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HAZARD

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TRENDS IN PHARMACEUTICAL
OPIOID-RELATED HARM IN
VICTORIA, 2008/09 TO 2017/18



TRENDS IN PHARMACEUTICAL OPIOID-RELATED HARM IN VICTORIA, 2008/09 TO 2017/18

Hazard 86 is focused on pharmaceutical opioid-related harm in Victoria. Opioid poisoning related admissions data were extracted from the Victorian Admitted Episodes Dataset (VAED), and relevant Emergency Department presentations were extracted from the Victorian Emergency Minimum Dataset (VEMD), for the period 2008/09-2017/18. Findings related to ten-year trends and three-year patterns in hospital admissions and Emergency Department attendances are presented to provide an overview of pharmaceutical opioid-related harm in Victoria, Australia. In addition, the Hazard provides insight into intentional self-harm vs. unintentional opioid poisoning, age and sex-specific trends in opioid poisoning, and harms by type of pharmaceutical poisoning.

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EXECUTIVE SUMMARY

Pharmaceutical opioids are a group of medicines used primarily to treat pain. In addition to pain relief, opioids can produce euphoria, and regular use can lead to dependence. Misuse occurs when opioids are taken in a different way or in a larger quantity than prescribed, or taken without a doctor’s prescription. Opioid use can result in overdose; opioid-induced respiratory suppression can be fatal. The aim of this edition of Hazard is to provide an overview of pharmaceutical opioid-related harm in Victoria, Australia. Harm is profiled in terms of hospital admissions and Emergency Department presentations related to pharmaceutical opioid poisoning.

Opioid-Related Harm: 2015/16 to 2017/18

Emergency Department Presentations

In the three-year period from 2015/16 to 2017/18 (the most recent three years of data), there were 2,618 Emergency Department records coded as opioid poisoning. The most commonly encountered opioid types were codeine and oxycodone, followed by tramadol.

Females (n=1,535, 58.6%) were more likely than males (n=1,083, 41.4%) to present to EDs for opioid-related poisoning. The single largest group in terms of opioid-related ED presentations were females aged 15-19 years (n=217).

More than half of opioid-related ED presentations were coded as ‘Intentional self-harm’ (51.3%); 26.1% were coded as unintentional, and 22.7% were coded as ‘other and undetermined intent’. *Intentional* self-poisoning proportions were particularly high among females aged 15-19 years (71.4%).

Those presenting to the ED were likely to be admitted to hospital for further treatment (56.1%); a further 38.0% were discharged to home/usual residence. In 3.4% of presentations the case was recorded as *left before treatment completed*; this proportion is higher than for injury overall (1.6%).

Hospital Admissions

A total of 3,946 hospital admissions for pharmaceutical opioid-related harm were recorded in 2015/16 to 2017/18: an average of 1,315 per year. The majority of these cases (77.0%, n=3,037) were coded as involving ‘Other opioids’ such as codeine and morphine.

Females (n=2,444, 61.9%) were more likely than males (n=1,502, 38.1%) to be admitted to hospital for opioid-related poisoning. The single largest group in terms of opioid-related hospital admissions were females aged 20-24 years (n=305).

The majority of cases were coded as intentional self-harm (60.5%); 27.3% were coded as unintentional poisoning and a smaller proportion were coded as poisoning of undetermined intent (12.2%). The proportion of cases coded as *intentional* was very high in the age group 15-19 years: 86.5% among females and 70.5% among males in this age group.

Regionality and Place of Occurrence

Victorians living in the Melbourne metropolitan area accounted for over two-thirds of pharmaceutical opioid-related harm hospital admissions (68.0%, n=2,684) and ED presentations (67.6%, n=1,771) in 2015/16-2017/18. *Population-based rates*, however, were higher in Victorian inner regional areas than in major cities.

‘Home’ was the most common location for opioid-related ED presentations (59.9%, n=1,568) and hospital admissions (49.1%, n=1,899). Location was unspecified in 29.1% of ED presentations and 39.0% of hospital admissions records.

Admission Costs and Bed Days

Between 2015/16 and 2017/18, 13,135 bed days were accounted for by pharmaceutical opioid-related harm in Victoria. Females aged 65+ years were the demographic accounting for the largest proportion of opioid-related harm bed days (18.0%, n=2,368).

In the two-year period for which costs were available (2015/16-2016/17), the hospital treatment costs (direct and indirect) for pharmaceutical opioid-related hospital admissions totalled \$16.35 million.

Females aged 45-54 years were the demographic accounting for the largest proportion of opioid-related admission costs (\$2.24 million).

Trends in Opioid-Related Harm:
2008/09 to 2017/18

Trends in Emergency Department Presentations

The pharmaceutical opioid poisoning ED presentation rate of 13.6 per 100,000 population per year consisted of intentional self-poisoning, unintentional poisoning, and other & undetermined intent poisoning, with rates of 6.9, 3.0 and 3.7 per 100,000 population, respectively.

The pharmaceutical opioid poisoning ED presentation rate increased statistically significantly over the 10-year period, with an average annual increase of 3.1%. The increase was most pronounced among males aged 45-54 years, at +7.9% per year.

Trends in Hospital Admissions

The pharmaceutical opioid poisoning hospital admission rate of 22.1 per 100,000 population per year consisted mostly of intentional self-poisoning (13.3 per 100,000 population), with a lesser contribution of unintentional poisoning and poisoning of undetermined intent (5.3 and 3.5 per 100,000 population, respectively).

The trend in hospital admissions needs to be interpreted with caution, due to the effect of the Victorian hospital admission policy change in 2012. The rates of *overnight* hospital admissions related to pharmaceutical opioid poisoning, which are less affected by the policy change, showed a slight decrease of 2.3% per year, from 2008/09 to 2017/18.

Narratives of Opioid-Related Emergency
Department Presentations

Exploration of the Emergency Department record narrative was carried out for males aged 45-54 years, who had the greatest increase in rate of pharmaceutical opioid-related presentations (n=496).

Narratives mostly did not contain detailed information regarding the circumstances of the opioid poisoning. Source of the opioids (prescribed or diverted) were rarely listed. The intent was recorded as self-harm in 46% of cases, undetermined in 32% and unintentional in 22% of cases.

In this group, codeine poisoning was the most commonly reported opioid (20.2%, n=100), followed by oxycodone poisoning (19.2%, n=95).

Polypharmacy was common with 30% of cases listing multiple drugs (n=150). Polypharmacy was most likely to occur among intentional self-harm cases. Of the cases with drug combinations noted in the narrative, 52.6% (n=72) had taken one type of opioid with one additional non-opioid drug; the non-opioid drug was most likely to be a benzodiazepine (n=22, 30.6%); 'sleeping pills' were also commonly recorded (n=10, 13.9%).

RECOMMENDATIONS

Pharmaceutical Opioid-Related Harms

1.	2.	3.	4.
Increased Naloxone Availability	Interventions to Prevent Self-Harm	Ensure Self-Harm Prevention Activities Address Identified Risk Groups	Data linkage Studies to Optimise Health Service Delivery
ED presentations due to pharmaceutical opioid-related poisoning have been rising over the past decade. Increasing the availability of opioid overdose “reversal” drug, naloxone, may help to reduce fatalities associated with accidental overdoses.	More than half of the non-fatal poisonings captured in ED and hospitalisations were the result of intentional self harm. Intentional pharmaceutical poisoning is the second leading suicide method. This confirms the need for ongoing collection and analysis of self-harm related metrics to monitor the impact of policy and other interventions.	Consider implementing place-based approaches to self-harm prevention to target risk groups identified through this work (e.g. young women and middle-aged men at risk of opioid-related harm).	Data linkage studies could examine the patient pathways between GPs, mental health services, ambulances and EDs, to examine how service-usage may mitigate high risk periods, and how patterns of service usage may be used to identify where earlier intervention and prevention are required.

Injury Surveillance and Coding

5.	6.	7.	8.
Expand ED Data Collection to Inform Prevention	ICD-10-AM Coding of Pharmaceutical Opioid Harm	Monitoring of Opioid-Specific Harm	Self-Harm Surveillance
Additional data collection through VEMD free-text field may lead to improved identification of motivations for self-harm injury incidents. Data collection should include, where possible, source of the opioids (doctor-prescribed; diverted; other illicit).	Improved opioid-specific coding in both hospital datasets may also better inform prevention efforts. In particular, better opioid-specific coding in the ICD-10-AM is required.	Opioid-specific monitoring is particularly relevant to monitoring the impact of the changed availability of codeine, and the potential effect of this on the uptake of other opioid types. Improved coding (the previous recommendation) may also help to monitor for changes associated with the implementation of prescription monitoring and other policy changes intended to reduce opioid-related harm.	Continued monitoring of trends in hospital admissions due to pharmaceutical opioid-related poisoning once the influence of the changes made to the Victorian hospital admission policy are settled will also provide a more detailed picture of trends over time.

INTRODUCTION

What are Pharmaceutical Opioids?

Pharmaceutical opioids are a group of medicines used primarily to treat pain. They are either naturally occurring alkaloids (e.g. morphine or codeine) from the opium poppy, or chemically synthesised to have a similar chemical structure and effect (e.g. oxycodone, fentanyl or buprenorphine). Opioids have their pain relieving, or *analgesic* effects through acting at the mu-opioid reception. Many of the side-effects from opioids are also through acting at this same receptor. Common side effects include sedation, constipation, and respiratory depression (slow and ineffective breathing). Most opioid overdoses occur through supressing respiration. The well-known illicit opioid heroin (also known as diacetylmorphine), also belongs to this same drug class of opioids. Diacetylmorphine is also used as a pharmaceutical opioid in other parts of the world, both as a pain reliever and as treatment for opioid dependence.

Pharmaceutical opioids can differ in important ways, such as their potency as analgesics (Drewes et al., 2013). Opioids such as fentanyl and sufentanil are considered high-potency, oxycodone and morphine are examples of medium-potency opioids and codeine, tramadol and tapentadol are examples of lower-potency opioids (Drewes et al., 2013). Some opioids such as tramadol

and tapentadol have multiple mechanisms by which they reduce pain. For this reason they are sometimes called ‘atypical opioids’, with additional pharmacological actions involving the neurotransmitters serotonin and noradrenaline (Bravo, Mico, & Berrocso, 2017; Miotto et al., 2017; Vadivelu, Timchenko, Huang, & Sinatra, 2011).

The euphoric effects that opioids can cause or their ‘likeability’ also differ between opioids. For example, oxycodone has consistently been shown to have a high ‘abuse liability’ (Wightman, Perrone, Portelli, & Nelson, 2012). There are a range of contexts in which people use pharmaceutical opioids, including for pain management, in the context of self-medication (for example, for psychological distress) and for non-medical reasons (e.g. for the euphoric feelings that they cause). In some cases there are multiple reasons for use. The most common reason opioids are prescribed in Australia is for pain management.

Opioid-Related Harms, Globally

Opioids were not commonly prescribed in high-income countries for most of the 20th century due to their addictive potential. However, this changed in the 1990s with a series of US developments such as marketing campaigns around “pain as the fifth vital sign”, and the use of opioids to treat non-cancer pain (Dasgupta, Beletsky, & Ciccarone, 2018; Humphreys, 2017; Jones et al., 2018).

Since then, the epicentre of global opioid-related harms remains in the US, and is characterised by three waves. The first was associated with pharmaceutical opioids in the 1990s, the second with heroin around 2010, and the third wave from 2013 onwards was associated with synthetic opioids such as illicit fentanyl (Ciccarone, 2019; Scholl, 2019).

During the period 1999-2017, which has been called the “opioid crisis”, there were 400,000 opioid-related deaths in the US (Scholl, 2019), which in effect lowered the general population’s life expectancy (Dyer, 2018).

Opioid-Related Harm in Australia

The nations which consume the highest quantities of opioids are high-income countries, and Australia is the eighth highest consumer in the world (Humphreys, 2017).

There are more accidental drug-related deaths in Australia than road deaths (Pennington Institute, 2018; Roxburgh et al., 2017). Over the past 10 years, the Australian opioid overdose death rate has almost doubled from 3.8 to 6.6 deaths per 100,000 population, and these were primarily related to prescription opioids (Australian Bureau of Statistics, 2018; Roxburgh et al., 2017).

In 2016, there were 679 deaths in Australia attributed to pharmaceutical opioids only, and a further 111 attributed to both pharmaceutical opioids and heroin (Roxburgh, Dobbins, Degenhardt, & Peacock, 2018). The majority of these deaths are considered accidental (85% in 2016 (Roxburgh et al., 2018)). From 2012-2016, there were 2,544 accidental deaths due to pharmaceutical opioids in Australia (0.9 per 100,000 population), 585 of which occurred in Victoria (Pennington Institute, 2018).

Risk Factors for Opioid-Related Harm

Age

Though older Australians are more likely to be prescribed opioids, harms are more pronounced for younger cohorts. Almost half (44%) of all prescriptions are dispensed to those aged 65 and over (AIHW, 2018), however, adverse consequences peak at ages 25-to-44-years (Berecki-Gisolf, Hassani-Mahmoeei, Clapperton, & McClure, 2017).

Gender

Most (58%) opioid prescriptions are dispensed to women and rates of pharmaceutical-opioid hospitalisations are higher for women (AIHW, 2018); however, rates of pharmaceutical opioid deaths are higher among males (Roxburgh et al., 2017).

Rurality

Age-adjusted rates of opioid supply are highest for inner regional areas of Australia, followed by outer regional areas, remote, major cities, and lastly very remote areas (AIHW, 2018).

SES

Australians living in the lowest socio-economic areas have the highest burden of disease and highest rates of opioid prescriptions (AIHW, 2018). There is a complex interplay between resources and health, including many jobs within disadvantaged communities having elevated physical hazards, which increase the risk of chronic pain conditions and lower access to alternative pain management (Dasgupta et al., 2018).

Combining Medications and Higher Doses

There are also other risk factors for experiencing adverse effects from opioids. For example, the primary mechanism for opioid overdose fatalities is respiratory depression, and the combination of benzodiazepines and opioids can compound this side effect (Jones, Mogali, & Comer, 2012). Higher doses of opioids also increase the risk of harm, particularly when more than 100mg of oral morphine equivalent (OME) is prescribed per day (Hawk, Vaca, & D’Onofrio, 2015).

