

# Impact of supply-side policies for control of illicit drugs in the face of the AIDS and overdose epidemics: investigation of a massive heroin seizure

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## Abstract

**Background:** More than 93% of the nearly \$500 million spent annually on Canada's drug strategy goes toward efforts to reduce the illicit drug supply. However, little is known about the effectiveness of this strategy. On Sept. 2, 2000, Canadian police seized approximately 100 kg of heroin in one of the nation's largest-ever seizures of this drug. An ongoing prospective cohort study of injection drug users afforded an opportunity to evaluate the impact of this seizure.

**Methods:** The Vancouver Injection Drug User Study is a prospective cohort study of injection drug users that began in 1996. The present study relied primarily on data acquired from participants who were seen during the 30-day periods immediately before and after the seizure. We compared drug use and behavioural characteristics, heroin and cocaine prices, and participants' reports of whether law enforcement had affected their source of drugs or the types of drugs available on the street, as well as overdoses, in these 2 periods.

**Results:** The 138 participants seen before the seizure were similar to the 123 participants seen after the seizure with respect to age, sex, ethnic background, education, HIV serostatus, neighbourhood residence, instability of housing, employment status, use of methadone maintenance therapy and all other measured potential confounders (all  $p > 0.10$ ). We found no difference in the extent to which participants in the 2 groups reported daily use of heroin, frequency of nonfatal overdoses, or whether law enforcement had affected their source of drugs or the types of drugs available on the street (all  $p > 0.10$ ). Although we detected no difference in the price of cocaine, the median reported price of heroin went down after the seizure ( $p = 0.034$ ), which suggests that other shipments compensated for the seizure. External evaluations of deaths from overdoses and heroin purity indicated that the seizure had no impact, nor was any impact seen when the periods of analysis were extended.

**Interpretation:** The massive heroin seizure appeared to have no measurable public health benefit. Closer scrutiny of enforcement efforts is warranted to ensure that resources are delivered to the most efficient and cost-effective public health programs.

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The primary response to the spread of HIV among injection drug users (IDUs) has been to intensify law enforcement in an effort to limit the supply and use of illicit drugs. Locally, the enforcement budget for Vancouver's Downtown Eastside district has doubled since 1995, with no observed benefit with regard to drug supply or public order (Vancouver District 2 total budget figures for 1995–2001; Vancouver Police Department, Financial Services, unpublished data), and reports of police misconduct in the neighborhood have recently raised major concerns.<sup>1</sup> At the national level, a recent report from the Canadian auditor general estimated that of the \$454 million spent in 1999/2000 to deal with illicit drugs in Canada, \$426 million (93.8%) was devoted to reducing supply.<sup>2</sup> Despite the expenditures on supply reduction,<sup>4</sup> high HIV incidence rates persist in many Canadian cities, and overdoses of illicit drugs have been a leading cause of death.<sup>4,5</sup>

Few studies have attempted to evaluate the impact of the supply-reduction strategy on community drug-use patterns. An Australian study found no evidence that heroin seizures affected the price, purity or perceived availability of heroin.<sup>5</sup> Similarly, despite spending of over US\$18 billion annually on supply-reduction efforts in the United States,<sup>7</sup> the most recent heroin availability report from the US Office of National Drug Control Policy stated that the price of heroin in that country decreased 3-fold between 1988 and 2000, while purity has reached an all-time high.<sup>8</sup>

On Sept. 2, 2000, Canadian law enforcement officials seized approximately 100 kg of uncut heroin soon after its arrival in the port of Vancouver,<sup>9</sup> in what was reportedly the nation's largest-ever seizure of the drug. To put this seizure in perspective, the US Drug Enforcement Administration's 10-month Operation White Horse resulted in the seizure of 6.5 kg of heroin,<sup>10</sup> and the total amount of heroin seized by the US Customs Service along that country's southwest border during the entire year 2000 was 113 kg.<sup>11</sup>

In the wake of the Vancouver seizure, it was suggested that the removal of this quantity of heroin from the market could substantially limit the supply of the drug and could

keep prices beyond the range of youth at high risk for experimentation<sup>9,12</sup> and that it was responsible for a decline in the city's overdose rate.<sup>13</sup> We sought to determine if the seizure had a measurable effect on the price of drugs, injection drug using behaviour, the incidence of overdoses or the supply of heroin to Vancouver's IDUs.

