












# High rates of resumption of injecting drug use following release from prison among men who injected drugs before imprisonment

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## Funding information

The Prison and Transition Health Cohort Study was funded by a National Health and Medical Research Council (NHMRC) Project Grant (APP1029915). M.C. is the recipient of an NHMRC post-graduate award and a Monash Addiction Research Centre PhD top-up scholarship. M.S. and P.D. are recipients of NHMRC Senior Research Fellowships. We gratefully acknowledge the support provided to the Burnet Institute by the Victorian Government Operational Infrastructure Support Program.

## Abstract

**Aims:** To estimate incidence of post-release injecting drug use (IDU) among men who injected drugs before imprisonment and determine factors associated with post-release IDU frequency.

**Design, setting, participants:** Prospective cohort study of men reporting monthly IDU before a period of sentenced imprisonment in Victoria, Australia, recruited between September 2014 and May 2016 ( $n = 195$ ).

**Measurements:** Any post-release IDU and IDU frequency was measured via self-report at 3-month follow-up interview. IDU frequency, measured over the preceding month, was categorised as no IDU, irregular IDU (1–4 days IDU) and regular IDU ( $\geq 5$  days IDU). Incidence of any IDU was calculated at 3 months post-release. Factors associated with IDU frequency were estimated using ordinal logistic regression.

**Findings:** Most (83%) participants reported post-release IDU (265 per 100 person-years, 95% CI, 227–309); with half (48%) reporting regular IDU, 23% irregular IDU and 29% no IDU in the month preceding follow-up. Poorer psychological well-being at follow-up (General Health Questionnaire [GHQ-12] score; adjusted odds ratio [AOR], 1.18; 95% CI, 1.07–1.29) and post-release unemployment (AOR, 4.57; 95% CI, 1.67–12.49) were associated with increased IDU frequency. Retention in opioid agonist treatment (AOR, 0.49; 95% CI, 0.24–0.98) was associated with reduced IDU frequency. Non-linear (inverted-u) associations between IDU frequency and age (age: AOR, 1.51; 95% CI, 1.17–1.96; age-squared: AOR, 0.99; 95% CI, 0.99–0.99) and pre-imprisonment IDU frequency (pre-imprisonment IDU frequency: AOR, 1.36; 95% CI, 1.15–1.61; pre-imprisonment IDU frequency-squared: AOR, 0.99; 95% CI, 0.99–0.99) were found, with odds peaking at age 39 and 19 days IDU, respectively. Longer baseline sentence length was associated with reduced odds of irregular and regular IDU (AOR, 0.99; 95% CI, 0.99–0.99).

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**Conclusion:** Among Australian men who inject drugs before imprisonment, resumption of injecting drug use after release from prison appears to be common, with imprisonment seeming to have little impact on reducing injecting drug use behaviour.

**KEYWORDS**

Cohort, harm reduction, injecting drug use, methamphetamine, opioid agonist treatment, opioids, prison

## INTRODUCTION

People who inject drugs are imprisoned at disproportionately high rates [1, 2]. In Australia, only 1.5% of the population report lifetime and 0.3% report recent injecting drug use (IDU) [3], but an estimated 46% of people entering Australian prisons in 2016 reported lifetime IDU and 29% in the month before imprisonment [4]. Although some people continue IDU during episodes of imprisonment, most abstain [5, 6].

Resumption of IDU after release from prison is associated with outcomes such as recidivism and reimprisonment [7, 8], unemployment [9], poor mental health [10] and post-release mortality—attributable primarily to opioid overdose [11]. Incidence of drug-related mortality is greatest in the first 2 weeks post-release, but remains elevated for at least 3 months [12–14]. Some post-release harms, such as injection injury, reimprisonment and non-fatal overdose, increase as IDU frequency increases [7, 8, 15, 16].

Despite the documented harms associated with post-release IDU resumption, little research describes rates of IDU resumption and associated factors. One study identified unemployment and hepatitis B and C coinfection as associated with faster post-release IDU resumption, but relied on cross-sectional survey data with substantial risk of recall bias (mean recall period of 4.6 years) and focused exclusively on people who injected opioids [17]. Prospective cohort studies estimate that 30% [10] and 41% [18] of people released from prison engaged in IDU by 1 and 6 months post-release, respectively. Although these studies also described factors such as unemployment, shorter periods of imprisonment, in-prison IDU and psychological well-being before release as associated with increased risk of post-release IDU [10, 18], they did not measure IDU resumption among people injecting before imprisonment. By recruiting general prison populations [10] or analysing data from people reporting lifetime IDU [18], these studies also included participants who may not have been injecting in the period before imprisonment and therefore, are unlikely to accurately determine risk of IDU resumption.