The term ‘adverse selection’ refers to the phenomenon where patients who have more risk factors for opioid-related harms are more likely to be prescribed opioids. For example, individuals with mental health problems, complex medical histories, chronic pain, benzodiazepine use, and social and economic disadvantage, are more likely to receive longer term prescriptions of higher dose opioids (Campbell et al., 2015; Sullivan, 2010).

RESULTS

Australian Policies Related to Opioid Harms

Information on the Australian policy environment around opioid harms may be found in the following documents:

- The Royal Australasian College of Physicians: “Prescription Opioid Policy” (The Royal Australasian College of Physicians, 2009)
- Therapeutic Goods Administration consultation paper: “Prescription strong (Schedule 8) opioid use and misuse in Australia – options for a regulatory response” (Therapeutic Goods Administration (TGA), 2018b)
- AIHW: “Opioid harm in Australia and comparisons between Australia and Canada” report (AIHW, 2018).
- Royal Australian College of General Practitioners (RACGP): “Prescribing drugs of dependence in general practice, Part C2: The role of opioids in pain management” (Royal Australian College of General Practitioners (RACGP), 2017)

Aim

The aim of this edition of Hazard is to provide an overview of pharmaceutical opioid-related harm in Victoria, in terms of emergency department presentations and hospital admissions.

Additional aims are to provide insight into:

- Intentional **self-harm vs. unintentional** opioid poisoning
- Age and sex-specific opioid harm trends
- Opioid harm trends **in regional vs. metropolitan** areas
- The role of **naloxone** use (as captured in the ED presentations)
- Harms by **type of opioid**
- Broad trends over a ten-year period

Sources

The data sources for this edition of Hazard are the Victorian **Emergency** Minimum Dataset (VEMD), the Victorian **Admitted Episodes** Dataset (VAED), and population data sourced from the Australian Bureau of Statistics (ABS).

Overview of Methods Used to Determine Patterns of Opioid Poisoning

For the correct interpretation of the presented emergency department and hospital admissions statistics, an understanding of the case selection for each data source is essential.

Emergency Department cases were selected from the Victorian Emergency Minimum Dataset (VEMD) using two methods:

1. Via a text search of the case narrative to identify overdoses and/or poisonings related to specific pharmaceutical opioids. Search terms used are shown in Appendix A in Table A2.
2. Additional cases were selected via the ICD-10-AM diagnosis codes in the VEMD (T40.2, T40.3 or T40.4) to identify poisoning cases where the type of pharmaceutical opioid was not mentioned in the text narrative. Further details about case selection are given in Appendix A.

Hospital admission cases were selected from the Victorian Admitted Episodes Dataset (VAED) if a pharmaceutical opioid poisoning was recorded [International Classification of Disease (ICD-10-AM)] with codes T40.2, T40.3 or T40.4, and the case was also specified as caused by accidental poisoning (ICD-10-AM X42, specifying narcotics), intentional self-poisoning (ICD-10-AM X62, specifying narcotics), or poisoning of undetermined intent (ICD-10-AM Y12, specifying narcotics).

In this edition of Hazard, the Emergency Department data are used primarily to give insight into the particular opioid types involved in opioid poisoning. The coding system (based on ICD-10-AM) does not distinguish between specific opioid types such as oxycodone, tramadol and fentanyl. The Emergency Department records provide this information through the narrative; however, these narratives are inconsistent in quality and completeness and are likely to give an underestimate of the total number of cases.

Emergency Department data are presented in two ways. First, an overall number of opioid-poisoning cases, as determined from coded data and/or narrative. Many of these cases do not specify which opioid type was involved. Second, an overview of *opioid types*, depending on reporting of this in the case narrative.

Therefore, it is recommended that the rates of hospital admissions and Emergency Department presentations are used to provide a robust (but conservative) overview of opioid poisoning in Victoria, whereas the reported opioid-specific Emergency Department results provide a more detailed insight into the *types of opioids* involved in opioid poisoning in Victoria.

The vast majority of opioid poisoning hospital admission cases were admitted following presentation to the Emergency Department. Given that not all Emergency Department presentations were subsequently admitted, it is to be expected that ED presentations outnumber admissions. This was not the case: in this report, there were 2,618 ED presentations and 3,946 hospital admissions in the most recent three years. This could be due to poor coding in the ED, resulting in undercounting of ED presentations due to opioid poisoning. It could, however, also be due to uncertainty in the ED regarding the specific opioid type. To verify this, all ED presentations coded as poisoning (medication or other) were selected based on the ‘cause’ variable. In these cases, the top 12 diagnoses were analysed. The most commonly occurring T40 diagnosis (the T40 category captures poisoning due to narcotics and psychodysleptics) was T40.6: *Other and unspecified psychodysleptics [hallucinogens]*. Indeed, the most commonly reported specific diagnosis overall was T50.9: *Other and unspecified drugs, medicaments and biological substances*, which suggests a general lack of specificity regarding the type of poison. The admission rate among those with an ED diagnosis code of T40.6 was 60%. Many of the pharmaceutical opioid *admissions* captured in the current analysis, therefore, may not have been identified as such in the ED. In the current analysis, ED cases with an unspecified diagnosis were not included; this may have led to undercounting. The exact matching of ED presentations records to admissions records could be achieved through a data linkage study. This is, however, outside the scope of this edition of Hazard.

Section A is a detailed examination of opioid-related harms from the past three years, in terms of various demographic and clinical details. **Section B** is a broad examination of opioid-related trends over the past 10 years.



SECTION A

A1. OPIOID-RELATED HARM: 2015/16 TO 2017/18, VICTORIA

A1 (i) Overall Emergency Department Presentations: Coded and/or Narrative-Reported

In the three-year period from 2015/16 to 2017/18 there were 2,618 records coded as opioid poisoning. Opioid poisoning was recorded in the diagnosis fields using the ICD-10-AM codes T40.2, T40.3 or T40.4 in 62.2% of those cases (n=1,631) (Table 1). The type of opioid (or the term opiate/opioid) was mentioned in the case narrative in 65.6% of cases (n=1,717). Therefore, opioid type was not mentioned in the narrative in at least 901 cases. Among those cases where the type of opioid was mentioned in the narrative, only 43% were accurately coded using ICD-10-AM codes in the diagnosis (n=730).

Table 1

Opioid Poisoning Cases in the Emergency Department:
Number of Cases that were Coded vs. Case Narrative Descriptions

		Opioid poisoning coded in ICD-10-AM	Opioid poisoning not coded in ICD-10-AM^	Total
ED presentations coded as opioid poisoning	Opioid type recorded in case narrative	730	987	1,717
	Opioid type not coded in case narrative	901	0	901
	Total	1,631	987	2,618

^Poisoning was coded from terms in the case narrative for these cases, see Appendix A for more details of search terms used.

Opioid-Specific Emergency Department Presentations (Opioid Type Recorded in Narrative)

Emergency Department presentations that reported the type of opioid involved in opioid poisoning were selected based on specific reporting of the following opioid types:

- Codeine
 - Morphine
 - Hydromorphone
- Oxycodone
 - Methadone
 - Buprenorphine
- Dextropropoxyphene
 - Pethidine
 - Fentanyl
- Tramadol
 - Tapentadol

For completeness, the more general terms ‘opioid’ and ‘opiate’ (with no specific opioid mentioned) were also included in the search. Frequencies for ED presentations involving the thirteen opioid types are provided in Table 2.

Table 2

Opioid-Related Emergency Department Presentations by Opioid Type, Victoria, 2015/16 to 2017/18

VEMD Category	VEMD Frequencies (%)
Codeine	693 (40%)
Morphine	49 (2.9%)
Hydromorphone	6 (0.3%)
Oxycodone	538 (31.3%)
Opioid NEC	62 (3.6%)
Methadone	133 (7.7%)
Opiate NEC	30 (1.7%)
Buprenorphine	34 (2.0%)
Dextropropoxyphene	<5 (<0.3%)
Pethidine	<5 (<0.3%)
Fentanyl	24 (1.4%)
Tramadol	201 (11.7%)
Tapentadol	21 (1.2%)
Total cases	1,794

#This total includes cases where more than one type of poisoning occurred (see Table 3 for combinations)
NEC - Not Elsewhere Classified

The most commonly encountered opioid types were codeine and oxycodone, followed by tramadol. Tapentadol, which was Therapeutic Goods Administration (TGA) registered in 2011 and Pharmaceutical Benefits Scheme (PBS) approved (for Restricted Benefit listing) in 2013, was reported in 21 cases. A similar number of cases was reported for fentanyl (n=24). Opioid or opiate was not commonly reported without mention of a specific opioid type (n=62 and 30, respectively). Dextropropoxyphene, which is TGA listed in Australia but was withdrawn from the PBS in 2012, was rarely reported (less than five cases). Reporting of pethidine was similarly rare.

The 1,717 ED presentations that specifically mentioned an opioid type in the case narrative occasionally referred to more than one opioid type; there were 1,794 opioid terms identified in the 1,717 cases. An overview of the combinations is provided in Table 3. The most commonly reported combinations were codeine and oxycodone (33 cases), codeine and tramadol (14 cases) and oxycodone and tramadol (14 cases).

Table 3

Opioid-Related Emergency Department Presentations:
Combinations of Overdose/Poisoning by Drug Type, Victoria, 2015/16 to 2017/18

Drug Type	Codeine	Morphine	Hydromorphone	Oxycodone	Methadone	Buprenorphine	Dextropropoxyphene	Pethidine	Fentanyl	Tramadol	Tapentadol
Codeine	*	√	-	√	√	√	√	-	√	√	√
Morphine	√	*	√	√	√	-	-	-	√	√	-
Hydromorphone	-	√	*	-	-	-	-	-	-	-	-
Oxycodone	√	√	-	*	√	-	√	-	√	√	√
Methadone	√	√	-	√	*	√	-	-	√	√	-
Buprenorphine	√	-	-	-	√	*	-	-	-	-	-
Dextropropoxyphene	√	-	-	√	-	-	*	-	-	-	-
Pethidine	-	-	-	-	-	-	-	*	-	-	-
Fentanyl	√	√	-	√	√	-	-	-	*	-	-
Tramadol	√	√	-	√	√	-	-	-	-	*	√
Tapentadol	√	-	-	√	-	-	-	-	-	√	*

*=not applicable; √=drug combination detected (one or more cases); -=no drug combinations detected.

In interpreting these results, it must be emphasised that this is an underestimate of the total number of cases, as reporting of the opioid type in the case narrative is not a specific requirement.

A1 (ii) Hospital Admissions

A total of 3,946 hospital admissions for pharmaceutical opioid-related harm were recorded over the three-year period from 2015/16 to 2017/18: an average of 1,315 per year. Over three-quarters (77.0%, n=3,037) of cases were identified as involving ‘Other opioids’ such as codeine and morphine (Table 4). This ICD-10-AM poisoning category (T40.2) also includes hydromorphone, oxycodone, opioid (NEC - Not Elsewhere Classified) and hydrocodone. A small proportion of cases (3.5%, n=141) involved a combination of codes.

Table 4

Opioid-Related Hospital Admissions by Opioid Type as Coded in ICD-10-AM, Victoria, 2015/16 to 2017/18

ICD-10-AM Codes	Hospital Admissions
T40 – Poisoning by Narcotics and Psychodysleptics (Hallucinogens)	3,946 (100.0%)
T40.2 only – Other Opioids (Codeine, Morphine)	3,037 (77.0%)
T40.3 only – Methadone	239 (6.1%)
T40.4 only – Other synthetic narcotics (Pethidine)	529 (13.4%)
Any Combination	141 (3.5%)
Total T40.2*	3,176 (80.5%)
Total T40.3*	258 (6.5%)
Total T40.4*	653 (16.5%)

*Totals include cases where more than one type of poisoning occurred

A2. OPIOID-RELATED HARM, BY AGE AND SEX

A2 (i) Emergency Department Presentations

An overview of the opioid-related ED presentations by age group and sex is shown in Figure 1. Females (n=1,535, 58.6%) were more likely than males (n=1,083, 41.4%) to present to EDs for opioid-related poisoning. The male/female difference was highest among 15-19 year olds where 75.6% of cases were females; 20-24 year olds, where 65.4% of cases were females, and 25-29 year olds, where females accounted for 59.3% of cases. Regarding age differences, opioid-related ED presentations were most common among those aged 15-49 years, with this age range accounting for 72.2% of cases (n=1,891). The single largest group in terms of opioid-related ED presentations were females aged 15-19 years (n=217).

Figure 1

Opioid-Related Emergency Department Presentations by Age Group and Sex, Victoria, 2015/16 to 2017/18



A2 (ii) Hospital Admissions

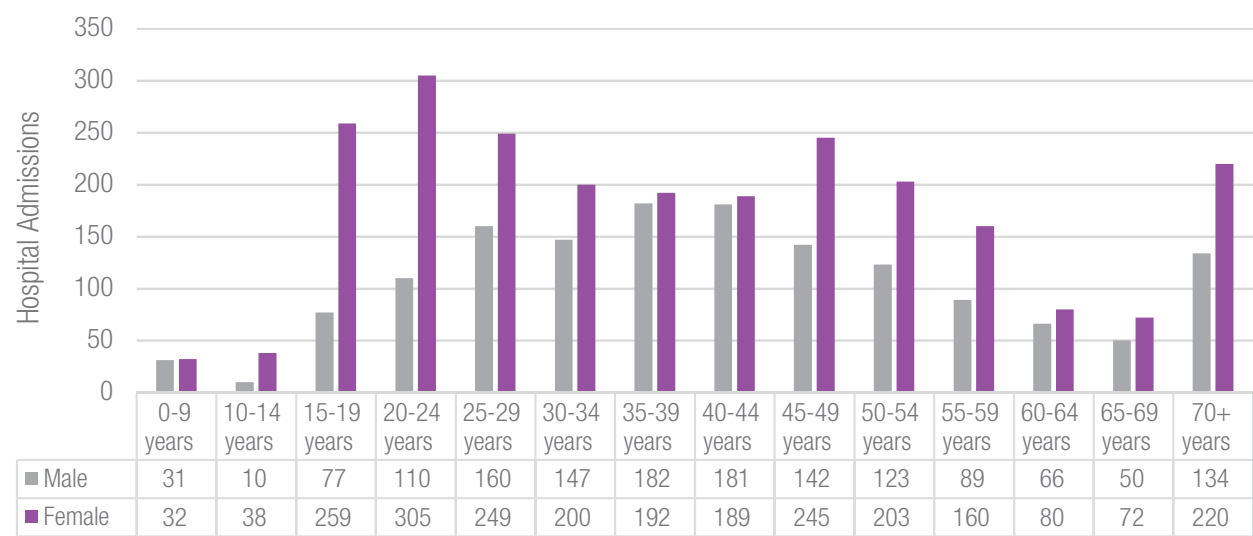
Opioid-related hospital admissions by age and sex, for the three-year period from 2015/16 to 2017/18, are shown in Figure 2. Females (n=2,444, 61.9%) were more likely than males (n=1,502, 38.1%) to be admitted to hospital for opioid-related poisoning. The male/female difference was pronounced in the 15-19 year age groups, where 76.9% of cases were female, and in the 20-24 year age group (73.5%).

