

## Non-medical prescription opioid injection in a sample of Australians who regularly inject drugs: Are there differences by gender and age?

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### Key findings



There was no statistically significant difference between males and females in past 6-month injection of 'any' non-prescribed opioids.



Younger age and past 12 month mental health problems were associated with recent non-prescribed injecting of opioids among people who use heroin.

### Introduction

In Australia, opioid-related deaths increased from 2.1 deaths per 100,000 people in 2006 to a peak of 5.7 deaths per 100,000 people in 2017; more recent estimates for 2018-2020 are subject to revision (1). Most of these opioid-related deaths are unintentional (1). In 2020, the majority of unintentional opioid-related deaths in Australia involved heroin (49%), followed by natural and semi-synthetic opioids (e.g., codeine, morphine, oxycodone; 32%), methadone (21%), and synthetic opioids (e.g., fentanyl, pethidine, tramadol; 19%) in 2019 (1).

Non-medical prescription opioid use (NMPOU) refers to the use of a pharmaceutical opioid outside the bounds of a doctor's prescription (e.g., using more than prescribed or via a route of administration other than as prescribed). In Australia, NMPOU continues to be an issue, with 2.7% of Australian adults aged 14+ reporting non-medical use of painkillers/opioids in the past 12 months in 2019 (2). It has been estimated that as a group, 51% of unintentional opioid-induced deaths in Australia during 2020 were due to pharmaceutical opioids, with no other opioids (e.g., heroin) identified (1).

While there is an increasing body of research about the gender differences in NMPOU (3-6), there are some discrepancies in the literature. For instance, while some studies suggest that there are no differences in terms of engagement in NMPOU between males and females (3), others suggest that the frequency of NMPOU is more likely among males than females (5), or among females than males (6).

## Introduction cont.

Early research on the age-related differences in NMPOU found that young adults were more likely to engage in NMPOU than older adults (7-8). However, little is known about age differences related to injecting non-medical prescription opioids in Australia among recent samples of people who inject drugs (PWID).

Determining the gender and age-related differences might contribute to the implementation specific education programs targeting those who are more likely to inject these substances in order to reduce harms related to NMPOU.

In a previous work, we investigated gender differences in injecting risk behaviours and injection-related health problems in a sample of people residing in Perth, Western Australia, who inject drugs (9). This bulletin builds on that by i) examining the gender and age differences in injecting non-prescribed opioids among a recent group of PWID surveyed in Australia in 2021; and ii) identifying sociodemographic and mental health factors associated with injecting non-prescribed opioids.

## Method

Data were obtained from the 2021 IDRS national survey. The IDRS is an ongoing illicit drug monitoring system conducted in all states and territories of Australia since 2000. The aim of the IDRS is to monitor the use, market features, and harms of illicit drugs in Australia. The results of the IDRS are not representative of all PWID in the general population, as they are issued from a non-randomly selected sentinel population of people who regularly inject drugs.

A total sample of 888 PWID were recruited nationally across all Australian capital cities between June and July 2021. Participants were recruited through advertisements in needle and syringe programs and peer referral. To be eligible, participants had to be at least 18 years of age, have injected at least monthly during the preceding six months of the interview, and had to be residing in the capital city in which they were interviewed for the past 12 months.

Participants were administered a structured questionnaire face-to-face or via phone that assessed a variety of topics including participants' socio-demographic characteristics, patterns of drug consumption, price, perceived purity, and availability of drugs, as well as drug-related harms and other risk factors. Participants were reimbursed \$40 for their time.

For the purpose of this bulletin, we examined a series of survey questions related to the injecting use of non-prescribed opioids in the 2021 national IDRS sample. With respect to age and gender, participants were asked their current age and which category best describes their current gender identity: male, female, non-binary/gender fluid, or different identity. Full details of the [methods for the 2021 annual interviews](#) are available for download.

## Results

Participants were aged 18 to 71 years with a mean age of 45 (SD=10). The majority of participants were male (65%) and identified as heterosexual/straight (82%). More than half of participants had obtained a trade/technical/university qualification (58%) and lived in their own home/flat/rental accommodation (66%). The majority of the sample were unemployed (88%), and on government pension, allowance or benefit (95%). The median weekly income was \$358 (IQR \$300 to \$460) per week. Please refer to the [2021 National IDRS report](#) report for more information on the national sample.