Given the health and social harms associated with IDU following release from prison [8, 11, 12, 14], and evidence showing these harms increase with IDU frequency [7, 8, 15, 16], an improved understanding of the rate at which people resume IDU and the factors associated with increased IDU frequency following release from prison is needed to inform responses. We used data from a prospective cohort study of men released from prison who reported IDU before imprisonment to conduct an exploratory study of the incidence of IDU in the 3 months following release and to identify factors associated with IDU frequency in this period.

## METHODS

### Data sources and participants

Data for this analysis came from the Prison and Transition Health (PATH) Cohort Study [6, 19]. Briefly, PATH was a prospective study of 400 men recruited in prison that reported approximately monthly IDU before imprisonment and aimed to characterise the transition from prison to the community. Participants were recruited from one maximum-, one medium- and one minimum-security prison in Victoria, Australia. Eligibility criteria included self-reporting approximately monthly IDU in the 6 months before recruitment (index imprisonment episode, being ages 18 years or over, being sentenced and able to provide informed consent. Women were excluded because of operational constraints in Victoria's main women's prison during study recruitment. Baseline interviews occurred between September 2014 and May 2016, a median of 39 (interquartile range [IQR], 13–62) days before release from index imprisonment episode. The median length of index imprisonment episode was 206 (IQR, 109–381) days. Follow-up interviews occurred approximately 3, 12 and 24 months following release from index imprisonment episode. Participants were invited to consent to data linkage to various health and social services databases using names, aliases, dates of birth, addresses, corrections identification numbers and universal healthcare insurance scheme numbers to deterministically or probabilistically link records. The Alfred Hospital Ethics Committee (79/12) and Victoria's Department of Justice and Community Safety (DJCS) Human Research Ethics Committee (CF/14/10169) approved PATH.

Participants who completed 3-month follow-up interviews in the community were eligible for inclusion in this analysis. Participants who completed these interviews in prison were excluded because we could not classify IDU frequency in the community using past 30-day frequency.

### Outcomes

Our study used two primary outcomes, resumption of any post-release IDU and IDU frequency in the preceding 30 days; measured at the first follow-up interview scheduled at 3 months post-release (median release–interview interval = 108 days; IQR, 90–148 days). Participants were asked whether they had injected any of 22 drug types (e.g. heroin, methamphetamine, pharmaceuticals) since baseline

interview. Participants were classified as engaging in any IDU if they responded 'yes' to injecting at least one drug type.

To measure IDU frequency, participants were also asked the number of days each drug was injected in the 30 days before follow-up interview and this was summed across all drug types and categorised into no IDU (0 days IDU), irregular IDU (1–4 days IDU) and regular IDU ( $\geq 5$  days IDU). The threshold for regular IDU was selected to replicate a threshold used in previous Australian research [3, 20, 21], which approximates weekly IDU.

## Covariates

Model covariates were selected a priori, after review of previous literature regarding post-release IDU [10, 17, 18], from data collected at baseline and 3-month follow-up interviews, alongside novel covariates collected within PATH and considered potential modifiers of risk of IDU frequency. Baseline covariates included in analyses were, age at baseline (continuous); identifying as Aboriginal or Torres Strait Islander (no/yes); pre-imprisonment IDU frequency in the month before index sentence (days, continuous); index sentence length (days, continuous), determined via linkage to DJCS; and reporting IDU during index sentence (no/yes), derived from questions about injecting any of the 22 drug types during their index sentence. Participants who responded 'yes' to any question were classified 'yes' to IDU during index sentence, irrespective of whether they answered all 22 questions; participants who responded 'no' to prison injecting of all 22 drug types were classified as 'no' and participants who did not respond to any drug type questions or had missing data on some drug types, but responded no to others were classified as 'missing'.

Covariates from 3-month follow-up interviews included psychological well-being (General Health Questionnaire-12 [GHQ-12], interval, range: 0–12, higher scores indicate poorer psychiatric well-being) [22]; reporting current accommodation as unstable (no/yes); current employment status (employed/unemployed); current correctional supervision (no/yes), with people reporting current parole, probation or community corrections classified as 'yes'; accessed drug treatment excluding opioid agonist treatment (OAT) (e.g. counselling) since release (no/yes), determined via linkage to Victorian public drug treatment services data, with episodes consisting of assessment or referral only excluded as no treatment was provided; and current OAT (no/yes and retained in treatment since release/yes and initiated post-release). Because OAT dispensation data is not recorded in any centralised administrative dataset in Victoria, current OAT was derived from the following questions administered at 3-month interview: 'Did you get released on to a subsidised (OAT) program from prison?', 'Are you on an (OAT) program now?' and 'How long have you been on the program for?' Participants who reported being released from index imprisonment on OAT and being on OAT for longer than the time elapsed since index release were classified as 'retained in treatment since release'. Participants who reported current OAT, but were not released on OAT, or their treatment duration

was less than time elapsed since release from index imprisonment episode, were classified as 'initiated post-release'.

