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Short communication

Non-medical use of pharmaceutical opioids with and without other illicit substance use: Trends from two repeated nationally representative Australian surveys

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ABSTRACT

Background: Due to concerns over the public health impact of increasing opioid use, Australia up-scheduled codeine in 2018, requiring codeine-containing pharmaceuticals to be prescription-only. We examined pre-post changes in the prevalence and correlates of non-medical use of pharmaceutical opioids (NMUPO) and other illicit substance use (ISU).

Methods: We conducted a cross-sectional analysis of 45,463 participants aged 14 or above in the Australian National Drug Strategy Household Surveys (NDSHS) 2016 and 2019. Participants were categorized based on their past 12 months NMUPO and ISU patterns. Correlates examined included socio-demographic, psychological (Kessler 10), health and behavioral variables.

Results: The overall prevalence of any NMUPO decreased from 3.56% in 2016 to 2.65% in 2019, and the prevalence of codeine use from 2.98% to 1.49%. No significant changes were observed in the use of other types of painkillers (e.g. oxycodone and fentanyl) between 2016 and 2019. The overall decrease in NMUPO primarily occurred among people who used NMUPO only and did not use other illicit drugs. Older adults were more likely to report NMUPO only. Younger age, higher psychological distress, risky alcohol use, and daily smoking were associated with both NMUPO and illicit drug use.

Conclusions: A comparison of cross-sectional data from two time-points showed that the prevalence of NMUPO use among people who used NMUPO exclusively was lower post-up-scheduling of codeine in Australia. However, NMUPO use did not reduce among people who used both NMUPO and other illicit drugs. Public health interventions are needed to reduce opioid-related harm in those who also used other illicit drugs.

1. Introduction

There are public concerns for the increasing rates of opioid prescribing and its use for managing chronic pain (Degenhardt et al., 2019). Opioid overprescribing has been associated with addiction, diversion to the illicit drug market, polysubstance use, and overdose (Kolodny et al., 2015; Makary et al., 2017; Webster et al., 2011). A rise in opioid-related deaths has been documented in several countries in the last ten years (Larney et al., 2020; Leung et al., 2022a). Australia's opioid-related mortality has increased predominantly from prescription opioid use in the last decade (Chrzanowska et al., 2021). Understanding trends and characteristics of opioid use is important to design appropriate interventions to mitigate opioid-related deaths and harm and in evaluating the effects of such interventions.

A previous Australian study using national-level data found that the majority of those engaged in the use of pharmaceutical opioids like painkillers or pain-relievers for non-medical purposes (non-medical use of pharmaceutical opioids - NMUPO) were more likely to use over-the-counter codeine products than those reported using other illicit drugs in addition to opioids (Chan et al., 2019). Codeine has been the most used pharmaceutical opioid in Australia (Donovan et al., 2020). Concerns regarding codeine-related morbidity and mortality have prompted the Australian government to up-schedule the substance in 2010 and 2018, limiting combination analgesics containing codeine to be moved behind

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the counter at pharmacies in 2010 and then it was restricted to prescription only on 1 February 2018 (Elphinston et al., 2021). More evidence is needed on potential unintended harms arising from concerns about a shift in use from codeine to potentially more potent illicit opioids, as access to codeine has become limited following the up-scheduling (Nielsen, 2020).

This study examined: 1) the change in prevalence of NMUPO in the Australian population between 2016 and 2019 for two types of opioid use – those who predominantly use opioids only and those who use opioids in addition to other illicit substances; and 2) the socio-demographic, psychological, health and behavioral correlates of these types of opioid use in the latest survey.

2. Methods

2.1. Sample

The sample was drawn from two cross-sectional National Drug Strategy Household Surveys (NDSHS) conducted across Australia in 2016 (N=23,448) and 2019 (N=22,015). Data from these waves represent the most recent years that data was collected preceding and following the most recent up-scheduling of codeine. The response rates were 51.1% in 2016 and 49.0% in 2019. Participants aged below 14 years old (n=324) were excluded because they were not asked about pharmaceutical opioids use. Australia's Therapeutic Goods Administration's safety review specified that codeine products should not be used in children under 12 years of age, which should not affect our analysis because we included persons aged 14 years old and above.