Due to the lower number of participants having reported being currently non-binary/gender fluid (1%, n=4) or other (0%, n=0), participants from this group were excluded from the subsequent analyses. Table 1 illustrates the injection of non-prescribed opioids in the past 6 months among women and men from the 2021 national IDRS sample. Chi-square tests for independence with Yates Continuity Correction revealed that there were no significant differences between males and females in terms of injecting any pharmaceutical opioid, or in injecting the following specific opioids: methadone syrup; methadone tablets; buprenorphine tablets; buprenorphine-naloxone; oxycodone-naloxone; morphine; and fentanyl.

Moreover, Fisher's exact test revealed that there were no significant differences by gender in terms of injecting non-prescribed generic oxycodone; tamper-resistant oxycodone; oxycodone-naloxone; and tramadol.

No participants reported having injected any codeine, non-prescribed tapentadol, as well as any other non-prescribed opioids and consequently no statistics were computed.

## Results

**Table 1. Past six months injection of non-prescribed opioids among males and females from the 2021 national sample.**

|  | Males      | Females    | <i>p</i> |
|--|------------|------------|----------|
| <b>% Injected non-prescribed methadone syrup</b>   |            |            |          |
| Yes  | 9 (n=49)   | 6 (n=20)   | 0.260    |
| No   | 91 (n=519) | 94 (n=299) |          |
| <b>% Injected non-prescribed methadone tablets (e.g., Physeptone®)</b>                   |            |            |          |
| Yes  | 2 (n=11)   | -          | 0.894    |
| No   | 98 (n=557) | 98 (n=314) |          |
| <b>% Injected non-prescribed buprenorphine tablets (e.g., Subutex®)</b>                  |            |            |          |
| Yes  | 5 (n=28)   | 6 (n=20)   | 0.489    |
| No   | 95 (n=540) | 94 (n=299) |          |
| <b>% Injected non-prescribed buprenorphine-naloxone (Suboxone® Film)</b>                 |            |            |          |
| Yes  | 5 (n=30)   | 4 (n=13)   | 0.522    |
| No   | 95 (n=538) | 96 (n=306) |          |
| <b>% Injected non-prescribed oxycodone (generic oxycodone) (Sandoz® and Novacodone®)</b> |            |            |          |
| Yes  | 3 (n=17)   | -          | 0.160    |
| No   | 97 (n=551) | 99 (n=315) |          |

Note. <sup>a</sup>Fisher's Exact Test has been applied, as there was a violation of the Chi-Square minimum expected cell frequency assumption. <sup>b</sup>No statistics were computed because it is a constant. – Values suppressed due to small cell size (n≤5 but not 0).

**Results cont.**

|   | Males       | Females     | <i>p</i>           |
|---|-------------|-------------|--------------------|
| <b>% Injected non-prescribed tamper-resistant oxycodone (OxyContin®)</b>        |             |             |                    |
| Yes   | 2 (n=12)    | -           | 0.155              |
| No  | 98 (n=556)  | 99 (n=317)  |                    |
| <b>% Injected non-prescribed oxycodone- naloxone (Targin®)</b>                  |             |             |                    |
| Yes   | -           | -           | 1.000 <sup>a</sup> |
| No  | 100 (n=566) | 100 (n=318) |                    |
| <b>% Injected non-prescribed oxycodone- naloxone) (e.g., Endone®; OxyNorm®)</b> |             |             |                    |
| Yes   | 2 (n=11)    | -           | 0.627              |
| No  | 98 (n=557)  | 99 (n=315)  |                    |
| <b>% Injected non-prescribed morphine) (MsContin®; Kapanol®)</b>                |             |             |                    |
| Yes   | 16 (n=88)   | 14 (n=45)   | 0.648              |
| No  | 85 (n=480)  | 86 (n=274)  |                    |
| <b>% Injected non-prescribed fentanyl (e.g., Durogesic® patches)</b>            |             |             |                    |
| Yes   | 6 (n=33)    | 5 (n=16)    | 0.739              |
| No  | 94 (n=535)  | 95 (n=302)  |                    |
| <b>% Injected non-prescribed codeine</b>  |             |             |                    |
| Yes   | 0 (n=0)     | 0 (n=0)     | NA <sup>b</sup>    |
| No  | 100 (n=568) | 100 (n=318) |                    |

Note. <sup>a</sup>Fisher's Exact Test has been applied, as there was a violation of the Chi-Square minimum expected cell frequency assumption. <sup>b</sup>No statistics were computed because it is a constant. – Values suppressed due to small cell size (n≤5 but not 0).

