

# METHODS FOR “TRENDS IN DRUG-RELATED HOSPITALISATIONS IN AUSTRALIA, 1999–2019”

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## General note

Data on hospitalisations presented in the [online interactive visualisation](#) and reported in the [bulletin](#) were derived from the [National Hospital Morbidity Database](#) (NHMD) held by the Australian Institute of Health and Welfare (AIHW).

## Scope of the data

The National Hospital Morbidity Database (NHMD) is compiled from data supplied by the state and territory health authorities. It is a collection of electronic confidentialised summary records for hospital [separations](#) (that is, completed [episodes of care](#)) in public and private hospitals in Australia. Separations for which the care type was reported as ‘[newborn without qualified days](#)’, and records for ‘[posthumous organ procurement](#)’ and ‘[hospital boarders](#)’ have been excluded. It should be noted that state of hospitalisation equals the state of usual residence, and that cross-border separations were not provided. Although there are national standards for data on hospital services, there are some variations in how hospital services are defined and counted, between public and private hospitals, among the states and territories and over time. The national data on hospital care does not include care provide by non-hospital providers, such as community health centres. For more information, see the [AIHW report](#) ‘Variation in hospital admission policies and practices: Australian hospital statistics’.

For Tasmanian records, provision of data between 2008-09 and 2015-16 was limited to selected drug and alcohol related principal and/or additional diagnoses and external causes.

At the time of separation, a principal (i.e., main) diagnosis, and up to 99 additional diagnoses may be recorded. The data presented in this bulletin include only hospitalisations where drugs were determined to be the principal reason for the hospital admission (i.e., identified in the principal diagnosis field).

**We have not included hospitalisations where the principal diagnosis is related to tobacco or alcohol use, other unspecified drug use and fetal and perinatal conditions. It is important to note many drug-related hospitalisations involve more than one drug (including alcohol) but may have one substance coded as the ‘principal diagnosis’. Further, sometimes it is not possible to determine one**

**substance as the primary drug leading to the hospitalisation; these cases are coded and presented as ‘multiple drug use’ and thus will not be represented in the count of hospitalisations for a single substance.**

Hospitalisations are coded according to the World Health Organization’s (WHO) [International Statistical Classification of Diseases](#) (ICD) and Related Problems, [Australian Modification](#). The ICD 10th revision (ICD-10-AM) (National Centre for Classification in Health, 1998) was used to code data dating from 1999 to the present in South Australia (SA), Western Australia (WA), and Queensland (QLD). The remaining jurisdictions commenced using ICD-10-AM codes in 1998. Caution should be exacted in comparing diagnosis, procedure and external cause data over time, as the classifications and coding standards for these data can change. Drug involvement in presentation to hospital may be underreported or under-ascertained, and the coding system used does not necessarily allow identification of the specific drug involved in presentations (often instead the broader substance category e.g., ‘synthetic opioids’ rather than ‘fentanyl’). Please refer to Chronicle of [ICD-10-AM/ACHI/ACS](#) First-Eleventh Edition for information on changes in classifications and coding standards over time and ICD-10-AM editions.

Due to the different ways in which psychotic disorder and withdrawal codes are treated in the 9<sup>th</sup> and 10<sup>th</sup> revision of the ICD coding structure, analyses presented in this bulletin include data from 1999-2000 to 2018-19 only. For trends in drug-related hospitalisations from 1993-94 to 2014-15 that do not include psychotic disorder and withdrawal codes, please refer to our [previous reports](#) or contact the authors ([drugtrends@unsw.edu.au](mailto:drugtrends@unsw.edu.au)).

## Presentation of results

Results of the analysis of the hospitalisations data are presented as:

- **number of hospitalisations**,
- **crude rate of hospitalisations per 100,000 people**, calculated using the Australian Bureau of Statistics estimated resident population figures as of 30 June each year, and
- **age-standardised rate per 100,000 people**, calculated using the [Australian Standard Population](#) at 30 June 2001.

Age-standardised rates enable the comparison of rates over time and between populations of different age structures. Counts less than or equal to 5 have been suppressed to protect confidentiality. The rates were calculated using the [direct](#) standardisation method as recommended by the Australian Bureau of Statistics (ABS) and AIHW. In accordance with recommendations to ensure stability of age-standardised rates from sparse data, age-standardised rates were not calculated if the number of total hospitalisations was less than or equal to 10. In this case, the reader should refer to other measures such as number of deaths or crude rate of deaths. Age-standardised rates are only calculated for people of all ages (i.e., the rate is not calculated for specific age groups). In the [online interactive visualisation](#), data are not displayed if age-standardised rate is selected for age group analysis.

