

**Title :** Drug use practices among people who inject drugs in a context of drug market changes: challenges for optimal coverage of harm reduction programs.

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## **Abstract**

**Background:** Until the early 2000s, people who inject drugs (PWID) in Québec had mainly been injecting powder cocaine and heroin. Since then, ethnographic studies have shown that the drug market has diversified, with crack and prescription opioids (PO) becoming increasingly available. This could have led to changes in drug use practices among PWID. The objectives of our study were to examine annual trends in injection of different drugs, crack smoking and frequent injection (FI), as well as relationships between injected drugs and FI.

**Methods:** PWID are participants in the ongoing Québec SurvUDI surveillance system. PWID (past 6 months) were recruited in 2 urban and 6 semi-urban/rural sites. Each visit included a structured interview addressing drug use behaviours. Analyses were carried out using GEE methods. For trend analyses (2003-2014) on drugs and FI (number of injections  $\geq$  upper quartile, previous month), the first annual interview was selected for PWID with multiple participations per year. Analyses on associations between FI and types of injected drugs were based on all interviews (2004-2014).

**Results:** Crack/cocaine and heroin injection declined significantly, with prevalence ratios (PR) per year of 0.983 [95% confidence interval (CI): 0.980-0.986] and 0.979 (95% CI: 0.969-0.990), while PO injection [PR=1.052 (1.045-1.059)], crack smoking [PR=1.006 (1.001-1.012)], and FI ( $\geq 120$  injections, previous month) significantly increased [PR=1.015 (1.004-1.026)]. Compared to PWID who injected crack/cocaine  $\pm$  other drugs, the proportion of PWID reporting FI was higher among those who injected PO + heroin/speedball, crack/cocaine or other drugs (adjusted PR 2.29; 95% CI: 2.07-2.53) or PO only (aPR 1.72; 95%CI: 1.47-2.01).

**Conclusions:** Changes that have occurred in the drug market are reflected in PWID's practices. The high frequency of injection observed among PO injectors is of particular concern. Drug market variations are a challenge for health authorities responsible for harm reduction programs.

## Introduction

It is widely recognised that injection drug use is associated with a host of adverse health consequences. People who inject drugs (PWID) are at particularly high-risk for HIV and hepatitis C virus (HCV) infections (Patrick et al., 2001; Shepard, Finelli, & Alter, 2005; Mathers et al., 2008; Joint United Nations Programme on HIV/AIDS, 2012). Worldwide, in 2013, global HIV prevalence among PWID was 13.5%, and 52% of PWID were infected with HCV (United Nations Office on Drugs and Crime, 2015). In Eastern Central Canada, data from an epidemiological monitoring surveillance network reported that, for the 2003-2014 time period, 14.3% of participating PWID were HIV-infected and 62.9% were HCV-positive (Leclerc, Roy, Morissette, Alary, & Parent, 2015). HIV and HCV incidence rates were estimated to be respectively 2.2 per 100 person-years for the period 1995-2014 and 22.1 per 100 persons-years for 1997-2014 (Leclerc et al., 2015).

In Canada, cocaine injection has been identified for years as one of the main factors that have fueled the HIV and HCV epidemics among PWID (Tyndall et al., 2003; Bruneau, Roy, Arruda, Zang, & Jutras-Aswad, 2012; Kerr et al., 2016). The periods of erratic and high intensity use, characteristic of cocaine injection, are believed to be at cause (Tyndall et al., 2003; Kerr et al., 2016). Indeed, cocaine injection has been associated with higher daily number of injections and higher monthly injection frequency than heroin injection (Leri, Stewart, Tremblay, & Bruneau, 2004). This is of major concern because to this day powder cocaine remains the most commonly injected drug across the country and in Eastern Central Canada, with 64.3% and 72.0% of PWID respectively reporting cocaine injection in the previous six months (Public Health Agency of Canada, 2014; Leclerc et al., 2015).