The 5-year age band with the highest number of opioid poisoning admissions was 20-24 years (n=415), followed by 25-29 years (n=409). Of all opioid-poisoning related admissions, 75.1% (n=2,964) were in the ages between 15-54 years.

The single largest group in terms of opioid-related hospital admissions were females aged 20-24 years (n=305).

Figure 2

Opioid-Related Hospital Admissions by Age Group and Sex, Victoria, 2015/16 to 2017/18



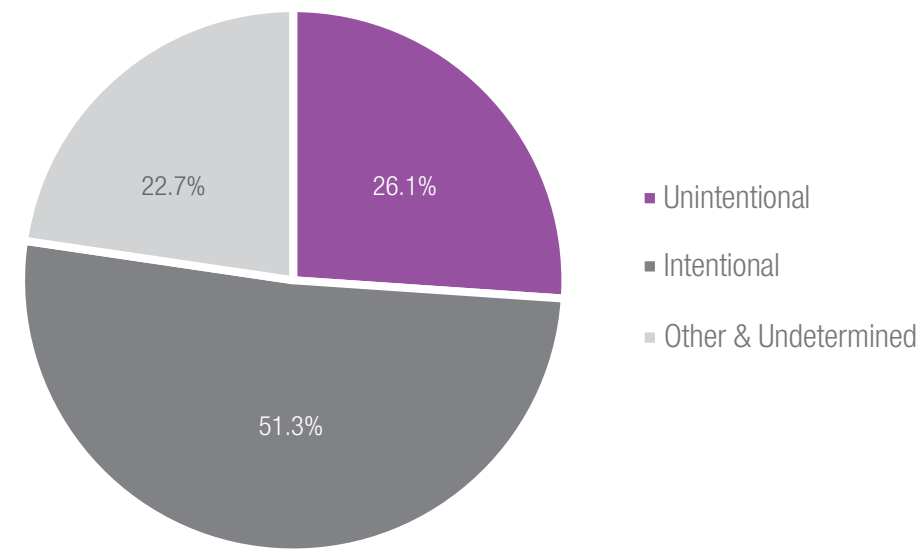
A3. INTENTIONAL VS. UNINTENTIONAL OPIOID-RELATED HARM

A3 (i) Emergency Department Presentations

Figure 3 shows that just over half of opioid-related ED presentations were coded as 'Intentional self-harm' (51.3%). Around one-quarter of cases (26.1%) were coded as unintentional, and 22.7% were coded as 'other and undetermined intent'.

Figure 3

Opioid-Related Emergency Department Presentations by Intent, Victoria, 2015/16 to 2017/18



*Note that a small number of cases coded as 'Assault & Maltreatment' were omitted from the analyses due to confidentiality concerns.

Table 5 shows that for both males (41.7%) and females (58.0%), the greatest proportion of ED presentations relating to opioids were coded as intentional self-poisoning. The highest proportion of unintentional poisonings were observed among children aged 0-14 years (males 76.1% & females 60.7%). Intentional self-poisoning proportions were very high for females at 15-19 years (71.4%), then self-poisonings accounted for between 54% and 66% of cases up until the age of 59 years. For males, the highest proportion of intentional self-poisonings were in the 15-19 year age group (62.9%) followed by the 20-24 year age group (50.5%). Cases of undetermined intent were more common among males (27.1%) than females (19.5%).

Table 5
Opioid-Related Emergency Department Presentations by Intent, Age and Sex, Victoria, 2015/16 To 2017/18

Sex	Age Group	Unintentional Poisoning	Row %	Intentional Self-Poisoning	Row %	Undetermined Intent Poisoning	Row %	Total
Male	0-14	51	76.1	*	*	*	*	*
	15-19	14	20.0	44	62.9	12	17.1	70
	20-24	29	28.7	51	50.5	21	20.8	101
	25-29	29	26.6	43	39.4	37	33.9	109
	30-34	30	26.3	50	43.9	34	29.8	114
	35-39	41	29.9	45	32.8	51	37.2	137
	40-44	39	32.5	58	48.3	23	19.2	120
	45-49	22	20.0	50	45.5	38	34.5	110
	50-54	19	21.6	40	45.5	29	33.0	88
	55-59	20	36.4	*	*	*	*	*
	60+	43	38.4	43	38.4	26	23.2	112
Male Total		337	31.1	452	41.7	294	27.1	1,083
Female	0-14	51	60.7	25	29.8	8	9.5	84
	15-19	34	15.7	155	71.4	28	12.9	217
	20-24	28	14.7	124	64.9	39	20.4	191
	25-29	26	16.4	100	62.9	33	20.8	159
	30-34	26	19.3	75	55.6	34	25.2	135
	35-39	26	18.4	78	55.3	37	26.2	141
	40-44	27	20.3	77	57.9	29	21.8	133
	45-49	26	16.9	102	66.2	26	16.9	154
	50-54	18	18.2	64	64.6	20	20.2	99
	55-59	21	26.6	43	54.4	15	19.0	79
	60+	62	43.4	51	35.7	30	21.0	143
Female Total		345	22.5	891	58.0	299	19.5	1,535
Grand Total		682	26.1	1,343	51.3	593	22.7	2,618

*Cell suppression due to cell count less than five. In some cases, multiple cells are suppressed (some with cell counts of five or above) to maintain confidentiality

A3 (ii) Hospital Admissions

An overview of opioid-related hospital admissions, broken down by intent, is shown in Figure 4; this is based on the ICD-10-AM cause codes X42 (intentional self-poisoning), X62 (unintentional poisoning) and Y12 (poisoning of undetermined intent) that were combined with the pharmaceutical opioid-related poisoning codes. The greatest proportion of cases were coded as intentional self-harm (60.5%); 27.3% were coded as unintentional poisoning and a smaller proportion were of undetermined intent (12.2%).

Figure 4
Opioid-Related Hospital Admissions by Intent, Victoria, 2015/16 to 2017/18

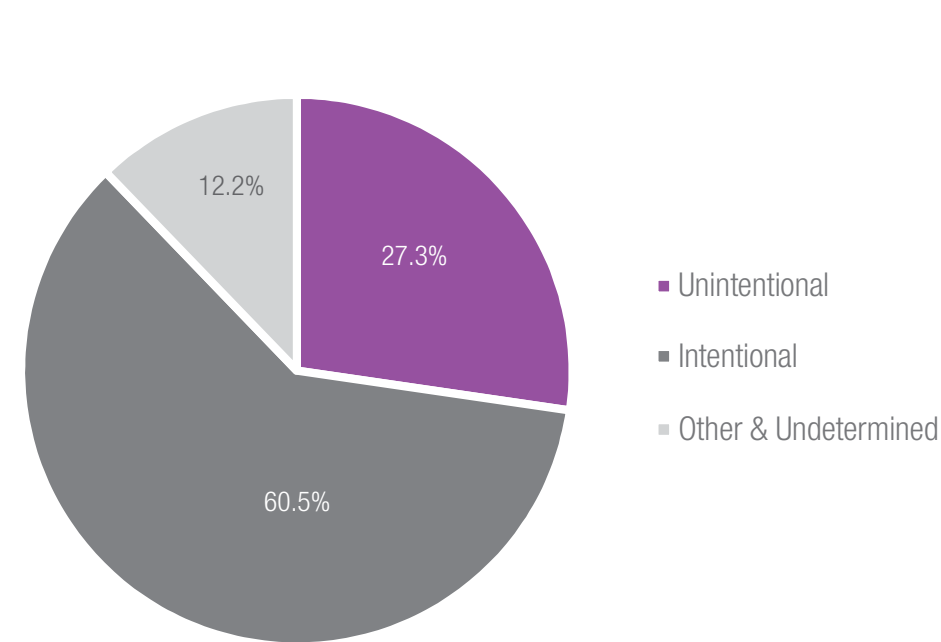


Table 6 gives on overview of opioid-related hospital admissions per age group and sex, by intent. For both males and females, the greatest proportion of cases were recorded as intentional (52.1% and 65.7%, respectively). The highest proportion of cases coded as unintentional were observed in males aged 0-14 years; however, unintentional poisoning occurred in more than half of males aged 60 years and over (56.0%). Among females, the highest proportion of cases coded as unintentional were observed in the age group 60 years and above (53.8%). The proportion of cases coded as intentional was very high among females aged 15-19 years (86.5%), but this was also the case among males in this age group (70.5%). Among females the proportion of intentional self-harm cases remained high at more than 70% between the ages of 20-34 years.

Table 6
Opioid-Related Hospital Admissions by Intent, Age and Sex, Victoria, 2015/16 to 2017/18

Sex	Age Group	Unintentional Poisoning	Row %	Intentional Self-Poisoning	Row %	Undetermined Intent Poisoning	Row %	Total
Male	0-14	35	85.4	6	14.6	0	0.0	41
	15-19	15	19.2	55	70.5	8	10.3	78
	20-24	29	26.4	70	63.6	11	10.0	110
	25-29	42	26.3	96	60.0	22	13.8	160
	30-34	40	27.2	78	53.1	29	19.7	147
	35-39	45	24.7	104	57.1	33	18.1	182
	40-44	50	27.6	97	53.6	34	18.8	181
	45-49	36	25.4	81	57.0	25	17.6	142
	50-54	32	26.0	71	57.7	20	16.3	123
	55-59	35	39.3	43	48.3	11	12.4	89
	60+	140	56.0	82	32.8	28	11.2	250
	Male Total	498	33.2	783	52.1	221	14.7	1,502
Female	0-14	33	*	35	*	*	*	*
	15-19	16	6.2	224	86.5	19	7.3	259
	20-24	48	15.7	236	77.4	21	6.9	305
	25-29	35	14.1	182	73.1	32	12.9	249
	30-34	34	17.0	148	74.0	18	9.0	200
	35-39	41	21.4	117	60.9	34	17.7	192
	40-44	39	20.6	126	66.7	24	12.7	189
	45-49	38	15.5	169	69.0	38	15.5	245
	50-54	45	22.2	135	66.5	23	11.3	203
	55-59	50	*	93	*	*	*	*
	60+	200	53.8	140	37.6	32	8.6	372
	Female Total	579	23.7	1,605	65.7	260	10.6	2,444
Grand Total		1,077	27.3	2,388	60.5	481	12.2	3,946

*Cell suppression due to cell count less than five. In some cases, multiple cells are suppressed (some with cell counts of five or above) to maintain confidentiality.

A4. METROPOLITAN AND REGIONAL DIFFERENCES

An overview of the region of residence of persons with hospital-treated opioid poisoning is provided in Table 7. The majority of persons presenting to the ED or admitted to hospital lived in the Melbourne metropolitan area; they accounted for over two-thirds of pharmaceutical opioid-related harm hospital admissions (68.0%, n=2,684) and ED presentations (67.6%, n=1,771) over the period 2015/16-2017/18. Less than one-third lived in regional areas, whereas only around 3% were interstate/overseas patients, or those with unknown place of residence.

Table 7
Opioid-Related Harm by Metropolitan vs. Regional Area: ED Presentations and Hospital Admissions, Victoria, 2015/16 to 2017/18

Region of Residence	Emergency Department Presentations	Hospital Admissions
Melbourne Metropolitan Area	1,771 (67.6%)	2,684 (68.0%)
Regional/Rural Victoria	773 (29.5%)	1,157 (29.3%)
Interstate/Overseas/Unknown	74 (2.8%)	105 (2.7%)
Total	2,618 (100.0%)	3,946 (100.0%)

To provide insight into the regional incidence of opioid poisoning, population-based incidence of hospital-treated opioid poisoning is provided in Table 8. Non-Victorian residents have been excluded from this table. Rates of ED presentation and hospital admission respectively were 12.4 and 15.6 per 100,000 population in major cities, vs. 19.7 and 39.4 per 100,000 population in inner regional areas. Rates of pharmaceutical opioid-related ED presentations in outer regional/remote areas were similar to rates in major cities, whereas rates of hospital admissions were 34.6 vs. 15.6 in outer regional/remote vs. major city areas.

Table 8
Opioid-Related Harm by Metropolitan vs. Regional Area: Population-Based Rates of ED Presentations and Hospital Admissions, Victoria, 2015/16 to 2017/18

	Emergency Department Presentations	Hospital Admissions
	Annual Rate (per 100,000 pop)	Annual Rate (per 100,000 pop)
Major City	12.38	15.59
Inner Regional	19.67	39.41
Outer Regional/Remote	12.69	34.58

A5. PLACE OF OCCURRENCE

The recorded place of occurrence of opioid poisonings is shown in Table 9. Home was the most common location for opioid-related ED presentations (59.9%, n=1,568). The category 'Home' was also the most common place of occurrence for pharmaceutical opioid-related harm resulting in hospital admission (48.1%, n=1,899) followed by 'School, public buildings' (8.1%, n=318).