## Methods

Beginning in May 1996, IDUs were recruited into the Vancouver Injection Drug User Study, a prospective cohort study that has been described in detail previously.<sup>3,5</sup> Over 1400 study subjects have been recruited through self-referral and street outreach, and we have previously reported that the cohort appears to be highly representative of IDUs in the Vancouver area.<sup>14,15</sup>

At baseline and semiannually thereafter, subjects provided blood samples and completed an interviewer-administered questionnaire. The questionnaire elicited demographic data including age, sex and place of residence, as well as drug use, risk behaviour and attendance at drug treatment. In addition, since the cohort's inception several general questions have been added to evaluate the effect of law enforcement efforts on the supply of drugs and patterns of drug use. Participants were also asked to report the current street price per "point" (single shot) of injection heroin and injection cocaine.

For the primary analysis in this study we assumed a priori that acute street-level impacts would be measurable within a month starting the day after the seizure.<sup>16,17</sup> Therefore, pre-seizure and post-seizure participants were defined as those seen for follow-up within 30 days before and 30 days after Sept. 2, 2000, respectively. In addition, because of uncertainty concerning the appropriateness of the 30-day period for observing any impact of the seizure, we conducted several sensitivity analyses. First, we compared participants seen during the 60 days before Sept. 2, 2000, with those seen during the 60 days after this date. Second, we evaluated participants seen in 6 successive 2-week periods after Sept. 2, 2000.

Statistical analyses were applied to compare pre- and post-seizure participants. Categorical explanatory variables were analyzed with Pearson's  $\chi^2$  test and Fisher's exact test, and continuous variables were analyzed with the Wilcoxon rank-sum test. In addition, to adjust for potential confounding due to differences between the IDUs seen before and after the seizure, we conducted a logistic regression analysis in which the dependent variable was the period (before v. after).

## Results

In the 30 days before Sept. 2, 2000, 138 participants visited the study site for follow-up; 123 participants visited for a follow-up visit in the 30 days after this date. The 2 groups were similar with respect to age, sex, ethnic background, education, HIV serostatus, neighbourhood residence, instability of housing, employment status, methadone use and all other measured potential confounders (all  $p > 0.10$ ).

In univariate analyses of drug use and behavioural characteristics (Table 1), we found no difference in the proportion of participants who reported that law enforcement had affected their source of drugs ( $p = 0.55$ ) or the type of drugs available on the street ( $p = 0.73$ ). Similarly, we found no

differences in overall drug-use pattern ( $p = 0.60$ ), injection drug-use pattern ( $p = 0.13$ ), current heroin use ( $p = 0.57$ ), frequency of heroin injection ( $p = 0.52$ ) or frequency of cocaine injection ( $p = 0.42$ ). In addition, we did not detect any difference in the proportion of participants reporting a recent nonfatal overdose (within the previous 6 months) ( $p = 0.12$ ). Although the seizure was not associated with a change in the per-point price of cocaine ( $p = 0.36$ ), we did detect a statistically significant decrease in the per-point

**Table 1: Univariate analyses comparing drug use and behavioural characteristics of participants before and after seizure of heroin on Sept. 2, 2002**

Characteristic	30-day period relative to seizure; no. (and %) of participants*		p value
	Before n = 138	After n = 123	
<b>Enforcement affected drug source</b>			
No	101 (73.2)	94 (76.4)	0.55
Yes	37 (26.8)	29 (23.6)	
<b>Enforcement affected drugs available</b>			
No	109 (79.0)	95 (77.2)	0.73
Yes	29 (21.0)	28 (22.8)	
<b>Change in overall drug-use pattern†</b>			
No	90 (65.2)	84 (68.3)	0.60
Yes	48 (34.8)	39 (31.7)	
<b>Injection drug-use pattern‡</b>			
Same or more	84 (60.9)	86 (69.9)	0.13
Less or quit	54 (39.1)	37 (30.1)	
<b>Current heroin use</b>			
No	62 (44.9)	51 (41.5)	0.57
Yes	76 (55.1)	72 (58.5)	
<b>Frequency of heroin use</b>			
< 1/d	96 (69.6)	90 (73.2)	0.52
≥ 1/d	42 (30.4)	33 (26.8)	
<b>Frequency of cocaine use</b>			
< 1/d	109 (79.0)	102 (82.9)	0.42
≥ 1/d	29 (21.0)	21 (17.1)	
<b>Recent nonfatal overdose</b>			
No	128 (92.8)	107 (87.0)	0.12
Yes	10 (7.2)	16 (13.0)	
<b>Median drug price (and IQR), \$</b>			
Cocaine	10 (10–10)	10 (8–10)	0.36
Heroin	20 (15–20)	16 (12–20)	0.034

Note: IQR = interquartile range.