Rate ratio, corresponding 95% confidence interval and p-value of difference in age-standardised rates (crude rates for age group analysis) between 2018-19 and 2017-18 were calculated in a Poisson model using Stata version 16.0. Sampling weights were used in the Poisson model to obtain corresponding estimates for the age-standardised rates (based on the Australian Standard Population at 30 June 2001). Rate ratios range between 0 and infinity. In our bulletin, a rate ratio of <1 indicate that there was a decrease in rate of hospitalisations from 2017-18 to 2018-19 and a rate ratio of >1 indicate that there was an increase in rate of hospitalisations from 2017-18 to 2018-19. The threshold for statistical significance is  $p < 0.05$ .

## Age and sex

Age of the person at the time of admission to hospital is provided by the AIHW in the NHMD as a 5-year and 10-year age group. In the bulletin and in the online data visualisation we report on findings for Australians of all ages and by 10-year age group (10-19 to 60-69 and 70 and over), where data allows for such disaggregation. We do not report on finding for age under 10 years due to sensitivity of these data. [Sex](#) is reported as male and female, as provided by the AIHW in the NHMD. Hospitalisations where sex was reported as intersex or indeterminate or was not stated/inadequately described are grouped in the NHMD as one category. These records are not included in sex analysis but are included in analyses of total hospitalisations.

## Jurisdiction and remoteness area

Data on state and territory is defined by the place of usual residence of the admitted patient. Records where the state of hospitalisation was the same as the state of usual residence were provided (i.e., cross-border separations were not provided).

Data on the remoteness area of usual residence was classified, using the Australian Statistical Geography Standard ([ASGS](#)), into five categories: Major Cities, Inner Regional, Outer Regional, Remote, and Very Remote Australia. These data have been collected by AIHW in the NHMD dataset since 2012-13. Due to small numbers, we further combined Remote and Very Remote Australia into one category to protect confidentiality. Data on remoteness was released by all jurisdictions, except Queensland, until 2018-19. The omission of Queensland data means that national trend analysis could not be presented and only summary statistics for 2018-19 are available for Queensland and Australia. Trend analysis for period 2012-13 to 2018-19 are available for other jurisdictions for which data were released.

## Terminology

Terminology used in this bulletin aligns with terminology used by AIHW in the report [Drug related hospitalisations](#) to describe findings from the NHMD.

An **admitted patient** is a patient who undergoes a hospital's formal admission process to receive treatment and/or care.

A **hospitalisation** in our reporting (also called hospital [separation](#)) refers to a completed [episode of admitted patient's care](#) in a hospital ending with discharge, death, transfer or a portion of a hospital stay beginning or ending in a change to another type of care. There can be more than one hospitalisation for each patient and hospitalisation can be either same-day (hospital admission and separation happen on the same day) or overnight (hospital admission and separation happen on a different date).

Each NHMD separation record includes one principal diagnosis and up to 99 additional diagnoses.

The **principal diagnosis** is defined as the diagnosis determined after study and established at the completion of the episode of care to be chiefly responsible for occasioning the patient's episode of admitted patient care.

**Additional diagnoses** are conditions or complaints that either coexists with the principal diagnosis or develop during the episode of care and affect patient's management.

A **drug-related hospitalisation** refers to hospital care with selected principal diagnoses of substance-use disorder or harm due to selected substances. Hospitalisations where the diagnosis of drug-related harm or disorder is additional to the principal diagnosis, such as problems related to certain chronic conditions, have been excluded and, as aforementioned, hospitalisations where alcohol or tobacco comprise the principal diagnosis are not included.

## Coding of hospitalisations

### All drug-related hospitalisations

The following ICD-10-AM codes were used to examine trends in drug-related hospitalisations from 1999-00 to 2018-19.