2.2. Procedure

Households were randomly selected using a multistage stratified design based on statistical local areas, the smallest level of geography contained in the Australian Standard Geographical Classification (ASGC), which enables the production of comparable statistics. To address any disparity arising from the survey design, and to align the samples with the Australian population, sample weights were applied to the data. The NDSHS was approved by the Australian Institute of Health and Welfare Health Ethics committee, and data access was approved by the Australian Social Science Data Archive.

The surveys were administered using a multi-mode completion methodology. Individuals could complete the survey using a paper form, an online form, or a telephone interview. The proportion of respondents who completed the surveys online was 22% in 2016 and 25% in 2019.

2.3. Measures

2.3.1. Non-medical use of pharmaceutical opioids (NMUPO) and other illicit substance use

NMUPO was measured using the questions "*Have you used Painkillers/Pain-relievers and Opioids for non-medical purposes in the last 12 months?*" Response options were: codeine, oxycodone, tramadol, morphine, fentanyl, gabapentinoids, and other prescription pain killers/opioids. We acknowledge that this item included non-opioids (gabapentinoids; prevalence=0.01% in 2019), but in this study, we used the NMUPO label to refer to all the options under this item and included them in our "opioids" analysis.

Other illicit substance use was measured using similar self-reported items, which included items relating to cannabis, heroin, amphetamines/methamphetamine, ecstasy, methadone, ketamine, cocaine and other injectable drugs use. These substances were grouped together because they are all illegal for recreational use in Australia.

Participants were categorized into four NMUPO/illicit drug use groups: 1) No illicit substance use (ISU) and no NMUPO, 2) ISU but no NMUPO, 3) NMUPO but no ISU, and 4) NMUPO and ISU.

2.3.2. Sample characteristics

Characteristics factors included age (mean=45.01, 95%CI [44.70, 45.32]; range=14-99), gender (49.21% male), marital status (59.95% partnered), education level (63.11% completed high school or above), language background (87.30% English), region of residence remoteness (72.56% major cities), employment status (63.04% employed), socio-economic status for area quintiles, Kessler-10 psychological distress (63.88% low; 21.71% moderate, 9.64% high, 4.76% very high; Andrews and Slade, 2001), general health (17.96% excellent, 38.68% very good, 31.77% good, 9.60% fair, 1.99% poor), smoking status (82.31% non-smoker), and alcohol drinking risk level measured using the AUDIT-C scale (a brief screening instrument used to identify hazardous drinking; 30.65% high risk, 21.01% moderate risk) Bush et al. (1998).

2.4. Analysis

Weighted prevalence of each NMUPO group and type were estimated and compared between 2016-2019, and the groups were cross-tabulated by sample characteristics. Multinomial logistic regressions were used to examine the associations between the NMUPO and ISU patterns in 2019 (dependent variable) and sample characteristics (independent variables). Relative risk ratios (RRR) were estimated for three sets of analyses: 1) each of the three use groups compared to the no use group; 2) both use groups (NMUPO and ISU), compared to the NMUPO only group; and 3) both use group (NMUPO and ISU), compared to ISU only group. To adjust for the potential increase of Type 1 error due to multiple comparisons, an alpha level of 0.004 was used (0.05/12 variables). All analyses were conducted in STATA 17 with the *svy* command to account for the complex survey design.

3. Results

3.1. Changes in non-medical use and types of pharmaceutical opioids

Overall prevalence of NMUPO decreased from 3.56% (95% CI [3.27, 3.87]) in 2016 to 2.65% (95% CI [2.40, 2.92]) in 2019. It is estimated that in 2019, there were 547,000 Australians (95% CI [495,000, 603,000]) who used pharmaceutical opioids for non-medical purposes. Of these, 326,000 (95% CI [287,000, 370,000]) used only pharmaceutical opioids and 221,000 (95% CI [188,000, 260,000]) also used ISU.