## Results cont.

|  | Males       | Females     | <i>p</i>           |
|--|-------------|-------------|--------------------|
| <b>% Injected non-prescribed tapentadol (e.g., Palexia®)</b> |             |             |                    |
| Yes  | 0 (n=0)     | 0 (n=0)     | NA <sup>b</sup>    |
| No   | 100 (n=568) | 100 (n=318) |                    |
| <b>% Injected non-prescribed tramadol (e.g., Tramal®)</b>    |             |             |                    |
| Yes  | -           | -           | 0.356 <sup>a</sup> |
| No   | 100 (n=566) | 99 (n=315)  |                    |
| <b>% Injected any other non-prescribed opioids</b>           |             |             |                    |
| Yes  | 0 (n=0)     | 0 (n=0)     | NA <sup>b</sup>    |
| No   | 100 (n=568) | 100 (n=318) |                    |
| <b>% Injected any non-prescribed opioids</b>                 |             |             |                    |
| Yes  | 31 (n=178)  | 28 (n=88)   | 0.287              |
| No   | 69 (n=390)  | 72 (n=230)  |                    |

Note. <sup>a</sup>Fisher's Exact Test has been applied, as there was a violation of the Chi-Square minimum expected cell frequency assumption. <sup>b</sup>No statistics were computed because it is a constant. – Values suppressed due to small cell size (n≤5 but not 0).

Past six month injection of non-prescribed opioids among various age groups is illustrated in Table 2. Fisher's exact test revealed that there were statistically significant differences between age groups in terms of injection of non-prescribed buprenorphine tablets; buprenorphine-naloxone and tamper-resistant oxycodone.

However, there were no significant differences between age groups in terms of injecting any non-prescribed opioid, or the following specific opioid types: methadone syrup; methadone tablets; tamper-resistant oxycodone; oxycodone-naloxone; oxycodone-naloxone; morphine; fentanyl; and tramadol.

No participants reported having injected any codeine, tapentadol, as well as any other non-prescribed opioids, and consequently no statistics were computed.

**Table 2. Past six months injection of non-prescribed opioids among age groups from the 2021 national sample.**

|  | 18-25 years   | 26-34 years   | 35-49 years   | 50+ years     | <i>p</i>             | Total sample  |
|--|---------------|---------------|---------------|---------------|----------------------|---------------|
| <b>% Injected non-prescribed methadone syrup</b>                         |               |               |               |               |                      |               |
| Yes  | -             | -             | 9<br>(n=45)   | 6<br>(n=17)   | 0.066 <sup>a</sup>   | 8<br>(n=69)   |
| No   | 86<br>(n=19)  | 96<br>(n=108) | 91<br>(n=433) | 94<br>(n=259) |                      | 92<br>(n=819) |
| <b>% Injected non-prescribed methadone tablets (e.g., Physeptone®)</b>   |               |               |               |               |                      |               |
| Yes  | 0<br>(n=0)    | -             | 2<br>(n=9)    | 2<br>(n=6)    | 0.848 <sup>a</sup>   | 2<br>(n=16)   |
| No   | 100<br>(n=22) | 99<br>(n=111) | 98<br>(n=469) | 98<br>(n=270) |                      | 98<br>(n=872) |
| <b>% Injected non-prescribed buprenorphine tablets (e.g., Subutex®)</b>  |               |               |               |               |                      |               |
| Yes  | -             | 6<br>(n=7)    | 7<br>(n=34)   | -             | 0.001 <sup>**a</sup> | 5<br>(n=48)   |
| No   | 86<br>(n=19)  | 94<br>(n=105) | 93<br>(n=444) | 99<br>(n=272) |                      | 95<br>(n=840) |
| <b>% Injected non-prescribed buprenorphine-naloxone (Suboxone® Film)</b> |               |               |               |               |                      |               |
| Yes  | -             | 5<br>(n=6)    | 6<br>(n=27)   | 2<br>(n=6)    | 0.006 <sup>**a</sup> | 5<br>(n=43)   |
| No   | 82<br>(n=18)  | 95<br>(n=106) | 94<br>(n=451) | 98<br>(n=270) |                      | 95<br>(n=845) |

