

Identifying the most common barriers to opioid agonist treatment in an Australian setting

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ABSTRACT

Background. Opioid use disorder is a public health concern in Australia. Opioid agonist treatment (OAT) is effective at treating and minimising harm from opioid use disorder, yet is underused in Australia due to client barriers. Although these barriers have been reported, the barriers that are most important to clients is unclear. The aim of this paper was to determine the most important OAT barriers to Australian clients. **Methods.** A cross-sectional, self-completed survey was given to 204 opioid-dependent clients who attended needle and syringe sites in Australia. Participants were given 15 OAT barrier statements, which they answered using a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree). The Likert scale data are presented using the count method and the mean Likert scores (for the whole sample and for subgroups). **Results.** The two methods determined that the four most important barriers to OAT were stigma, lack of support services, no flexibility and enjoy using opioids. Furthermore, those who used prescription opioids (compared with heroin) were female or non-binary (compared with male), were not currently using OAT (compared with current OAT), were younger (compared with older) and had high dependence scores (compared with low dependence scores) were impacted more by certain OAT barriers. **Conclusions.** Policies around improving support services, reducing stigma and increasing flexibility would be beneficial to reduce barriers to OAT in Australia. Second, certain groups were more vulnerable to OAT barriers, emphasising the importance to better tailor opioid treatment programs to these specific populations to increase treatment engagement.

Keywords: Australia, barriers to treatment, heroin dependence, Likert scale analysis, needle syringe sites, opioid agonist treatment, opioid use disorder, prescription opioid dependence.

Introduction

Opioid use disorder (OUD) has reached epidemic levels worldwide (0.35%), in the USA (1.17%) and Australasia (0.41%) (Degenhardt *et al.* 2018). OUD increases mortality (Darke *et al.* 2011; Degenhardt and Hall 2012), blood-borne viruses (Mathers *et al.* 2008; Nelson *et al.* 2011), mental health comorbidities (Ross *et al.* 2005; Jones and McCance-Katz 2019) and crime (Ross *et al.* 2005; Winkelmann *et al.* 2018) compared with the general public and, therefore, contributes greatly to the global burden of disease (Degenhardt *et al.* 2018). In fact, the global burden of OUD in 2016 was comparable with the global burden of alcohol use disorder, which has a prevalence almost four times OUD (Degenhardt *et al.* 2018).

Opioid agonist treatment (OAT) reduces illicit opioid use, mortality, crime and blood-borne diseases (Tran and Nguyen 2013; Fullerton *et al.* 2014; Sordo *et al.* 2017), and, therefore, improves individual outcomes and reduces the global burden of disease. Despite this, treatment-seeking rates are low, with a 2009 study finding that OAT use in the OUD population was 8% globally and 23% in Australia (Mathers *et al.* 2010). Contributing to this are the negative perceptions those with heroin dependence have of OAT in Australia, which include high costs, a lack of flexibility with treatment, OAT as

Received: 1 September 2022

Accepted: 20 February 2023

Published: 20 March 2023

Cite this:

Hall NY *et al.* (2023)
Australian Journal of Primary Health, 29(5),
445–454.
doi:[10.1071/PY22269](https://doi.org/10.1071/PY22269)

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an addiction itself and the stigma associated with OAT (Ezard et al. 1999; Gourlay et al. 2005; Madden et al. 2008).

More broadly, a recent systematic review investigating barriers to OAT found that stigma, regulatory, logistical, attitudinal and social barrier themes were common (Hall et al. 2021). This review found that the most reported barrier subthemes were negative treatment perceptions, cost, stigma and lack of flexibility (Hall et al. 2021). However, although the barrier frequency was reported, overall client preferences and attitudes towards OAT barrier, including identifying the barrier items that were found to be the most important to the sample using Likert scale methods, are unclear. Presently, there are two studies, one from New Zealand (Deering et al. 2011) and one from the USA (Muthulingam et al. 2019), which ranked the barriers to OAT using a Likert scale method. The New Zealand study found lack of flexibility and availability were the most important barriers (Deering et al. 2011), whereas the USA study found attitudinal barriers, lack of flexibility and stigma were the highest ranked barriers (Muthulingam et al. 2019). One Australian pilot study (Dean et al. 2011) reviewed the barriers to OAT; however, that study had a small sample size ($n = 69$) and could only identify the OAT barriers (without preferences and attitudes to OAT barriers being reported). It is evident that more research on ranking OAT barriers in an Australian context is required to better understand OAT perceptions of those who would benefit from OAT the most. Therefore, the aim of this paper was to determine the importance of OAT barriers in a group of Australian opioid-dependent clients. The results of which can be used to develop and improve OAT interventions accordingly.

Method

Study design, setting, sample size and participants

The study was an Australian cross-sectional study that recruited people with heroin or prescription opioid (PO) dependence. Recruitment occurred via six Needle Syringe Programs (NSP) sites situated within community health centres in Victoria and the medically supervised injecting room (MSIR) in Sydney. The data from the Sydney MSIR were included in the data analysis, even though only a small percentage (7%, 13 participants) were recruited from the Sydney MSIR, to increase the sample size, and because Melbourne and Sydney are similar cities both with NSP sites and MSIR sites. Data were also collected from a Bendigo health site (<5%), but these data were not included in the final sample due to the differences in city demographics between Bendigo and capital cities Melbourne and Sydney. A snowball technique was used, where participants who completed the survey were asked to recommend other eligible participants. Flyers advertising the survey were

displayed at the NSP sites in Melbourne, the MSIR in Sydney and a health centre in Bendigo in 2021. The flyers had a QR code, which allowed access to the online survey using a mobile device. NSP staff members and the lead researcher, who attended the NSP sites in Melbourne for a period of 6 months in 2021, approached clients to discuss survey participation. The online survey was self-completed by participants either on their device or on the researcher's iPad. All participants who completed the survey were given an A\$10 voucher as compensation for their time. Ethical approval for the study was obtained from Deakin University Human Research Ethics Committee (approval reference: 2020–350) and Cohealth Human Ethics Advisory Group.

Participants were included in the study if they were aged between 16 and 75 years, reported opioids as their primary drug, were dependent on opioids and could self-complete the survey. Those who were visibly experiencing acute psychiatric conditions or acute intoxication were excluded from the study, as were those who could not read or understand English, or those who had a severe mental illness or mental disability, as assessed by the lead researcher.

The minimum sample size for Likert scales is 10 observations or participants per Likert group (Knapp 1990; Jamieson 2004). Therefore, as there were 15 dependent treatment barrier variables (Likert groups), the minimum sample size for these 15 variables was 150 participants.