Drug type	Examples of drugs commonly assigned to ICD-10-AM category	ICD-10-AM
<b>Opioids</b>		F11.0–F11.9, T40.0–T40.4, T40.6
Opium		T40.0
Heroin		T40.1
Natural and semi-synthetic opioids	Oxycodone, Morphine, Codeine	T40.2
Methadone		T40.3
Synthetic opioids	Fentanyl, Tramadol, Pethidine	T40.4
Other and unspecified opioids		T40.6
<b>Non-opioid analgesics</b>	Paracetamol, Ibuprofen, Aspirin	F55.2, T39.0–T39.9, N14.0
4-Aminophenol derivatives	Paracetamol	T39.1
<b>Antiepileptic, sedative-hypnotic and antiparkinsonism drugs</b>	Barbiturates, Pregabalin, Benzodiazepines, Ketamine	F13.0*–F13.9*, T41.2*, T42.0–T42.8
Benzodiazepines	Benzodiazepines	T42.4
<b>Cannabinoids</b>	Cannabis, Cannabis derivatives	F12.0–F12.9, T40.7
<b>Hallucinogens</b>	LSD	F16.0*–F16.9*, T40.8–T40.9
<b>Cocaine</b>		F14.0–F14.9, T40.5
<b>Amphetamines and other stimulants</b>	Methamphetamine, MDMA, Caffeine	F15.0*–F15.9*, T43.6*
<b>Antidepressants</b>	Sertraline, Citalopram, Venlafaxine, Fluoxetine, Mirtazepine, Fluvoxamine, Paroxetine, Duloxetine	F55.0, T43.0–T43.2
<b>Antipsychotics and neuroleptics</b>	Quetiapine, Olanzapine, Risperidone	T43.3–T43.5
<b>Volatile solvents</b>	Petroleum products, nitrogen oxides	F18.0–F18.9, T52.0–T52.9, T53.0–T53.9, T59.0, T59.8
<b>Multiple drug use</b>		F19.0–F19.9

\*ICD-10-AM code starting with the characters

## Opioid-related hospitalisations

The following ICD-10-AM codes were used to examine trends in opioid-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
<i>Poisoning by narcotics and psychodysleptics:</i>		
Poisoning	Opium poisoning	T40.0
Poisoning	Heroin poisoning	T40.1
Poisoning	Natural and semi-synthetic	T40.2
Poisoning	Methadone poisoning	T40.3
Poisoning	Other synthetic narcotics poisoning	T40.4
Poisoning	Other and unspecified narcotics poisoning	T40.6
<i>Mental and behavioural disorders due to use of opioids:</i>		
Acute intoxication	Acute intoxication	F11.0
Harmful use	Harmful use	F11.1
Dependence	Dependence syndrome	F11.2
Withdrawal	Withdrawal state	F11.3
Withdrawal	Withdrawal state with delirium	F11.4
Psychotic disorder	Psychotic disorder	F11.5
Other	Amnesic syndrome	F11.6
Psychotic disorder	Residual and late-onset psychotic disorder	F11.7
Other	Other mental and behavioural disorders	F11.8
Other	Unspecified mental and behavioural disorder	F11.9

## Non-opioid analgesic-related hospitalisations

The following ICD-10-AM codes were used to examine trends in non-opioid analgesic-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
Harmful use	Harmful use of nondependence-producing substances: analgesics	F55.2
<i>Poisoning by nonopioid analgesics, antipyretics and antirheumatics:</i>		
Poisoning	Salicylates	T39.0
Poisoning	4-Aminophenol derivatives	T39.1
Poisoning	Other nonsteroidal anti-inflammatory drugs [NSAID]	T39.3
Poisoning	Antirheumatics, not elsewhere classified	T39.4
Poisoning	Other nonopioid analgesics and antipyretics, not elsewhere classified	T39.8
Poisoning	Nonopioid analgesic, antipyretic and antirheumatic, unspecified	T39.9
Other	Drug- and heavy-metal-induced tubulo-interstitial and tubular conditions: analgesic nephropathy	N14.0

## Antiepileptic, sedative-hypnotic and antiparkinsonism drug-related hospitalisations

The following ICD-10-AM codes were used to examine trends in antiepileptic, sedative-hypnotic and antiparkinsonism drug-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
Poisoning	Poisoning by other and unspecified general anaesthetics	T41.2*
	<i>Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs:</i>	
Poisoning	Hydantoin derivatives	T42.0
Poisoning	Iminostilbenes	T42.1
Poisoning	Succinimides and oxazolinediones	T42.2
Poisoning	Barbiturates	T42.3
Poisoning	Benzodiazepines	T42.4
Poisoning	Mixed antiepileptics, not elsewhere classified	T42.5
Poisoning	Other antiepileptic and sedative-hypnotic drugs	T42.6
Poisoning	Antiepileptic and sedative-hypnotic drugs, unspecified	T42.7
Poisoning	Antiparkinsonism drugs and other central muscle-tone depressants	T42.8
	<i>Mental and behavioural disorders due to use of sedatives or hypnotics:</i>	
Acute intoxication	Acute intoxication	F13.0*
Harmful use	Harmful use	F13.1*
Dependence	Dependence syndrome	F13.2*
Withdrawal	Withdrawal state	F13.3*
Withdrawal	Withdrawal state with delirium	F13.4*
Psychotic disorder	Psychotic disorder	F13.5*
Other	Amnesic syndrome	F13.6*
Psychotic disorder	Residual and late-onset psychotic disorder	F13.7*
Other	Other mental and behavioural disorders	F13.8*
Other	Unspecified mental and behavioural disorder	F13.9*