Table 1 shows the prevalence of different patterns of NMUPO by year. The only significant change between 2016 and 2019 was for codeine where the prevalence of codeine use decreased (2.98% to 1.49%). There were no significant changes in oxycodone, tramadol, morphine, fentanyl, and gabapentinoids use.

The decrease in NMUPO predominantly occurred among those who only used pharmaceutical opioids. The prevalence of NMUPO but not ISU decreased from 2.37% in 2016 to 1.58% in 2019. There was no significant change in those who use both NMUPO and ISU (1.18% in 2016 and 1.07 in 2019).

3.2. Sample characteristics of NMUPO and ISU use groups

Bivariate analyses showed that age, gender, marital status, language background, employment status, socio-economic status for the area, psychological distress, general health, alcohol risk and smoking status were associated with NMUPO (see Table S2 in supplementary materials). Overall, the characteristics of the two ISU groups (with and without NMUPO) are very similar. Both ISU groups were younger than other groups, had a higher proportion of males, a lower proportion of partnered individuals, and a higher proportion of high-risk alcohol drinkers. The NMUPO-only group (NMUPO and no ISU) were older.

Table 1
Change in past 12 months non-medical use of pharmaceutical opioids and type of painkiller use between 2016 and 2019 in Australia.

	Year				
	2016		2019		
Opioids use pattern	%	95% CI	%	95% CI	p-value
No illicit substance use (ISU) and no non-medical use of pharmaceutical opioids (NMUPO)	85.82	(85.24, 86.38)	85.04	(84.42, 85.64)	0.068
ISU but no NMUPO	10.62	(10.13, 11.14)	12.31	(11.75, 12.90)	< .001
NMUPO but no ISU	2.37	(2.15, 2.62)	1.58	(1.39, 1.79)	< .001
NMUPO and ISU	1.18	(1.01, 1.39)	1.07	(0.91, 1.26)	0.383
Type of opioids/painkiller use					
Codeine	2.98	(2.71, 3.27)	1.49	(1.31, 1.70)	< .001
Oxycodone	0.56	(0.45, 0.70)	0.74	(0.61, 0.90)	0.071
Tramadol	0.32	(0.25, 0.41)	0.35	(0.26, 0.45)	0.655
Morphine	0.14	(0.10, 0.22)	0.17	0.12, 0.25)	0.563
Fentanyl	0.03	(0.01, 0.07)	0.07	(0.04, 0.13)	0.071
Gabapentinoids	0.06	(0.03, 0.10)	0.01	(0.07, 0.17)	0.081
Other opioids	0.49	(0.39, 0.62)	0.84	(0.07, 0.10)	< .001

NMUPO: Non-medical use of pharmaceutical opioids; ISU: illicit substance use (including cannabis, heroin, amphetamines/methamphetamine, ecstasy, methadone, ketamine, cocaine and other injectable drugs)

Table 2
Adjusted multinomial logistic regression on past 12 months NMUPO and ISU patterns in 2019.