Survey development and measurement

The survey questions related to patient demographics, drug use, past treatment use and client OAT barriers. Two screening questions asked about the participant's primary drug of concern, and either the OWLS (Overuse, Worrying about use, Losing interest in usual activities and feeling Slowed down) screening tool (Nielsen et al. 2020) or the Severity of Dependence Scale (SDS) screening tool (Gossop et al. 1995; González-Sáiz et al. 2009) were used. The OWLS is a validated screening tool to determine PO dependence (Nielsen et al. 2020), and the SDS is a validated screening tool to determine heroin dependence (Gossop et al. 1995; González-Sáiz et al. 2009). The demographic, drug use and treatment questions were adapted from the Australian Treatment Outcomes Study longitudinal study (Ross et al. 2005).

The Likert scale had 15 dependent client treatment barrier variables that were identified from a systematic review, which determine the most frequently reported barriers to OAT (Hall et al. 2021). Second, discussions occurred with key stakeholders (Cohealth, which is a group of community health centres in Melbourne, health professionals and five OAT clients) for appropriateness. Furthermore, pilot testing and discussion around appropriateness of the survey and the client barrier statements was completed with five participants, and minor adjustments to the survey were

made. The OAT barrier statements are described in detail in Supplementary Appendix 1.

Participants were given the 15 statements related to treatment barriers in Supplementary Appendix 1 and asked to answer using a 5-point Likert scale – where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree – indicating how these barriers had affected (or would affect in those not receiving treatment) their ability to seek OAT for their opioid or heroin use. The survey was administered using Qualtrics.

Data and statistical analysis

Statistical analysis was conducted using STATA SE 17.0 and Microsoft Excel. The Likert scale data were presented using the count method, Likert mean scores and linear regression. The count method reported the percentage of participants who chose each Likert scale response and, second, the percentage who reported they agreed or strongly agreed with the OAT barrier statements. Barrier items were considered important if at least 50% of the sample agreed or strongly agreed with the barrier item. Linear regression and mean Likert scores were used to analyse the Likert scale data, as recent studies and simulations have found that parametric statistics can be used appropriately without issue, error or restrictions, and can provide increased statistical power compared with non-parametric approaches (Norman 2010; DeWees *et al.* 2020). Both *t*-tests (Supplementary Appendix 2) and linear regression were used to determine the difference between the means for the groups. *T*-tests, however, cannot control for confounders, whereas linear regression can control for confounding variables and, therefore, produces more robust results. Hence, linear regression results were used to determine the mean Likert score difference for key groups while controlling for confounders (age, primary drug, sex, dependence score and current or past treatment). The R^2 , *F*-statistic and root mean square error are presented alongside the linear regression to show model fit. Higher mean scores indicate higher importance of the barrier item. The independent variables included in the regression were:

- Primary drug (heroin or PO)
- Gender (male, female or non-binary)
- OAT use (current OAT vs no current OAT)
- History of OAT use (history of OAT vs no history of OAT)
- Age (<40 years or ≥40 years)
- Dependence score (low: SDS < 8 or OWLS < 7 vs high: SDS > 7 or OWLS > 6)

Mean Likert scores were considered an important barrier if they were >3 (greater than neutral rating), and considered not a barrier if they were <3 (less than the neutral rating), which is consistent with other Likert difference of mean methodology (Saunders *et al.* 2006; Haffajee *et al.* 2020).

Ethical statement

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation, and with the Helsinki Declaration of 1975, as revised in 2008. Ethics approval was granted by Deakin University Human Research Ethics Committee (approval number: 2020–350).

Results

Participant demographics

Over the 6-month data collection period, 224 participants agreed to take the survey, and of these, 20 were not eligible, as they were not dependent on opioids. This left a sample size of 204 eligible participants with 195 completing the full survey. The percentage of missing data in the sample was 3.5%, and according to Little's missing completely at random test, the missing data could be considered missing completely at random ($X^2 = 510.13, P = 0.246$). The completed case analysis was performed. Finally, no collinearity was observed between the six independent variables, as per the variance inflation factor, which was <10 for each variable (University of California, Los Angeles 2021).

The mean age of participants was 39.3 years (s.d. 10.9), with over half of the sample being male and the majority unemployed. Most participants had a history of treatment for their opioid dependence (74.9%), and just under half were currently receiving heroin dependence treatment. Table 1 provides further information on participant demographics.

Table 1. Demographics, drug use and treatment history.

Demographics	Dependent cohort % (n), n = 195
Male gender	59.0 (115)
Currently employed	24.1 (47)
Opioid dependent	100.0 (195)
Heroin dependent	88.7 (173)
Prescription opioid dependent	11.3 (22)
Recruitment location – Victoria	93.3 (182)
Current heroin dependence treatment (any treatment)	47.2 (92)
Has a history of heroin dependence treatment (any treatment)	74.9 (146)
Number of times started treatment (s.d.)	5.8 (11.8)
Currently using OAT	45.6 (89)
Has history of OAT use	70.8 (138)
Living homeless/shelter/hostel	30.3 (59)
Born in Australia	80.0 (156)
Aboriginal or Torres Strait Islander	14.4 (28)

Participants perceived barriers to OAT

The most common perceived barriers, which was determined by those who strongly agreed or agreed with the statement barriers, were 'stigma (self-stigma and public stigma)' (58%), 'lack of support services' (57%), 'lack of flexibility' (52%), 'I am not ready to start treatment because I still enjoy using opioids' (50%) and 'cost' (48%). The least commonly observed barriers were 'cultural issues' (12%), 'fear of police' (17%), 'feeling worthlessness' (24%) and 'distance to the clinic' (25%). Fig. 1 shows the percentage of participants that selected the five Likert options for each OAT barrier, and, furthermore, shows the percentage of participants agreeing or strongly agreeing with the OAT barrier. Supplementary Appendix 3 shows this same data for those currently on OAT and for those not currently on OAT. Most of the distribution was centred around the middle three responses, with 67% of participants selecting these responses for stigma, to 83% selecting these middle responses for negative perceptions of treatment.

The mean Likert scores for the OAT barrier statements or items all fell between 2 and 4, with nine items being considered as barriers to OAT and six items not being considered OAT barriers. The OAT barriers with the highest mean Likert scores were 'lack of support services', 'stigma', 'lack of flexibility', 'enjoy using opioids' and 'treatment being hard to access'. Further details of the mean scores can be found in Table 2.

Linear regression to compare mean Likert score differences of the 15 OAT barriers between subgroups

The mean Likert scores of the 15 different OAT barrier items were compared between subgroups for 186 participants

Table 2. Mean Likert barrier score for the opioid-dependent sample.