The drug market is constantly evolving, and Canada is not an exception in this regard. Unfortunately, at this time, there is no reliable information system about the illicit drug market in the country, with regard to production, purity, prices or types and amounts of drugs sold. Recent ethnographic studies, carried out in Montreal suggest that the street drug market has been changing significantly since the early 2000s, with a notable increase in the availability of crack cocaine [a form of cocaine usually inhaled] and

prescription opioids (PO) (Roy, Arruda, & Bourgois, 2011; Roy et al., 2012; Roy & Arruda, 2015). Empirical data seem to confirm that these market changes have occurred not only in Montréal but throughout the province of Québec, the setting of the present study.

Previous literature has highlighted the influence of drug markets on drug use patterns, namely the types of drugs and routes of drug administration being used in the population. A report published in 1993 by the United Nations Office on Drugs and Crime described how political and legal changes in various regions of the world brought about variations in the drug market, which in turn led to the spread of injection drug use in many areas (Stimson, 1993). One example stated by the author is the spread of heroin injection that occurred in Asian countries in the 50s and later, mostly in drug-producing areas and along drug transit routes. Heroin availability led to transitions from opiate inhalation to injection among societies where smoked opium use was a tradition. Another eloquent example presented in the report is the drug injection peaks in the United States in the late 60s that coincided with abundant supplies of heroin from the French Connection and Mexico. Conversely, heroin shortages have also been shown to impact patterns of drug use. Following a sustained heroin shortage in 2001 in Australia, researchers documented several changes in drug use patterns in the population which included a reduction of the prevalence of injection drug use and a shift in the types of drugs injected among PWID from heroin to stimulants, most notably cocaine and methamphetamine (Topp, Day, & Degenhardt, 2003). In Great Britain, during a significant heroin shortage between 2010 and 2011, researchers found that heroin users were transitioning to other types of drugs, most notably benzodiazepines and crack cocaine (Harris, Forseth & Rhodes, 2015). In Hungary, the increasing availability of synthetic cathinones accompanied by a decrease of heroin availability has led to a decrease of heroin injection and an increase of synthetic cathinones injection among PWID (Péterfi, Tarján, Horváth, Cseztregi & Nyírády, 2014). Furthermore, a number of studies have shown that the arrival of crack cocaine in the street-drug market has led to a decline in injection drug use in several regions of the world (Leonard et al., 2008; Bourgois, 2003a; Bourgois, 2003b; Inciardi et al., 2006; van Ameijden & Coutinho, 2001; Mesquita et al., 2001).

Of course, the drug market is not the only determinant of drug use patterns in a population, but it has an undeniable influence. It is plausible that observed changes in the street drug market landscape have modulated the drug use patterns and injection practices of PWID in Québec, most notably in the type of drugs injected and injection frequency. Updated data on drug use trends and injection frequency could allow re-evaluation of types of sterile injection material available and coverage of prevention programs to better prevent parenteral transmission of HIV and HCV (Bluthenthal, Anderson, Flynn, & Kral, 2007; Vickerman, Martin, Turner, & Hickman, 2012). The objectives of the present paper are twofold: 1) to examine the annual trends of injected drugs, crack smoking and frequency of injection among PWID in the province of Québec, and 2) to study the relationships between types of injected drugs and frequent injection (FI).

## **Methodology**

This study was carried out using data from the SurvUDI network, whose complete methodology has been previously described (Hankins et al., 2002). Briefly, the SurvUDI network is a second-generation surveillance program for HIV, HCV and risk behaviours among PWID in Eastern Central Canada. The ongoing network was implemented in 1995 and targets hard-to-reach, mostly out-of-treatment PWID. Eligibility criteria include being 14 or older, injecting at least once within the past 6 months, speaking French or English, and being able to provide informed consent. For the province of Québec, participants are recruited in 2 urban and 6 semi-urban/rural sites, mainly in harm reduction programs. Others are recruited in drop-in centres, detention centres, detoxification clinics, and rehabilitation programs. Each visit involves obtaining the participant's informed consent, completing an interviewer-administered questionnaire and collecting a saliva sample for HIV and HCV antibody testing. Participants are encouraged to complete interviews at 6-month intervals. They are given a stipend ranging from CAN\$5 to \$10 at the end of each visit. All procedures have been approved by the ethics committee of the CHU de Québec – Université Laval.