## Data analysis

We assessed for differences between included and excluded participants across a range of baseline sociodemographic variables using independent sample *t* tests or Mann–Whitney U tests for continuous variables and  $\chi^2$  or Fisher's exact tests for categorical variables.

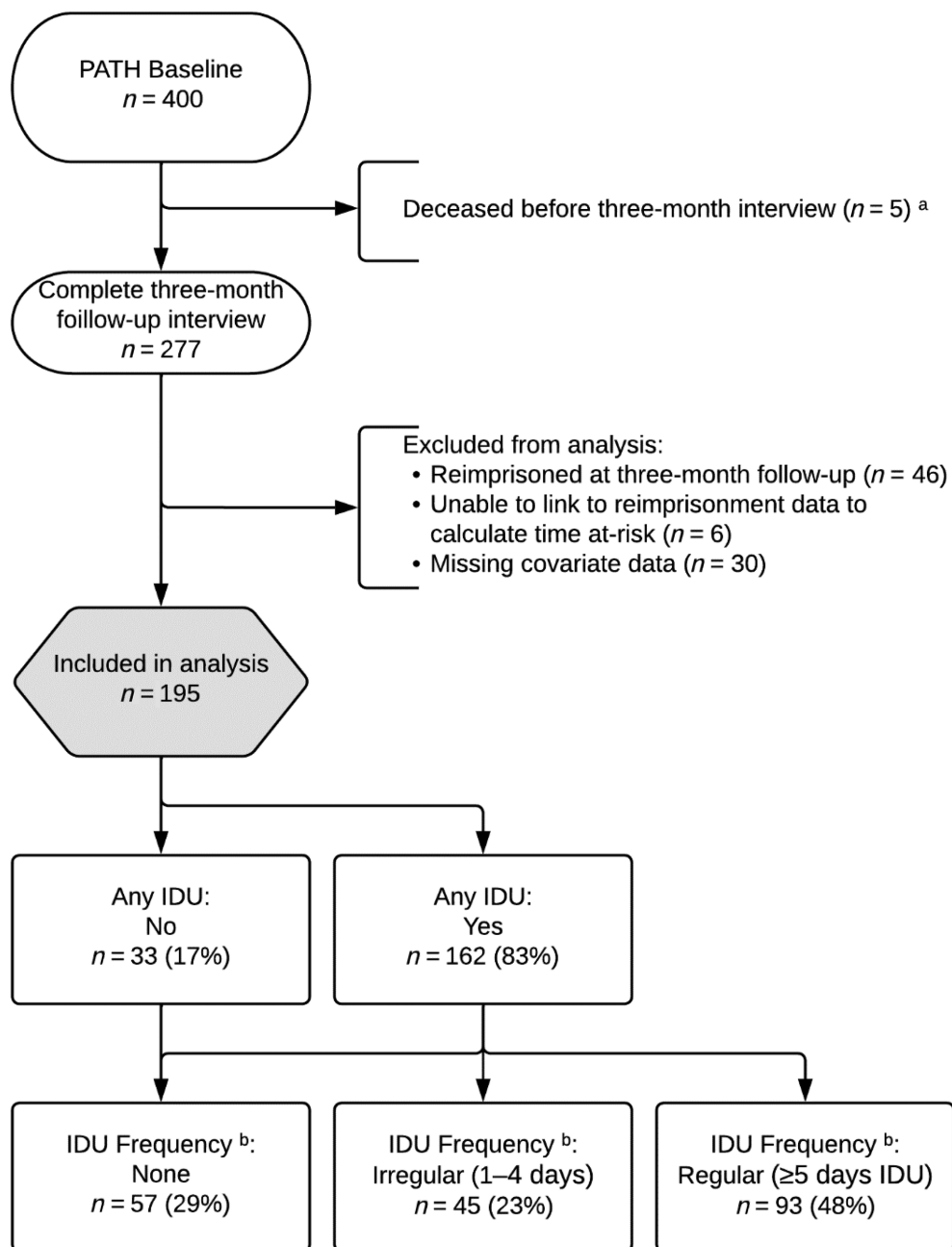
We described the proportion of participants who engaged in any IDU, IDU frequency and the most commonly injected drugs after release. Baseline sociodemographics and participant characteristics were stratified by IDU frequency and differences assessed using one-way analysis of variance or Kruskal–Wallis tests for continuous variables and  $\chi^2$  or Fisher's exact tests for categorical variables.