Note. <sup>a</sup>Fisher's Exact Test has been applied, as there was a violation of the Chi-Square minimum expected cell frequency assumption. <sup>b</sup>No statistics were computed because it is a constant. – Values suppressed due to small cell size (n≤5 but not 0). Note. *p*<0.05\*; *p*<0.01\*\*

**Results cont.**

|  | 18-25 years   | 26-34 years    | 35-49 years    | 50+ years      | <i>p</i>               | Total sample   |
|--|---------------|----------------|----------------|----------------|------------------------|----------------|
| <b>% Injected non-prescribed oxycodone (generic oxycodone) (Sandoz® and Novacodone®)</b> |               |                |                |                |                        |                |
| Yes  | -             | -              | 3<br>(n=15)    | -              | 0.028*<br><sup>a</sup> | 2<br>(n=21)    |
| No   | 91<br>(n=20)  | 98<br>(n=110)  | 97<br>(n=463)  | 99<br>(n=274)  |                        | 98<br>(n=867)  |
| <b>% Injected non-prescribed tamper-resistant oxycodone (OxyContin®)</b>                 |               |                |                |                |                        |                |
| Yes  | 0<br>(n=0)    | 0<br>(n=0)     | 3<br>(n=12)    | -              | 0.144 <sup>a</sup>     | 2<br>(n=14)    |
| No   | 100<br>(n=22) | 100<br>(n=112) | 98<br>(n=466)  | 99<br>(n=274)  |                        | 98<br>(n=874)  |
| <b>% Injected non-prescribed oxycodone- naloxone (Targin®)</b>                           |               |                |                |                |                        |                |
| Yes  | 0<br>(n=0)    | -              | -              | 0<br>(n=0)     | 0.291 <sup>a</sup>     | -              |
| No   | 100<br>(n=22) | 99<br>(n=111)  | 100<br>(n=476) | 100<br>(n=276) |                        | 100<br>(n=885) |
| <b>% Injected other non-prescribed oxycodone- naloxone (e.g., Endone®; OxyNorm®)</b>     |               |                |                |                |                        |                |
| Yes  | 0<br>(n=0)    | -              | 2<br>(n=9)     | -              | 0.913 <sup>a</sup>     | 2<br>(n=15)    |
| No   | 100<br>(n=22) | 99<br>(n=111)  | 98<br>(n=469)  | 98<br>(n=271)  |                        | 98<br>(n=873)  |

Note. <sup>a</sup>Fisher's Exact Test has been applied, as there was a violation of the Chi-Square minimum expected cell frequency assumption. <sup>b</sup>No statistics were computed because it is a constant. – Values suppressed due to small cell size (n≤5 but not 0). Note. *p*<0.05\*; *p*<0.01\*\*



**Results cont.**

|  | 18-25 years | 26-34 years | 35-49 years | 50+ years   | <i>p</i>           | Total sample |
|--|-------------|-------------|-------------|-------------|--------------------|--------------|
| <b>% Injected non-prescribed morphine) (MsContin®; Kapanol®)</b>     |             |             |             |             |                    |              |
| Yes  | -           | 13 (n=15)   | 16 (n=78)   | 14 (n=38)   | 0.699 <sup>a</sup> | 15 (n=133)   |
| No   | 91 (n=20)   | 87 (n=97)   | 84 (n=400)  | 86 (n=238)  |                    | 85 (n=755)   |
| <b>% Injected non-prescribed fentanyl (e.g., Durogesic® patches)</b> |             |             |             |             |                    |              |
| Yes  | -           | 6 (n=7)     | 6 (n=26)    | 4 (n=12)    | 0.086 <sup>a</sup> | 6 (n=49)     |
| No   | 82 (n=18)   | 94 (n=105)  | 95 (n=451)  | 96 (n=264)  |                    | 94 (n=838)   |
| <b>% Injected non-prescribed codeine</b>                             |             |             |             |             |                    |              |
| Yes  | 0 (n=0)     | 0 (n=0)     | 0 (n=0)     | 0 (n=0)     | NA <sup>b</sup>    | 0 (n=0)      |
| No   | 100 (n=22)  | 100 (n=112) | 100 (n=477) | 100 (n=276) |                    | 100 (n=887)  |
| <b>% Injected non-prescribed tapentadol (e.g., Palexia®)</b>         |             |             |             |             |                    |              |
| Yes  | 0 (n=0)     | 0 (n=0)     | 0 (n=0)     | 0 (n=0)     | NA <sup>b</sup>    | 0 (n=0)      |
| No   | 100 (n=22)  | 100 (n=112) | 100 (n=477) | 100 (n=276) |                    | 100 (n=887)  |