Barriers	Total sample n = 195 Mean (s.d.)
Lack of support services	3.56 (1.14)
Stigma	3.52 (1.24)
No flexibility	3.37 (1.12)
Enjoy using opioids	3.28 (1.20)
Hard to access	3.26 (1.12)
OAT does not fit with social model of using	3.21 (1.18)
Cost	3.18 (1.25)
Treatment is not priority, chaotic lifestyle	3.14 (1.21)
Difficult registration	3.08 (1.22)
Daily association with drug users	2.93 (1.18)
Negative perception of OAT	2.92 (1.08)
Distance	2.64 (1.12)
Worthlessness	2.55 (1.24)
Fear of police	2.43 (1.07)
Cultural issues	2.27 (1.04)

(missing data meant that nine participants were not included in the regression analysis) and 195 participants for the *t*-test results (Supplementary Appendix 2). Supplementary Appendix 2 shows that the *t*-tests produced more items to be significant as barriers between the groups; however, when linear regression is used (Table 3) and the confounders are controlled, the number of significant barrier items reduces and the results become more robust.

Table 3 shows the results of the differences in mean Likert scores for six subgroups: primary drug, gender,

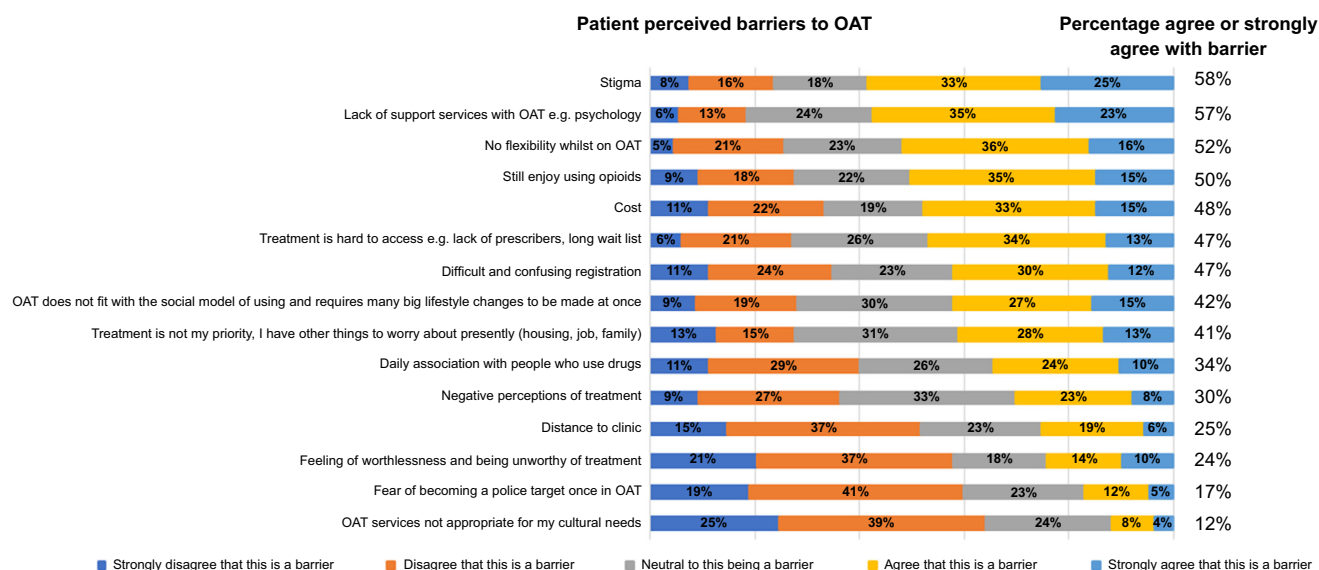


Fig. 1. Patient perceived barriers to OAT and the percentage that agree or strongly agree with OAT barrier.

current OAT, history of OAT, age and dependence level. First, when comparing the means of the primary drug subgroup (POs compared with heroin), the barrier item 'lack of support services' had a significantly larger mean value for people dependent on POs compared with heroin (mean difference between PO group and heroin group 0.65, s.e. = 0.28), meaning that those with PO dependence found 'lack of support services' to be a more significant barrier to OAT than those with heroin dependence. When comparing the Likert mean differences between the gender subgroup, mean differences were found comparing female to male and female to non-binary. No significant differences were found between non-binary and male. The barrier item 'no flexibility' had a significantly larger mean Likert value for females compared with males (0.35, s.e. = 0.18), which means that females experience 'no flexibility' as a more significant barrier to OAT than males. The mean Likert value for 'cultural issues' was greater for males compared with females (0.32, s.e. = 0.16), and larger for non-binary people compared with females (0.65, s.e. = 0.31), indicating that males and non-binary people find 'cultural issues' to be a more significant barrier to OAT compared with females.

When comparing the mean Likert values of the current OAT subgroup (current OAT compared with no current OAT), the mean Likert score for 'enjoy using opioids', 'difficult registration', 'OAT does not fit with social model of using', 'treatment is not priority, chaotic lifestyle' and 'cultural issues' were all significantly higher for those not using OAT compared with those using OAT. This indicates that those who were not using OAT believed that 'enjoy using opioids', 'difficult registration', 'OAT does not fit with social model of using', 'treatment is not priority, chaotic lifestyle' and 'cultural issues' were more significant barriers to OAT compared with those using OAT. When comparing the mean Likert values for the age subgroup (<40 years compared with ≥ 40 years), 'enjoy using opioids' was a barrier item that had a significantly larger mean Likert score in younger participants compared with older participants (0.44, s.e. = 0.18), which indicates that the younger group experienced 'enjoy using opioids' as a barrier to OAT significantly more than the older group.

Finally, when comparing the mean Likert values for the dependence subgroup (low dependence compared with high dependence), eight of the barrier items were found to have significantly greater mean Likert scores. These barrier items include 'stigma', 'no flexibility', 'hard to access', 'difficult registration', 'OAT does not fit with social model of using', 'treatment is not priority, chaotic lifestyle', 'daily association with people who use drugs' and 'distance'. This means that those in the high-dependence group believed the above eight barrier items were more significant barriers to OAT compared with the low-dependence group. Further details of the mean Likert differences can be seen in [Table 3](#).