\*ICD-10-AM code starting with the characters



## Cannabinoid-related hospitalisations

The following ICD-10-AM codes were used to examine trends in cannabinoid-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
Poisoning	Poisoning by narcotics and psychodysleptics: Cannabis (derivatives)	T40.7
<i>Mental and behavioural disorders due to use of cannabinoids:</i>		
Acute intoxication	Acute intoxication	F12.0
Harmful use	Harmful use	F12.1
Dependence	Dependence syndrome	F12.2
Withdrawal	Withdrawal state	F12.3
Withdrawal	Withdrawal state with delirium	F12.4
Psychotic disorder	Psychotic disorder	F12.5
Other	Amnesic syndrome	F12.6
Psychotic disorder	Residual and late-onset psychotic disorder	F12.7
Other	Other mental and behavioural disorders	F12.8
Other	Unspecified mental and behavioural disorder	F12.9

## Hallucinogen-related hospital separations

The following ICD-10-AM codes were used to examine trends in hallucinogen-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
<i>Poisoning by narcotics and psychodysleptics [hallucinogens]:</i>		
Poisoning	Lysergide [LSD]	T40.8
Poisoning	Other and unspecified psychodysleptics [hallucinogens]	T40.9
<i>Mental and behavioural disorders due to use of hallucinogens:</i>		
Acute intoxication	Acute intoxication	F16.0*
Harmful use	Harmful use	F16.1*
Dependence	Dependence syndrome	F16.2*
Withdrawal	Withdrawal state	F16.3*
Withdrawal	Withdrawal state with delirium	F16.4*
Psychotic disorder	Psychotic disorder	F16.5*
Other	Amnesic syndrome	F16.6*
Psychotic disorder	Residual and late-onset psychotic disorder	F16.7*
Other	Other mental and behavioural disorders	F16.8*
Other	Unspecified mental and behavioural disorder	F16.9*

\*ICD-10-AM code starting with the characters

## Cocaine-related hospitalisations

The following ICD-10-AM codes were used to examine trends in cocaine-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
Poisoning	Poisoning by narcotics and psychodysleptics: Cocaine	T40.5
<i>Mental and behavioural disorders due to use of cocaine:</i>		
Acute intoxication	Acute intoxication	F14.0
Harmful use	Harmful use	F14.1
Dependence	Dependence syndrome	F14.2
Withdrawal	Withdrawal state	F14.3
Withdrawal	Withdrawal state with delirium	F14.4
Psychotic disorder	Psychotic disorder	F14.5
Other	Amnesic syndrome	F14.6
Psychotic disorder	Residual and late-onset psychotic disorder	F14.7
Other	Other mental and behavioural disorders	F14.8
Other	Unspecified mental and behavioural disorder	F14.9

## Amphetamine and other stimulant-related hospitalisations

The following ICD-10-AM codes were used to examine trends in amphetamine and other stimulant-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
Poisoning	Poisoning by psychostimulants (excluding cocaine)	T43.6*
<i>Mental and behavioural disorders due to use of other stimulants, including caffeine:</i>		
Acute intoxication	Acute intoxication	F15.0*
Harmful use	Harmful use	F15.1*
Dependence	Dependence syndrome	F15.2*
Withdrawal	Withdrawal state	F15.3*
Withdrawal	Withdrawal state with delirium	F15.4*
Psychotic disorder	Psychotic disorder	F15.5*
Other	Amnesic syndrome	F15.6*
Psychotic disorder	Residual and late-onset psychotic disorder	F15.7*
Other	Other mental and behavioural disorders	F15.8*
Other	Unspecified mental and behavioural disorder	F15.9*

\*ICD-10-AM code starting with the characters

## Antidepressant, antipsychotic and neuroleptic-related hospitalisations

The following ICD-10-AM codes were used to examine trends in antidepressant, antipsychotic and neuroleptic-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
<b>Antidepressants</b>		
Harmful use	Harmful use of nondependence-producing substances: antidepressants	F55.0
<i>Poisoning by psychotropic drugs, not elsewhere classified:</i>		
Poisoning	Tricyclic and tetracyclic antidepressants	T43.0
Poisoning	Monoamine-oxidase-inhibitor antidepressants	T43.1
Poisoning	Other and unspecified antidepressants	T43.2
<b>Antipsychotics and neuroleptics</b>		
<i>Poisoning by psychotropic drugs, not elsewhere classified:</i>		
Poisoning	Phenothiazine antipsychotics and neuroleptics	T43.3
Poisoning	Butyrophenone and thioxanthene neuroleptics	T43.4
Poisoning	Other and unspecified antipsychotics and neuroleptics	T43.5