Note. <sup>a</sup>Fisher's Exact Test has been applied, as there was a violation of the Chi-Square minimum expected cell frequency assumption. <sup>b</sup>No statistics were computed because it is a constant. – Values suppressed due to small cell size (n≤5 but not 0). Note. *p*<0.05\*; *p*<0.01\*\*

### Results cont.

|   | 18-25 years   | 26-34 years    | 35-49 years    | 50+ years      | <i>p</i>           | Total sample   |
|---|---------------|----------------|----------------|----------------|--------------------|----------------|
| <b>% Injected non-prescribed tramadol (e.g., Tramal®)</b> |               |                |                |                |                    |                |
| Yes   | -             | -              | -              | -              | 0.075 <sup>a</sup> | -              |
| No  | 96<br>(n=21)  | 99<br>(n=111)  | 100<br>(n=476) | 99<br>(n=274)  |                    | 99<br>(n=882)  |
| <b>% Injected any other non-prescribed opioids</b>        |               |                |                |                |                    |                |
| Yes   | 0<br>(n=0)    | 0<br>(n=0)     | 0<br>(n=0)     | 0<br>(n=0)     | NA <sup>b</sup>    | 0<br>(n=0)     |
| No  | 100<br>(n=22) | 100<br>(n=112) | 100<br>(n=477) | 100<br>(n=276) |                    | 100<br>(n=887) |
| <b>% Injected any non-prescribed opioids</b>              |               |                |                |                |                    |                |
| Yes   | 32<br>(n=7)   | 25<br>(n=28)   | 34<br>(n=160)  | 26<br>(n=71)   | 0.085              | 30<br>(n=266)  |
| No  | 68<br>(n=15)  | 75<br>(n=84)   | 67<br>(n=317)  | 74<br>(n=205)  |                    | 70<br>(n=621)  |

Note. <sup>a</sup>Fisher's Exact Test has been applied, as there was a violation of the Chi-Square minimum expected cell frequency assumption. <sup>b</sup>No statistics were computed because it is a constant. – Values suppressed due to small cell size (n≤5 but not 0). Note. *p*<0.05\*; *p*<0.01\*\*

Three multivariable logistic regressions were performed to assess the relationship between a number of factors (age, gender, employment status, living arrangements, mental health problems in the last 6 months, use of heroin in the last 6 months) and reporting of injecting non-prescribed buprenorphine tablets (see Appendix A, table 4), buprenorphine-naloxone (see Appendix B, table 5), as well as generic oxycodone (see Appendix C, table 6) among the 2021 national sample. Potential explanatory variables were selected based on the literature. Unsurprisingly, these found, consistent with the strong association between NMPOU and heroin use in the literature (10-11), that heroin use in the last 6 months was a significant factor associated with injection use of non-prescribed generic oxycodone (see Appendix C, Table 6).

As a result, a second multivariable logistic regression was performed only on those participants who had used heroin in the last 6 months (n=444). In order to provide adequate cell size and mitigate standard error, the dependent variable was injection of any nonprescribed opioids (i.e., those detailed earlier) in the past 6 months.

## Results cont.

When controlling for other factors, age, mental health problems in the last 6 months, as well as the interaction between age, gender and mental health problems were the only factors significantly associated with reporting that they had injected non-prescribed opioids (Table 3). Older adults were less likely to report having injected non-prescribed opioids than younger adults. People who had mental health problems in the last 6 months were more likely to report having injected non-prescribed opioids than those who had no mental health problems.