### *Variables*

Types of injected drugs (including PO substances) and crack smoking are assessed for the six months prior to the interview since 2003, and for the last month since 2004. A list of several drugs is shown to participants, who are asked to specify if they have injected any of the listed drugs prior to the interview. For the analyses related to the second objective, since participants can inject several different substances, five mutually exclusive categories were created: 1) prescription opioids only, 2) prescription opioids with any other drug be it heroin (including speedball), crack/cocaine or other drugs (ex. amphetamine-type stimulants, benzodiazepines, ketamine, etc.), 3) heroin/speedball with/without crack/cocaine or other drugs, 4) crack/cocaine with/without other drugs, and 5) other drugs only.

To assess injection frequency, participants are asked how many times they have injected during the last month. High frequency injection corresponds to the values in the upper quartile of the number of injections reported during the month. Sociodemographic characteristics include sex, age, residential status (homeless or not) and the region where the interview took place (urban or semi-urban). Homelessness is defined as having slept/lived at least once in the last six months in the street, a squat, an emergency shelter, or any place unfit for human habitation such as a car or a subway station.

### *Analyses*

Trends analyses are based on visits that took place between January 2003 and December 2014. All PWID who participated in SurvUDI during that time period were selected for the trends analyses performed on types of injected drugs and crack smoking in the six months prior to interview. Analyses of trends of FI are based on the subsample of PWID who injected in the previous month. Only the first annual interview was selected for PWID with multiple participations per year.

Analyses of the association between FI and drugs injected in the previous month were based on all interviews carried out between March 2004 and December 2014, and included all visits where the type of drugs injected and injection in the previous month

were reported. FI was treated as a dependent variable; co-variables included in the modelling were age, sex, crack smoking and homelessness.

Descriptive statistics included means and standard deviation (SD) and medians and corresponding interquartile ranges (IQR) for continuous variables, and frequency distributions for categorical variables. Principal analyses were carried out using a generalized estimating equations (GEE) method (Liang & Zeger, 1986). All prevalence ratios were estimated using log-binomial regression, and 95% Wald confidence intervals were calculated. For trends analyses, year of observation was treated as a continuous variable. Additional exploratory analyses using nonparametric generalized additive models with splines smoothers made it possible to identify sub-periods of significant fluctuations within the full study period (Hastie & Tibshirani, 1990). Then, separated GEE models for each identified sub-period were also examined.

## **Results**

A total of 5,137 PWID participated in the SurvUDI network between January 2003 and December 2014 (Table 1). At first visit, the sample was mainly comprised of men (76.4%) and participants aged 25 years or older (82.9%). The most reported injected drug was crack/cocaine (with/without speedball) (86.6%) followed by PO (47.4%), heroin (with/without speedball) (34.3%) and other drugs (12.0%) and two thirds reported crack smoking. More than a quarter of participants (29.8%) reported FI ( $\geq 120$ /month).

Trends analyses of injected drugs and crack smoking in the last six months for 2003 to 2014 were based on a total of 9,355 visits (Figure 1). Global trends show that crack/cocaine and heroin injection significantly declined, with prevalence ratios (PR) per year of 0.983 [95% confidence interval (CI): 0.980-0.986] and 0.979 (95% CI: 0.969-0.990), while PO injection [PR=1.052 (1.045-1.059)] and crack smoking [PR=1.006 (1.001-1.012)] significantly increased. FI in the last month (8,386 visits) also rose significantly [PR=1.015 (1.004-1.026)]. Further analyses show that these overall trends were the result of significant fluctuations over the study period (Table 2). PO injection and FI increased mainly between 2003 and 2008 whereas heroin injection followed the opposite trend mostly between 2003 and 2007. Crack smoking increased between 2003

and 2008 and then declined slightly while crack/cocaine injection, that had first remained stable, decreased significantly between 2007 and 2014.