However, a large proportion of opioid-related harm hospital admissions had their location of occurrence coded as 'Unspecified places' (39.0%, n=1,540); similarly, the location of injury was unspecified in 29.1% (n=761) of ED presentations.

Table 9

Opioid-Related Harm by Location of Injury: ED Presentations and Hospital Admissions, Victoria, 2015/16 to 2017/18

Location of Injury	Emergency Department Presentations	Hospital Admissions
Home	1,568 (59.9%)	1,899 (48.1%)
School, Public Buildings	27 (1.0%)	318 (8.1%)
Trade & Service Area	5 (0.2%)	50 (1.3%)
Residential Institution	32 (1.2%)	41 (1.0%)
Road, Street & Highway	47 (1.8%)	40 (1.0%)
Other Specified Places	178 (6.8%)*	58 (1.5%)
Unspecified Places	761 (29.1%)	1,540 (39.0%)
Total	2,618 (100.0%)	3,946 (100.0%)

*Due to small cell counts for ED presentations, numbers for 'industrial & construction area' & 'sports & athletic area' were included in the 'other specified places' category.



FOR BOTH MALES AND FEMALES, THE GREATEST PROPORTION OF PHARMACEUTICAL OPIOID-RELATED HOSPITAL ADMISSIONS WERE RECORDED AS INTENTIONAL (52.1% AND 65.7% FOR MALES AND FEMALES, RESPECTIVELY).

A6. EMERGENCY DEPARTMENT PRESENTATION DEPARTURE STATUS

An overview of the departure status of those presenting to the ED in relation to opioid poisoning is shown in Table 10. Those presenting to the ED were highly likely to be admitted to hospital for further treatment (56.1%). Thirty eight percent of ED presentations were discharged to home. There were in total 90 cases recorded as left before treatment completed; this equates to 3.44%. This is considerably higher than among injury presentations overall (not limited to poisoning or opioids: n=1,218,661 for the three-year period), where 1.58% departed before treatment was completed: the difference between these percentages is 1.87% [95% confidence interval: 1.23 to 2.63%].

Table 10

Departure Status for Opioid-Related Emergency Department Presentations, Victoria, 2015/16-2017/18

Departure Status	Frequency	Percent
Discharge to Home/Returning To Usual Residence	996	38.0%
Admission to Ward/This Campus	1,470	56.1%
Transfer to Another Hospital Campus	62	2.4%
Left at Own Risk – Before Treatment Commenced/Without Treatment	*	*
Left at Own Risk – After Treatment Commenced	86	3.3%
Left After Clinical Advice Regarding Treatment Options	*	*
Died Within the ED	*	*
Total	2,618	100.0

*Note that cells were suppressed due to cell counts <5 for confidentiality reasons

A7. NALOXONE USE RECORDED IN THE EMERGENCY DEPARTMENT RECORDS

Reported naloxone or Narcan® use was analysed by means of a text search in the case narratives in opioid poisoning-related ED presentations data. Based on this, it was found that naloxone/narcan administration was mentioned in the narrative in around 1% of ED presentations. Statistical analysis is not meaningful due to the low number of cases. Whether this is due to low incidence of naloxone/narcan administration or due to underreporting cannot be established in this data source. Use of naloxone/narcan in the ambulance was frequently mentioned in these cases, and therefore the Victorian Ambulance data might provide a better data source for analysing naloxone/narcan use, trends in use, and patient demographics.

A8. BURDEN OF OPIOID POISONING: 2015/16 – 2017/18 (THREE YEARS)

Overall, 13,135 bed days were accounted for by pharmaceutical opioid-related harm in Victoria between 2015/16 and 2017/18, with 10,866 bed days resulting from harm caused by ‘Other opioids’ (T40.2). Overall, females aged 65+ years accounted for the largest proportion of opioid-related harm bed days (18.0%, n=2,368) followed by males aged 65+ years (11.8%, n=1,544). Females accounted for a greater proportion of bed days resulting from ‘Other opioid’ related harm than men (60.4% versus 39.6% respectively) and this was also the case for bed days utilised due to harm resulting from the use of ‘Other synthetic narcotics’ (T40.4), where females accounted for 57.2% of bed days compared with 42.8% accounted for by males. Regarding ‘Methadone’ (T40.3) related harm, males (60.0%) accounted for more bed days than females (40.0%). The highest proportion of bed days utilised as a result of methadone-related harm was accounted for by males aged 45-54 years (17.4%, n=145), followed by females 45-54 years (13.4%, n=120). Females aged 65+ years contributed the greatest proportion of bed days resulting from ‘Other opioid’ (T40.2) related harm (18.7%, n=2,030) followed by females aged 45-54 years (12.1%, n=1,318) and males aged 65+ years (11.8%, n=1,287). With regard to bed days utilised as a result of harm caused by ‘Other synthetic narcotics’ (T40.4), 27.3% (n=525) were accounted for by females aged 65+ years followed by males aged 65+ years (10.2%, n=197).

Table 11

Total Bed Days for Hospital Admissions Related to Opioid Poisoning, by Opioid Type and Person’s Age and Sex, Victoria, 2015/16 to 2017/18

	VAED			
	T40.2 ‘Other Opioids’	T40.3 ‘Methadone’	T40.4 ‘Other Synthetic Narcotics’	Overall†
Males				
0-14 years	25 (0.2%)	6 (1.0%)	11 (0.6%)	42 (0.3%)
15-24 years	247 (2.3%)	10 (1.3%)	67 (3.5%)	304 (2.3%)
25-34 years	431 (4.0%)	76 (10.6%)	117 (6.1%)	607 (4.6%)
35-44 years	894 (8.2%)	148 (12.1%)	231 (12.0%)	1,167 (8.9%)
45-54 years	713 (6.6%)	145 (17.4%)	128 (6.6%)	959 (7.3%)
55-64 years	710 (6.5%)	90 (4.0%)	74 (3.8%)	862 (6.6%)
65+ years	1,287 (11.8%)	61 (3.5%)	197 (10.2%)	1,544 (11.8%)
Total	4,307 (39.6%)	536 (60.0%)	825 (42.8%)	5,485 (41.8%)
Females				
0-14 years	57 (0.5%)	* (*)	11 (0.6%)	* (*)
15-24 years	549 (5.1%)	* (*)	171 (8.9%)	* (*)
25-34 years	760 (7.0%)	50 (5.6%)	99 (5.1%)	886 (6.7%)
35-44 years	856 (7.9%)	65 (7.3%)	120 (6.3%)	981 (7.5%)
45-54 years	1,318 (12.1%)	120 (13.4%)	82 (4.3%)	1,489 (11.3%)
55-64 years	989 (9.1%)	90 (10.1%)	93 (4.8%)	1,140 (8.7%)
65+ years	2,030 (18.7%)	21 (2.3%)	525 (27.3%)	2,368 (18.0%)
Total	6,559 (60.4%)	357 (40.0%)	1,101 (57.2%)	7,650 (58.2%)
Grand Total	10,866 (100.0%)	893 (100.0%)	1,926 (100.0%)	13,135 (100.0%)

*Cell suppression due to cell count less than five. In some cases, multiple cells are suppressed (some with cell counts of five or above) to maintain confidentiality. †As some cases involved multiple codes, this column should be considered separately. It will often be smaller than the sum of each ‘code’ column as the code columns are not independent, whilst the ‘overall’ bed days were calculated with overlapping codes taken into account. Calculations for length of hospital stay included transfers within and between hospitals to more accurately estimate burden of injury.

Overall, 62.6% (n=2,648) of hospital stays, where the initial admission was the result of pharmaceutical opioid-related harm, were of a duration of <2 days (Table 12). Stays of 2-7 days accounted for over a quarter of cases (27.8%, n=1,174). Shorter stays became less common with increasing age: among males aged 0-14 years, 88.1% (n=37) of stays were <2 days whilst 33.8% (n=71) of stays among males aged 65+ years were <2 days. The same pattern was observed among females; 86.3% (n=63) of stays among females aged 0-14 years were <2 days compared with 33.9% (n=109) among females aged 65+ years. As a result of the aforementioned pattern, the proportion of stays of length 2-7 days increased with age. Among males, stays of 2-7 days accounted for 11.9% (n=5) of cases among those aged 0-14 years compared with 39.0% (n=82) among those aged 65+ years. Similarly, among females aged 0-14 years, stays of 2-7 days accounted for 13.7% of cases (n=10) compared with 36.0% (n=116) among those aged 65+ years. Due to low cell counts, little information can be drawn from the data regarding stays of 8-30 days and 31+ days: opioid poisoning-related hospital stays of longer than eight days were relatively rare.

Table 12

Grouped Length of Stay for Hospital Admissions Related to Opioid Poisoning, by Age and Sex, Victoria, 2015/16 to 2017/18

	<2 days n (row %)	2-7 days n (row %)	8-30 days n (row %)	31+ days n (row %)	Total
Males					
0-14	37 (88.1%)	5 (11.9%)	0 (0.0%)	0 (0.0%)	42 (100.0%)
15-24	155 (78.3%)	35 (17.7%)	* (*)	* (*)	198 (100.0%)
25-34	215 (66.6%)	89 (27.6%)	19 (5.9%)	0 (0.0%)	323 (100.0%)
35-44	240 (61.9%)	116 (29.9%)	* (*)	* (*)	388 (100.0%)
45-54	171 (61.5%)	84 (30.2%)	* (*)	* (*)	278 (100.0%)
55-64	69 (39.7%)	72 (41.4%)	* (*)	* (*)	174 (100.0%)
65+	71 (33.8%)	82 (39.0%)	46 (21.9%)	11 (5.2%)	210 (100.0%)
Total	958 (59.4%)	483 (29.9%)	151 (9.4%)	21 (1.3%)	1,613 (100.0%)
Females					
0-14	63 (86.3%)	10 (13.7%)	0 (0.0%)	0 (0.0%)	73 (100.0%)
15-24	494 (83.0%)	87 (14.6%)	* (*)	* (*)	595 (100.0%)
25-34	340 (73.9%)	94 (20.4%)	* (*)	* (*)	460 (100.0%)
35-44	265 (64.5%)	121 (29.6%)	* (*)	* (*)	409 (100.0%)
45-54	292 (59.3%)	158 (32.1%)	37 (7.5%)	5 (1.1%)	492 (100.0%)
55-64	127 (48.7%)	105 (38.7%)	* (*)	* (*)	265 (100.0%)
65+	109 (33.9%)	116 (36.0%)	86 (26.7%)	11 (3.4%)	322 (100.0%)
Total	1,690 (64.6%)	691 (26.4%)	209 (8.0%)	26 (1.0%)	2,616 (100.0%)
Grand Total	2,648 (62.6%)	1,174 (27.8%)	360 (8.5%)	47 (1.1%)	4,229 (100.0%)

*Cell suppression due to cell count less than five. In some cases, multiple cells are suppressed (some with cell counts of five or above) to maintain confidentiality. Total N=4,229 includes transfers within and between hospitals to more accurately estimate burden of injury.

Hospital treatment costs refer to the direct and indirect monetary cost associated with an episode of care upon admission. These costs are estimated for each case (see Appendix A for details). Hospital treatment costs for pharmaceutical opioid-related hospital admissions were not available for the 2017/18 financial year, therefore Table 13 displays treatment costs for the period July 2015 to June 2017. During this two-year period the treatment costs for pharmaceutical opioid-related hospital admissions totalled \$16.35 million, with \$9.06m attributed to cases involving females. The ICD-10-AM code associated with the greatest proportion of incurred costs was 'T40.2 – Other opioids', which accounted for \$12.80m, of which \$7.44m was attributed to cases involving females. Females aged 45-54 years accounted for the greatest proportion of costs (\$1.97m) incurred in treating 'Other opioid' related admissions followed by females aged 65+ years (\$1.47m) and males aged 65+ years (\$1.44m). The greatest proportion of costs due to Methadone (T40.3) related admissions was incurred by males aged 45-54 years (\$0.33m), followed by males aged 35-44 years (\$0.31m). Males aged 35-44 years incurred the greatest costs related to 'Other synthetic narcotics' (T40.4) related harm (\$0.50m), followed by females aged 65+ years (\$0.39m) and males aged 25-34 years (\$0.28m).

Table 13

Costs of Hospital Admissions Related to Opioid Poisoning, by Opioid Type and Person's Age and Sex, Victoria, 2015/16 to 2016/17

	T40.2 'Other opioids'	T40.3 'Methadone'	T40.4 'Other Synthetic Narcotics'	Overall*
Males				
0-14	\$27,988	\$969	\$29,697	\$58,027
15-24	\$302,080	\$14,391	\$96,572	\$387,174
25-34	\$905,007	\$174,821	\$278,402	\$1,326,707
35-44	\$1,206,311	\$306,426	\$495,665	\$1,763,386
45-54	\$737,232	\$327,227	\$85,403	\$1,119,140
55-64	\$739,466	\$117,366	\$74,790	\$923,934
65+	\$1,438,496	\$14,569	\$270,802	\$1,716,631
Total	\$5,356,580	\$955,769	\$1,331,331	\$7,294,999
Females				
0-14	\$135,012	\$1,661	\$18,800	\$153,285
15-24	\$882,715	\$5,476	\$237,024	\$1,088,828
25-34	\$802,391	\$173,852	\$196,328	\$1,099,742
35-44	\$1,112,858	\$149,802	\$201,538	\$1,383,299
45-54	\$1,966,179	\$151,698	\$180,031	\$2,242,696
55-64	\$1,076,264	\$26,451	\$166,954	\$1,260,574
65+	\$1,466,543	\$11,528	\$389,693	\$1,830,000
Total	\$7,441,962	\$520,468	\$1,390,368	\$9,058,424
Grand Total	\$12,798,542	\$1,476,237	\$2,721,699	\$16,353,423

*As some cases involved multiple codes, this column should be considered separately. It will often be smaller than the sum of each 'code' column as the code columns are not independent, whilst the 'overall' costs were calculated with overlapping codes taken into account. Calculations for costs of hospital admissions included transfers within and between hospitals to more accurately estimate burden of injury.