**Table 3. Factors associated with injection of non-prescribed opioids among the participants who reported heroin use in the last 6 months in the 2021 national sample.**

|   | % sample   | Odds Ratio | 95% CI    | <i>p</i> |
|---|------------|------------|-----------|----------|
| <b>Age (mean=45;SD=10)</b>  | -          | 0.97       | 0.95-1.00 | 0.025*   |
| <b>Gender</b>   |            |            |           |          |
| Female  | 36 (n=161) | -          | -         | -        |
| Male  | 64 (n=282) | 0.67       | 0.38-1.19 | 0.169    |
| <b>Employment Status</b>  |            |            |           |          |
| Unemployed  | 89 (n=397) | -          | -         | -        |
| Full time   | 2 (n=9)    | 0.62       | 0.12-3.12 | 0.559    |
| Part time/casual  | 6 (n=25)   | 1.24       | 0.52-2.93 | 0.632    |
| Other   | 3 (n=13)   | 1.62       | 0.49-5.38 | 0.431    |
| <b>Living arrangements</b>  |            |            |           |          |
| Own house/flat  | 65 (n=286) | -          | -         | -        |
| Parents/ family house   | 5 (n=23)   | 1.54       | 0.61-3.88 | 0.356    |
| Boarding house/ hostel  | 26 (n=115) | 0.88       | 0.54-1.44 | 0.606    |
| Other   | 4 (n=19)   | 0.38       | 0.11-1.38 | 0.142    |
| <b>Mental health problems in the last 6 months</b>                |            |            |           |          |
| No  | 53 (n=230) | -          | -         | -        |
| Yes   | 47 (n=206) | 0.41       | 0.20-0.81 | 0.011*   |
| <b>Age x Gender x Mental health problems in the last 6 months</b> | -          | 1.02       | 1.00-1.04 | 0.033*   |

Note. *p*<0.05\*

## Discussion

This bulletin has examined the gender and age differences in injecting non-prescribed prescription opioids among a group of 888 PWID interviewed across all capital cities in Australia.

Univariate analyses indicated that there were no statistically significant gender differences among the 2021 national sample in terms of injecting non-medical prescription opioids. However, there were significant age group differences in terms of injecting non-prescribed buprenorphine tablets (e.g., Subutex®), buprenorphine-naloxone (Suboxone® Film), as well as generic oxycodone (Sandoz® and Novacodone®). In addition, multivariable analysis limited to participants who had used heroin in the last 6 months found that when controlling for potential confounding factors, age was also significantly associated with injection of non-prescribed opioids. Indeed, older adults were less likely to report having injected non-prescribed opioids than younger adults.

These results are consistent with existing international data. For example, a systematic review and meta-analysis on risk factors for NMPOU found that young adults were twice as more likely to engage in NMPOU than older adults, while younger-opioid naive people were five times more likely to engage in NMPOU in comparison to their older counterparts (7). Similarly, another study found that participants aged between 18 and 34 years old were more likely to report NMPOU in the last year than older age groups (8). More specifically, 7.1% of participants aged between 26 and 34 reported NMPOU in the past year, followed by 6.9% of participants aged 18 to 25, 4.4% aged between 35 and 49, and 2.4% aged 50 and older (8). These results are in line with our study which found that the majority of participants who injected non-prescribed buprenorphine tablets (e.g., Subutex), buprenorphine-naloxone (Suboxone Film), and oxycodone (generic oxycodone) (Sandoz® and Novacodone®) were aged 18-25, with respectively 14%, 18%, and 9%. Similarly, a prospective cohort study found that NMPOU among younger cohorts was significantly associated with younger age (9). Nevertheless, there was a similar proportion of younger and older participants reporting NMPOU over the study period (2013-2015), with 40% and 35% respectively (10).

There are a few potential explanations for these results. Young adults might be less informed about the risks and harms associated with NMPOU than older adults, which might increase their higher exposure to those substances (12). For instance, previous research found that US youth aged 14-24 years believed that prescribed opioid medications were safer than non-prescribed medications (13). Ease of access to prescription drugs from family members and friends might also account for this age difference (14), although noting much of this research is based on data from North America where rates of NMPOU are higher.

