Opioid consumption in South Australia:

an analysis of wastewater and prescription data, 2011 to 2018

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There have been increases in prescriptions for some pharmaceutical opioids[1] in Australia, as well as increases in harms associated with their use. This was investigated in South Australia by measuring opioid consumption levels in wastewater, supplemented by data on prescription rates, and measures of mortality and morbidity.

Summary

- Wastewater data from 2012 to 2015 indicate that opioid consumption levels increased, with decreases thereafter.
- PBS data from 2011 to 2017 show no change or decreases in prescriptions for most opioids, but increases for oxycodone.
- Unintentional drug-induced deaths increased between 2011 and 2017 in all opioid classes; the rate of increase was highest in those classes that include oxycodone and fentanyl.
- The majority of opioid-related Emergency Department (ED) presentations and hospitalisations were for morphine, oxycodone and fentanyl. There were increases between 2014 and 2017 for these drugs, as well as for heroin.
- These data suggest that there was no significant increase in the consumption level and prescription rate of most pharmaceutical opioids in South Australia between 2011 and 2017, despite increases in harm.

Conclusions

- Data are suggestive of a small cohort of high-risk individuals who may experience morbidity and mortality after consuming these drugs. Changes to prescribing such as a move to low dose oxycodone might also explain the discrepancy between PBS and wastewater data, with prescriptions increasing while consumption levels have decreased.
- Further research is needed looking at the age, sex and location of those who are prescribed pharmaceutical opioids, as well as those who overdose. They may comprise two distinct groups with different levels of harm associated with use. Guidelines to reduce unintentional opioid-induced deaths should take into account the profile of those who are at higher risk of experiencing harm.
- While it is essential to continue monitoring these indicators, wastewater, prescription and hospitalisation data do not indicate a significant increase in use and harms associated with other opioids in South Australia.

Limitations

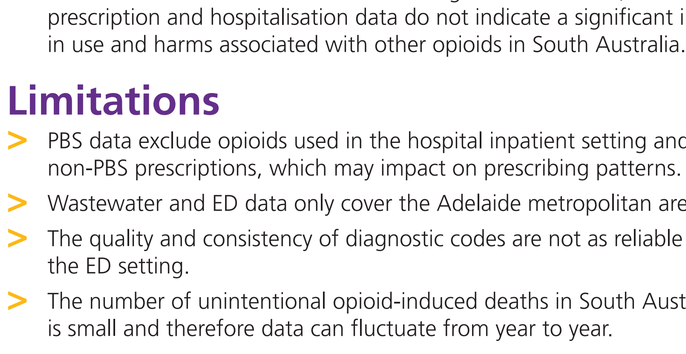
- PBS data exclude opioids used in the hospital inpatient setting and non-PBS prescriptions, which may impact on prescribing patterns.
- Wastewater and ED data only cover the Adelaide metropolitan area.
- The quality and consistency of diagnostic codes are not as reliable in the ED setting.
- The number of unintentional opioid-induced deaths in South Australia is small and therefore data can fluctuate from year to year.

Data sources

- Wastewater: sampling every two months at four treatment plants in Adelaide. Twenty-four-hour composite samples taken over one week in each period; analysed for drug metabolites and converted to doses/week/1000 people.
- Prescription: community-based prescriptions from pharmacies and South Australian hospitals under the Pharmaceutical Benefits Scheme (PBS). Based on date drug is supplied to patient and on patient location.
- Opioid-induced deaths: unintentional deaths[2,3], ED presentations and hospitalisations.