For the period 2004 to 2014, analyses of the association between FI and injected drugs in the previous month were based on 9,077 visits (4,363 PWID) (Table 3). Homelessness was reported in 39.3% of visits and crack smoking (in the previous month) in 53.0%; 89.7% of interviews were carried out in urban sites. Observed frequencies for the five categories of injected drugs in the month prior to interview were as follows: 1) PO only: 9.0% of visits; 2) PO + heroin/speedball, crack/cocaine or other drugs: 36.4%; 3) heroin/speedball ± crack/cocaine or other drugs: 9.9%; 4) crack/cocaine ± other drugs: 44.4%; and 5) other drugs only: 0.3%. FI was reported in 29.9% of all visits. Finally, compared to PWID who injected crack/cocaine ± other drugs, the proportion of PWID reporting frequent injection was higher among those who injected PO + heroin/speedball, crack/cocaine or other drugs (adjusted PR 2.29; 95% CI: 2.07-2.53), or PO only (aPR 1.72; 95% CI: 1.47-2.01), adjusted for age, sex, homelessness and crack smoking.

## **Discussion**

Our results indicate that the substances used by PWID in Québec changed from 2003 to 2014. Even though fluctuations occurred during that time-period, prevalence of crack/cocaine and heroin injection decreased from 91.8% to 72.1% and from 44.0% to 34.3% respectively while prevalence of crack smoking and PO injection increased from 52.5% to 60.4% and from 29.8% to 58.6% respectively. These results are analogous with the drug situation in Vancouver, in Western Canada, where researchers documented major changes in drug use trends over a 15-year period (1996-2011) among people who use drugs (Urban Health Research Initiative, 2013). Those researchers found that both daily cocaine injection and daily heroin injection decreased substantially, while daily crack smoking and PO injection increased.

Explaining changes in drug use trends may be a complicated task. In Québec, previous research work helps shed light on the present findings. According to a mixed-method study conducted in Montréal that included epidemiological and ethnographic data, crack smoking became highly prevalent among regular cocaine users, including those who used



to inject powder cocaine, after crack cocaine became more widely accessible in the early 2000s (Roy et al., 2012). Although powder cocaine was still available, its accessibility decreased as new selling strategies limited “street-corner” transactions in favour of telephone orders. Therefore, whereas crack was not previously accessible, PWID now had options (powder or crack cocaine). Aside from these market-related factors, what we could consider as new social norms in the drug milieu also may have played a role in the observed changes in drug use patterns. In fact, another ethnographic study conducted in crack houses (*piaules*) in a Montréal neighbourhood during the same time period revealed that injection was prohibited in those settings and crack was the only form of cocaine sold (Roy & Arruda, 2015). While the drug dealers’ decision to only sell crack was motivated by generating higher profits, it also aimed to eradicate the negative consequences associated with injection drug use, namely discarded needles and drug overdoses that can draw police attention, which is bad for business.

Our findings that show increased PO injection are consistent with the growing availability of PO in the community. As is the case elsewhere in North America, a sharp rise in opioid analgesic prescriptions has been observed over the last several years in Canada (Fischer, Jones, & Rehm, 2014). This phenomenon has led to a large increase in non-medical use of PO in the population (Fischer, Gooch, Goldman, Kurdyak, & Rehm, 2014). An ethnographic study conducted in Montréal reported that diverted PO (mainly hydromorphone in the form of tablets or capsules) were easily accessible on the streets and some doses could be bought for a fairly low price. Conversely, in addition to being more expensive, heroin had to be telephone-ordered and a limited number of PWID had access to the dealers’ phone numbers. These differences in accessibility and selling strategies may help explain the evolving trends of each substance (Roy et al., 2011). This particular situation where the decrease of heroin injection may be due to the growing availability/accessibility of PO seems to contrast with the experience in the USA where increases in PO misuse have led to an increase of heroin use/injection mainly due to the lower cost and easier access of heroin (Jones, 2013; Lipari & Hughes, 2015; Mars, Bourgois, Karandinos, Montero, & Ciccarone, 2014; Kolodny et al., 2015).