Furthermore, among people who had recently used heroin, after controlling for potential confounding factors, mental health in the last 6 months was significantly associated with injecting non-prescribed opioids. These results are in line with a recent systematic review which examined the associations between NMPOU and general health outcomes

## Discussion cont.

and found that a large body of evidence reported significant associations between engaging in NMPOU and mood disorders (e.g., depression, general anxiety disorders, post-traumatic stress disorders, panic and phobia) (15). A recent Australian study also found that NMPOU was significantly associated with higher levels of psychological distress (2). Similarly, another study found that participants who engaged in NMPOU in the last year had higher odds of psychological distress than those who did not, and this was particularly common among the 18-25 age group (5).

There are several potential explanations for these findings. People who have higher psychological distress might self-medicate and engage in NMPOU to feel less anxious or depressed (16) and therefore use it as a maladaptive coping strategy (17). They might also use it as a pain reliever (18), as a large body of evidence found a significant association between chronic pain and psychological distress (19). Individuals who have higher psychological distress might also engage in NMPOU to avoid withdrawal symptoms when other substances are not available (16). NMPOU might indeed be driven by the supply and demand of heroin in the market. For example, a qualitative research study aiming to analyse the transition from oxycodone to heroin found that some consumers might rely on oxycodone when supply of heroin is scarce (20). Some suppliers might also directly suggest to their clients to use heroin when supply of oxycodone is low (20). However, it is important to note that a recent quantitative study found that there was no increase in heroin use since the introduction of a tamper-resistant formulation of controlled-release oxycodone in Australia in 2014 (21).

In terms of gender-related differences, there has been mixed evidence in the literature in regard to NMPOU (3). While our study results suggest that the same proportion of males and females engage in injecting non-prescribed opioids, which is consistent with previous research published in the field (3-4), other studies found that NMPOU was more frequent among males than females (5), or higher among females than males (6). These conflicting results might be explained by sample size or sampling error. These discrepancies might also be explained by possible concurrent interaction effects between gender, age and mental health problems which were statistically significant in our model and were not necessarily controlled for in other studies. For example, in Chan et al. (5), the association between mental health issues and engagement in NMPOU was observed among those aged 18 to 25 years, yet there was no significant association between gender and psychological distress. This was despite more males (55%) than females (48%) engaging in NMPOU. Further research is therefore warranted to consider the potential concurrent interaction effects of age, gender and mental health on NMPOU.

Our findings suggest that specific targeted intervention programs aimed at people who use heroin who are at higher risk of injecting non-prescribed opioids may be warranted in order to reduce the harms and risks associated with injecting non-medical prescription opioids among this group. Best practice would indicate that involvement of people who use drugs and peer organisations in the design and implementation of such interventions would be essential.

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The National Drug and Alcohol Research Centre (NDARC), UNSW Australia, coordinated the IDRS. The following researchers and research institutions contributed to IDRS 2021:

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- Cristal Hall, Sarah Eddy, Dr Campbell Aitken and Professor Paul Dietze, Burnet Institute Victoria;
- Yalei Wilson and Associate Professor Raimondo Bruno, School of Psychology, University of Tasmania, Tasmania;
- Dr Seraina Agramunt and Professor Simon Lenton, National Drug Research Institute, Curtin University, Western Australia;
- Catherine Daly, Dr Jennifer Juckel, Dr Natalie Thomas and Associate Professor Caroline Salom, Institute for Social Science Research, The University of Queensland, Queensland; and
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## Appendix A

**Table 4. Factors associated with injection of non-prescribed buprenorphine tablets in the 2021 national sample**

| Injection of non-prescribed buprenorphine tablets (e.g. Subutex®) |            |           |          |
|---|------------|-----------|----------|
|   | Odds Ratio | 95% CI    | <i>p</i> |
| <b>Age</b>  | 0.96       | 0.93-1.00 | 0.021*   |
| <b>Gender</b>   |            |           |          |
| Female  | -          | -         | -        |
| Male  | 0.76       | 0.29-1.96 | 0.563    |
| <b>Employment Status</b>  |            |           |          |
| Unemployed  | -          | -         | -        |
| Full time   | 1.00       | 0.13-7.90 | 0.996    |
| Part time/casual  | 0.71       | 0.16-3.05 | 0.643    |
| Other   | 2.72       | 0.75-9.83 | 0.128    |
| <b>Living arrangements</b>  |            |           |          |
| Own house/flat  | -          | -         | -        |
| Parents/ family house   | 1.77       | 0.61-5.13 | 0.291    |
| Boarding house/ hostel  | 1.19       | 0.59-2.40 | 0.619    |
| Other   | 0.90       | 0.11-7.19 | 0.923    |
| <b>Mental health problems in the last 6 months</b>                |            |           |          |
| No  | -          | -         | -        |
| Yes   | 1.46       | 0.56-3.80 | 0.439    |
| <b>Use of heroin in the last 6 months</b>                         |            |           |          |
| No  | -          | -         | -        |
| Yes   | 1.14       | 0.61-2.11 | 0.685    |
| <b>Age x Gender x Mental health problems in the last 6 months</b> | 1.01       | 0.98-1.04 | 0.519    |