Discussion

The count method and the mean Likert value method found that the OAT barrier items, 'stigma', 'lack of support services', 'lack of flexibility' and 'still enjoy using opioids', had the largest percentage of participants agreeing or strongly agreeing that these items were barriers and had larger mean Likert value (a larger mean Likert value indicates a more significant barrier to the group). The items that were not considered barriers according to the mean Likert score in our NSP sample were 'daily association with other people who use drugs', 'negative perception of OAT', 'distance to OAT service', 'feelings of worthlessness', 'fear of police' and 'cultural issues'. Changes in OAT service delivery in Australia in recent years, such as increased dosing points and reduced client-to-pharmacy ratios (in Victoria), have meant that the above six items may no longer be considered barriers to OAT in this population, indicating that treatment barriers can be reduced and removed. For example, 'Distance to the OAT service' was not identified as a barrier to OAT in this sample, which could be due to increased OAT services in Australia. The number of dosing points in Australia increased by 40% between 2010 and 2011 and 2019 and 2020, and 90% of OAT dosing points are accessible within pharmacies. Furthermore, most (64%) dosing points were located in major cities in 2021 ([Australian Institute of Health and Welfare 2022](#)) and, therefore, as the recruitment for this study was completed in Melbourne suburbs, this barrier item may be specific to urban populations only.

'Daily association with people who use drugs' at the OAT site was a second item that was not identified as a barrier. This could be partly explained by decreasing client-to-OAT pharmacy ratio. From 2016 to 2021, the number of clients per OAT dosing point has reduced by 8% in Victoria.

'Fear of police' when in OAT was a third item that was not seen as a barrier to OAT. Reasons for this include policy changes in Australia surrounding drug possession, where a 'treatment instead of incarceration initiative' was introduced in 1999 ([United Nations Office on Drugs and Crime 2008](#)). Furthermore, the introduction of MSIR in Australia, which allow clients to carry a small amount of drugs for personal use with no harassment from police, may have further helped to reduce fear of police in the OAT setting ([North Richmond Community Health 2022](#)). Hence, increased OAT dosing points and the introduction of MSIR in Victoria may be a contributor to reduced OAT barriers, which shows that barrier items can be reduced by new delivery models, new interventions and new initiatives.

The barrier items, 'stigma', 'lack of support services' and 'lack of flexibility', are factors that are amenable to treatment system changes, whereas the barrier item, 'enjoy using opioids', cannot be changed by treatment system changes. Therefore, new interventions/initiatives could be applied to the barrier items that were identified as those that could be

Table 3. Difference between the mean Likert barrier scores for the six subgroups.

	Primary drug Heroin (n = 167) PO (n = 19)	Gender ^A Male (n = 108) Female (n = 65) Non-binary (n = 13)		Current OAT Tx Yes (n = 83) No (n = 103)	History OAT Tx Yes (n = 133) No (n = 53)	Age (years) <40 (n = 92) >40 (n = 94)	Dependence High (n = 102) Low (n = 84)	R ² , Adj R ²	F-statistic	RMSE
	Mean difference PO to heroin (s.e.)	Mean difference female to male (s.e.)	Mean difference female to non- binary (s.e.)	Mean difference no OAT to OAT (s.e.)	Mean difference no OAT Hx to OAT Hx (s.e.)	Mean difference older to younger (s.e.)	Mean difference lower dependence to higher dependence (s.e.)			
Stigma	−0.11 (0.30)	0.22 (0.19)	−0.45 (0.37)	0.03 (0.20)	0.08 (0.22)	−0.12 (0.18)	−0.75*** (0.18)	0.14, 0.10	F(7,178) = 3.98, P < 0.01	1.19
Lack of support services	0.65* (0.28)	−0.11 (0.18)	−0.04 (0.35)	0.21 (0.19)	−0.19 (0.21)	0.21 (0.17)	−0.33 (0.17)	0.05, 0.02	F(7,178) = 1.43, P = 0.20	1.14
No flexibility	0.25 (0.27)	0.35* (0.18)	−0.07 (0.34)	0.38* (0.19)	−0.21 (0.20)	0.26 (0.17)	−0.36* (0.17)	0.09, 0.05	F(7,178) = 2.41, P < 0.05	1.10
Enjoy using opioids	0.07 (0.29)	−0.18 (0.19)	0.14 (0.36)	0.46* (0.20)	−0.15 (0.22)	−0.44* (0.18)	0.18 (0.18)	0.09, 0.05	F(7,178) = 2.49, P < 0.05	1.18
Cost	0.30 (0.31)	0.03 (0.20)	0.08 (0.39)	0.07 (0.21)	0.29 (0.23)	0.12 (0.19)	−0.36 (0.19)	0.04, 0.001	F(7,178) = 1.03, P = 0.41	1.26
Hard to access	0.19 (0.28)	0.14 (0.18)	−0.18 (0.34)	0.12 (0.19)	0.04 (0.21)	0.07 (0.17)	−0.43* (0.17)	0.05, 0.02	F(7,178) = 1.46, P = 0.18	1.12
Difficult registration	0.60* (0.28)	0.04 (0.18)	−0.34 (0.34)	0.68*** (0.19)	−0.07 (0.21)	0.29 (0.17)	−0.75*** (0.17)	0.19, 0.16	F(7,178) = 5.87, P < 0.01	1.12
OAT does not fit with social model of using	0.23 (0.29)	−0.16 (0.18)	0.18 (0.35)	0.55** (0.19)	−0.18 (0.21)	−0.03 (0.18)	−0.53** (0.18)	0.09, 0.05	F(7,178) = 2.52, P < 0.05	1.15
Treatment is not priority, chaotic lifestyle	0.14 (0.30)	0.10 (0.19)	0.10 (0.37)	0.49* (0.20)	−0.18 (0.22)	0.10 (0.18)	−0.48** (0.18)	0.07, 0.03	F(7,178) = 1.93, P = 0.07	1.19
Daily association with people who use drugs	0.14 (0.29)	0.14 (0.19)	−0.28 (0.36)	0.25 (0.20)	−0.05 (0.21)	0.13 (0.18)	−0.42* (0.18)	0.06, 0.02	F(7,178) = 1.53, P = 0.16	1.17
Negative perception of OAT	0.34 (0.27)	−0.10 (0.17)	−0.35 (0.33)	0.21 (0.18)	−0.09 (0.20)	−0.30 (0.16)	−0.11 (0.16)	0.06, 0.02	F(7,178) = 1.48, P = 0.18	1.07
Distance	0.19 (0.26)	0.29 (0.17)	−0.15 (0.33)	0.33 (0.18)	0.10 (0.19)	0.28 (0.16)	−0.41* (0.16)	0.10, 0.06	F(7,178) = 2.80, P < 0.01	1.06
Worthlessness	0.001 (0.30)	0.09 (0.19)	−0.25 (0.37)	0.39 (0.20)	0.31 (0.22)	−0.24 (0.18)	−0.28 (0.18)	0.10, 0.06	F(7,178) = 2.79, P < 0.01	1.20
Fear of police	0.22 (0.27)	−0.12 (0.17)	−0.36 (0.33)	0.31 (0.18)	0.06 (0.20)	0.09 (0.16)	−0.38 (0.16)	0.06, 0.03	F(7,178) = 1.69, P = 0.11	1.07
Cultural issues	−0.09 (0.25)	−0.32* (0.16)	−0.65* (0.31)	0.35* (0.17)	0.05 (0.18)	0.18 (0.15)	−0.09 (0.15)	0.07, 0.04	F(7,178) = 2.02, P = 0.05	0.99

RMSE, root mean square error.