Findings

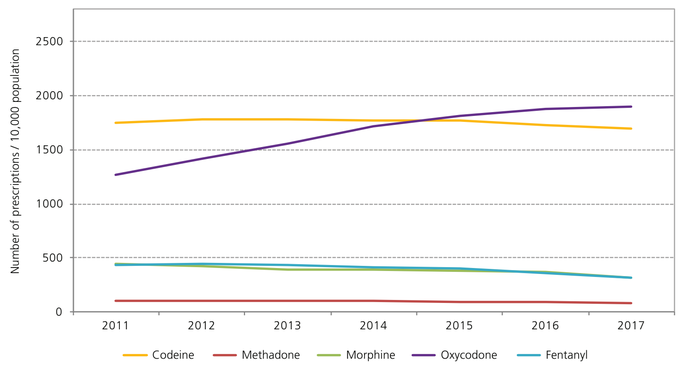
Figure 1: Average consumption levels of opioids in wastewater, Adelaide metropolitan area, 2012-2018



Data for 2016 and 2017 are preliminary. Natural and semi-synthetic opioids include codeine, oxycodone, morphine; synthetic opioid analgesics include fentanyl, pethidine, tramadol. Can include multiple opioids. Data source: Australian Bureau of Statistics (ABS) using data from the National Coronial Information System (NCIS). Extracted and analysed by the Penington Institute.

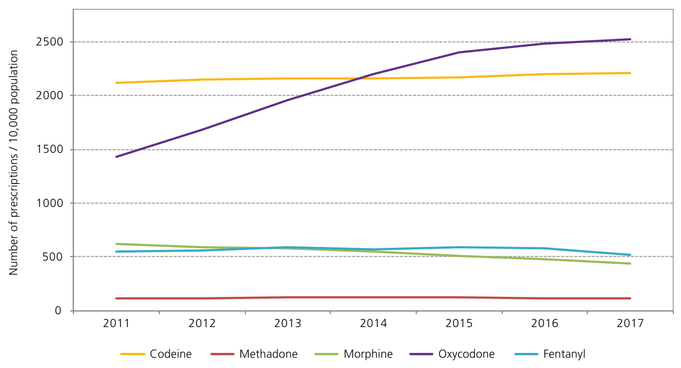
- Oxycodone and fentanyl consumption levels in wastewater increased from 2012 to 2015 and decreased after that time. While there was a small increase in fentanyl consumption levels between 2017 and 2018, they did not return to those seen in 2015.
- Morphine, methadone and codeine consumption levels in wastewater decreased from 2012 to 2018.

Figure 2: Number of opioid* prescriptions per 10,000 population, Adelaide metropolitan area, 2011-2017**



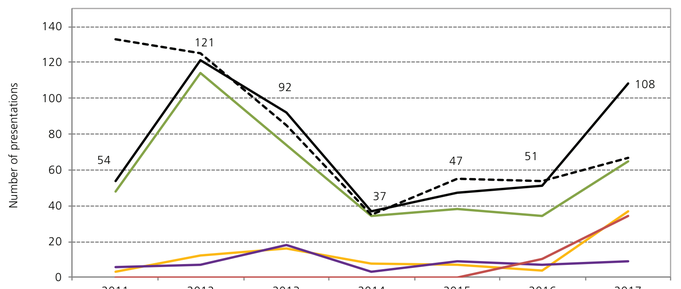
*Excludes over the counter codeine products; codeine prescriptions also include the combination of codeine/aspirin and codeine/paracetamol. Oxycodone prescriptions also include the combination of oxycodone/naloxone. Includes scripts from the PBS and RPBS and excludes under-co-payment scripts. Cell suppression was applied where scripts were >0 and <6. For a full list of item numbers see www.pbs.gov.au.
**Population estimates are based on ABS data for South Australians aged 15 years and over, as at June 30 of each year. Data source: Commonwealth Department of Human Services.

Figure 3: Number of opioid* prescriptions per 10,000 population, regional and remote South Australia, 2011-2017**



- In the Adelaide metropolitan area between 2011 and 2017, the prescription rate per 10,000 population for codeine, morphine, methadone and fentanyl decreased.
- In regional and remote South Australia between 2011 and 2017, the prescription rate increased slightly for codeine, and decreased for morphine, methadone and fentanyl.
- Oxycodone was the only opioid where the prescription rate increased over time, in both the Adelaide metropolitan area and in regional and remote South Australia.

