Full length article

Analysis of time of drug use according to needle and syringe program operating hours in Melbourne, Australia: Effects on individual-level needle and syringe coverage

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ABSTRACT

Background: Restricted needle and syringe program (NSP) operating hours in Australia have been reported as a barrier to access for people who inject drugs (PWID). We explored the prevalence of drug use occurring outside NSP operating hours with a particular focus on its impacts on individual-level needle and syringe coverage.
Methods: Using data from 584 participants in a cohort of PWID in Melbourne, Australia, we analyzed time and day of drug use for heroin, methamphetamine and pharmaceutical opioids. We related this drug use to the typical operating times of Melbourne's fixed-site NSPs, categorizing drug use as either "in-hours" or "out-of-hours". We explored associations with out-of-hours drug use using a generalized linear mixed model of pooled longitudinal data.
Results: 23% of heroin use and 50% of methamphetamine use occurred out-of-hours. In regression analysis, males and those injecting in public locations had significantly reduced odds of out-of-hours drug use. Those currently employed and those using methamphetamine (compared to heroin) had significantly increased odds of out-of-hours drug use. There was no significant association between individual-level needle and syringe coverage and hours of drug use.
Conclusions: Deficiencies in individual-level needle and syringe coverage may not be due to restricted NSP operating hours. Instead, insufficient coverage may be the result of other factors in the lives of PWID or other NSP access difficulties. These preliminary results suggest improvements to coverage in Australia may not result from increased hours of NSP operation, but instead via improvements to client targeting.

1. Introduction

According to the 2017 Illicit Drug Reporting System (IDRS) – a national system of surveillance of people who inject drugs (PWID) in Australian capital cities – heroin remains the most prominent drug of choice amongst sampled PWID in Australia, with 46% nominating heroin and 32% methamphetamine. Overall, nearly half of the sampled PWID report injecting daily (Karlsson and Burns, 2018). Ninety-four percent of Australian PWID also report acquiring sterile needles and syringes via fixed-site needle and syringe programs (NSPs) (Karlsson and Burns, 2018). However, restricted NSP operating hours in Australia has repeatedly been reported as a barrier to sterile needle and syringe access (Dodding and Gaughwin, 1995; Islam et al., 2008; Treloar and Cao, 2005; Treloar et al., 2010). The same barrier has been reported internationally (Wood et al., 2002; Wright et al., 2004).

Scott et al. (2015) showed that a substantial minority of reported instances of drug use by a cohort of PWID in Melbourne, Australia occurred during times when most NSPs are closed. In particular, most Melbourne-based NSPs have reduced harm reduction services on weekends. While some "secondary" fixed-site NSPs (those attached to hospitals or health centers) operate on a 24-h basis, only one of Melbourne's nine "primary" fixed-site NSPs (services specifically designed for PWID, with trained staff and complementary health/social services) is open 24 h a day. The operating hours of most primary fixed-site NSPs are restricted to Monday–Friday, 9 a.m.–5/6 p.m. (some have truncated weekend opening hours) (Victorian State Government Department of Health, 2017). Fixed-site needle and syringe distribution are often supplemented by outreach delivery or syringe vending machines (SVMs) to increase out-of-hours access, but only 1% and 12% (respectively) of Victorian PWID reported acquiring syringes via these sources

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in 2017 (Karlsson and Burns, 2018). Overall, Melbourne-based PWID who seek to inject drugs when NSPs are closed have fewer avenues for acquiring sterile needles and syringes. It follows that the inability to acquire sterile injecting equipment when needed should decrease needle and syringe coverage, and therefore increase risky injecting practices, such as receptive syringe sharing and syringe re-use (Bluthenthal et al., 2007a; Noroozi et al., 2015; O'Keefe et al., 2017a). Nevertheless, the timing of injecting drug use, and its effect on needle and syringe coverage, has not been explored thoroughly.

Needle and syringe coverage, measured at the individual level, is an estimate of the proportion of a person's injecting episodes that are "covered" by a sterile syringe. Numerous factors, including injecting frequency and methamphetamine injection (Bluthenthal et al., 2007a; Iversen et al., 2012; O'Keefe et al., 2016), affect a person's ability to acquire sufficient syringes for all injecting episodes. The non-use or inconsistent use of NSPs has also previously been associated with insufficient coverage (Bryant et al., 2012; O'Keefe et al., 2016), which may be partially due to restricted opening hours. We explore the prevalence of drug use both inside and outside fixed-site NSP operating times, specifically testing the association between out-of-hours drug use and individual-level needle and syringe coverage. Using data from a currently active cohort of PWID, we aimed to:

1) describe drug use occurring during and outside NSP operating times by injectable drug type: heroin, methamphetamine and pharmaceutical opioids, and
2) explore associations between exposure sub-groups and out-of-hours drug use, in particular, the association with insufficient individual-level needle and syringe coverage where we hypothesized that those using drugs out-of-hours would have greater proportions of insufficient coverage.