*P < 0.05; **P < 0.01; ***P < 0.001.

^ANon-binary to male non-significant for all barrier items.

reduced by system changes. This includes, increasing support services (especially psychological services; [Nielsen et al. 2015](#)), reducing stigma via community education and involvement ([Gidman and Coomber 2014](#)), increasing flexibility in the form of take away doses ([Treloar et al. 2007](#)), providing free treatment ([Kwiatkowski et al. 2000](#); [Booth et al. 2003](#)) and reducing wait list time for OAT through increased prescribers ([Fatseas and Auriacombe 2007](#)), which are all ways in which treatment uptake has been improved, and drug use reduced internationally and in treatment trials. Moreover, broader prescribing of the long-acting weekly or monthly buprenorphine injection in Australia, which has been listed on the pharmaceutical benefits scheme since 2020 ([Pharmaceutical Benefits Scheme 2022](#)) will help improve the flexibility and cost barriers, as a daily pick up and daily dispensing fee for medication will not be required ([Barnett et al. 2021](#)). In Australia, a 2017 study found that in New South Wales, the top 20% of prescribers treated 87% of OAT clients ([Jones et al. 2021](#)). This high-volume prescribing occurs at similar rates in other Australian states ([Australian Institute of Health and Welfare 2021b](#)), and creates questions surrounding psychological and social support that are given alongside OAT ([Jones et al. 2021](#)). Increasing the number of mid-volume OAT prescribers would help to improve the robustness of OAT prescribing, and reduce the 'lack of psychological services' barrier in Australia ([Jones et al. 2021](#)).

In terms of the regression analyses, when females were compared with males, two barrier items had significantly different mean values. These were 'lack of flexibility' and 'lack of culturally appropriate services'. 'Lack of flexibility' was identified as a more significant OAT issue in females compared with males. Although there is no direct evidence that females are required to attend doctors and pharmacies more often than males for their check-ups and OAT doses, the evidence suggests that opioid-dependent females may experience more severe mental ([Back et al. 2011](#); [McHugh et al. 2013](#); [Parlier-Ahmad et al. 2021](#)) and physical health compared with males ([Ross et al. 2005](#); [Back et al. 2011](#)). Furthermore, the literature demonstrates that females may experience more severe cravings than males, and are impacted more significant in family, employment and social functional addiction domains when compared with males ([Back et al. 2011](#); [McHugh et al. 2013](#)). The implications of this are that females are likely to require increased monitoring and assessment compared with males, and may be given less OAT take home doses, which would lead to 'lack of flexibility' being a more significant barrier in females versus males. Opioid-dependent women were also less likely to be employed than opioid-dependent males ([Back et al. 2011](#); [Bawor et al. 2015](#); [Parlier-Ahmad et al. 2021](#)), which could further add to the 'lack of flexibility' barrier, as employed people receive increased take home doses ([Health and Human Services Victoria 2020](#)) and, therefore, attend the OAT site less frequently. Treatment

barriers for females may be better addressed if social, family, employment and comorbidity factors are considered. Female-only group counselling sessions that focus not only on substance use, but also co-occurring psychological illness, family relationships, self-care, employment support and physical health had greater reduction in substance use ([Cummings et al. 2010](#); [Prendergast et al. 2011](#)), greater satisfaction with treatment ([Greenfield et al. 2007](#)) and reduced crime ([Niv and Hser 2007](#); [Prendergast et al. 2011](#)) compared with mixed gender approaches.

When comparing Likert scores of high opioid dependence versus low opioid dependence, there were seven barrier items that had larger mean Likert scores, indicating that these barrier items more significantly impact OAT uptake in those with high opioid dependence compared with low opioid dependence. The first of these was 'stigma'. This is consistent with the literature, where stigma was found to be greater in those with higher SDS scores and with past month depression ([Cama et al. 2016](#)). Furthermore, stigma has been linked to greater levels of psychological distress ([Chang et al. 2019](#); [Cheng et al. 2019](#)). Therefore, OUD treatments that address psychological distress are likely to improve stigma and, therefore, reduce stigma as a treatment barrier in the high opioid dependence group. 'Lack of flexibility' was the second item where the Likert mean value was larger in those with high dependence compared with those with low dependence. Greater dependence means more monitoring by health staff and less take away doses due to client instability and higher risk of OAT misuse ([Health and Human Services Victoria 2020](#)). Once stability is achieved, increasing flexibility by increasing take away doses improves treatment compliance, retention and treatment uptake ([Fatseas and Auriacombe 2007](#); [Treloar et al. 2007](#)). Reasons cited are feelings of normality, being trusted by healthcare providers, less travel, lower costs and improved work capacity ([Treloar et al. 2007](#)). 'Treatment being hard to access', 'distance' and 'difficult registration requirements' were all seen as barriers to OAT by those with higher dependence, but not by those with lower dependence.

The SDS and OWLS scores indicate dependence levels in individuals and, therefore, higher scores indicate higher dependence. One theory why those with higher opioid dependence scores may experience more barriers to OAT is because they may experience more fear that entering treatment may not adequately prevent withdrawal ([Pergolizzi et al. 2020](#)). Furthermore, individual withdrawal response is impacted by the opioid type, dosage, duration of use, physical health and psychological health ([Gossop et al. 1987](#)). The SDS score and OWLS evaluate opioid dependence by asking questions about drug use, and include questions, such as worry about opioid use and anxiety around missing doses (Supplementary Appendix 4; [Gossop et al. 1995](#); [González-Sáiz et al. 2009](#); [Nielsen et al. 2020](#)), meaning that a higher SDS score may contribute to higher withdrawal due

to worry, anxiety and worse psychological health when it comes to drug use (as measured by the SDS and OWLS; compared with lower dependence scores). This could potentially mean that people with higher dependence scores may experience more difficulty completing certain tasks or activities, including healthcare navigation, compared with lower dependence groups. Therefore, although it may not actually be harder to access, further to travel or more difficult to register for OAT in those with higher dependence, high levels of addiction and daily withdrawal worries can make everything harder. Hence, support networks, case managers and treatment centres that help with the logistical aspects of starting OAT are important, and need to be incorporated into opioid treatment systems.