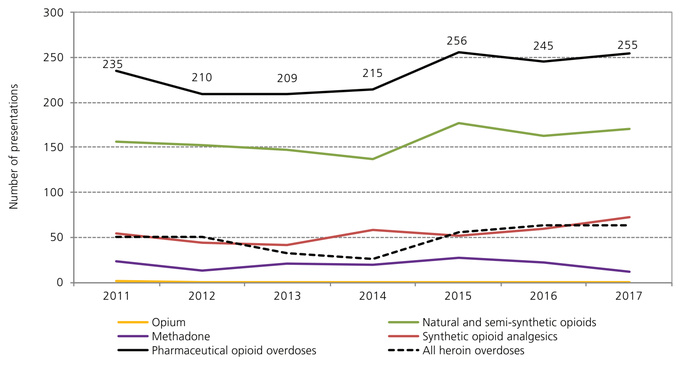
Figure 4: Number of presentations to metropolitan emergency departments where the principal diagnosis relates to opioid overdose, 2011-2017



Codes are based on the International Classification of Diseases (ICD) Version 10: T40.0-T40.4 Poisoning by narcotics and psychodysleptics (hallucinogens). Includes opium (T40.0), heroin (T40.1), natural and semi-synthetic opioids (T40.2, e.g. codeine, oxycodone, morphine), methadone (T40.3) and synthetic opioid analgesics (T40.4 e.g. buprenorphine, fentanyl, pethidine). Population estimates are based on ABS data for South Australians aged 15 years and over, as at June 30 of each year. Data source: Emergency Department Data Collection (EDDC), Department for Health and Wellbeing.

- The number of ED presentations related to pharmaceutical opioid overdose increased from 2011 to 2017 (54 to 108), while the number of heroin-related overdoses decreased (133 to 67). Trends are not consistent with wastewater and prescription data.
- Most presentations related to pharmaceutical opioid overdose were attributed to natural and semi-synthetic opioids (60% in 2017); there were no overdoses attributed to synthetic opioid analgesics until 2016 (20% of overdoses) and 2017 (31% of overdoses).

Figure 5: Number of hospitalisations where the principal diagnosis relates to opioid overdose, 2011-2017



See Figure 4 for codes used. Data source: Integrated South Australian Activity Collection (ISAAC), Department for Health and Wellbeing.

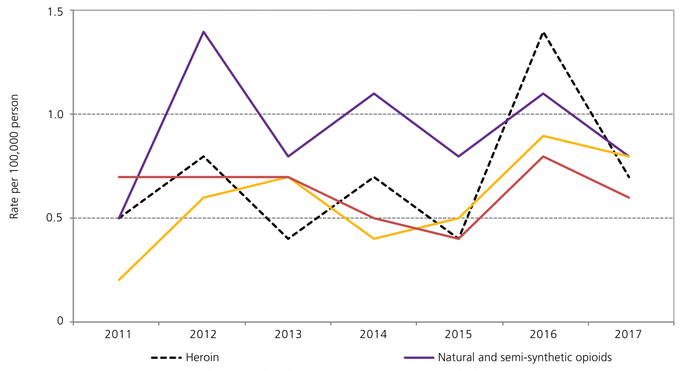
- The number of hospitalisations related to pharmaceutical opioid overdose increased slightly from 2011 to 2017 (235 to 255), as did the number of heroin-related overdoses (51 to 63). Again, the trend is not consistent with wastewater and prescription data.
- Most hospitalisations related to pharmaceutical opioid overdose were attributed to natural and semi-synthetic opioids (67% in 2017).

Figure 6: Rate of unintentional opioid-induced deaths per 100,000 persons, South Australia and Australia, 1997–2017

Codes based on the International Classification of Diseases (ICD) Version 10 were used to extract cases where unintentional opioid-induced death was the underlying cause . Data for 2016 and 2017 are preliminary. Can include multiple drugs. Data source: Australian Bureau of Statistics (ABS) using data from the National Coronial Information System (NCIS). Extracted and analysed by the National Drug and Alcohol Research Centre (NDARC).