2. Methods

Our data come from the Melbourne Injecting Drug User Cohort (MIX) study, which has been described in detail elsewhere (Horyniak et al., 2013). Briefly, participants are administered a structured questionnaire annually. Recruitment of the original 688 MIX participants occurred between 2008 and 2010, though an additional 69 participants were included in the cohort in 2011 via past involvement in the Networks II cohort (Sacks-Davis et al., 2012), resulting in 757 participants. Both MIX and Networks II sought to recruit PWID who injected regularly. The characteristics of the cohorts at baseline (2005 for Networks II) were comparable (Scott et al., 2016). Eligibility criteria for the original MIX cohort were being aged 18–30 years and reporting injecting of heroin and/or methamphetamine regularly (at least once a month in the six months prior to recruitment) (O'Keefe et al., 2017b). The most recent MIX study dataset covers the period from March 2008 to May 2017 and includes 3635 observations.

2.1. Participant sample

Coverage questions were not introduced into the MIX questionnaire until June 2010. Consequently, all interviews prior to this date (902 interviews involving, amongst others, 173 participants not interviewed after June 2010) were excluded from analysis. The final, amended dataset consisted of 584 participants and 2733 observations over a maximum of nine interview waves. Attrition was low, with 80% of participants completing at least three interviews in the amended dataset.

2.2. Coding time of drug use

We categorized the day and time of drug use via questions on recent illicit drug purchasing. We analyzed purchasing of frequently injected drug types: heroin, methamphetamine and pharmaceutical opioids.

Only 1% of past month heroin use but 14% of past month methamphetamine use was reported as not involving injection. To account for this, we only analyzed heroin and methamphetamine purchasing data for participants reporting past month injecting of those drugs. We also analyzed non-prescribed pharmaceutical opioids, including oxycodone, morphine, and opioid substitution therapy (OST) medications (methadone and buprenorphine), but only if their injection was also reported.

Drug purchasing questions in the MIX questionnaire changed over time. Initially, participants could respond that they had purchased drugs: "today/yesterday/within the last week/within the last month/more than a month ago". Only the "today" and "yesterday" responses were analyzed. These responses were related to the day on which the interview occurred, so that if the interview occurred on a Thursday, and the participant reported a drug purchase occurring "yesterday", it was coded as occurring on a Wednesday. MIX questionnaire iterations from 2015 onwards explicitly asked participants for the day of their most recent drug purchase. We confirmed the drug purchases resulted in drug use using the following question: "How soon after you purchased the heroin/methamphetamine/pharmaceutical opioids did you first use it?" Between 94% and 97% of drug use (across the three-drug types) reportedly occurred within 90 min of drug purchase, meaning the day of purchase was a suitable proxy for the day of use. However, after accounting for the time difference between drug purchase and drug use, those observations reporting different days of drug purchase and drug use were excluded from analysis (n = 36).

Participants were asked about the time of first drug use (of the reported purchase). Drug use occurring from Monday to Friday, 9 a.m.–6 p.m., was coded as "in-hours". We accounted for the different opening hours of some primary fixed-site NSPs. If participants reported their drug purchase occurring within the same local government area (LGA) as the only 24-h primary fixed-site NSP in Melbourne (Port Phillip LGA), then drug use was automatically categorized as "in-hours". Further, we categorized as "in-hours" drug use that matched the Saturday opening hours for particular primary fixed-site NSPs in three particular LGAs: Melbourne (12 p.m. to 7 p.m.), Maribyrnong (10 a.m. to 2 p.m.) and Yarra (9 a.m. to 2 p.m.). Primary fixed-site NSP opening hours were drawn from Victorian government documentation accessed at the time of analysis (Victorian State Government Department of Health, 2017). Drug use not within these days/hours was coded as "out-of-hours".

2.3. Individual-level needle and syringe coverage measurement

Using data on past two-week syringe acquisition, peer-to-peer syringe distribution and an estimate of past two-week injecting frequency, we calculated individual-level needle and syringe coverage according to a method devised by Bluthenthal et al. (2007a) and adapted by McCormack et al. (2016). The number of syringes distributed was subtracted from the number of syringes acquired. The number of syringes retained was divided by the past two-week injecting frequency estimate, then multiplied by 100, giving a percentage of injecting episodes covered by a sterile syringe (O'Keefe et al., 2016). The coverage measurement was dichotomized: "sufficient coverage" (≥100% of injecting episodes covered by a sterile syringe) or "insufficient coverage" (< 100% coverage) for the two weeks prior to the interview.

Coverage was only calculated for participants with valid coverage parameter data and those who reported both syringe acquisition and injecting within the two-week period. Forty-five percent of all coverage responses were missing; of these, 71% were due to injecting abstinence. A further 26% were missing because participants did not report acquiring syringes.

2.4. Independent variables

Independent variables were selected via literature search and *a priori* consideration of exposure variables' potential to influence the