SECTION B

B1. TEN-YEAR TRENDS IN OPIOID POISONING (2008/09-2017/18): HARMS ACROSS ALL PHARMACEUTICAL OPIOIDS

In the ten-year period from 2008/09 to 2017/18, there were 12,771 hospital admissions and 7,835 ED presentations due to pharmaceutical opioid poisoning in Victoria. This equates to an average standardised annual rate of 22.1 admissions and 13.6 presentations per 100,000 population.

A graphical representation of the standardised rates over time, for each age group, is shown in Figure 5 and Figure 6. A general upward trend is observed in ED presentation rates, particularly in the 35-44 and 45-54 year age groups. In both ED presentations and admission rates, the youngest age group generally had the lowest rate.

Visual inspection of the rates over time indicates a transient decrease in admission rates starting in 2012/13, which is not observed in the ED presentation rates. This is likely to be caused by the Victorian hospital admission policy change (Hayman & Berecki-Gisolf, 2019). Since the Victorian Hospital Admission Policy change in July 2012, episodes of care delivered entirely within a designated emergency department or urgent care centre could no longer be categorised as an admission regardless of the amount of time spent in the hospital. This has had the transient effect of reducing the number of admissions recorded in the VAED, starting in the 2012/13 financial year.

It is therefore recommended that the hospital admission trends and trend analysis be interpreted with caution, as underlying trends may be masked by the Victorian Admission policy change in 2012.

To better understand underlying trends in hospital admissions, an overview of overnight stay admissions is provided in Appendix C, Figure 8. Same day admissions, which are the most likely to be affected by the Victorian Hospital Admissions policy change in 2012, have been excluded from this analysis. Visual inspection of the trends presented in Figure 8 suggest a slight overall decreasing trend in overnight admissions in the ten-year period from 2008/09 to 2017/18. A slight transient decrease in 2012/13 and 2013/14 is still observed in the overnight stay graph.

Figure 5

Age-Standardised Rates of Opioid-Related Emergency Department (ED) Presentations, Per Broad Age Group, Victoria, 2008/09 to 2017/18

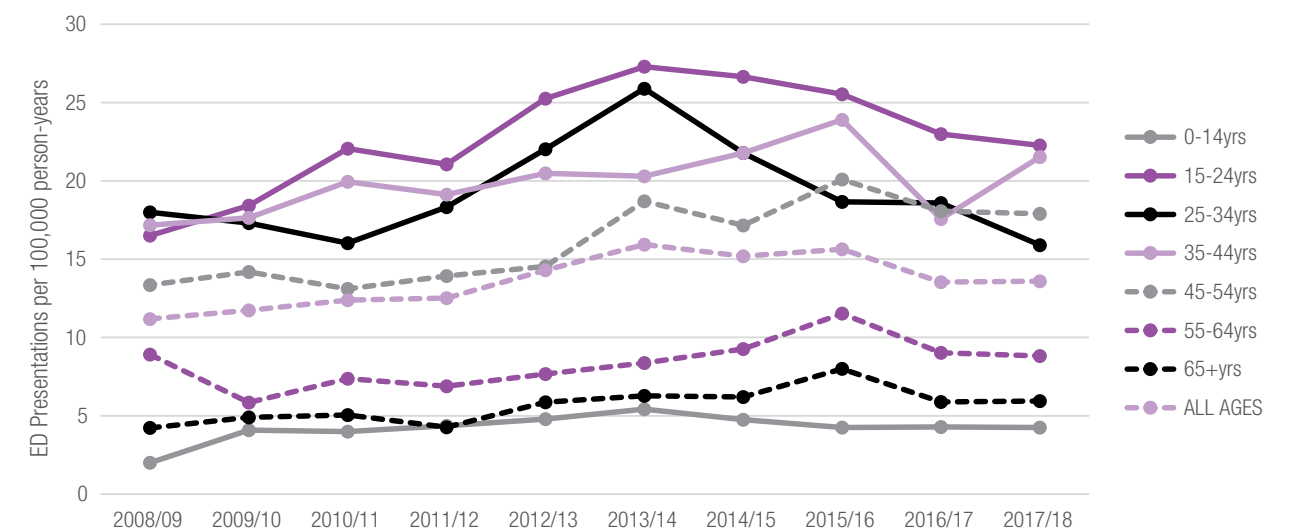
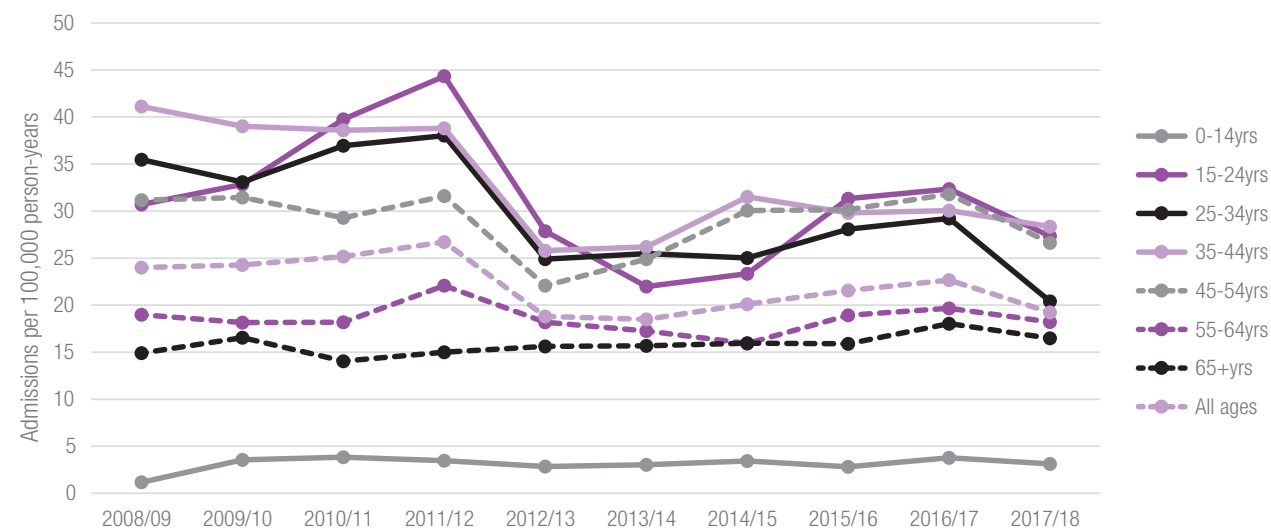


Figure 6

Age-Standardised Rates of Opioid-Related Hospital Admissions, Per Broad Age Group, Victoria, 2008/09 to 2017/18



The number and rate of admissions and ED presentations due to pharmaceutical opioid poisoning, per age group and intent, for the ten-year period from 2008/09 to 2017/18, is shown in Table 14. On average, ED presentation rates among females were higher than among males (16.1 vs. 11.0 per 100,000 population). Similarly, hospital admission rates among females were higher than among males (27.5 vs. 16.5 per 100,000 population). The age group with the lowest rates of opioid poisoning, in both ED presentations and admissions, was the 0-14 year age group: this was observed in both males and females. The demographic with the highest rates of opioid poisoning, observed in both ED presentations and admissions, was that of females aged 15-24 years, with annually 33.0 ED presentations and 47.1 hospital admissions per 100,000 population. Among females, the age group with the highest rates of pharmaceutical opioid poisoning was therefore the 15-24 year age group. Among males, however, the highest rates were observed in the 35-44 year age group, followed by the 25-34 year age group: this pattern was observed in rates of ED presentations as well as hospital admissions. The age group 65 years and above, although expected to be the most exposed to pharmaceutical opioids due to higher prevalence of chronic disease and pain-related conditions in this age group, had relatively low rates of pharmaceutical opioid poisoning. This was particularly the case for ED presentation rates and less so for hospital admission rates, possibly because the chances of being admitted subsequent to ED presentation are higher in this age group. This pattern was observed among both men and women.

The pharmaceutical opioid poisoning ED presentation rate of 13.6 per 100,000 population per year consisted of intentional self-poisoning, unintentional poisoning, and poisoning of other & undetermined intent, with rates of 6.9, 3.0 and 3.7 per 100,000 population, respectively. Similarly, the hospital admission rate of 22.1 per 100,000 population per year consisted mostly of intentional self-poisoning (13.3 per 100,000), with a lesser contribution of unintentional poisoning and poisoning of undetermined intent (5.3 and 3.5 per 100,000 population, respectively).

Modelled changes in rate, adjusted for age group (in 5-year age bands) and sex, are also presented in Table 14. Because the Victorian hospital admission policy change introduced in 2012 may mask underlying admission trends, the formal trend analysis is presented in Table 14 but must be interpreted with caution, and results are therefore shown in grey-shades. For a better understanding of the underlying trends in opioid-related hospital admissions, overnight stay only admission rates (excluding same-day admissions) are presented in Appendix C, Table 17. Overall, there appeared to be a slight decrease in the rate of overnight admissions due to opioid poisoning, during the ten-year period. This decrease was observed overall, among females, and particularly among females aged 15-44 years. A similar decrease was observed among males, in particular males aged 15 to 34 years. Females aged 65 years and above showed an increase in rate of overnight admissions due to opioid poisoning.

The pharmaceutical opioid poisoning ED presentation rate increased statistically significantly over the 10-year period, with an average annual increase of 3.1%. This increase was observed in unintentional poisonings as well as intentional self-poisoning, whereas the rate of other and undetermined intent cases decreased, suggesting a gradual improvement in data quality/completeness. The rate increase among males was slightly higher than the rate increase among females (3.5 vs. 2.2% per year). The demographic with the steepest increase in ED presentation rate was that of males aged 45-54 years, with an increase of 7.9% per year. Females age 65 years and above also showed a steep increase with 5.3% per year. Females aged 15-24 years, the group with the highest ED presentation rates over the ten-year period, showed an average increase of 3.2% per year during the 10-year period.



Table 14

Ten-Year Trends in Opioid-Related Harm, in Terms of ED Presentations and Hospital Admissions
(2008/09 to 2017/18) in Victoria

	Emergency Department Presentations, 2008/09 to 2017/18			Hospital admissions, 2008/09 to 2017/18		
	Frequency, Total (n)	Annual Rate [†] (per 100,000 Population)	Change in Rate, Annually (%, p-value) [‡]	Frequency, Total (n)	Annual Rate [†] (per 100,000 Population)	Change in Rate, Annually (%, p-value) ^{‡§}
Overall	7835	13.60	+3.06%, p<0.0001	12,771	22.10	-1.49%, p=0.007
Demographics						
Males	3157	11.02	+3.51%, p<0.0001	4736	16.51	-1.73%, p=0.008
0-14 years	209	3.60	+2.11%, p=0.43	122	2.10	+4.47%, p=0.35
15-24 years	528	12.90	+2.93%, p=0.06	642	15.69	-3.76%, p=0.04
25-34 years	743	17.00	+1.05%, p=0.52	1066	24.82	-5.19%, p<0.0001
35-44 years	748	18.52	+3.46%, p=0.01	1135	28.24	-1.40%, p=0.30
45-54 years	496	13.11	+7.90%, p<0.0001	765	20.34	+1.33%, p=0.35
55-64 years	220	6.95	+4.23%, p=0.08	461	14.62	+0.04%, p=0.98
65+ years	213	5.33	+3.29%, p=0.18	545	13.98	-1.50%, p=0.35
Females	4678	16.10	+2.15%, p<0.0001	8035	27.53	-1.94%, p<0.001
0-14 years	257	4.87	+4.56%, p=0.11	214	4.14	+2.80, p=0.27
15-24 years	1263	32.98	+3.15%, p=0.02	1810	47.10	-2.41%, p=0.15
25-34 years	940	21.44	-0.13%, p=0.93	1491	34.38	-4.61%, p<0.0001
35-44 years	878	21.32	+0.78%, p=0.51	1535	37.51	-6.39%, p<0.0001
45-54 years	744	19.03	+2.28%, p=0.06	1451	37.28	-1.70%, p=0.17
55-64 years	323	9.79	+3.24%, p=0.03	736	22.50	-0.57%, p=0.66
65+ years	273	5.92	+5.25%, p=0.02	798	17.24	+3.45%, p=0.007
Intent						
Unintentional Poisoning	1765	3.02	+5.99%, p<0.0001	3157	5.30	+0.41%, p=0.55
Intentional Self-Poisoning	3981	6.93	+4.13%, p<0.0001	7617	13.29	-0.94%, p=0.17
Other & Undetermined Intent	2089	3.65	-2.10%, p=0.02	1999 [#]	3.52	-8.51%, p<0.0001

[†] Age-standardised to the 2011 reference population.
[‡] Negative binomial modelling, adjusted for age group in 5-year bands and sex.
[§] Rate changes of hospital admissions must be interpreted with caution, as the Victorian hospital admission policy change in 2012 may have resulted in a decrease in rate that masks underlying trends.
[#] For hospital admissions the summed totals for intent groups are slightly higher than the sample total due to the case selection criteria: a person could have more than one poisoning diagnosis code that could also be associated with more than one type of intent within those diagnosis codes.

Characteristics of ED Presentations Among 45-54 Year Old Males, 2008/09 to 2017/18

As males aged 45-54 years showed the largest increase in ED presentation rates per 100,000 population (an annual increase of 7.9%) during the 10-year period, a search of the text narrative was undertaken to gain some insight into this sub-group. Among this group of males (n=496) most ED presentations were for intentional self-harm (46%, n=228), just under one-third were of undetermined intent (31.8%, n=158), and around one-fifth were unintentional poisonings (22.2%, n=110). The majority resided in Metropolitan Melbourne (63.7%, n=316), with just under one-third residing in Rural/Regional Victoria (32.1%, n=159). Most had arrived at hospital via ambulance (79%, n=392), with 20% arriving via other means, including private cars (n=99). Only 1% were brought in to the emergency department by police (n=5).

The types of opioids used by this group were similar to the pattern found for all ED presentations in that codeine poisoning was the most common (20.2%, n=100), followed by oxycodone poisoning (19.2%, n=95). Methadone and tramadol were the next most commonly reported opioids relating to ED presentations among this group of males aged 45-54 years (6.9%, n=34 for both). Naloxone/narcan use was mentioned in the VEMD text field in only 1% of cases (n=6). As stated previously, it is unclear if this accurately reflects a low incidence of use or if it is due to underreporting in hospital records. Similarly, alcohol was mentioned in a small number of cases (9.1%, n=45) among this group of men.