	Ref: No ISU and no NMUPO						Ref: NMUPO but no ISU		Ref: ISU but no NMUPO	
	ISU but no NMUPO		NMUPO but no ISU		NMUPO and ISU		NMUPO and ISU		NMUPO and ISU	
	RRR	99.6% CI	RRR	99.6% CI	RRR	99.6% CI	RRR	99.6% CI	RRR	99.6% CI
Age	0.97*	(0.96, 0.97)	1.02*	(1.01, 1.04)	0.97*	(0.95, 0.98)	0.95*	(0.93, 0.97)	1.00	(0.98, 1.02)
Female	0.73*	(0.60, 0.88)	0.99	(0.67, 1.46)	0.62	(0.37, 1.04)	0.63	(0.33, 1.19)	0.85	(0.51, 1.42)
Partnered	0.59*	(0.48, 0.72)	0.84	(0.55, 1.28)	0.57	(0.31, 1.02)	0.68	(0.33, 1.39)	0.96	(0.53, 1.76)
Completed High School	1.10	(0.88, 1.37)	0.67	(0.43, 1.04)	0.99	(0.55, 1.77)	1.48	(0.70, 3.10)	0.90	(0.50, 1.61)
Non-English-speaking background	0.45*	(0.29, 0.71)	1.32	(0.67, 2.60)	0.28	(0.07, 1.14)	0.21*	(0.05, 1.00)	0.62	(0.15, 2.59)
Remoteness (Ref: Major cities)										
Inner regional	0.78*	(0.61, 1.00)	0.86	(0.52, 1.40)	0.68	(0.32, 1.46)	0.80	(0.32, 1.96)	0.88	(0.41, 1.88)
Outer regional	0.70*	(0.51, 0.97)	1.48	(0.80, 2.73)	0.59	(0.21, 1.65)	0.40	(0.12, 1.31)	0.84	(0.30, 2.37)
Employment status (Ref: Employed)										
Not in labour force	0.74*	(0.56, 0.98)	0.60	(0.36, 1.01)	0.42	(0.18, 1.01)	0.70	(0.26, 1.91)	0.57	(0.24, 1.38)
Unemployed	1.04	(0.73, 1.48)	1.30	(0.60, 2.81)	0.77	(0.34, 1.74)	0.59	(0.20, 1.80)	0.74	(0.33, 1.64)
Socio-economic index for area (Ref: Lowest)										
2nd quintile	0.94	(0.7, 1.27)	0.81	(0.46, 1.41)	1.98	(0.89, 4.43)	2.44	(0.92, 6.45)	2.09	(0.93, 4.70)
3rd quintile	0.87	(0.64, 1.19)	0.95	(0.55, 1.65)	1.33	(0.54, 3.27)	1.40	(0.49, 3.96)	1.53	(0.63, 3.75)
4th quintile	0.91	(0.68, 1.23)	0.88	(0.50, 1.55)	1.82	(0.76, 4.34)	2.07	(0.74, 5.79)	2.00	(0.83, 4.78)
Highest quintile	1.17	(0.86, 1.57)	0.54	(0.27, 1.07)	1.56	(0.64, 3.79)	2.89	(0.95, 8.82)	1.34	(0.55, 3.24)
Psychological distress (Ref: Low)										
Moderate	1.35*	(1.09, 1.68)	1.47	(0.92, 2.35)	1.41	(0.68, 2.95)	0.96	(0.41, 2.28)	1.04	(0.5, 2.19)
High	1.66*	(1.25, 2.22)	1.84	(0.95, 3.58)	3.00*	(1.46, 6.18)	1.63	(0.61, 4.32)	1.80	(0.87, 3.73)
Very high	1.96*	(1.27, 3.02)	2.01	(0.88, 4.63)	6.90*	(3.19, 14.94)	3.43*	(1.14, 10.35)	3.52*	(1.64, 7.6)
General Health (Ref: Excellent)										
Very good	0.88	(0.68, 1.15)	0.84	(0.43, 1.63)	0.95	(0.41, 2.21)	1.13	(0.38, 3.34)	1.07	(0.45, 2.54)
Good	0.88	(0.66, 1.17)	0.97	(0.50, 1.89)	0.63	(0.26, 1.52)	0.65	(0.21, 1.96)	0.72	(0.29, 1.75)
Fair	1.05	(0.72, 1.55)	1.42	(0.64, 3.13)	0.82	(0.28, 2.38)	0.57	(0.15, 2.16)	0.78	(0.26, 2.30)
Poor	1.32	(0.66, 2.65)	0.68	(0.21, 2.23)	1.17	(0.25, 5.50)	1.71	(0.25, 11.62)	0.88	(0.20, 4.00)
Alcohol risk (Ref: No risk)										
Low	2.27*	(1.38, 3.75)	1.48	(0.78, 2.82)	1.17	(0.23, 5.81)	0.79	(0.14, 4.50)	0.51	(0.09, 2.91)
Moderate	4.77*	(3.03, 7.50)	1.19	(0.65, 2.19)	3.30	(0.83, 13.06)	2.76	(0.65, 11.77)	0.69	(0.16, 3.05)
High	9.87*	(6.28, 15.52)	1.51	(0.83, 2.74)	9.64*	(2.56, 36.32)	6.40*	(1.61, 25.44)	0.98	(0.23, 4.17)
Smoking status (Ref: Non-smoker)										
Daily smoker	4.07*	(3.17, 5.24)	1.69	(0.95, 2.98)	12.81*	(6.67, 24.61)	7.60*	(3.21, 17.96)	3.14*	(1.63, 6.08)
Non-daily smoker	4.94*	(3.82, 6.39)	1.18	(0.50, 2.78)	7.57*	(3.51, 16.33)	6.42*	(2.06, 20.06)	1.53	(0.71, 3.31)