This study had several limitations. First, the ranking method used was a Likert scale. Likert scales are simple to use and can give an idea of individual preference; however, no trade-off between choices needs to be made. This gives rise to several limitations and biases, such as social desirability bias, acquiescence bias and extreme response bias (Baumgartner and Steenkamp 2001; Lee et al. 2008), which may be present in our paper. Some of these biases could be resolved by using alternative techniques, such as the Best Worst Scaling technique (Lee et al. 2008; Louviere et al. 2015). Second, most of the survey participants lived in metropolitan Melbourne and, therefore, the results cannot be generalised to other parts of Australia, especially those living in rural regional areas. Third, this sample was an opportunistic sample with participants recruited via NSP sites and discussing a stigmatising issue, which means participation bias and responder bias may be present. Furthermore, the NSP sample does not reach people who do not engage with health services and, therefore, barriers may be significantly different in this population. Finally, although significant results were found when comparing barrier importance between females and non-binary and PO compared with heroin, the small sample size of these subgroups (non-binary = 13 and PO = 19) means caution is required when interpreting these results. Important future research to better understand the barriers to OAT in Australia would include mixed methods research, qualitative work to explore individuals' experiences and insights into OAT, and further quantitative analysis examining the effects that new treatments, such as OAT injectables, have on client barriers.

Conclusion

This paper identified barriers to OAT in an Australian population using two methods: the percentage of participants identifying the item as a barrier and the mean Likert score method. The barrier items with the largest mean Likert values and the highest percentage of participants in agreement that they were barriers were 'lack of support services', 'stigma' and

'lack of flexibility'. The barrier items with the smallest mean scores and the lowest percentage of participants in agreement that they were barriers were 'feelings of worthlessness', 'fear of police' and 'lack of culturally appropriate services'. Policies around improving support services, reducing stigma and increasing flexibility would be beneficial to further reduce barriers to OAT in an Australian context. Furthermore, this paper compared OAT barriers between various subgroups, and found that certain groups were more vulnerable to treatment barriers. These groups included females, high opioid dependence scores, age <40 years and those not currently on OAT. Better tailoring of opioid treatment programs, in particular OAT, to these specific populations is likely to encourage treatment uptake and treatment sustainability, and, therefore, improve functioning in these groups.

Supplementary material

Supplementary material is available [online](#).

References

- Australian Institute of Health and Welfare (2021b) National opioid pharmacotherapy statistics annual data collection – Table PRESCRIBER2: ratio of clients to prescriber, by prescriber type and state/territory, 2021 [Online]. (Australian Government: Canberra) Available at <https://www.aihw.gov.au/reports/other-drug-treatment-services/national-opioid-pharmacotherapy-statistics-2019/contents/prescribers> [Accessed 01/02/2023]
- Australian Institute of Health and Welfare (2022) National opioid pharmacotherapy statistics annual data collection [Online]. (AIHW: Canberra) Available at <https://www.aihw.gov.au/reports/other-drug-treatment-services/national-opioid-pharmacotherapy-statistics-2019/contents/dosing-points> [Accessed 05/04/2022]
- Back SE, Payne RL, Wahlquist AH, Carter RE, Stroud Z, Haynes L, Hillhouse M, Brady KT, Ling W (2011) Comparative profiles of men and women with opioid dependence: results from a national multisite effectiveness trial. *The American Journal of Drug and Alcohol Abuse* 37, 313–323. doi:10.3109/00952990.2011.596982
- Barnett A, Savic M, Lintzeris N, Bathish R, Arunogiri S, Dunlop AJ, Haber P, Graham R, Hayes V, Lubman DI (2021) Tracing the affordances of long-acting injectable depot buprenorphine: a qualitative study of patients' experiences in Australia. *Drug and Alcohol Dependence* 227, 108959. doi:10.1016/j.drugalcdep.2021.108959
- Baumgartner H, Steenkamp J-BEM (2001) Response styles in marketing research: a cross-national investigation. *Journal of Marketing Research* 38, 143. doi:10.1509/jmkr.38.2.143.18840
- Bawor M, Dennis BB, Bhalerao A, Plater C, Worster A, Varenbut M, Daiter J, Marsh DC, Desai D, Steiner M, Anglin R, Pare G, Thabane L, Samaan Z (2015) Sex differences in outcomes of methadone maintenance treatment for opioid use disorder: a systematic review and meta-analysis. *CMAJ Open* 3, E344–E351. doi:10.9778/cmajo.20140089
- Booth RE, Corsi KF, Mikulich SK (2003) Improving entry to methadone maintenance among out-of-treatment injection drug users. *Journal of Substance Abuse Treatment* 24, 305–311. doi:10.1016/S0740-5472(03)00038-2
- Cama E, Brenner L, Wilson H, von Hippel C (2016) Internalized stigma among people who inject drugs. *Substance Use & Misuse* 51, 1664–1668. doi:10.1080/10826084.2016.1188951
- Chang K-C, Lin C-Y, Chang C-C, Ting S-Y, Cheng C-M, Wang J-D (2019) Psychological distress mediated the effects of self-stigma on quality of life in opioid-dependent individuals: a cross-sectional study. *PLoS ONE* 14, e0211033. doi:10.1371/journal.pone.0211033