The source of prescription opioids was difficult to ascertain from the text descriptions. It was unclear if the person was using a drug prescribed to them, if they had been given it by someone else to whom it was prescribed, or if it was obtained illegally. There were some instances where the drug was not taken as prescribed, for example tablets were crushed and injected (e.g. kapanol, targin, ms contin, oxycodone, oxynorm, suboxone), methadone was injected, or a fentanyl patch was melted and injected (n=13, 2.6%).

Mention of a pain condition or an injury suggested possible reasons for taking opioid medication among this group of 45-54 year old males. These included back pain, neck and knee pain, shoulder pain, cancer, or general pain (n=11, 2.2%). Injuries included those to the ankle, back, fractured ribs, and dislocated shoulder (n=6, 1.2%). Mental health conditions such as bipolar disorder, schizophrenia, panic attacks or depression were mentioned in a small number of cases (n=14, 2.8%). Suicidal intent was mentioned in 8.7% of cases (n=43). Life stressors were mentioned in a small number of cases (n=21, 4.2%), and these included arguments with spouse or partner, separation or marriage breakdown, trouble with family and other relationship stressors, lost their job, death in the family, work cover payments stopped, or hearing bad news.

Drug Combinations Recorded for ED Presentations Among 45-54 Year Old Males, 2008/09 to 2017/18

Polypharmacy was common among this group (n=496), with 30% of cases listing non-opioid drugs (n=150), that were combined with one or more prescription opioids. Polypharmacy was most likely to occur among intentional self-harm cases (42.1%, n=96,), compared to 20.9% of unintentional intent cases (n=23) and 19.6% of cases with undetermined intent (n=31). Thirteen cases mentioned polypharmacy in the narrative but did not state the additional drug types involved. Drug combinations recorded in the narrative are displayed in Table 15 for the remaining 137 cases.

Table 15

Polypharmacy Patterns Among Men Aged 45-54 Years, 2008/09 to 2017/18

Drug Type	Antidepressant	Antipsychotic	Benzodiazepine	Other drugs#	Sleeping Pills	Anti Anxiety	Illicit Drugs
One type of opioid & 1 additional drug (n=72)	9 (12.5%)	*	22 (30.6%)	16 (22.2%)	10 (13.9%)	*	8 (11.1%)
One type of opioid & 2-3 additional drugs (n=34)							
Antidepressant	*	-	√	√	-	-	-
Antipsychotic	-	*	√	-	√	√	-
Benzodiazepine	√	√	*	√	√	√	√
Other Drugs	√	-	√	*	√	√	-
Sleeping Pills	-	√	√	√	*	-	-
Anti Anxiety	-	√	√	√	-	*	-
Illicit Drugs	-	-	√	-	-	-	*
More than 1 type of opioid & 1 additional drug ^ (n=10)	√	-	√	√	√	-	-
More than 1 type of opioid & 2-3 additional drugs (n=6)							
Antidepressant	*	-	-	-	√	√	-
Antipsychotic	-	*	-	-	-	-	-
Benzodiazepine	-	-	*	√	√	√	-
Other Drugs	-	-	√	*	-	√	-
Sleeping Pills	√	-	~√	-	*	√	-
Anti Anxiety	√	-	√	√	√	*	-
Illicit Drugs	-	-	-	-	-	-	*

Other drugs included aspirin, paracetamol, insulin, nurofen, blood pressure tablets, non-codeine cold & flu tabs.
^ In the more than 1 opioid group n=15 mentioned polypharmacy but did not list any drugs in the text apart from opioids.

Panadeine forte was mentioned in 32% (n=45) of polypharmacy cases – either taken on its own and combined with non-opioid drugs, or combined with other opioids and/or non-opioid drugs. A small number of the polypharmacy cases involved consumption of alcohol in addition to opioids and other drug types (16.7%, n=25).

Of the cases that described drug combinations in the text, 52.6% (n=72) had taken one type of opioid with one additional non-opioid drug. Table 15 shows that for this group the non-opioid drug was most likely to be a benzodiazepine (n=22, 30.6%), followed by ‘other’ drugs (n=16, 22.2%) and sleeping pills (n=10, 13.9%). Illicit drugs were combined with a single opioid in 11% of cases (n=8).

Around one-quarter of the males in this age group had combined one type of opioid with two or three other drug types (25.8%, n=34). The non-opioid was commonly a benzodiazepine, which was combined with all of the non-opioid drug types, namely antidepressants, antipsychotics, other drugs, sleeping pills, and anti-anxiety medication. Note that when an illicit drug was combined with one opioid these were also combined with benzodiazepines and anti-anxiety drugs.

A small number of males had taken more than one prescription opioid, combined with one additional non-opioid drug, namely antidepressants, benzodiazepines, other drugs, or sleeping pills. Similarly, taking more than one opioid prescription drug and combining it with more than one type of non-opioid was not common (4.4%, n=6) (Table 15).

B2. TEN-YEAR TRENDS IN OPIOID POISONING (2008/09-2017/18):
HARMS BY PHARMACEUTICAL-OPIOID TYPE

The time trends of specific ED-recorded opioid types in the period 2008/09 to 2017/18 are presented in Table 16 and Figure 7. These need to be interpreted with caution, as these numbers rely on reporting of specific opioid types in the case narrative. Fluctuations in quality and completeness of reporting can influence these trends. For this reason, calculation of population-based trends and modelling of rates over time were not carried out.

Visual inspection of the fluctuations over time showed a gradual increase in oxycodone from 2008/09 to reach a maximum in 2015/16 (n=196) with a decrease in the 2017/18 financial year (n=169). The number of cases reporting codeine also reached a maximum in 2015/16 (n=286) but these also decreased recently to 174 cases in 2017/18. Over the ten-year period, the number of morphine-reported cases gradually decreased. Presentations relating to methadone remained relatively stable and while presentations relating to tramadol fluctuated over the 10-year period they were also relatively stable during this period.

Table 16

Ten-Year Trends in Opioid Types Recorded in Opioid-Related ED Presentations in Victoria, 2008/09 to 2017/18

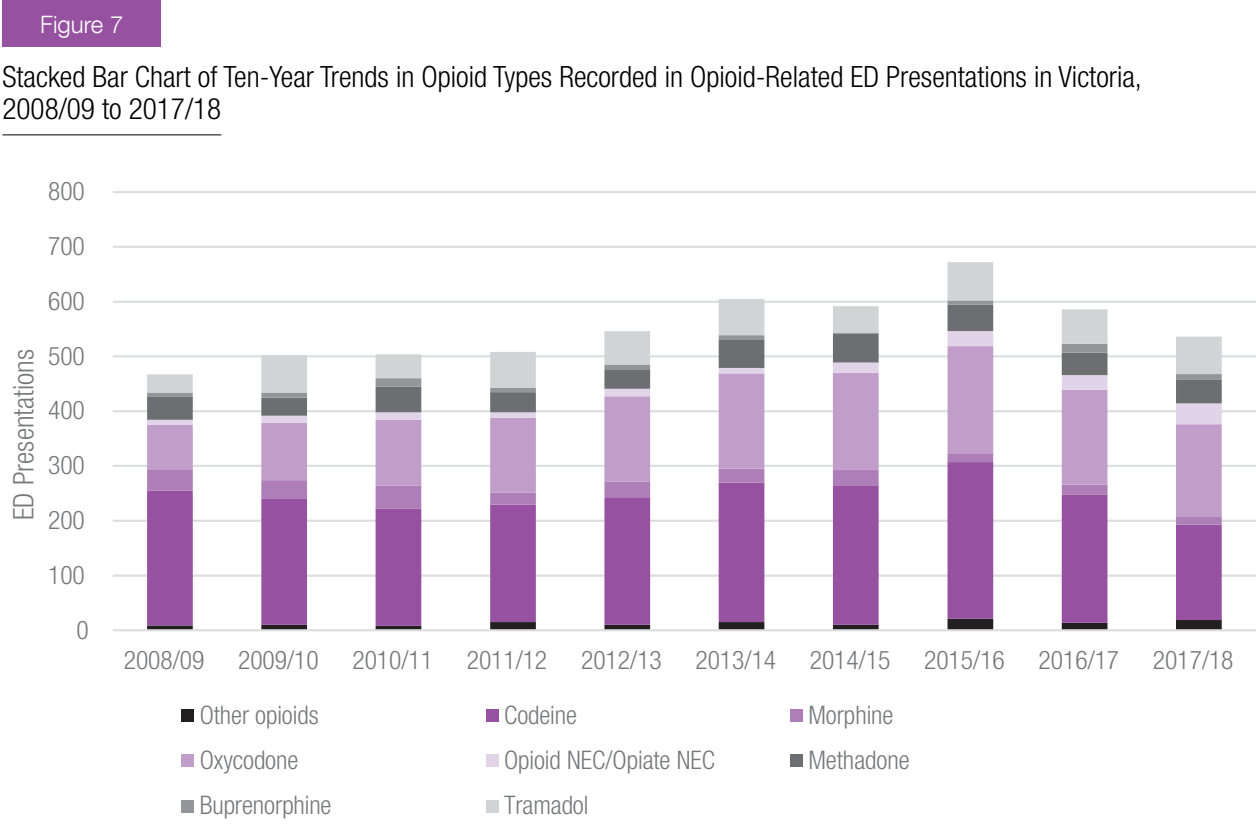
VEMD Category	2008/ 09	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	2014/ 15	2015/ 16	2016/ 17	2017/ 18
Codeine	246	230	214	214	233	255	255	286	233	174
Morphine	39	34	42	22	28	25	28	16	19	14
Hydromorphone	*	0	0	*	0	*	*	*	*	*
Oxycodone	81	105	120	137	156	174	177	196	173	169
Opioid NEC	6	*	6	*	7	7	12	17	20	25
Methadone	42	33	47	37	34	51	52	49	41	43
Opiate NEC	*	*	8	6	7	*	7	10	7	13
Buprenorphine	8	9	15	8	10	9	*	7	16	11
Dextropropoxyphene	5	*	5	*	*	*	0	*	0	*
Pethidine	0	*	*	0	*	0	0	0	*	0
Fentanyl	*	5	*	10	6	13	9	15	6	*
Tramadol	33	68	44	65	61	66	48	70	63	68
Tapentadol	0	0	0	0	0	0	*	*	5	12
Total cases	457	476	480	479	519	577	564	639	557	521

* Cell suppression due to cell count less than five. In some cases, multiple cells are suppressed (some with cell counts of five or above) to maintain confidentiality.

This total includes cases where more than one type of opioid poisoning occurred.



Figure 7 shows trends in opioid types mentioned in the narrative for ED presentations. This shows a consistently high proportion of poisonings related to codeine, which ranged from 53% of all cases in 2008/09, around 43% of all cases between 2010/11 and declining to 32% of all cases in 2017/18. In contrast, the proportion of oxycodone-related poisonings rose from 17% of all cases in 2008/09 to around 29% of all cases during the period 2012/13 to 2016/17 and increasing slightly to 32% of all cases in 2017/18. As stated previously, trends in specific opioid types rely on quality and completeness of the case narrative and thus should be interpreted with caution.



PHARMACEUTICAL OPIOID-RELATED ED PRESENTATION RATES AND HOSPITAL ADMISSION RATES WERE HIGHER AMONG FEMALES THAN MALES.

AMONG FEMALES, THE AGE GROUP WITH THE HIGHEST RATES OF PHARMACEUTICAL OPIOID POISONING WAS THE 15-24 YEAR AGE GROUP; THIS WAS OBSERVED IN ED PRESENTATIONS AS WELL AS HOSPITAL ADMISSIONS.

DISCUSSION

Main Findings from the Most Recent Three Years

In the three-year period from 2015/16 to 2017/18, there were 2,618 Emergency Department presentations and 3,946 hospital admissions due to pharmaceutical opioid poisoning in Victoria.

The most commonly encountered **opioid types** in the ED presentations were codeine (40%) and oxycodone (31%), followed by tramadol (12%). For both ED presentations and inpatient admissions, oxycodone and codeine accounted for more than 70% of cases.

ED presentations were highest in the 15-49 year old **age** bracket (72% of all presentations). Similarly, most (75.1%) hospital admissions were for individuals aged 15-54; however, it is of note that 9% of hospitalisations were for individuals aged 70+ years.

There were more **female** opioid-related ED presentations (58.6%) and hospital admissions (61.9%) than for males. The distribution of harms across age varied depending on gender. Harms were highest for females in their teens and twenties, whereas male harms peaked in their 30s. The single largest group in terms of opioid-related ED presentations were females aged 15-19 years. In hospital admissions, the largest group was females aged 20-24, followed by females aged 15-19 years. Within these younger age groupings (15-24 years), females represented 70.5% of ED cases and 75.1% of hospital admissions.

Half (51.3%) of the ED cases, and 60.5% of hospital admissions were related to **intentional self-harm**. More females were represented at every age grouping for intentional self-harm, accounting for 66.3% (ED presentations) to 67.2% (hospital admissions) of cases across all ages. The intentional poisonings of women skewed toward individuals in their teens and twenties – e.g. 71.4% of ED presentations and 86.5% of opioid-related hospital admissions for 15-19 year old females were due to intentional self-poisoning. This highlights the importance of addressing youth mental health with initiatives that are gender-appropriate to meet the needs of this high-risk group.

Consistent with measures of prescription opioid use (AIHW, 2018) and waste water analyses (Australian Criminal Intelligence Commission, 2019), population-adjusted ED and inpatient attendances associated with pharmaceutical opioid poisoning were greatest in **regional** areas compared with metro areas. The inner regional rate was 1.6 times higher compared to the major city areas for ED presentations (19.7 vs 12.4 per 100,000 residents), and was 2.5 times higher for hospital admissions (39.4 vs 15.6 per 100,000 residents).

The most common recorded **location** of the opioid poisoning was the home (59.9% ED, 48.1% hospital admissions), followed by a road, street or highway for ED presentations (1.8%) and a school or public building for hospital admissions (8.1%).