RRR: relative risk ratio; NMUPO: Non-medical use of pharmaceutical opioids; ISU: illicit substance use (including cannabis, heroin, amphetamines/methamphetamine, ecstasy, methadone, ketamine, cocaine and other injectable drugs)

3.3. Regression on NMUPO and ISU patterns

Table 2 shows the results from adjusted multinomial logistic regression. Compared to the no use group (no NMPOU and no ISU), those who were older were more likely to report NMUPO but no ISU. Those who were younger, and those who had higher psychological distress, higher alcohol risk and smoked daily were more likely to report NMUPO and ISU.

Compared to those who reported NMUPO but no ISU, those who were younger, from an English-speaking background, had higher alcohol risk and smoked cigarettes were more likely to report both NMUPO and ISU. Compared to those who reported ISU but no NMUPO, those who had higher psychological distress and smoked cigarettes were more likely to report both NMUPO and ISU.

4. Discussion

We examined changes in the prevalence of non-medical use of pharmaceutical opioids (NMUPO) in Australia before and after the up-scheduling of codeine. Our study responds to concerns over the public

health impact of increasing codeine use in Australia - codeine-containing medications previously could be purchased over the counter from a pharmacist, but now requires a prescription from a medical practitioner since 2018 (Kirby, 2018).

Overall, our findings support the efficacy of policy changes aimed at reducing codeine use, as the prevalence of NMUPO decreased, both among those who only used NMUPO but not ISU (2.37% in 2016 and 1.58% in 2019), as well as those who used both NMUPO and ISU (1.18% in 2016 and 1.07% in 2019).

Among different user groups, our study showed that the prevalence of exclusive NMUPO (that is, did not use other illicit drugs) decreased when we compared data from 2016 (pre-up-scheduling) with 2019 (post-up-scheduling), but the prevalence of the use of both NMUPO and other ISU did not. Our study provides support for the effectiveness of the regulation change in Australia in reducing codeine use among those who exclusively used NMPOU. It did not significantly affect NMPOU among those who also used other illicit drugs.

We found differences between people who engaged in NMUPO without using other illicit drugs and those who used NMUPO in addition to other drugs (cannabis, heroin, amphetamines/methamphetamine, ecstasy, methadone, ketamine, cocaine or other injectable drugs use). The latter group was younger, had higher levels of risky alcohol use, and was more likely to smoke cigarettes daily. They also had a polysubstance use profile therefore use of opioids is likely a reflection of opportunistic access (Chan et al., 2019). This means that policies that reduce codeine access would likely have less impact on this group.