Note. \* $p < 0.05$

## Appendix B

**Table 5. Factors associated with injection of non-prescribed buprenorphine-naloxone in the 2021 national sample**

| Injection of non-prescribed buprenorphine-naloxone (Suboxone® Film) |            |           |          |
|---|------------|-----------|----------|
|   | Odds Ratio | 95% CI    | <i>p</i> |
| <b>Age</b>  | 0.95       | 0.91-0.98 | 0.002**  |
| <b>Male</b>   |            |           |          |
| Female  | -          | -         | -        |
| Male  | 1.35       | 0.54-3.40 | 0.522    |
| <b>Employment Status</b>  |            |           |          |
| Unemployed  | -          | -         | -        |
| Full time   | /          | /         | 0.998    |
| Part time/casual  | 2.10       | 0.77-5.69 | 0.146    |
| Other   | 0.91       | 0.12-7.14 | 0.930    |
| <b>Living arrangements</b>  |            |           |          |
| Own house/flat  | -          | -         | -        |
| Parents/ family house   | 2.24       | 0.77-6.48 | 0.139    |
| Boarding house/ hostel  | 1.13       | 0.55-2.33 | 0.732    |
| Other   | 0.80       | 0.10-6.54 | 0.835    |
| <b>Mental health problems in the last 6 months</b>                  |            |           |          |
| No  | -          | -         | -        |
| Yes   | 0.71       | 0.24-2.17 | 0.553    |
| <b>Use of heroin in the last 6 months</b>                           |            |           |          |
| No  | -          | -         | -        |
| Yes   | 1.51       | 0.79-2.87 | 0.214    |
| <b>Age x Gender x Mental health problems in the last 6 months</b>   | 1.01       | 0.98-1.04 | 0.515    |

Note. / included in the model but small numbers so value is not shown. \* $p < 0.05$

## Appendix C

**Table 6. Factors associated with injection of non-prescribed generic oxycodone in the 2021 national sample**

| Injection of non-prescribed oxycodone (generic oxycodone) (Sandoz® and Novacodone®) |            |            |          |
|---|------------|------------|----------|
|   | Odds Ratio | 95% CI     | <i>p</i> |
| <b>Age</b>  | 0.97       | 0.92-1.03  | 0.333    |
| <b>Gender</b>   |            |            |          |
| Female  | -          | -          | -        |
| Male  | 4.63       | 0.54-39.33 | 0.161    |
| <b>Employment Status</b>  |            |            |          |
| Unemployed  | -          | -          | -        |
| Full time   | 2.48       | 0.27-22.46 | 0.420    |
| Part time/casual  | /          | /          | 0.997    |
| Other   | /          | /          | 0.998    |
| <b>Living arrangements</b>  |            |            |          |
| Own house/flat  | -          | -          | -        |
| Parents/ family house   | 1.73       | 0.32-9.28  | 0.520    |
| Boarding house/ hostel  | 1.51       | 0.55-4.16  | 0.429    |
| Other   | /          | /          | 0.998    |
| <b>Mental health problems in the last 6 months</b>                                  |            |            |          |
| No  | -          | -          | -        |
| Yes   | 2.54       | 0.24-27.44 | 0.442    |
| <b>Use of heroin in the last 6 months</b>   |            |            |          |
| No  | -          | -          | -        |
| Yes   | 3.02       | 1.07-8.56  | 0.037*   |
| <b>Age x Gender x Mental health problems in the last 6 months</b>                   | 0.99       | 0.94-1.50  | 0.760    |

Note. / included in the model but small numbers so value is not shown.  $p < 0.05^*$