Our trends results find an echo in previous literature documenting changing patterns of drug use. Sharp decreases in cocaine injection following the introduction of crack cocaine have been documented elsewhere (Bourgois, 2003a; Inciardi et al., 2006; Mesquita et al., 2001). Changes in drug trafficking and the fear of HIV/AIDS were mentioned as mechanisms modulating the new drug use patterns. However, unlike the decline of heroin injection documented in Australia, Great Britain and Hungary, that was accompanied by an increase of stimulant use (Topp et al., 2003; Harris, Forseth & Rhodes, 2015; Pétreffi et al., 2014), the decrease in heroin injection in Québec does not appear to be due to a heroin shortage. Rather, it seems to be attributable to the growing availability/accessibility of PO and selling strategies. It should be noted that PWID in Québec did not transition from one pharmacological class of injected drugs to another. Rather, Québec has been witnessing a diversification of injectable substances belonging to the same pharmacological class (opioids: heroin and PO) and of the available forms of the same substance (powder cocaine and crack). Once dominated by powder cocaine and heroin, crack and PO are now some of the most used substances by PWID in Québec.

Since high frequency of injection can render PWID more vulnerable to various negative health outcomes (Philipps & Stein, 2010; Yao et al., 2009; Tyndall et al., 2003; Nelson et al., 2002; Thorpe, Ouellet, Levy, Williams, & Monterroso, 2000), one particularly worrisome finding of the present study is that FI ( $\geq 120$  injections in the previous month) rose slightly between 2004 and 2014, from 24.2% to 32.3%. This increase occurred despite the fact that cocaine injection, which can generate a high number of injections (Tyndall et al., 2003; Leri et al., 2004), decreased during the same time period. In fact, our results show that the proportion of PWID reporting FI was highest among those who injected PO. It is possible that the increase in crack smoking among PWID has led to a reduction in the number of cocaine injections. Also, it seems logical that PO are associated with more frequent injections since opioids cause physical dependence that compels PWID to inject daily.

Although heroin and PO are pharmacologically similar (Compton, Jones, & Baldwin, 2016), our results indicate that FI was more prevalent among PWID who injected PO. A previous ethnographic study may help understand this observation (Roy et al., 2011).

When compared with powder heroin available in Québec, PO can be bought in small doses for a price as low as CAN\$5 (e.g. Dilaudid© 4 mg or Hydromorph-Contin© 6 mg). In contrast to the minimal heroin dose that can be purchased for CAN\$25 and that produces an effect lasting several hours, small PO doses produce a suboptimal effect that requires users to inject several times a day to keep withdrawal symptoms at bay. Furthermore, when PO users are able to buy optimal doses (e.g. Hydromorph-Contin© 30 mg), multiple injections are necessary since the volume of water to dissolve the pills or capsules exceeds the capacity of syringes distributed by needle exchanges programs (selected in the prior context of cocaine and heroin predominance). In either case, PO injection can lead to FI.

Changes in the drug use trends of PWID in Québec seem largely due to the dynamic nature of street-drug markets. Indeed, drug markets are part of environmental and structural factors that shape drug use patterns (Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005). They can significantly modulate the influence of individual and social factors on drug use behaviours (Sterk & Elifson, 2000; Ciccarone, 2009; Gamella, 1994; Stimson & Choopanya, 1998). In a study conducted in Sao Paulo, Brazil, a decline in HIV prevalence was accompanied by a decrease in cocaine injection frequency concurrent with an increase in crack smoking (Mesquita et al., 2001). However, this is not what has happened in Québec. The high frequency of injection among PWID who inject PO is of particular concern. Although little research has been conducted, some studies have found associations between PO injection and HIV/HCV transmission (Bruneau et al., 2012; Lankenau, Kecojevic, & Silva, 2015; Conrad et al., 2015; Zibbell, Hart-Malloy, Barry, & Flanigan, 2014). Of particular interest, a prospective cohort study of PWID conducted in Montréal observed that PO injectors who did not inject heroin were more likely to become infected with HCV, whereas no association was found for participants using both drugs (Bruneau et al., 2012). In addition, compared to non-PO injectors, PO injectors exhibited greater injection risk behaviours such as syringe sharing and FI. Clearly more research is needed in this area.