Information is available about the **departure status** of ED presentations. More than half (56.1%) were admitted to hospital in the same ward/campus location for further treatment, 38.0% were discharged to home, and 3.3% left before treatment was completed.

Overall, 13,135 **bed days** were accounted for by pharmaceutical opioid-related hospital admissions in Victoria. Two thirds (62.6%) of these hospital stay durations were less than two days, and 27.8% for 2-7 days, with the proportion of longer stays increasing with patient age. The **costs** of these admissions to the health system exceeded 16 million dollars.

Main Findings About Trends Over the Past 10 Years

Trends were observed for the ten-year period 2008/09-2017/18. Over this time, there were 7,835 ED presentations and 12,771 hospital admissions due to pharmaceutical opioid poisoning in Victoria. Note this pattern of greater hospital admissions than ED presentations is likely due to underestimation of ED cases: unspecified opioid poisoning cases were not included. Also note the fluctuations in hospital admission rates over the past 10 years, which are likely influenced by the 2012 policy change in the way hospital admissions are classified. When excluding data most likely affected by this policy change (admissions for less than one day), there appeared to be a slight decreasing trend in overnight admissions.

Due to the detail in opioid-specific recording in the narrative, we describe the ED trends in greater detail. There was a **general upward trend** observed for the ED presentation rates over the past decade (3.1% per year); however, earlier trends of rising harms appear to be stabilising, with a slight peak in pharmaceutical opioid-related ED presentations around 2013/14 and 2015/16. Similar to what was presented in the past 3 years’ findings, the past 10 years’ harms were more common amongst younger individuals, and mostly due to intentional poisoning. The demographic group which continued to have the highest rates were females aged 15-24 years; however, the steepest increases in rates were for males aged 45-54 years (7.9% per year), and females aged ≥65 years (5.3% per year). It is of note that this steeply rising demographic of middle aged men are the group most likely to be represented in fatal drug overdoses, who are typically described as male aged 40+ years, living in a regional setting who used a combination of pharmaceutical-opioids as well as benzodiazepines (Pennington Institute, 2018).

Codeine was associated with the greatest proportion of ED cases in all 10 years observed; however, the proportion appears to be declining from 53.8% of all poisoning cases in 2008/09 to 33.4% of all cases in 2017/18. In contrast, the proportion of oxycodone-related poisonings rose from 17.7% of all cases in 2008/09 to 32.4% of all cases in 2017/18.

Findings Within the Context of Current Policy Responses and Policy Implications

Pharmaceutical opioid harms rose throughout the 2000s (Roxburgh et al., 2017). This Hazard report shows early signs that harms with pharmaceutical opioids may be decreasing, though it will be important to continue to monitor these trends. This report also clearly demonstrates that opioid-related harms continue to be substantiative, and Victorians may be at particular risk of harm. Deaths due to pharmaceutical opioid use, adjusted for population, and even in absolute terms for the most recent data available, are higher in Victoria than in other jurisdictions (Pennington Institute, 2018). In wastewater analyses which cover approximately half of the Australian population, Victoria’s estimated oxycodone and heroin consumption was substantially higher compared to all other jurisdictions (Australian Criminal Intelligence Commission, 2019).

Unintentional overdose accounts for the majority of deaths (Pennington Institute, 2018), and increasing overdose education and **naloxone** availability may prevent some of these deaths. Naloxone availability may be increased through provision without a prescription and a user-fee, and via multiple channels such as peer user groups, community pharmacies and as a part of a hospital diagnostic flow for patients who are admitted with an overdose (Nielsen & Dietze, 2019).

However, most of the non-fatal poisonings captured in ED and hospitalisations were intentional. This calls for a more nuanced response underpinned by an understanding of the drivers of intentional self-harm. We must consider what policy and practice responses may be appropriate, especially for higher risk **demographics** such as young females, and higher risk opioid formulations such as codeine-paracetamol combinations which can cause liver damage due to the paracetamol content.

Study of opioid-related deaths was outside the scope of this edition of Hazard. In a study by Roxburgh et al. (2017), however, the majority of pharmaceutical opioid deaths in Australia were reported to be unintentional. Of the 4963 pharmaceutical opioid deaths in Australia between 2001 and 2012, 1106 (22%) were reported to be intentional, 3028 (61%) unintentional and in 829 (17%) cases, intent was not determined (Roxburgh et al., 2017). However, in studies of suicide deaths, intentional pharmaceutical poisoning is the second leading method in Victoria (Victorian Injury Surveillance Unit, 2017) and in Australia (Australian Bureau of Statistics, 2017). There is good evidence that limiting ‘access to means’ reduces suicide rates. For example, closing off access to common suicide hotspots (such as bridges) reduces suicide rates - it doesn’t shift the problem elsewhere (Pirkis et al., 2015). Prescription opioid policy and practice could, therefore, play a role in suicide prevention; furthermore, identifying risk factors for opioid poisoning could help to inform suicide prevention efforts.

The finding that most harms were associated with oxycodone and **codeine** is consistent with other studies, and relative to their common supply (AIHW, 2018). In 2018, codeine became a prescription-only medicine (previously available over the counter in lower doses). The apparent decrease in codeine harms may have been affected by the announcement of intention to reschedule codeine in 2015 (Therapeutic Goods Administration (TGA), 2015) and may coincide temporally with wide scale efforts to increase consumer and health care professional education about risks associated with codeine use (Therapeutic Goods Administration (TGA), 2018a).

In April 2019 Victoria became the first Australian jurisdiction to commence implementation of mandatory **real time prescription monitoring** (Parliament of Victoria, 2017). “SafeScript”, which will become mandatory in April 2020, applies to doctors when writing and to pharmacists when dispensing certain medications. When risky behaviours are identified, the health care professional decides whether to refer to treatment or to continue to supply; however, typically, GPs and pharmacists are often not confident in talking about substance use and mental health relative to other areas of practice (Phokeo, Sproule, & Raman-Wilms, 2004; Survey Research Laboratory, 2000; White, Hayes, Boyes, Chiu, & Paul, 2019). This highlights an important area for ongoing training and professional support.

Policy changes intended to reduce harms must be approached cautiously, address underlying drivers for use, and the potential for use to be displaced into other avenues. For example, attempts to restrict nonmedical use of oxycodone via pill reformulation can have unintended consequences where regular users may switch to other opioids such as heroin, with flow-on effects such as increased blood-borne virus transmission (Jauncey, Livingston, Salmon, & Dietze, 2018; Powell, Alpert, & Pacula, 2019).

Continued monitoring of these trends and changing environment are required to assess the impact of various policy changes on pharmaceutical poisoning related harm. This report will provide a clear baseline from which to compare changing patterns of harms with pharmaceutical opioids following the rescheduling of codeine, reformulation of oxycodone, and the implementation of real time prescription monitoring.

Limitations

The quality and completeness of the findings presented in this edition of Hazard are dependent on the quality and completeness of the data sources. Policy changes can impact the capture of hospital admissions data and affect trends (Davie et al., 2019): an example of this is the Victorian Hospital Admission policy change which occurred in 2012 (Hayman & Berecki-Gisolf, 2019). Since the Victorian Hospital Admission policy change in July 2012, episodes of care delivered entirely within a designated emergency department or urgent care centre could no longer be categorised as an admission regardless of the amount of time spent in the hospital. The hospital admissions data presented in the Appendix are a step towards filtering the effect of this policy change on trends observed in the admissions data. These changes, however, may have had a ripple effect on other types of admissions, which cannot be readily eliminated from the data.

Coding of opioid-related harm in the VAED is based on ICD-10-AM, which is not well suited for distinguishing between the various pharmaceutical opioid types. The relevant injury codes are T40.2: Other opioids, codeine, morphine; T40.3: Methadone; and T40.4: Other synthetic narcotics, pethidine. Important pharmaceutical opioids such as oxycodone, tramadol and buprenorphine are not explicitly listed; therefore, specific patterns of hospital admissions related to these opioid types could not be reported.

The VEMD is also limited in terms of pharmaceutical opioid capture: in the VEMD, involvement of specific opioid types is determined based on reporting of this in the narrative (text field). Substantial mismatches between opioid poisoning according to the coding vs. the narrative are reported in Table 1. Furthermore, the results suggest that the opioid poisoning is frequently not specified during the ED presentation: in the T40 diagnosis group, which captures poisoning due to narcotics and psychodysleptics, the most commonly occurring code was T40.6: *Other and unspecified psychodysleptics [hallucinogens]*. These cases are not included in this edition of Hazard, because this category is not limited to *pharmaceutical opioid* poisoning. This may have contributed to undercounting of cases in this report.

RECOMMENDATIONS

The following recommendations are made in light of the findings from the current study:

Pharmaceutical Opioid-Related Harms

1.	2.	3.	4.
Increased Naloxone Availability	Interventions to Prevent Self-Harm	Ensure Self-Harm Prevention Activities Address Identified Risk Groups	Data linkage Studies to Optimise Health Service Delivery
ED presentations due to pharmaceutical opioid-related poisoning have been rising over the past decade. Increasing the availability of opioid overdose “reversal” drug, naloxone, may help to reduce fatalities associated with accidental overdoses.	More than half of the non-fatal poisonings captured in ED and hospitalisations were the result of intentional self harm. Intentional pharmaceutical poisoning is the second leading suicide method. This confirms the need for ongoing collection and analysis of self-harm related metrics to monitor the impact of policy and other interventions.	Consider implementing place-based approaches to self-harm prevention to target risk groups identified through this work (e.g. young women and middle-aged men at risk of opioid related harm).	Data linkage studies could examine the patient pathways between GPs, mental health services, ambulances and EDs, to examine how service-usage may mitigate high risk periods, and how patterns of service usage may be used to identify where earlier intervention and prevention are required.

Injury Surveillance and Coding

5.	6.	7.	8.
Expand ED Data Collection to Inform Prevention	ICD-10-AM Coding of Pharmaceutical Opioid Harm	Monitoring of Opioid-Specific Harm	Self-Harm Surveillance
Additional data collection through VEMD free-text field may lead to improved identification of motivations for self-harm injury incidents. Data collection should include, where possible, source of the opioids (doctor-prescribed; diverted; other illicit).	Improved opioid-specific coding in both hospital datasets may also better inform prevention efforts. In particular, better opioid-specific coding in the ICD-10-AM is required.	Opioid-specific monitoring is particularly relevant to monitoring the impact of the changed availability of codeine, and the potential effect of this on the uptake of other opioid types. Improved coding (the previous recommendation) may also help to monitor for changes associated with the implementation of prescription monitoring and other policy changes intended to reduce opioid related harm.	Continued monitoring of trends in hospital admissions due to pharmaceutical opioid-related poisoning once the influence of the changes made to the Victorian hospital admission policy are settled will also provide a more detailed picture of trends over time.

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APPENDIX A: DATA SOURCES AND CASE SELECTION

The scope of this Hazard is limited to pharmaceutical opioid-related harm. Unintentional and intentional self-poisoning are included, but assault and medical injury (complications of medical and surgical care) are not. In addition, the VEMD and VAED cases include those coded as ‘Undetermined intent’.

Hospital Admissions

Hospital admissions data were extracted from the Victorian Admitted Episodes Dataset (VAED), which records all admissions to public and private hospitals in the state of Victoria. The VAED includes demographic, clinical and administrative details for every admitted episode of care. The coding in the VAED conforms to the definitions in the National Health Data Dictionary (NHDD) (Australian Institute of Health and Welfare, 2015).

The clinical details include forty diagnosis codes that include injury and external cause information coded according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). Hospital admissions between 01 July, 2008 and 30 June, 2018 were selected.

Table A1 shows the ICD-10-AM codes used for selection of hospital admissions from the VAED. Records were retained if a pharmaceutical opioid poisoning (ICD-10-AM code T40.2 (poisoning by narcotics and psychodysleptics - other opioids such as Codeine, Morphine etc), T40.3 (poisoning by narcotics and psychodysleptics - Methadone) or T40.4 (poisoning by narcotics and psychodysleptics - other synthetic narcotics such as Pethidine)), and an external cause code of accidental poisoning (ICD-10-AM X42-accidental poisoning by and exposure to narcotics and psychodysleptics, not elsewhere classified) or intentional self-poisoning (ICD-10-AM X62-intentional self-poisoning by and exposure to narcotics and psychodysleptics, not elsewhere classified) or poisoning of undetermined intent (ICD-10-AM Y12- poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified, undetermined intent) was recorded in any one of the forty diagnosis codes.

Transfers within and between hospitals were excluded to avoid over-counting the incidence, but were included when providing estimates of hospital costs and number of hospital bed-days as their inclusion provides a more accurate estimate of the burden of injury.

The Service and Funding Projects Branch of the Victorian Department of Health and Human Services (DHHS) supplied VISU with cost data sourced from the Victorian Cost Data Collection Centre (VCDC). DHHS conducts an annual collection of cost data via the VCDC and this data forms the basis for the cost data which is submitted to the National Hospital Cost Data Collection (NHCDC) and managed by the Independent Hospital Pricing Authority (IHPA).

Cost data collected through the VCDC can be broken down by cost bucket components to understand resource consumption across health service areas (e.g. allied health, Emergency Department, critical care unit, intensive care unit, imaging, medical and surgical, nursing, pathology, pharmacy, theatre and other).

Australian Refined Diagnosis Related Groups (AR-DRGs) provide a clinically meaningful way of relating the types of patients treated in a hospital to the resources required by the hospital. DHHS supplied average costs per AR-DRG (inpatient episodes) to be applied to the VISU-held VAED. The costs provided were stratified by age group and sex and include both direct and indirect costs of treating patients.

