



## Short Communication

# Impact of incarceration on rates of methadone use in a community recruited cohort of injection drug users



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## HIGHLIGHTS

- Opioid addiction is associated with incarceration and severe health consequences.
- Methadone maintenance therapy is the standard of care for opioid addiction.
- Recent incarceration decreases the likelihood of being on methadone.

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## ABSTRACT

**Background:** Despite barriers to its use in many settings, opioid agonist therapy with methadone has become the standard of care for treating opioid (e.g. heroin) use disorder. Since people with opioid use disorders have an increased incidence of incarceration, we undertook the present study to evaluate the association between incarceration and methadone maintenance therapy among a cohort of injection drug users in a Canadian setting.

**Methods:** A cohort of people who inject drugs was prospectively followed between May 1996 and May 2013 in Vancouver, Canada. We investigated the relationship between recent incarceration and methadone use using multivariate generalized estimating equation (GEE) logistic regression analysis.

**Results:** Overall, 2758 individuals were recruited during the study period and followed for a median of 64 (interquartile range: 23–106) months. After adjusting for various potential confounders in the multivariate GEE model, being incarcerated remained independently associated with a lower likelihood of having received methadone treatment (Adjusted Odds Ratio: 0.87, 95% confidence interval: 0.81–0.93).

**Conclusions:** Our study demonstrates that incarceration was independently associated with a significantly lower likelihood of being on methadone. Given the role of methadone in reducing the harms of heroin use, including drug acquisitive crime and recidivism, these data suggest a need to scaleup methadone provision for incarcerated injection drug users.

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## 1. Introduction

Although only a fraction of patients with a diagnosed substance use disorder identify opioids as their drug of choice, a greater proportion of these individuals will suffer severe health consequences. This increased risk is particularly pronounced in individuals who use heroin. Heroin use and increased access to prescribed opioids has also led to an epidemic of overdose deaths in North America (Fischer, Jones, & Rehm, 2013). Substantial public health and social issues are associated with opioid

addiction, particularly in urban centers. These include involvement in the sex trade, drug acquisition crime, loss of child custody, and unstable housing. Sadly, despite increased efforts to apply a medical approach to the treatment of opioid addiction, stigmatization and criminalization of affected individuals abound (Wolfe, Carrieri, & Shepard, 2010).

Barriers to opioid agonist therapy internationally include access-limiting legislation, costs associated with the medication, and negative public and patient opinion about treatments such as methadone. Individual factors, such as residence and drug-using behaviors, have also been identified as barriers to care (Callon et al., 2006). Limiting timely access to methadone defies strong evidence demonstrating its record for decreasing illicit opioid use as well as decreasing HIV infection rates as substantiated by its position on the World Health

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Organization's List of Essential Medicines (Herget, 2005; MacArthur et al., 2012; Mattick, Breen, Kimber, & Davoli, 2009).

Methadone for the treatment of incarcerated individuals with opioid use disorders has been shown to decrease the risk of contracting viral hepatitis, decrease HIV risk behaviors and reduce rates of recidivism (Bukten et al., 2011; Hedrich et al., 2012; Werb et al., 2008). Unfortunately, the criminal justice system is often not optimized to address the addiction treatment needs of high-risk patients. To better understand this gap in practice, the present study was conducted to examine the relationship between incarceration and engagement in methadone maintenance treatment among individuals with a history of injection drug use.

## 2. Methods

### 2.1. Study design

Beginning in May 1996, individuals who had injected illicit drugs in the past month were recruited into the Vancouver Injection Drug Users Study (VIDUS), a prospective cohort study that has been described in detail previously (Miller et al., 2002; Tyndall et al., 2003; Wood et al., 2003). Since 2005, people who were HIV-positive at baseline or during the study were subsequently followed through a sister study known as the AIDS Care Cohort to Evaluate Access to Survival Services (ACCESS). With exception to parameters related to HIV infection, both studies used essentially identical recruitment and follow-up procedures to allow for combined analyses.

### 2.2. Participants

Participants of the studies were 18 years of age or older and resided in the greater Vancouver region. All participants provided written informed consent. Participants were given a stipend (\$20 CDN) at each study visit for their time and transportation. The study was approved by the University of British Columbia/Providence Healthcare Research Ethics Board.

### 2.3. Measures

At baseline and semiannually thereafter, participants completed an interviewer-administered questionnaire that elicited a range of data, including those on demographic characteristics, injection and non-injection drug use, and engagement in addiction treatment. In addition, venous blood samples were drawn at each visit and tested for HIV and hepatitis C Virus (HCV) antibodies. All participants had private interviews and were offered both pre- and post-test counseling with trained nurses.