## Volatile solvent-related hospitalisations

The following ICD-10-AM codes were used to examine trends in volatile solvent-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
<i>Toxic effect of organic solvents:</i>		
Poisoning	Petroleum products	T52.0
Poisoning	Benzene	T52.1
Poisoning	Homologues of benzene	T52.2
Poisoning	Glycols	T52.3
Poisoning	Ketones	T52.4
Poisoning	Other organic solvents	T52.8
Poisoning	Organic solvent, unspecified	T52.9
<i>Toxic effect of halogen derivatives of aliphatic and aromatic hydrocarbons:</i>		
Poisoning	Carbon tetrachloride	T53.0
Poisoning	Chloroform	T53.1
Poisoning	Trichloroethylene	T53.2
Poisoning	Tetrachloroethylene	T53.3
Poisoning	Dichloromethane	T53.4
Poisoning	Chlorofluorocarbons	T53.5
Poisoning	Other halogen derivatives of aliphatic hydrocarbons	T53.6
Poisoning	Other halogen derivatives of aromatic hydrocarbons	T53.7
Poisoning	Halogen derivative of aliphatic and aromatic hydrocarbons, unspecified	T53.9
<i>Toxic effect of other gases, fumes and vapours:</i>		
Poisoning	Nitrogen oxides	T59.0
Poisoning	Other specified gases, fumes and vapours	T59.8
<i>Mental and behavioural disorders due to use of volatile solvents:</i>		
Acute intoxication	Acute intoxication	F18.0
Harmful use	Harmful use	F18.1
Dependence	Dependence syndrome	F18.2
Withdrawal	Withdrawal state	F18.3
Withdrawal	Withdrawal state with delirium	F18.4
Psychotic disorder	Psychotic disorder	F18.5
Other	Amnesic syndrome	F18.6
Psychotic disorder	Residual and late-onset psychotic disorder	F18.7
Other	Other mental and behavioural disorders	F18.8
Other	Unspecified mental and behavioural disorder	F18.9

## Multiple drug use-related hospitalisations

The following ICD-10-AM codes were used to examine trends in multiple drug use-related hospitalisations from 1999-00 to 2018-19.

Diagnosis category	ICD-10 diagnosis	ICD-10-AM
<i>Mental and behavioural disorders due to multiple drug use and use of psychoactive substances:</i>		
Acute intoxication	Acute intoxication	F19.0
Harmful use	Harmful use	F19.1
Dependence	Dependence syndrome	F19.2
Withdrawal	Withdrawal state	F19.3
Withdrawal	Withdrawal state with delirium	F19.4
Psychotic disorder	Psychotic disorder	F19.5
Other	Amnesic syndrome	F19.6
Psychotic disorder	Residual and late-onset psychotic disorder	F19.7
Other	Other mental and behavioural disorders	F19.8
Other	Unspecified mental and behavioural disorder	F19.9

## Limitation in Tasmanian records

For Tasmanian records, provision of data between 2008-09 and 2015-16 was limited to selected drug and alcohol related principal and/or additional diagnoses and external causes. Specifically, of the ICD-10-AM codes specified above, only records with following codes were provided:

- Principal diagnosis codes at full character level (where applicable) for F10, F11, F12, F13, F14, F15, F16, F19, T40, T423, T424, T427, T436, T439.

Particularly, many of the T-codes related to poisoning are missing. Estimates of drug-related hospitalisations for this period are likely to be underestimated as a consequence.

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## Related Links

- For the hospitalisations data visualisations, go to: [https://drugtrends.shinyapps.io/hospital\\_separations](https://drugtrends.shinyapps.io/hospital_separations)
- For the hospitalisations bulletin, go to: <https://ndarc.med.unsw.edu.au/resource-analytics/trends-drug-related-hospitalisations-australia-1999-2019>
- For information on drug-induced deaths in Australia, go to: <https://ndarc.med.unsw.edu.au/resource-analytics/trends-drug-induced-deaths-australia-1997-2019>
- For more information on NDARC research, go to: <http://ndarc.med.unsw.edu.au/>
- For more information about the AIHW and NHMD, go to: <https://www.aihw.gov.au/>
- For more information on ICD coding go to: <http://www.who.int/classifications/icd/en/>  
<https://www.ihsa.gov.au/what-we-do/icd-10-am-achi-acs-current-edition>
- For more research from the Drug Trends program go to: <https://ndarc.med.unsw.edu.au/program/drug-trends>

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