Our results do not show increased use of other opioids after the up-scheduling of codeine in Australia. Codeine remained the most common opioid used following up-scheduling in 2019 (2.98% to 1.49%), and the prevalences of other types (e.g. oxycodone, tramadol, morphine, fentanyl) were low and did not significantly differ between the years. There have been concerns that decreased codeine availability may result in increased use of other more potent opioids, particularly for more vulnerable groups such as users of prescription opioids for non-medical purposes. We observed a significant reduction in codeine use between 2016 and 2019 in the absence of any comparable increases in the use of other opioids. Prevalence of other specific types of opioid use remained low and under 1% in the most recent population survey. For example, the prevalence of non-medical oxycodone use was 0.56% in 2016 and 0.74% in 2019, and the prevalence of non-medical fentanyl use was 0.03% in 2016 and 0.07% in 2019, which showed an increase, but these were based on a small number of cases with overlapping confidence intervals, so our analysis showed no significant change. Our findings are in line with previous studies that reported a reduction in codeine-associated sales (Cairns et al., 2020) and hospital admissions post-rescheduling (Elphinston et al., 2021) in Australia. They are also consistent with time-series analyses showing there was no switch to more potent opioids after codeine rescheduling in an Australian veteran population using Repatriation Pharmaceutical Benefits Scheme data (Kalisch Ellett et al., 2020), as has been seen in other jurisdictions such as Italy (Lombardi et al., 2019).

Psychological distress was associated with NMUPO and ISU. Although psychological distress was our exposure variable, and NMUPO and ISU was our outcome variable, our analysis was conducted on cross-sectional data and so we cannot infer temporal order. A recent systematic review of longitudinal studies reported that people who used prescription opioids had increased risks of mood and anxiety outcomes following use (Leung et al., 2022b). Mental health should be assessed when opioids are prescribed to prevent potential adverse mental health outcomes.

There are several key limitations of our findings. The survey did not measure if respondents were using other illicit substances concurrently or simultaneously. Our results are based on self-report household surveys in which substance use may be under-reported (Chan et al., 2022). The method of survey administration could impact the prevalence of reported substance use. For example, persons who were completing surveys online may be more willing to self-report their substance use compared to persons telling their responses to a survey data collector over the telephone. In our study, more respondents filled in the survey using the online mode in 2019 than in 2016 (25% vs 22%). We found no significant changes in the proportion of respondents who had reported substance use, so this may imply that the survey completion mode had little impact on the responses. Alternatively, if there had been a decrease in the prevalence of substance use in the population, the survey may not have detected it. Further, high-risk populations, are likely to be under-represented in the data.

Our results cannot be used to infer causality due to the repeated cross-sectional design. We observed a decrease in NMUPO in the population following the re-schedule, but there may be other environmental factors and public health interventions that have contributed to the changes in prevalence. However, we found that the decline only occurred in the use of codeine and only in those who only used opioids, which provided support that the effect is likely to be associated with the policy change. Our analysis is limited to only two repeated cross-sectional time-points pre-and-post the up-scheduling, and there may be other contributing factors that have happened between the two time-points that may have affected NMUPO use in the population. Future research that continues to monitor the trends in NMUPO and other types of opioid use is warranted.

We could not examine changes in socio-demographic correlates and age and sex differences in the use of specific opioid types with low cell sizes. In our regression, we found that younger people had higher risks of NMUPO and ISU. The use of prescription opioids extra-medically in the youth population had been highlighted as a public health concern in the USA (Marshall et al., 2016). Our findings may not generalize to the pediatric population because we did not have data on NMUPO in children, as our study excluded participants aged below 14 years old. Future studies of risk factors and outcomes of NMUPO in youth are warranted.

5. Conclusions

There was a decrease in the overall prevalence of NMUPO after the up-scheduling of codeine in Australia that was predominantly observed in those who used NMUPO exclusively. NMUPO was associated with youths who used other illicit substances, engaged in risky alcohol use, smoked cigarettes daily, and were experiencing higher levels of psychological distress. Public health interventions to prevent opioid-related harms by addressing NMUPO in people who also used other substances and certain high-risk demographic groups are warranted.

Contributors

Concept and design: JL, GC, WH, JC. Acquisition, analysis, and interpretation of data: GC, JL, GV, CL, AA. First draft: JL, GV, GC. Subsequent drafts and revisions: DS, WH, JC, JL, CL, AA, GV, GC. All authors approve the paper for publication and are accountable for the work.

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Declaration of Competing Interest

No conflict declared.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dadr.2022.100118.

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