For calculation of resumption of IDU incidence rates, time at risk commenced on release date, determined via linkage to DJCS, stopped for any time in prison, recommenced on any release date and all participants were censored at their 3-month interview as linked DJCS data was unavailable for the cohort beyond 3-month interview at the time of analysis. Because the exact date of any IDU was unknown, incident events were assigned to the date of 3-month interview. Incidence rates, along with 95% CIs, were reported per 100 person-years (PY).

Associations between the ordinal outcome of IDU frequency and covariates were modelled using ordinal logistic regression and reported as unadjusted odds ratios (OR) and adjusted odds ratios (AOR) with 95% CIs. To test the assumption of a linear association between continuous covariates and the regular IDU, a series of models were fitted with the full set of covariates, and a term for each of the continuous variables squared in turn (e.g. age and age-squared alongside all other covariates). Model fit was assessed at each step, with squared terms retained in the final model based on a significant Wald test and reductions in both Akaike's Information Criteria and Bayesian Information Criteria. Using a probability threshold of  $P < 0.05$ , we assessed the proportional odds assumption (that the independent effects of a covariate did not vary across levels of IDU frequency) using Brant tests [23], and where this assumption was violated, used generalised linear and latent mixed modelling [24] to specify covariate specific threshold logit models to relax the proportional odds assumption [25]. Using the final model, marginal cumulative predicted probabilities for the sample were estimated for covariates with non-linear associations and inspected visually, and the turning point (vertex) of the function calculated, along with 95% CIs, by the standard equation:  $x = -\beta_x / 2\beta_{x^2}$ . Data analysis was conducted using Stata 14.2 [26].

To examine whether factors associated with IDU frequency differed according to different definitions of regular IDU, we conducted two sensitivity analyses, where the final model was refit with a re-categorised IDU frequency outcome: (i) no IDU (0 days IDU), irregular IDU (1–9 days IDU) and regular IDU ( $\geq 10$  days IDU), and (ii) no IDU (0 days IDU), irregular IDU (1–19 days IDU) and regular IDU ( $\geq 20$  days IDU).

**FIGURE 1** Prison and Transition Health (PATH) participant inclusion and outcome derivation



<sup>a</sup> Determined via linkage to Australia's National Death Index

<sup>b</sup> Determined in the 30 days preceding three-month follow-up interview

We did not pre-register our analysis plan and results should be considered exploratory.

## RESULTS

### Participant characteristics

Of 400 participants, 277 (69%) completed a 3-month follow-up interview. Of these, 46 were in prison at 3-month follow-up, six were

excluded because of missing reimprisonment data and 30 were missing covariate data (Fig. 1), resulting in a final sample of 195 participants. Baseline characteristics of included and excluded participants did not differ significantly (Supporting information Table S1). At baseline, participants' mean age was 36 years (SD, 8 years); 90% were Australian-born and 20% completed high school. Median index sentence length was 202 days (IQR, 104–361) and the median number of prior adult imprisonments (determined via linkage to DJCS) was three (IQR, 1–6). Differences between participants who did and did not engage in regular post-release IDU were observed according to

**TABLE 1** Sociodemographic and baseline characteristics, stratified by IDU frequency in the 30 days preceding 3-month follow-up interview (*n* = 195)

	None ( <i>n</i> = 57) <i>n</i> (%)	Irregular ( <i>n</i> = 45) <i>n</i> (%)	Regular ( <i>n</i> = 93) <i>n</i> (%)	<i>P</i> -value
Age at baseline (mean, SD <sup>a</sup> ), <i>y</i>	35 (10)	39 (8)	36 (7)	0.065 <sup>b</sup>
Aboriginal and/or Torres Strait Islander	13 (41)	5 (16)	14 (44)	0.253 <sup>c</sup>
Born in Australia	53 (30)	40 (23)	83 (47)	0.710 <sup>c</sup>
Completed high school	10 (26)	7 (18)	22 (56)	0.461 <sup>c</sup>
Employment history				
Never employed	<5	5 (24)	12 (57)	0.095 <sup>c</sup>
Limited work history	12 (20)	17 (29)	30 (51)	
Intermittent work history	28 (31)	18 (20)	44 (49)	
Continuous employment	13 (52)	5 (20)	7 (28)	
Prior number of adult imprisonment episodes <sup>d</sup>				
0	14 (44)	<5	14 (44)	0.155 <sup>c</sup>
1–4	29 (31)	23 (24)	43 (45)	
5+	14 (21)	18 (26)	36 (53)	
Baseline sentence length (days) (median, IQR <sup>e</sup> )	250 (127–488)	176 (89–347)	190 (144–350)	0.124 <sup>f</sup>
GHQ-12 score (median, IQR <sup>e</sup> )	5 (2–7)	4 (2–6)	5 (2–7)	0.731 <sup>f</sup>
Days injected in month before prison (median, IQR <sup>e</sup> )	10 (0–28)	28 (9–28)	28 (21–28)	<0.001 <sup>f</sup>
Drugs injected at least once in the month before prison				
None <sup>g</sup>	16 (80)	<5	<5	0.000 <sup>h</sup>
Opioids <sup>i</sup>	8 (28)	10 (34)	11 (38)	
Stimulants <sup>j</sup>	17 (34)	8 (16)	25 (50)	
Opioids <sup>i</sup> and stimulants <sup>j</sup>	16 (17)	25 (26)	55 (57)	
Receiving OAT <sup>k</sup> immediately before prison	20 (25)	22 (28)	37 (47)	0.363 <sup>c</sup>
Received AOD <sup>l</sup> treatment during index imprisonment	29 (29)	20 (20)	50 (51)	0.590 <sup>c</sup>