- Cheng C-M, Chang C-C, Wang J-D, Chang K-C, Ting S-Y, Lin C-Y (2019) Negative impacts of self-stigma on the quality of life of patients in methadone maintenance treatment: the mediated roles of psychological distress and social functioning. *International Journal of Environmental Research and Public Health* **16**, 1299. doi:10.3390/ijerph16071299
- Cummings AM, Gallop RJ, Greenfield SF (2010) Self-efficacy and substance use outcomes for women in single-gender versus mixed-gender group treatment. *Journal of Groups in Addiction & Recovery* **5**, 4–16. doi:10.1080/15560350903543915
- Darke S, Mills KL, Ross J, Teesson M (2011) Rates and correlates of mortality amongst heroin users: findings from the Australian Treatment Outcome Study (ATOS), 2001–2009. *Drug and Alcohol Dependence* **115**, 190–195. doi:10.1016/j.drugalcdep.2010.10.021
- Dean AJ, Saunders JB, Bell J (2011) Heroin use, dependence, and attitudes to treatment in non-treatment-seeking heroin users: a pilot study. *Substance Use & Misuse* **46**, 417–425. doi:10.3109/10826084.2010.501655
- Deering DEA, Sheridan J, Sellman JD, Adamson SJ, Pooley S, Robertson R, Henderson C (2011) Consumer and treatment provider perspectives on reducing barriers to opioid substitution treatment and improving treatment attractiveness. *Addictive Behaviors* **36**, 636–642. doi:10.1016/j.addbeh.2011.01.004
- Degenhardt L, Hall W (2012) Extent of illicit drug use and dependence, and their contribution to the global burden of disease. *The Lancet* **379**, 55–70. doi:10.1016/S0140-6736(11)61138-0
- Degenhardt L, Charlson F, Ferrari A, Santomauro D, Erskine H, Mantilla-Herrera A, Whiteford H, Leung J, Naghavi M, Griswold M, Rehm J, Hall W, Sartorius B, Scott J, Vollset SE, Knudsen AK, Haro JM, Patton G, Kopec J, Carvalho Malta D, Topor-Madry R, McGrath J, Haagsma J, Allebeck P, Phillips M, Salomon J, Hay S, Foreman K, Lim S, Mokdad A, Smith M, Gakidou E, Murray C, Vos T (2018) The global burden of disease attributable to alcohol and drug use in 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Psychiatry* **5**, 987–1012. doi:10.1016/S2215-0366(18)30337-7
- DeWees TA, Mazza GL, Golafshar MA, Dueck AC (2020) Investigation into the effects of using normal distribution theory methodology for Likert scale patient-reported outcome data from varying underlying distributions including floor/ceiling effects. *Value in Health* **23**, 625–631. doi:10.1016/j.jval.2020.01.007
- Ezard N, Lintzeris N, Odgers P, Koutroulis G, Muhleisen P, Stowe A, Lanagan A (1999) An evaluation of community methadone services in Victoria, Australia: results of a client survey. *Drug and Alcohol Review* **18**, 417–423. doi:10.1080/09595239996284
- Fatseas M, Auriacombe M (2007) Why buprenorphine is so successful in treating opiate addiction in France. *Current Psychiatry Reports* **9**, 358–364. doi:10.1007/s11920-007-0046-2
- Fullerton CA, Kim M, Thomas CP, Lyman DR, Montejano LB, Dougherty RH, Daniels AS, Ghose SS, Delphin-Rittmon ME (2014) Medication-assisted treatment with methadone: assessing the evidence. *Psychiatric Services* **65**, 146–157. doi:10.1176/appi.ps.201300235
- Gidman W, Coomber R (2014) Contested space in the pharmacy: public attitudes to pharmacy harm reduction services in the West of Scotland. *Research in Social and Administrative Pharmacy* **10**, 576–587. doi:10.1016/j.sapharm.2013.07.006
- González-Sáiz F, Domingo-Salvay A, Barrio G, Sánchez-Niubó A, Brugal MT, De La Fuente L, Alonso J (2009) Severity of dependence scale as a diagnostic tool for heroin and cocaine dependence. *European Addiction Research* **15**, 87–93. doi:10.1159/000189787
- Gossop M, Bradley B, Phillips GT (1987) An investigation of withdrawal symptoms shown by opiate addicts during and subsequent to a 21-day in-patient methadone detoxification procedure. *Addictive Behaviors* **12**, 1–6. doi:10.1016/0306-4603(87)90002-5
- Gossop M, Darke S, Griffiths P, Hando J, Powis B, Hall W, Strang J (1995) The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction* **90**, 607–614. doi:10.1046/j.1360-0443.1995.9056072.x
- Gourlay J, Ricciardelli L, Ridge D (2005) Users' experiences of heroin and methadone treatment. *Substance Use & Misuse* **40**, 1875–1882. doi:10.1080/10826080500259497
- Greenfield SF, Trucco EM, McHugh RK, Lincoln M, Gallop RJ (2007) The women's recovery group study: a stage I trial of women-focused group therapy for substance use disorders versus mixed-gender group drug counseling. *Drug and Alcohol Dependence* **90**, 39–47. doi:10.1016/j.drugalcdep.2007.02.009
- Haffajee RL, Andraka-Christou B, Attermann J, Cupito A, Buche J, Beck AJ (2020) A mixed-method comparison of physician-reported beliefs about and barriers to treatment with medications for opioid use disorder. *Substance Abuse Treatment, Prevention, and Policy* **15**, 69. doi:10.1186/s13011-020-00312-3
- Hall NY, Le L, Majmudar I, Mihalopoulos C (2021) Barriers to accessing opioid substitution treatment for opioid use disorder: a systematic review from the client perspective. *Drug and Alcohol Dependence* **221**, 108651. doi:10.1016/j.drugalcdep.2021.108651
- Health and Human Services Victoria (2020) Policy for maintenance pharmacotherapy for opioid dependence. Available at <https://www.health.vic.gov.au/publications/policy-for-maintenance-pharmacotherapy-for-opioid-dependence> [Accessed 1/03/2023]
- Jamieson S (2004) Likert scales: how to (ab)use them. *Medical Education* **38**, 1217–1218. doi:10.1111/j.1365-2929.2004.02012.x
- Jones CM, McCance-Katz EF (2019) Co-occurring substance use and mental disorders among adults with opioid use disorder. *Drug and Alcohol Dependence* **197**, 78–82. doi:10.1016/j.drugalcdep.2018.12.030
- Jones NR, Nielsen S, Farrell M, Ali R, Gill A, Larney S, Degenhardt L (2021) Retention of opioid agonist treatment prescribers across New South Wales, Australia, 2001–2018: implications for treatment systems and potential impact on client outcomes. *Drug and Alcohol Dependence* **219**, 108464. doi:10.1016/j.drugalcdep.2020.108464
- Knapp TR (1990) Treating ordinal scales as interval scales: an attempt to resolve the controversy. *Nursing Research* **39**, 121–123. doi:10.1097/00006199-199003000-00019
- Kwiatkowski CF, Booth RE, Lloyd LV (2000) The effects of offering free treatment to street-recruited opioid injectors. *Addiction (Abingdon, England)* **95**, 697–704. doi:10.1046/j.1360-0443.2000.9556975.x
- Lee JA, Soutar G, Louviere J (2008) The best–worst scaling approach: an alternative to Schwartz's values survey. *Journal of Personality Assessment* **90**, 335–347. doi:10.1080/00223890802107925
- Louviere JJ, Flynn TN, Marley AAJ (2015) 'Best-worst scaling: theory, methods and applications.' (Cambridge University Press)
- Madden A, Lea T, Bath N, Winstock AR (2008) Satisfaction guaranteed? What clients on methadone and buprenorphine think about their treatment. *Drug and Alcohol Review* **27**, 671–678. doi:10.1080/09595230801935706
- Mathers BM, Degenhardt L, Phillips B, Wiessing L, Hickman M, Strathdee SA, Wodak A, Panda S, Tyndall M, Toufik A, Mattick RP (2008) Global epidemiology of injecting drug use and HIV among people who inject drugs: a systematic review. *The Lancet* **372**, 1733–1745. doi:10.1016/S0140-6736(08)61311-2
- Mathers BM, Degenhardt L, Ali H, Wiessing L, Hickman M, Mattick RP, Myers B, Ambekar A, Strathdee SA (2010) HIV prevention, treatment, and care services for people who inject drugs: a systematic review of global, regional, and national coverage. *The Lancet* **375**, 1014–1028. doi:10.1016/S0140-6736(10)60232-2
- McHugh RK, DeVito EE, Dodd D, Carroll KM, Potter JS, Greenfield SF, Connery HS, Weiss RD (2013) Gender differences in a clinical trial for prescription opioid dependence. *Journal of Substance Abuse Treatment* **45**, 38–43. doi:10.1016/j.jsat.2012.12.007
- Muthulingam D, Bia J, Madden LM, Farnum SO, Barry DT, Altice FL (2019) Using nominal group technique to identify barriers, facilitators, and preferences among patients seeking treatment for opioid use disorder: a needs assessment for decision making support. *Journal of Substance Abuse Treatment* **100**, 18–28. doi:10.1016/j.jsat.2019.01.019
- Nelson PK, Mathers BM, Cowie B, Hagan H, Des Jarlais D, Horyniak D, Degenhardt L (2011) Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: results of systematic reviews. *The Lancet* **378**, 571–583. doi:10.1016/S0140-6736(11)61097-0
- Nielsen S, Hillhouse M, Mooney L, Ang A, Ling W (2015) Buprenorphine pharmacotherapy and behavioral treatment: comparison of outcomes among prescription opioid users, heroin users and combination users. *Journal of Substance Abuse Treatment* **48**, 70–76. doi:10.1016/j.jsat.2014.06.006