This study presents some limitations. Our findings should only be generalized to PWID with more problematic behaviours who attend harm reduction community-based

resources. Furthermore, self-reported behavioural measures may lead to desirability and recall biases that could have led to imprecisions in prevalence estimates. However, previous studies have shown the validity and reliability of IDUs' self-reported behaviours (Darke, 1998; Goldstein et al., 1995).

In summary, our results indicate that the drug use patterns of PWID in Québec have changed over time, seemingly due to drug market changes. This has resulted in the reduction in certain risk behaviours but the exacerbation of others. Drug market variations pose major challenges to public health authorities in their endeavour to fully cover the needs for safe injection equipment and other prevention programs. Therefore, it is essential to follow drug use trends through drug market surveillance program data.

The results of the present study pose important challenges for optimal coverage of harm reduction programmes. The growing popularity of PO injection is particularly challenging for public health authorities and community-based organizations working among PWID since previous literature has found associations between PO misuse/injection and serious health-risks, most notably fatal overdoses (Jones, Mack & Paulozzi, 2010; Rudd, Aleshire, Zibbell & Gladden, 2016; Fischer, Jones & Rehm, 2013) and parenteral transmission of HIV/HCV (Bruneau et al., 2012; Lankenau et al., 2015; Conrad et al., 2015; Zibbell et al., 2014). One of the often mentioned policy change to counter PO-related health risks in the general population is to establish effective prescription drug monitoring programs (PDMP) and safe guidelines for prescribing PO. These measures could reduce the prevalence of PO addiction/injection and the amount of PO being diverted for non-medical use. However, in a drug using population where opioid addiction/injection is prevalent, concentrating policies on reducing the diverted supply of PO could have potential negative effects. For example, Mars and colleagues (2014) observed that supply-side changes that limited the sourcing of diverted *OxyContin*® prompted some PO users to transition to heroin. As other authors have suggested (King, Fraser, Boikos, Richardson, & Harper, 2014; Kolodny et al., 2015), we strongly believe that PDMP and better prescribing practices should be complemented with a better coverage of harm reduction strategies in order to reduce PO-related health risks. Among these, coverage of medication-assisted therapies (MAT) should be

maximised in order to decrease the pool of PO-addicted people. In addition, MAT could have the potential to reduce the risks of overdose deaths (Schwartz et al., 2013).

Expanding the availability and accessibility of naloxone kits (an opioid antagonist) to laypersons could prevent opioid-related fatal overdoses (Walley et al., 2013).

Furthermore, in order to prevent the parenteral transmission of HIV/HCV, coverage of sterile injection equipment distribution has to be evaluated, given the growing popularity of PO injection and its high injection frequency. Also, the characteristics of the equipment distributed have to be reviewed to ensure that they meet the requirements for injection of PO formulas that require high volumes of water. In addition to these harm reduction strategies, interventions aimed at preventing PO injection should be tailored in collaboration with PWID peers. Finally, it should be noted that closely following drug use behaviours, including injection drug use trends, is crucial to adapt harm reduction programmes and prevent HIV and HCV infections among PWID.