- The unintentional opioid-induced death rate in Australia increased from 4.3 per 100,000 persons in 2011 to 5.4 in 2017.
- The rate in South Australia also increased from 2011 (1.7) to 2017 (2.6), but the trend does not correlate with wastewater or PBS data.

Figure 7: Rate of unintentional opioid-induced deaths per 100,000 persons, by opioid type, South Australia, 2011–2017



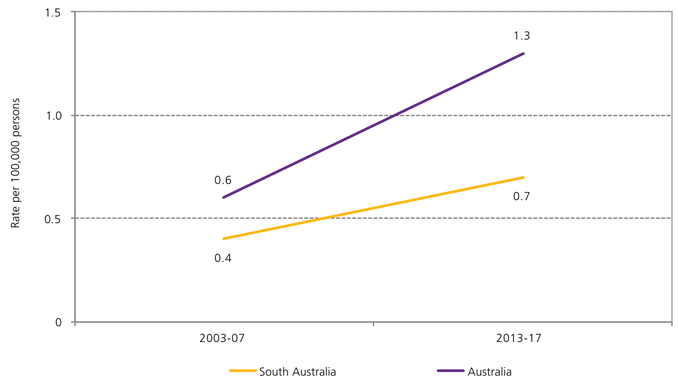
Data for 2016 and 2017 are preliminary. Natural and semi-synthetic opioids include codeine, oxycodone, morphine; synthetic opioid analgesics include fentanyl, pethidine, tramadol. Can include multiple opioids. Data source: Australian Bureau of Statistics (ABS) using data from the National Coronial Information System (NCIS). Extracted and analysed by the Penington Institute.

- There were small increases between 2011 and 2017 in the rate of unintentional opioid-induced deaths for each opioid type except methadone; this does not correlate with wastewater or prescription data.
- The increase was greatest for synthetic opioid analgesics (4x), followed by natural and semi-synthetic opioids (1.6x) and heroin (1.4x).

Figure 8a: Rate of unintentional pharmaceutical opioid-induced deaths per 100,000 persons, South Australia and Australia, 2003-07 to 2013-17

Data for 2016 and 2017 are preliminary. Pharmaceutical opioids include natural and semi-synthetic opioids, synthetic opioid analgesics and methadone. Can include multiple opioids. Data source: Australian Bureau of Statistics (ABS) using data from the National Coronial Information System (NCIS). Extracted and analysed by the Penington Institute.

Figure 8b: Rate of unintentional heroin-induced deaths per 100,000 persons, South Australia and Australia, 2003-07 to 2013-17



- Unintentional drug-induced deaths due to pharmaceutical opioids are mostly attributed to natural and semi-synthetic opioids (e.g. oxycodone).
- The rate of unintentional drug-induced deaths has increased between 2003-07 and 2013-17 for both pharmaceutical opioids (1.5x in South Australia and 2.5x in Australia), and heroin (1.8x in South Australia and 2.2x in Australia).

[1]Opioids are a class of drugs that are used for pain relief (e.g. codeine, morphine, oxycodone and fentanyl) or for the treatment of opioid dependence (e.g. methadone). Prior to February 2018, codeine was available both by prescription and over the counter, after which time it was rescheduled and is only available by prescription. Morphine, methadone, oxycodone and fentanyl can be used legally on prescription or may be sourced illegally. The data presented here cannot differentiate illicit from licit use, with the exception of heroin.

[2]Chrzanowska, A., Dobbins, T., Degenhardt, L. & Peacock, A. (2019). Trends in drug -induced deaths in Australia, 1997-2017. Drug Trends Bulletin Series. Sydney: National Drug and Alcohol Research Centre, UNSW Sydney.

[3]Penington Institute (2019). Australia's Annual Overdose Report 2019. Melbourne: Penington Institute.

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We pay respect to the traditional and original owners of this land the Muwinina people, to pay respect to those that have passed before us and to acknowledge today's Tasmanian Aboriginal people who are the custodians of this land.