Table A1

ICD-10-AM Codes for Selection of Hospital Admissions from the VAED

Includes	AND
T40.2 (other opioids: (codeine, morphine) [also hydromorphone, oxycodone, opioid NEC, hydrocodone]	X42 (accidental poisoning by and exposure to narcotics and psychodysleptics, not elsewhere specified).
Or T40.3 (methadone)	Or X62 (Intentional self-poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified)
Or T40.4 (other synthetic narcotics: pethidine) [also Opiate NEC, buprenorphine, dextropropoxyphene, fentanyl, tramadol]	Or Y12 (poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified, undetermined intent

Emergency Department Presentations

Emergency Department presentations data were extracted from the Victorian Emergency Minimum Dataset (VEMD), which records all presentations to Victorian public hospitals with 24-hour emergency departments (currently 38 hospitals). An ‘emergency department (ED) presentation’ is defined as an injury or poisoning that results in a person presenting to a hospital emergency department for treatment who is triaged (assessed for urgency), including those patients who leave before treatment commences.

VEMD case selection was based on ICD-10-AM diagnosis codes, as well as text searches. Consistency was checked based on a random sample (e.g. 200 cases) with both code and text indicating pharmaceutical opioid overdose. These cases were cross-checked for consistency in the coded vs. text information on opioid type and intent. Cases were limited to incidence, with return and pre-arranged visits excluded. Cases where human intent was coded as ‘Assault, Maltreatment & Neglect’ were removed from the analyses due to data confidentiality concerns related to small numbers. ED presentations between 01 July, 2008 and 30 June, 2018 were selected.

VEMD Case Selection Based on Text Searches (to Identify Specific Types of Pharmaceutical Opioids):

Cases were selected using a search of the ‘Description of Injury Event’ variable, which contains a text narrative describing the circumstances of the injury. Manual checks were undertaken for each search term category to check for relevance. Text search procedures were as follows:

1. Text search for mention of opioid drug names, including common misspellings and brand names
 - a) Using this method, there were 13 categories of pharmaceutical opioids coded: codeine, morphine, hydromorphone, oxycodone, opioid (Not Elsewhere Classified), methadone, opiate (Not Elsewhere Classified), buprenorphine, dextropropoxyphene, pethidine, fentanyl, tramadol, tapentadol. Full details of search terms used are shown in Table A2.
2. Determine if these cases were poisonings or overdoses using the following methods:
 - b) Text search within the 13 drug categories using the following terms:
 - i. Text search for ‘narcan’ or ‘naloxone’, which are medications used to block the effects of opioids, especially in the event of an overdose. Appearance of these drug terms was used as a proxy for overdose.
 - ii. Text search for the terms ‘overdose’, ‘o/d’, ‘od’, ‘over dose’ ‘over/dose’ ‘od,’.
 - iii. Text search for ‘poison’ or ‘poisoning’.
 - iv. Text search for ‘drug abuse’ and ‘toxicity’.
 - v. Diagnosis of ‘T40’ - poisoning by narcotics and psychodysleptics (hallucinogens) appeared in any of the three VEMD diagnosis codes (3-digit).

Cases where a person appeared in more than one drug category of overdose/poisoning were retained to assess the most common patterns of multi-drug use (see Table 2).

Table A2

Search Terms, Including Brand Names and Misspellings,
Used for Opioid-Related Emergency Department
Presentations by Opioid Type, Victoria

VEMD category	VEMD – misspellings & brand names
Codeine	codeine, codine, codene, codeien, hydrocodone^, panadeine, pandeine, panadine, panadiene, panadeine forte, mersyndol, mersyndol forte, aspalgin, nurofen plus,
Morphine	morphine, ms contin, mscontin, anamorph, sevredol, ms mono, kapanol
Hydromorphone	hydromorphone, dialudid, hydromorph, jurnista, dihydromorphinone
Oxycodone	oxycodone, oxycodine, oxycodne, oxycontin, oxcontin, oxy, endone, oxynorm, targin
Opioid NEC	opioid, opioids, opiod, opoid (no drug names or brands)
Methadone	methadone, methodone, metahdone, metjhadone, mehtadone, methatdone, methdone, physeptone, biodone
Opiate NEC	opiate, opiates, opioate
Buprenorphine	buprenorphine, norspan, suboxon, suboxone, soboxone, suboxine, subutex, temgesic, norbuprenorphine
Dextropropoxyphene	dextropropoxyphene, dextropropoxphene
Pethidine	pethidine, pethadine, meperidine, demerol, demarol,
Fentanyl	fentanyl, fentanil, durogesic, duragesic, actiq, fentora, abstral, onsolis, sublimaze
Tramadol	tramadol, lodam, tramedo, tramal, zydol
Tapentadol*	tapentadol, tapantadol, palexia

VEMD= Victorian Emergency Minimum Dataset.
^ Note that hydrocodone was included in the 'codeine' search terms for the VEMD.
* Tapentadol is not included in ICD-10-AM coding.

VEMD Case Selection Based on ICD-10-AM
Diagnosis Codes (to Identify Cases of Poisoning
Where Specific Types of Pharmaceutical Opioids
Were Not Mentioned):

These were selected if the relevant ICD-10-AM codes for poisoning (T40.2, T40.3 or T40.4) appeared in *any* of the three diagnosis codes (4-digit) contained within the VEMD.

APPENDIX B: STATISTICAL ANALYSIS

Rates for ED presentations and hospital admissions and deaths per 100,000 population, by age, sex and year were calculated using population data sourced from the Australian Bureau of Statistics (ABS), Estimated Residential Population. Population data was provided by age, sex, and year.

Trend analysis: changes in the rates of ED presentations and hospital admissions per population were modelled using Poisson and negative binomial models (whichever was the better fit for the data), as trends in the annual number of events, with the log of the Victorian population as offset. All models contained financial year (time indicator) and were adjusted for age group (in five-year bands) and sex, where possible (i.e. unless the analysis was limited to a single age group or sex). The percentage change per year was calculated as: $[e^{\alpha} - 1] \times 100$, where α is the model-estimated rate of increase or decrease. The analyses were conducted using the PROC GENMOD procedure in SAS V9.4.

APPENDIX C: OVERNIGHT STAY HOSPITAL ADMISSION TRENDS

Figure 8
Age-Standardised Rates of Opioid-Related Hospital Admissions, Overnight Stay Only (Same-Day Admissions Excluded), Per Broad Age Group, Victoria, 2008/09 to 2017/18

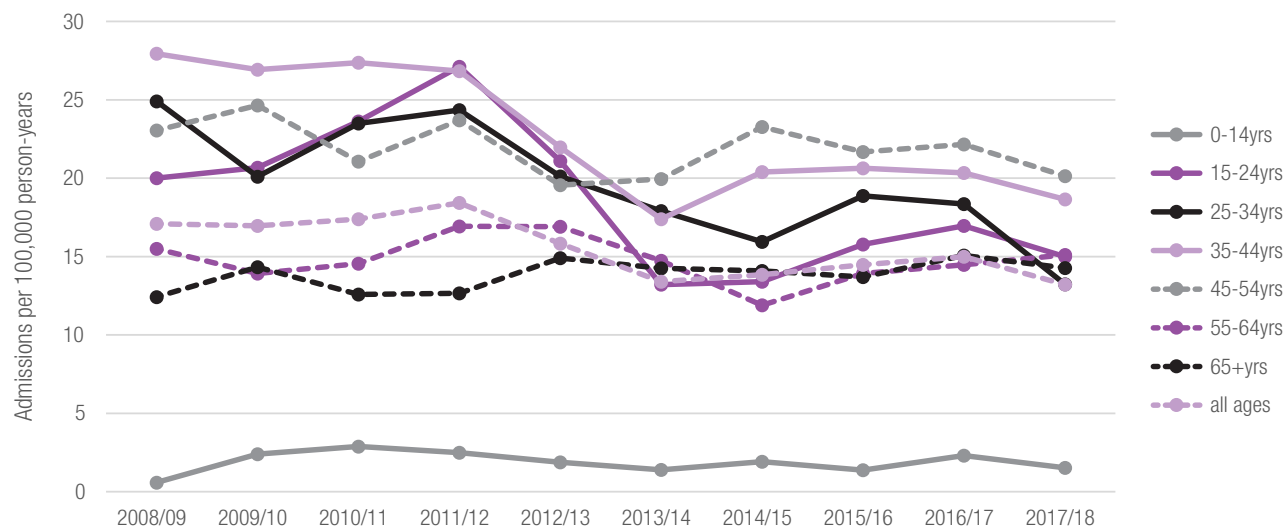


Table 17

Ten-Year Trends in Opioid-Related Harm, in Terms of Overnight (Non-Same Day) Hospital Admissions, Victoria, 2008/09 to 2017/18

	Overnight Hospital Admissions, 2008/09 to 2017/18		
	Frequency Total (n)	Annual Rate* (per 100,000 pop)	Change in Rate, Annually (% , p-value)†‡
Overall	9021	15.56	-2.31%, p<0.0001
Demographics			
Males	3382	11.72	-2.17%, p=0.001
0-14 years	68	1.19	-2.92%, p=0.61
15-24 years	401	9.81	-5.28%, p=0.002
25-34 years	703	16.32	-3.75%, p=0.006
35-44 years	787	19.58	-2.04%, p=0.19
45-54 years	573	15.25	+0.52%, p=0.72
55-64 years	378	11.97	-0.87%, p=0.67
65+ years	472	12.11	-1.21%, p=0.50
Females	5639	19.29	-2.85%, p<0.0001
0-14 years	133	2.60	+0.92%, p=0.80
15-24 years	1064	27.81	-5.15%, p=0.003
25-34 years	995	23.05	-5.91%, p<0.0001
35-44 years	1065	26.03	-6.84%, p<0.0001
45-54 years	1106	28.43	-1.98%, p=0.07
55-64 years	577	17.62	-0.78%, p=0.59
65+ years	699	15.17	+3.15%, p=0.03

* Age-standardised to the 2011 reference population.
† Negative binomial modelling, adjusted for age group in 5-year bands and sex.
‡ Rate changes of hospital admissions must be interpreted with caution, as the Victorian hospital admission policy change in 2012 may have resulted in a decrease in rate that masks underlying trends

HAZARD EDITION INDEX

Subject	Edition	Subject	Edition
Asphyxia	60	Latrobe Valley	
Assaults	55,73,79,83	First 3 Months, Injury Surveillance & Prevention	9
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Baseball	30	Lawn Mowers	22
Boating-Related Recreational Injury	56	Marine Animals	56
Bunkbeds	11, 75	Martial Arts	11
Button Batteries	75	Mobility Scooters	62
Bicycles		Motor Vehicle Related, Non-Traffic, Vehicle Jack Injuries	20,63
Bicycle Related	6,31,34,44,65	Motorcycles	64,65,81
Cyclist Head Injury Study	2,7,8,10	Needlestick Injuries	11,17,25
Burns		Nursery Furniture	37,44
Scalds, Burns Prevention	3,12,25	Older People	19,67,80,84
Unintentional Burns and Scalds in Vulnerable Populations	57	Off-Street Parking Areas	20
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Data Base Use, Interpretation & Example of Form 2		Domestic Chemical and Plant Poisoning	28
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Dishwasher Machine Detergents – Update	18	Early Childhood, Child Resistant Closures	2, 27, 47
Diy Maintenance Injuries	41	Adult Overview	39
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		Regional Injury Profiles	85
Domestic Architectural Glass	7,22,25	Residential Institutions	76,84
Domestic Violence	21,30,79,83	Road injury	36,65,76
Drowning/Near Drowning, Including Updates	2,5,7,30, 34,55	Roller Blades, Skateboards, Scooters	2,5,25,31,44,78
		School	10,76
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Escalator	24	Shopping Trolleys	22,25,42
Exercise Bicycles, Update	5,9	Smoking-Related	21,25,29,44
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		Sports - Child Sports, Adult Sports, Surf Sports, Snow Sports	8,9,44,15,51, 56,66,74,76
Farm, Tractors	24,30,33, 47,68	Suicide - Motor Vehicle Exhaust Gas	11,20,25,41
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		VISS: How it Works, Progress, A Decade of Victorian Injury Surveillance	1,26,40
Horse Related	7,23	VISAR: Celebration of Visar Achievements, VISAR Name Change to VISU	50,61
Infants - Injuries in the First Year of Life	8	Work-Related	17,18,58,76,82
Injury Surveillance Developments, inc. ICD-10 Coding	30,43		
Intentional	13,83		

VAED includes all Victorian public and private hospitals	
VEMD Participating hospitals	
<i>From October 1995</i>	
Austin & Repatriation Medical Centre	
Ballarat Base Hospital	
The Bendigo Hospital Campus	
Box Hill Hospital	
Echuca Base Hospital	
The Geelong Hospital	
Goulburn Valley Base Hospital	
Maroondah Hospital	
Mildura Base Hospital	
The Northern Hospital	
Royal Children's Hospital	
St Vincent's Public Hospital	
Wangaratta Base Hospital	
Warrnambool & District Base Hospital	
Western Hospital - Footscray	
Western Hospital - Sunshine Williamstown Hospital	
Wimmera Base Hospital	
<i>From November 1995</i>	
Dandenong Hospital	
<i>From December 1995</i>	
Royal Victorian Eye & Ear Hospital	
Frankston Hospital	
<i>From January 1996</i>	
Latrobe Regional Hospital	
<i>From July 1996</i>	
Alfred Hospital	
Monash Medical Centre	
<i>From September 1996</i>	
Angliss Hospital	
<i>From January 1997</i>	
Royal Melbourne Hospital	
<i>From January 1999</i>	
Werribee Mercy Hospital	

<i>From December 2000</i>
Rosebud Hospital
<i>From January 2004</i>
Bairnsdale Hospital
Central Gippsland Health Service (Sale)
Hamilton Base Hospital
Royal Women's Hospital
Sandringham & District Hospital
Swan Hill Hospital
West Gippsland Hospital (Warragul)
Wodonga Regional Health Group
<i>From January 2005</i>
Mercy Hospital for Women
<i>From April 2005</i>
Casey Hospital
<i>From July 2011</i>
Bass Coast Regional Health

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All issues of Hazard and other information and publications of the Monash University Accident Research Centre can be found on our internet home page:

www.monash.edu/muarc/visu

How to access VISU data

VISU collects and analyses information on injury problems to underpin the development of prevention strategies and their implementation. VISU analyses are publicly available for teaching, research and prevention purposes. Requests for information can be lodged via the data request form on the VISU website or by contacting the VISU office by phone.

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