### 2.4. Analysis

The present analyses considered all individuals with a history of injection drug use who were enrolled between May 1996 and May 2013. Our primary outcome of interest was participation in the methadone treatment program in the past 6 months. Our primary independent variable of interest was recent incarceration, defined as being in detention (under 19 years of age), prison (2 years or more) or jail (2 years less than a day or under) in the past 6 months.

To examine the relationship between methadone treatment use and recent incarceration we considered several demographic and behavioral explanatory variables that may act as confounders. The secondary variables included: age; gender (female vs. male); ethnicity (Caucasian vs. other); injection heroin use ( $\geq$  daily vs.  $<$  daily); injection cocaine use ( $\geq$  daily vs.  $<$  daily); crack cocaine smoking ( $\geq$  daily vs.  $<$  daily); HIV serostatus (positive vs. negative); involvement in sex work, defined as exchanging sex for money, food, drugs, shelter or other commodities (yes vs. no); currently living in unstable housing, defined as living in a single room occupancy hotel, transitional living arrangements, or

homelessness (Spittal et al., 2002). Unless specified, all behavioral variables refer to activities in the past 6 months.

Since the analyses included serial measures for each participant, we used generalized estimating equations (GEE) with the logit link function to assess the independent association of recent incarceration with participation in the methadone treatment program throughout the study period. The GEE methods provided standard errors adjusted by multiple observations per person using an exchangeable correlation structure (Liange & Zeger, 1986). As a first step, variables were examined in bivariate GEE analyses. Then, to fit the multivariate confounding model for the variable of interest, we employed a conservative model selection approach (Maldonado & Greenland, 1993). Specifically, we included all potential confounders (where  $p < 0.05$  in the bivariate analyses) in the full multivariate model and used a stepwise approach to fit a series of reduced models. After comparing the value of the coefficient associated with the main independent variable of interest in the full model to the value of the coefficient in each of the reduced models, we dropped the secondary variable associated with the smallest relative change. We continued this iterative process until the minimum change exceeded 5%. Remaining variables were considered confounders in the multivariate analysis. All statistical analyses were performed using the SAS software version 9.3 (SAS, Cary, NC). All  $p$ -values are two sided.

## 3. Results

Of the 2758 individuals recruited during the study, 906 (33%) were female, 1683 (61%) were Caucasian and the median age at baseline was 37 (interquartile range [IQR]: 29–43) years. The median duration under follow-up was 64 months (IQR: 23–106). Over the course of the study, 1524 (55%) participants reported some participation in a methadone treatment program.

Baseline characteristics of the study participants, stratified by recent incarceration, are shown in Table 1. As shown, 381 (14%) participants reported incarceration in the past six months at baseline. Younger age, at least daily injection heroin use, at least daily crack smoking and currently living in unstable housing were significantly associated with recent incarceration ( $p < 0.05$ ).

The unadjusted and adjusted results of the GEE analyses examining the associations between recent incarceration and participation in the methadone treatment program are shown in Table 2. As shown in the unadjusted analyses, being recently incarcerated was associated with lower odds of participating in the methadone treatment program (Odds Ratio = 0.66, 95% confidence interval [CI]: 0.62–0.71). Additionally, in the bivariate analyses, older age, female gender, Caucasian ethnicity, at least daily crack smoking and HIV positive status were positively associated with methadone treatment, while daily injection heroin use, daily injection cocaine use, sex work involvement and unstable housing were negatively associated with this outcome ( $p < 0.05$ ). In the multivariate GEE analysis, adjusting for age, female gender, Caucasian ethnicity and at least daily injection heroin use, recent incarceration remained independently associated with lower odds of using methadone treatment (Adjusted Odds Ratio = 0.87, 95% CI: 0.81–0.93).

## 4. Discussion

The present study demonstrates an independent association between incarceration and a lower likelihood of methadone use among a group of injection drug users. This cohort was followed in a setting with well-developed methadone programs where methadone is both provided through a network of community pharmacies as well as available within local correctional systems.

Untreated heroin use has been linked to crime and increased contact with the criminal justice system (Bukten et al., 2012; Oliver et al., 2010). As such, correctional facilities are a logical setting for the implementation of proven treatment strategies. Methadone maintenance therapy certainly meets this criterion, the benefits of which have been shown

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