IDU, injecting drug use.

<sup>a</sup>standard deviation;

<sup>b</sup>one-way ANOVA;

<sup>c</sup> $\chi^2$  test;

<sup>d</sup>determined via linkage to Department of Justice and Community Safety;

<sup>e</sup>interquartile range;

<sup>f</sup>Kruskal–Wallis test;

<sup>g</sup>includes one participant who reported steroid IDU;

<sup>h</sup>Fisher's Exact test;

<sup>i</sup>heroin and pharmaceutical opioids;

<sup>j</sup>meth/amphetamine, cocaine and pharmaceutical stimulants;

<sup>k</sup>opioid agonist treatment;

<sup>l</sup>alcohol or other drug.

pre-imprisonment IDU frequency ( $P = <0.001$ ) and the drug type injected at least once in the month before imprisonment ( $P = 0.001$ ) (Table 1).

## Incidence of any IDU

One hundred and sixty-two participants (83%) reported any post-release IDU during 61 PY in the community, a crude incidence of 265 per 100 PY (95% CI, 227–309). The most commonly injected drugs among participants that engaged in IDU after release were

crystal methamphetamine (66%), heroin (49%) and powder methamphetamine (speed; 12%).

## Associations with post-release IDU frequency

A total of 57 (29%) participants reported no IDU, 45 (23%) reported irregular IDU and 93 (48%) reported regular IDU in the 30 days preceding 3-month follow-up. Brant tests found that the specified model violated the proportional odds assumption ( $X^2(15) = 76.8$ ;  $P < 0.001$ ). As baseline sentence length ( $X^2(1) = 19.7$ ;  $P < 0.001$ ) and

accommodation stability ( $X^2(1) = 4.7$ ;  $P = 0.030$ ) exhibited non-proportional effects, an unconstrained model was specified for these covariates.

In multivariable analysis, age at baseline (AOR, 1.51; 95% CI, 1.17–1.96) (Table 2) and age-squared (AOR, 0.99, 95% CI, 0.99–0.99) were associated (joint Wald  $X^2(1) = 9.8$ ,  $P = 0.008$ ) with increased IDU frequency. Predicted probabilities from the final model showed that odds of IDU frequency post-release were higher in those with older age, until 39 years old (95% CI, 35–43), with higher age then yielding decreased odds of IDU frequency beyond this age (Supporting information Fig S1.). Pre-imprisonment IDU frequency (AOR, 1.36; 95% CI, 1.15–1.61) and pre-imprisonment IDU frequency-squared (AOR, 0.99; 95% CI, 0.99–0.99) were associated (joint Wald  $X^2(1) = 24.5$ ,  $P < 0.001$ ) with increased IDU frequency. Predicted probabilities from the final model showed that odds of IDU frequency post-release were higher in those with greater pre-imprisonment IDU frequency, until 19 days (95% CI, 16–22), with higher pre-imprisonment IDU frequency then yielding decreased odds of IDU frequency beyond this (Supporting information Fig. S1). Poorer psychiatric well-being (AOR, 1.18; 95% CI, 1.07–1.29) and being unemployed (AOR, 4.57; 95% CI, 1.67–12.49) were also associated with increased IDU frequency. Being retained on OAT since release (AOR, 0.49; 95% CI, 0.24–0.98) was associated with reduced IDU frequency. For each additional day of baseline sentence, the odds of any IDU (irregular and regular IDU) in the 30 days preceding follow-up interview were 1% lower (AOR, 0.99; 95% CI, 0.99–0.99); however, compared to no IDU and irregular IDU, sentence length was not associated with regular IDU.

Sensitivity analyses showed that factors associated with increased IDU frequency were consistent across different thresholds for regular IDU, with the exception of retention in OAT (Supporting information Table S2).