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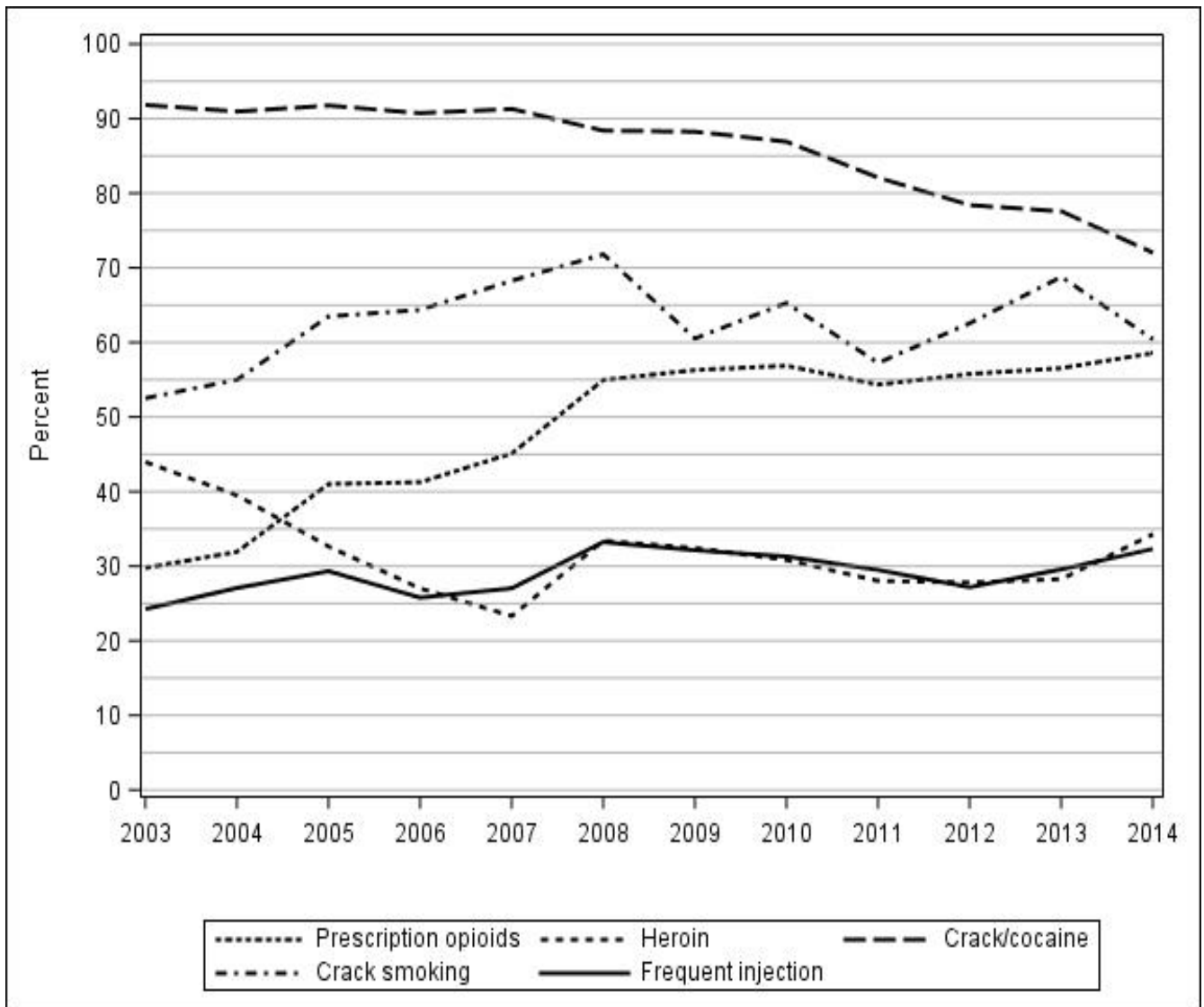
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Figure 1. Trends analyses of drugs injected, crack smoking and frequent injection



**Table 1**

Characteristics of the 5,137 PWID at first visit.

Characteristics	No.	%
<i>Sociodemographic</i>		
Male gender <sup>a</sup>	3,908	76.4
Age ≥25 years	4,257	82.9
Age (mean ± SD)	35.7 ± 10.2	-
Age (median [IQR])	36 [27-44]	-
Homelessness <sup>b,c</sup>	2,007	39.1
Urban sites	4,208	81.9
<i>Drug use<sup>c</sup></i>		
Prescription opioids injection	2,434	47.4
Heroin injection <sup>d</sup>	1,763	34.3
Crack/cocaine injection <sup>d</sup>	4,450	86.6
Other drugs injection <sup>e</sup>	617	12.0
Crack smoking <sup>f</sup>	3,272	63.8
<i>Injection practices<sup>g</sup></i>		
No. of injections (mean ± SD)	108.0 ± 172.9	-
No. of injections (median [IQR])	50 [12-120]	-
Frequent injection (≥120/month)	1,337	29.8

Abbreviations: SD, standard deviation; IQR, interquartile range.