\*Except where indicated otherwise.

†With reference to previous month.

‡With reference to previous 6 months.

price of heroin, from a median of \$20 before the seizure to a median of \$16 after the seizure ( $p = 0.034$ ). After adjustment for all combinations of potential confounders, the decrease in the price of heroin remained independently associated with the post-seizure period in logistic regression analyses ( $p < 0.05$ ).

Furthermore, our findings were unaffected when we doubled the length of the pre- and post-seizure periods and compared the 317 participants seen during the 60 days before Sept. 2, 2000, with the 259 participants seen during the 60 days after this date. In this analysis, the median post-seizure per-point price of heroin was higher than for the 30-day period, at \$18 (interquartile range \$14 to \$20), but it was still lower than the 60-day pre-seizure price, which remained unchanged at \$20 (interquartile range \$15 to \$20).

The percentages of participants reporting current heroin use, methadone maintenance therapy and recent nonfatal overdose during the period from 28 days (4 weeks) before Sept. 2, 2000, to 12 weeks after this date are shown in Fig. 1. For all 3 variables, comparisons of periods were nonsignificant except for the comparisons of period -2 and period -1 (the two 2-week periods before the seizure) with period 2 (the second 2-week period after the seizure) for nonfatal overdoses ( $p = 0.08$  and  $p = 0.001$  respectively); this variable was moderately greater during period 2 than during periods -2 and -1. Not shown in the figure is the percentage of participants who reported that law enforcement had affected the types of drugs available on the street. On average, 22.2% of participants reported that law enforcement had affected the types of drugs available during the 4 weeks before the seizure, whereas 19.5% of participants reported that law enforcement had affected the types of drugs available during the 12 weeks after the seizure ( $p = 0.19$ ).

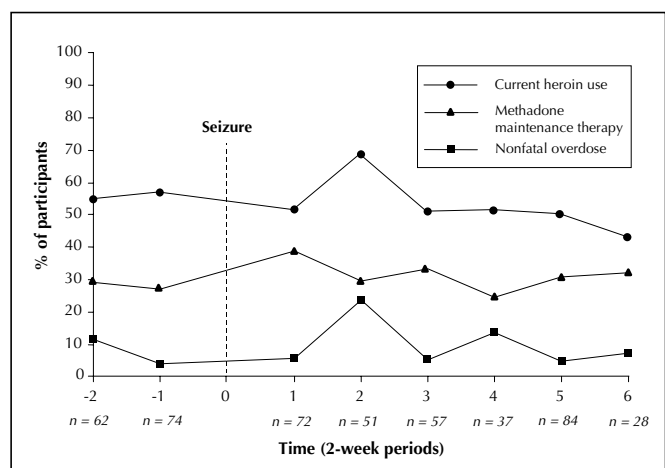
## Interpretation

The data presented here indicate that the record seizure of heroin in autumn 2000 appeared to have no impact on injection use of heroin or on perceived availability of heroin. Furthermore, we detected no difference in the extent to which drug users reported that enforcement had affected their drug source, the types of drugs available or their pattern of drug use.

Several factors may explain our observations. First, we must accept the possibility that the results can be explained by chance or confounding factors. Although we detected no evidence of a significant difference between the 2 study groups, it is possible that unmeasured confounding persisted. In addition, we recognize that the reduction in the price of heroin that we observed was probably due to random fluctuation or compensatory shipments and was not causally connected to the seizure. With regard to the possibility that compensatory shipments explain our findings, previous studies have found that heroin seizures tend to

correlate with times of high production and supply of drugs.<sup>18,19</sup> We do not believe that interview bias played a role because the interviews were not conducted to assess the effect of the seizure but rather constituted the data instrument for an ongoing HIV incidence study; thus the interviewers and participants were in effect "blind" to this eventual use of the data. We should also note that although 148 (56.7%) of those considered in the present analyses were active heroin injectors, only 75 (28.7%) injected heroin daily. Nevertheless, the results were unaffected when we restricted the analysis to current heroin users (data not shown).