- Nielsen S, Picco L, Campbell G, Lintzeris N, Larance B, Farrell M, Degenhardt L, Bruno R (2020) Development of a brief patient-administered screening tool for prescription opioid dependence for primary care settings. *Pain Medicine* **21**, e79–e88. doi:10.1093/pm/pnz213
- Niv N, Hser Y-I (2007) Women-only and mixed-gender drug abuse treatment programs: Service needs, utilization and outcomes. *Drug and Alcohol Dependence* **87**, 194–201. doi:10.1016/j.drugalcdep.2006.08.017
- Norman G (2010) Likert scales, levels of measurement and the “laws” of statistics. *Advances in Health Sciences Education* **15**, 625–632. doi:10.1007/s10459-010-9222-y
- North Richmond Community Health (2022) Medically supervised injecting room [Online]. (North Richmond Community Health: Melbourne) Available at <https://nrch.com.au/services/medically-supervised-injecting-room/> [Accessed 10/02/2022]
- Parlier-Ahmad AB, Martin CE, Radic M, Svikis DS (2021) An exploratory study of sex and gender differences in demographic, psychosocial, clinical, and substance use treatment characteristics of patients in outpatient opioid use disorder treatment with buprenorphine. *Translational Issues in Psychological Science* **7**, 141–153. doi:10.1037/tps0000250
- Pergolizzi JV Jr., Raffa RB, Rosenblatt MH (2020) Opioid withdrawal symptoms, a consequence of chronic opioid use and opioid use disorder: current understanding and approaches to management. *Journal of Clinical Pharmacy and Therapeutics* **45**, 892–903. doi:10.1111/jcpt.13114
- Pharmaceutical Benefits Scheme (2022) PBS Schedule search for “buprenorphine” [Online]. (Department of Health: Canberra) Available at <https://www.pbs.gov.au/pbs/search?term=buprenorphine&search-type=medicines&analyse=false> [Accessed 30/03/2022]
- Prendergast ML, Messina NP, Hall EA, Warda US (2011) The relative effectiveness of women-only and mixed-gender treatment for substance-abusing women. *Journal of Substance Abuse Treatment* **40**, 336–348. doi:10.1016/j.jsat.2010.12.001
- Ross J, Teesson M, Darke S, Lynskey M, Ali R, Ritter A, Cooke R (2005) The characteristics of heroin users entering treatment: findings from the Australian treatment outcome study (ATOS). *Drug and Alcohol Review* **24**, 411–418. doi:10.1080/09595230500286039
- Saunders SM, Zygowicz KM, D’Angelo BR (2006) Person-related and treatment-related barriers to alcohol treatment. *Journal of Substance Abuse Treatment* **30**, 261–270. doi:10.1016/j.jsat.2006.01.003
- Sordo L, Barrio G, Bravo MJ, Indave BI, Degenhardt L, Wiessing L, Ferri M, Pastor-Barriuso R (2017) Mortality risk during and after opioid substitution treatment: systematic review and meta-analysis of cohort studies. *BMJ* **357**, j1550. doi:10.1136/bmj.j1550
- Tran BX, Nguyen LT (2013) Impact of methadone maintenance on health utility, health care utilization and expenditure in drug users with HIV/AIDS. *International Journal of Drug Policy* **24**, e105–e110. doi:10.1016/j.drugpo.2013.07.007
- Treloar C, Fraser S, Valentine K (2007) Valuing methadone takeaway doses: the contribution of service-user perspectives to policy and practice. *Drugs: Education, Prevention and Policy* **14**, 61–74. doi:10.1080/09687630600997527
- United Nations Office on Drugs and Crime (2008) Drug policy and results in Australia. Available at https://www.unodc.org/documents/data-and-analysis/Studies/Drug_Policy_Australia_Oct2008.pdf [Accessed 1/03/2023]
- University of California, Los Angeles (2021) Chapter 2 – Regression diagnostics. In ‘Regression with Stata’ [Online]. (UCLA: Los Angeles). Available at <https://stats.oarc.ucla.edu/stata/webbooks/reg/chapter2/stata-webbooksregressionwith-statachapter-2-regression-diagnostics/> [Accessed 15/03/2023]
- Winkelman TNA, Chang VW, Binswanger IA (2018) Health, polysubstance use, and criminal justice involvement among adults with varying levels of opioid use. *JAMA Network Open* **1**, e180558. doi:10.1001/jamanetworkopen.2018.0558

Data availability. The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Conflicts of interest. The authors declare that they have no conflicts of interest.

Declaration of funding. No funding or financial support was received for this study.

Author contributions. Each author, Natasha Hall, Long Le, Julie Abimanyi-Ochom, Maree Teesson and Cathy Mihalopoulos, certifies that their contribution to this work meets the standards of the International Committee of Medical Journal Editors.

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