## DISCUSSION

We observed high rates of return to IDU, with 83% of participants reporting resumption of any IDU and 48% regularly injecting at 3 months after release. Our estimates of resumption of IDU are substantially greater than 3-month estimates for people reporting lifetime IDU before imprisonment [18] and indicate that resumption of IDU after release for people who frequently injected drugs before imprisonment was the norm in this cohort.

We found that as age at baseline increased, so did the odds of increased IDU frequency until 39 years of age, after which the odds decreased. Previous studies of post-release IDU reported no association with age [17, 18]. Studies of community-recruited people who inject drugs have reported inconsistent findings, with findings showing both increased [27–29] and decreased [30] rates of IDU cessation among younger adults and reduced risk of IDU resumption following cessation among older people [31]. Our results of reduced odds of resumption for younger participants, but also incrementally lower odds as participants age beyond 39 years, offer insights that

potentially bridge these paradoxical findings. Younger people in prison with IDU histories may have comparatively less established IDU behaviours than older people who inject drugs [27, 29], enabling a reduction in, or slower resumption of, regular post-release IDU. The diminishing odds of increased IDU frequency beyond 39 years of age may relate to more prior community- and prison-based cessations accumulated with age, as Xia *et al.* [31] and Huo *et al.* [28] suggested. Interventions to reduce post-release IDU frequency could prioritise people in their late 30s and people who report limited history of periods of abstinence or cessation. Additionally, interventions supporting young people in prison with recent histories of IDU may reduce the risk of developing established IDU behaviours.

Previous studies have found high-frequency IDU is associated with an increased risk of criminogenic behaviour [7] and imprisonment [32, 33]. We found post-release IDU generally increased with pre-imprisonment IDU frequency. We also found increased index sentence length was associated with reduced odds of any IDU in the month preceding follow-up, which is consistent with prior research [18]; however, sentence length was not associated with reduced odds of regular IDU. Although imprisonment is typically accompanied by cessation or reduced IDU frequency [5, 6] these results suggest imprisonment offers limited rehabilitative value for IDU. Participants serving short prison sentences may be more likely to have been imprisoned for non-violent drug-related crimes [18, 34], suggesting they may have been at greater risk of IDU resumption. Short sentences are a known barrier to accessing prison-based treatment and education services [35]. Non-custodial options (e.g. community-based treatment orders) typically facilitate better substance use and recidivism outcomes than imprisonment [36–39] and should be prioritised for drug-related offences. When imprisonment is unavoidable (e.g. serious drug-related violence), ensuring that evidence-based treatment programs are available immediately on custodial entry and continuously throughout imprisonment, especially for people who engaged in high-frequency pre-imprisonment IDU, may support reductions in post-release IDU frequency. These results also support arguments for the decriminalisation of drug use. International experience has shown drug decriminalisation is associated with improved health and social outcomes, including reduced drug-related harms and mortality and greater treatment utilisation [40]. Decriminalisation is also associated with lower justice expenditure [40, 41], enabling reinvestment into social services, including harm and demand reduction services.

We found that reduced psychiatric well-being at 3 months post-release was associated with increased IDU frequency. Findings from community-recruited cohorts of people who inject drugs also show an association between increased IDU frequency and reduced psychiatric well-being and mental health morbidity [42, 43]. These findings demonstrate a clear need to improve access to community mental health services, with several studies showing reductions in reoffending and reimprisonment among people who use drugs with mental illness who use such services following release from prison [44–47]. Prior research has shown that engagement with primary healthcare after release is associated with improved psychiatric well-being and

**TABLE 2** Factors associated with IDU frequency in the 30 days preceding 3-month follow-up interview among a cohort of men who injected drugs monthly before a period of imprisonment in Victoria, Australia: participant characteristics by IDU frequency and proportional odds regression analyses from generalised linear and latent mixed modelling showing OR and AOR, 95% CI and P-values (n = 195)

