nature of the problem. *Addiction* 1998;94:471. [PubMed: 10605843]
3. Ochoa KC, Davidson PJ, Evans JL, Hahn JA, Page-Shafer K, Moss AR. Heroin overdose among young injection drug users in San Francisco. *Drug Alc Depend* 2005;3:297–302.
4. Wood E, Stolz J, Montaner JSG, Kerr T. Evaluating methamphetamine use and risks of injection initiation among street youth: The ARYS study. *Harm Reduction J* 2006;3:1–6.
5. Wood E, Tyndall MW, Spittal PM, et al. Unsafe injection practices in a cohort of injection drug users in Vancouver: could safer injecting rooms help? *CMAJ* 2001;165:405–10. [PubMed: 11531048]
6. Kerr T, Fairbairn N, Tyndall M, Marsh D, Li K, Montaner J, Wood E. Predictors of non-fatal overdose among a cohort of polysubstance-using injection drug users. *Drug Alc Depend* 2007;87:39–45.
7. Roy E, Haley N, Leclerc P, et al. Drug injection among street youths in Montreal: Predictors of initiation. *J Urban Health* 2003;80:92–105. [PubMed: 12612099]
8. Rhodes T. The ‘risk environment’: A framework for understanding and reducing drug-related harm. *Int J Drug Policy* 2002;13:85–94.
9. Wall R, Rehm J, Fischer B, et al. Social costs of untreated opioid dependence. *J Urban Health* 2000;77:688–722. [PubMed: 11194311]
10. Dettmer K, Saunders B, Strang J. Take home naloxone and the prevention of deaths from opiate overdose: Two pilot schemes. *BMJ* 2001;322:895. [PubMed: 11302902]
11. Fendrich M, Xu Y. The validity of drug use reports from juvenile arrestees. *Int J Addiction* 1994;29:971–85.

Univariate analysis of factors associated with non-fatal overdose among street-involved youth ($n = 478$)

Table 1

Non-fatal overdose in the last 6 months

Characteristic	Yes ($n = 54$)	No ($n = 424$)	Total	Odds Ratio	95% CI*	p value
Age						
≤22 years old	28 (51.9)	212 (50.0)	240			
> 22 years old	26 (48.1)	212 (50.0)	238	1.08	0.61 – 1.90	0.798
Gender						
Female	19 (35.2)	111 (26.2)	130			
Male	35 (64.8)	313 (73.8)	348	1.53	0.84 – 2.79	0.164
Ethnicity						
White	36 (66.7)	293 (69.1)	329			
Other	18 (33.3)	131 (30.9)	149	0.89	0.49 – 1.63	0.716
Requiring help injecting						
Yes	10 (18.5)	23 (5.4)	33			
No	44 (81.5)	401 (94.6)	445	3.96	1.77 – 8.86	0.001
Injecting in public						
Yes	8 (14.8)	29 (6.8)	37			
No	46 (85.2)	395 (93.2)	441	2.37	1.02 – 5.49	0.044
CM** use						
Yes	33 (61.1)	177 (41.7)	210			
No	21 (38.9)	247 (58.3)	268	2.19	1.23 – 3.92	0.008
Injection heroin use						
Yes	27 (50.0)	71 (16.7)	98			
No	27 (50.0)	353 (83.3)	380	4.97	2.75 – 8.98	<0.001
Injection cocaine use						
Yes	19 (35.2)	29 (6.8)	48			
No	35 (64.8)	395 (93.2)	430	7.39	3.77 – 14.51	<0.001
Injection CM use						
Yes	18 (33.3)	75 (17.7)	93			
No	36 (66.7)	349 (82.3)	385	2.33	1.25 – 4.32	0.007
Heroin use						
Yes	17 (31.5)	80 (18.9)	97			
No	37 (68.5)	344 (81.1)	381	1.98	1.06 – 3.69	0.032
Opiate use						
Yes	7 (13.0)	23 (5.4)	30			
No	47 (87.0)	401 (94.6)	448	2.60	1.06 – 6.38	0.037
Frequent alcohol use						
Yes	5 (9.3)	13 (3.1)	18			
No	49 (90.7)	411 (96.9)	460	3.23	1.10 – 9.43	0.032

Note: All drug use variables refer to non-injection drug use unless otherwise stated.

* CI = Confidence Interval.

** CM = Crystal methamphetamine.

Table II

Multivariate logistic regression of factors associated with non-fatal overdose among street-involved youth[†] (*n* = 478)

Characteristic	Adjusted Odds Ratio	95% CI [*]	<i>p</i> -value
Gender			
Female vs Male	2.06	(1.04 – 4.07)	0.038
CM^{**} use			
Yes vs No	2.00	(1.06 – 3.77)	0.032
Injection heroin use			
Yes vs No	2.97	(1.49 – 5.93)	0.002
Injection cocaine use			
Yes vs No	5.27	(2.34 – 11.86)	< 0.001

Note: All drug use variables refer to non-injection drug use unless otherwise stated.

* CI = Confidence Interval.

** CM = Crystal methamphetamine.

[†] Model was adjusted for all variables analyzed in univariate analyses (i.e. age, requiring help injecting, injecting in public, injection crystal methamphetamine use, non-injection heroin use, non-injection opiate use, and frequent alcohol use). Variables not shown above were non-significant.