<sup>a</sup> 24 missing values.<sup>b</sup> 10 missing values.<sup>c</sup> In the six months prior to interview.<sup>d</sup> Including speedball.<sup>e</sup> Other drugs: amphetamine-type stimulants, benzodiazepines, ketamine, etc.<sup>f</sup> 5 missing values.<sup>g</sup> In the month prior to interview, among those who had injected drugs during that month, N=4,484 PWID.



**Table 2.**

Trends analyses of drugs injected, crack smoking and frequent injection: sub-periods of fluctuations.

	Sub-period	% beg. <sup>a</sup>	% end <sup>b</sup>	PR <sup>c</sup> (95% CI)	
Prescription opioids injection <sup>d</sup>	2003-2008	29.8	55.0	1.125 (1.101-1.150)	*
	2008-2014	55.0	58.6	1.007 (0.994-1.019)	*
Heroin injection <sup>d,e</sup>	2003-2007	44.0	23.3	0.847 (0.820-0.875)	*
	2007-2014	23.3	34.3	1.017 (1.000-1.035)	*
Crack/cocaine injection <sup>d,e</sup>	2003-2007	91.8	91.3	1.000 (0.992-1.006)	*
	2007-2014	91.3	72.1	0.971 (0.966-0.976)	*
Crack smoking <sup>d,f</sup>	2003-2008	52.5	71.8	1.063 (1.049-1.078)	*
	2008-2014	71.8	60.4	0.986 (0.976-0.997)	*
Frequent injection <sup>g</sup> (≥120/month)	2003-2008	24.2	33.2	1.040 (1.008-1.072)	*
	2008-2014	33.2	32.3	0.986 (0.964-1.008)	*

Abbreviations: PR: prevalence ratio; CI, confidence interval. \*\* p<0.0001, \* p<0.05

<sup>a</sup> Percentage at the beginning of the sub-period.

<sup>b</sup> Percentage at the end of the sub-period.

<sup>c</sup> Year treated as a continuous variable, separated models for each sub-period.

<sup>d</sup> In the six months prior to interview, N=9,355 visits.

<sup>e</sup> Including speedball.

<sup>f</sup> 7 missing values.

<sup>g</sup> In the month prior to interview, among those who had injected drugs during that month, N=8,386 visits.

**Table 3.**

Association between frequent injection ( $\geq 120$ /month) and drugs injected in the month prior to interview (N=9,077 visits).

<b>Drugs category</b>	<b>No.</b>	<b>%</b>	<b>Crude PR</b>	<b>Adjusted<sup>a</sup> PR (95% CI)</b>	
Crack/cocaine $\pm$ other drugs <sup>b</sup>	4,028	44.4	Ref	Ref	
Prescription opioids only	820	9.0	1.75	1.72 (1.47-2.01)	*
					*
Prescription opioids + heroin/speedball, crack/cocaine or other drugs <sup>b</sup>	3,303	36.4	2.40	2.29 (2.07-2.53)	*
					*
Heroin/speedball $\pm$ crack/cocaine or other drugs <sup>b</sup>	897	9.9	1.09	1.09 (0.92-1.28)	
Other drugs <sup>b</sup> only	29	0.3	0.18	0.18 (0.03-1.23)	

Abbreviations: PR: prevalence ratio; CI, confidence interval; Ref, reference. \*\*  $p < 0.0001$

<sup>a</sup> PR adjusted for age, sex, homelessness and smoking crack in the month prior to interview, N=9,016 visits (61 missing values).

<sup>b</sup> Other drugs: amphetamine-type stimulants, benzodiazepines, ketamine, etc.