	IDU frequency				Proportional odds				Unconstrained Effects			
	None		Regular <sup>b</sup>		OR (95% CI)		P-value		≥ Irregular IDU <sup>c</sup>		Regular IDU <sup>d</sup>	
	n (%)	n (%)	n (%)	n (%)	OR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	
Before index imprisonment												
Days IDU in the month before prison (median, IQR <sup>e</sup> )	10 (0–28)	28 (9–28)	28 (21–28)		1.06 (1.04–1.09)	<0.001	1.36 (1.15–1.61)	<0.001	-	-	-	-
Days IDU <sup>a</sup> in the month before prison-squared	-	-	-		-	-	0.99 (0.99–1.00)	0.004	-	-	-	-
During index imprisonment												
Age at baseline (mean, SD <sup>f</sup> ), y	35 (10)	39 (8)	36 (7)		1.00 (0.97–1.03)	0.972	1.51 (1.17–1.96)	0.002	-	-	-	-
Age at baseline-squared, y	-	-	-		-	-	0.99 (0.99–1.00)	0.002	-	-	-	-
Aboriginal and/or Torres Strait Islander												
No	44 (27)	40 (25)	79 (48)		REF		REF		-	-	-	-
Yes	13 (41)	5 (16)	14 (44)		0.68 (0.33–1.40)	0.297	0.52 (0.22–1.26)	0.148	-	-	-	-
IDU during baseline sentence												
No	42 (30)	36 (26)	60 (43)		REF		REF		-	-	-	-
Yes	15 (26)	9 (16)	33 (58)		1.58 (0.87–2.87)	0.136	1.80 (0.81–4.03)	0.151	-	-	-	-
Post-release												
Unemployed at follow-up												
No	10 (53)	<5	5 (26)		REF		REF		-	-	-	-
Yes	47 (27)	41 (23)	88 (50)		2.96 (1.19–7.33)	0.019	4.57 (1.67–12.49)	0.003	-	-	-	-
Receiving OAT <sup>g</sup> at follow-up												
No	36 (29)	22 (18)	66 (53)		REF		REF		-	-	-	-
Yes, retained since release	17 (31)	16 (30)	21 (39)		0.67 (0.37–1.22)	0.191	0.49 (0.24–0.98)	0.045	-	-	-	-
Yes, interrupted/initiated post-release	<5	7 (41)	6 (35)		0.72 (0.30–1.77)	0.476	0.57 (0.20–1.63)	0.293	-	-	-	-
Accessed post-release AOD <sup>h</sup> treatment												
No	41 (29)	33 (24)	66 (47)						-	-	-	-
Yes	16 (29)	12 (22)	27 (49)		1.05 (0.59–1.90)	0.861	0.95 (0.43–2.10)	0.899	-	-	-	-
	2 (0–5)	2 (0–5)	5 (2–7)		1.17 (1.08–1.28)	<0.001	1.18 (1.07–1.29)	0.001	-	-	-	-

(Continues)

TABLE 2 (Continued)

	IDU frequency			Proportional odds			Unconstrained Effects		
	None	Irregular <sup>a</sup>	Regular <sup>b</sup>	OR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value
	n (%)	n (%)	n (%)						
GHQ-12 <sup>c</sup> score at follow up (median, IQR <sup>e</sup> )									
Current correctional supervision									
No	33 (28)	27 (23)	57 (49)	REF		REF			
Yes	24 (31)	18 (23)	36 (46)	0.90 (0.52–1.53)	0.686	0.85 (0.41–1.76)	0.654		
Baseline sentence length (days) (median, IQR <sup>e</sup> )									
Unstable accommodation at follow-up									
No	48 (30)	41 (26)	69 (44)					REF	REF
Yes	9 (24)	<5	24 (65)					0.76 (0.27–2.12)	0.599
								1.36 (0.57–3.26)	0.485

Model cut points:  $k_1 = 9.68$ ,  $k_2 = 11.30$ .

AOR, adjusted odds ratios; IDU, injecting drug use; OR, unadjusted odds ratios.

<sup>a</sup>irregular IDU = 1–4 days;

<sup>b</sup>regular IDU ≥ 5 days;

<sup>c</sup>no IDU vs irregular IDU and regular IDU;

<sup>d</sup>no IDU and irregular IDU vs regular IDU;

<sup>e</sup>interquartile range;

<sup>f</sup>standard deviation;

<sup>g</sup>opioid agonist treatment;

<sup>h</sup>alcohol and other drugs;

<sup>i</sup>12-item General Health Questionnaire.



increased access to other forms of healthcare [48, 49]. However, one in five sentenced people in prison in Australia are released without a health and mental health discharge plan and only half report a referral for post-release healthcare [50]. Further, the quality and appropriateness of discharge planning, including linkage to community-based health services, is unknown. Comprehensive discharge planning and supported referral to accessible post-release health and mental health services is needed to facilitate healthcare engagement, which may improve psychiatric well-being and help prevent a return to regular post-release IDU.

Consistent with previous research [17, 18], we found that unemployment was associated with increased post-release IDU frequency. People in prison have reduced educational attainment and employment histories compared to the general population and as such experience difficulty obtaining post-release employment [51]. Re-entry challenges including insecure housing and poor physical and mental health also impede employment prospects. Structural issues, including the automation of low-skilled work and rising unemployment also reduce employment opportunities [9]. Justice systems may support post-release employment through expanded prison-based education and post-release employment programs [52]. The use of criminal-history checks in Australia, which are primarily employment-related, rose from 2.9 million in the 2010 to 2011 financial year to over 6.2 million in 2020 to 2021 [53, 54]. Although criminal-history checks are appropriate in certain industries, broad use of criminal-history checks dissuades people with criminal records from applying for employment and can result in employers arbitrarily excluding applicants without consideration of the relevance of prior offences [55]. De jure decriminalisation of drug use would eliminate new criminal records for many people who use drugs. Reforms that restrict the use of pre-employment criminal-history checks and ensure that employers consider the relevance of prior offences may support improved post-release outcomes among people who inject drugs [55, 56].