It could be argued that a 30-day period after the seizure was insufficient to capture a reduction in supply due to the seizure. To address this possibility, we conducted additional analyses and detected no difference when we examined data for a full 12 weeks after the seizure. It could also be argued that the heroin shipment was never intended for the local market. Although the inability to determine with certainty the final destination of the heroin is a limitation of the present study, the circumstances of the seizure suggest that the heroin was destined for the Vancouver market. Specifically, the seizure was the result of a 20-month investigation by the Vancouver Royal Canadian Mounted Police Asian Organized Crime Unit, which led to the arrest of several Vancouver men. During the investigation, information was acquired that led officials to conclude that the heroin was destined for the local market.<sup>9,12,13</sup> Nevertheless, had the heroin been destined for shipment away from the market created by the area's estimated 5000 to 10 000 injection drug users,<sup>5</sup> this would suggest that the local market was already saturated.<sup>16,17</sup> Finally, it could be argued that the seizure led suppliers to reduce the purity of the heroin they sold so as to maintain the quantity of drug available. How-



**Fig. 1:** Percentage of participants reporting current heroin use, methadone maintenance therapy and recent nonfatal overdose. Time zero is the date of the heroin seizure, Sept. 2, 2000. Time periods -2 and -1 are consecutive 2-week intervals before the seizure. Time periods 1 to 6 are consecutive 2-week intervals after the seizure.

ever, participants reported no difference in their source of drugs or the type of drugs available, and we found no decreases in overdoses or heroin use, nor any change in methadone use when the 12-week post-seizure period was examined (Fig. 1). All of these variables have previously been associated with fluctuations in the purity of street-level heroin.<sup>20-22</sup>

Externally compiled data appear to support our findings. Specifically, there were 10 fatal overdose deaths in the month before the seizure, whereas there was an average of 13.3 overdose deaths per month during the 3 months after the seizure (monthly illicit drug overdose statistics for 2000; BC Coroner Service, unpublished data). In addition, data from Health Canada's Drug Analysis Services, a group that often tests the purity of heroin samples provided by police, showed no decrease in the purity of heroin samples tested during the 3-month periods before and after the seizure (Health Canada, Drug Analysis Services, Burnaby, BC, unpublished data).

Analyses conducted by the United Nations Office for Drug Control and Crime Prevention suggest that a maximum of 5% of the global illegal drug flow is seized by law enforcement agencies.<sup>19</sup> For this reason, despite the expenditure of tens of billions of dollars annually on drug interdiction efforts in North America,<sup>7</sup> heroin purity has increased and prices have markedly decreased since the late 1980s.<sup>8,21</sup> In turn, high HIV incidence rates have persisted, and overdose is among the leading cause of death in many large Canadian and US cities.<sup>3,4,23,24</sup> In Baltimore, for example, overdose deaths increased by more than 425% between 1990 and 1997.<sup>24</sup>

In the present study we observed no beneficial public health effects of Canada's largest-ever heroin seizure. In our view, the most plausible explanation is that the seizure had no significant effect on the supply of heroin in this locality.<sup>25</sup> This conclusion is supported by a recent report by the World Customs Organization, which found that even post-September 11 security measures have had a "negligible" impact on the influx of illicit drugs into the US. Given the size of the seizure relative to other large heroin seizures,<sup>10,11</sup> our findings raise serious questions about the potential for Canada's present drug policies to adequately control the drug use epidemic through supply-side interventions. It is critical to emphasize our view that fault does not lie with the front-line law enforcement officers who are involved in supply-side strategies at the operational level. Rather, the responsibility lies with the politicians and policy-makers who continue to direct the overwhelming majority of resources into failing supply-reduction strategies, despite the wealth of scientific evidence demonstrating their ineffectiveness.<sup>6,26-28</sup> Our findings support the strong consensus that curbing the HIV and overdose epidemics will require a shift in emphasis toward alternative strategies based on prevention, treatment and harm reduction, even if this shift necessitates a diversion of resources away from criminal justice interventions.<sup>5,26-30</sup>

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