Consistent with previous randomised control trials [57–59], we found that retention in OAT was associated with reduced post-release IDU frequency. Prior studies have reported that retention in OAT post-release is associated with a 20% reduction in reimprisonment [60] and a 75% to 85% reduction in opioid overdose [14, 61, 62]. However, OAT retention post-release is poor [57, 58, 60, 63]. Strengthening pre-release discharge planning, as described above in the context of mental health, may support OAT retention among people released receiving OAT. People leaving prison on OAT in Victoria have community OAT dispensing fees (~\$5AUD/day) fully subsidised for the first 28 days of release [64], after which full payment is required. OAT dispensing fees discourage treatment engagement and retention [65–68]; permanent full subsidisation is likely to be cost-effective and improve retention [69]. Use of long-acting injectable buprenorphine (LAIB) in prison and post-release may also improve retention [70]. Currently, there is little evidence for effective pharmacotherapy-based responses to methamphetamine dependence [71]. Crystal methamphetamine was the most common drug injected in this cohort; effective pharmacotherapy-based responses for methamphetamine dependence are needed.

This study is not without limitations. PATH was restricted to sentenced men, so our findings are not generalizable to women, minors or people on remand. The sample size ( $n = 195$ ) reduced the precision of model estimates, potentially limiting the application of our findings to policy and practice. Future work should involve larger samples that include people from the groups we neglected. Estimated incidence rates in this study likely underestimate IDU resumption, because additional PY were likely accumulated in the unobserved period between resumption of IDU and the 3-month follow-up interview. Because IDU frequency data between release and the month before follow-up interview was not collected, we cannot exclude misclassification bias. Additionally, although we believe it unlikely, as survey questions asked about IDU since last interview, we cannot exclude participants may have engaged in IDU between baseline interview and index-release, and then ceased IDU on release. Although attrition bias was assessed on select baseline covariates; we cannot exclude differences for other covariates. Finally, our results are only applicable to the first 3 months after release.

## CONCLUSION

In a prospective study of men who injected drugs before imprisonment, most reported resumption of IDU and almost half reported regular IDU 3 months after release. Our findings indicate that previous studies markedly underestimated the incidence of post-release IDU among people who were injecting drugs before imprisonment. Improvements in discharge planning, addressing structural barriers to post-release employment and fully subsidised OAT are needed to reduce the resumption of regular post-release IDU.

## ACKNOWLEDGEMENTS

We acknowledge the participants involved in the Prison and Transition Health study for the time and knowledge they contributed to this study. We thank the Burnet Institute fieldwork team for their tireless efforts with data collection. We also acknowledge the Victorian Department of Justice and Community Safety, the Australian Institute of Health and Welfare and the Centre for Victorian Data Linkage for their support. Open access publishing facilitated by Monash University, as part of the Wiley - Monash University agreement via the Council of Australian University Librarians. Open access publishing facilitated by Monash University, as part of the Wiley - Monash University agreement via the Council of Australian University Librarians.

## DECLARATION OF INTERESTS

M.S. has received investigator-initiated funding from Gilead Sciences, AbbVie and Bristol Myers Squibb and consultant fees from Gilead Sciences for activities unrelated to this work. P.D. has received investigator-driven funding from Gilead Sciences for work related to hepatitis C treatment and an untied educational grant from Indivior for work related to the introduction of buprenorphine/naloxone into Australia. He has also served as an unpaid member of an Advisory Board for an intranasal naloxone product. The remaining authors

declare that they have no conflicts of interest. Open access publishing facilitated by Monash University, as part of the Wiley - Monash University agreement via the Council of Australian University Librarians.

## AUTHOR CONTRIBUTIONS

M.C., with assistance from R.W., P.D., A.W., P.A. and M.S., developed the framework for the paper, undertook statistical analysis and produced the initial draft. R.W., P.D., A.W., P.A., R.C., A.S., T.B., C.A., A.K., S.W. and M.S. provided substantial comments and edits. M.S. is the chief investigator of the PATH study and provided guidance for paper development and editorial support throughout the duration of planning and writing. All authors read and approved the final manuscript.

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#### SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Curtis M, Winter RJ, Dietze P, Wilkinson AL, Cossar RD, Stewart AC, et al. High rates of resumption of injecting drug use following release from prison among men who injected drugs before imprisonment. *Addiction.* 2022;117(11):2887–98. <https://doi.org/10.1111/add.15971>