

# Methods for “Trends in drug-induced deaths in Australia, 1997-2019”

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## General notes

This [bulletin](#) and the corresponding [online interactive visualisation](#) contain statistics on drug-induced deaths for Australia between 1997 and 2019. The data from the Australian Bureau of Statistics (ABS) were accessed from the Cause of Death Unit Record File (COD URF) datasets through the Australian Bureau of Statistics (ABS) before 2006 (1997 to 2005 dataset) and from the Queensland Registry of Births, Deaths and Marriages as the Australian Coordinating Registry (ACR) from 2006 onwards (2006 to 2019 dataset). The COD URF is a compilation of death records from each of the State and Territory Registries of Births, Deaths and Marriages (RBDMs) and from State and Chief Coroners through the National Coronial Information System (NCIS). Changes in data coding and collection have occurred over the time period reported.

To account for the length of time that it can take for the coronial process to be finalised and the coroner case closed, the ABS undertake a revision process for coroner-certified deaths over a 3-year period. Accordingly, causes of death data for 2018 and 2019 are preliminary and subject to two further revisions; data for 2017 are revised and subject to another revision; data for 2016 and earlier years are final. These figures should be viewed in conjunction with the ABS [Causes of Death Methodology document](#). For information on the proportion of closed cases each year see NCIS [Operation Statistics](#). In 2020, 2,812 additional Victorian deaths registered in 2017, 2018 and 2019 were reported to the ABS. These registrations needed to be allocated to the appropriate reference years. Our data have been adjusted in line with the [ABS Technical note](#) and this could have some impact on the trends in drug-induced deaths reported earlier.

In addition to the revision process, the ABS undertook further processing improvements from 2008 onwards. For both open and closed cases, the ABS increasingly use additional information from the NCIS (e.g., autopsy, police and toxicology reports) where available to apply more specific cause of death codes. These processing improvements are likely to have an impact on the number of drug-induced deaths reported from 2008 onwards. It should also be noted that availability of additional information within the NCIS varies by jurisdiction; improvements to data collection are likely to be applied differentially across jurisdictions.

Causes of death are coded according to the International Classification of Diseases and Related Health Problems, 10<sup>th</sup> Revision (hereafter 'ICD-10'). In 2014, the ABS implemented Iris, an automatic system for coding multiple causes of death and selecting the underlying cause of death, and the causes of death data from 2013 onwards were coded using the new system. This enabled ABS to carry through changes in coding practices associated with substance use dependence syndromes as an underlying cause of death and other ICD-10 updates introduced by the World Health Organization. Impacts on the data from 2013 onwards are described in more detail in the [ABS Technical Note 1, Causes of Death Australia 2013](#). At the time of publication of this document, latest statistics on causes of death for Australia, including drug-induced deaths, are presented in the annual ABS [3303.0 Causes of Death](#) Publication. For further information relating to ICD-10 codes, refer to the [World Health Organization](#) website.

For this bulletin, we have revised our definitions of opioid-, cocaine- and amphetamine-induced deaths and also included mixed drug toxicity deaths as deemed by the pathologist, where one of the drugs was opioid, cocaine and/or amphetamine. Hence, numbers from this bulletin may not match the numbers from previous reporting. Full details of the codes used for the revised definitions are presented later in this document.

## Scope and presentation of results

In line with [ABS recommendations](#) on presenting annual time series, we report the number of deaths by reference year. The reference year assigned to a death is determined by when the death was registered with jurisdictional RBDMs, as well as when it was received by the ABS. It is important to note that there can be lags in the registration of deaths with jurisdictional RBDMs (i.e., not all deaths are registered in the year that they occur), and there may also be delays in the ABS receiving notification of the death from the registries due to processing or data transfer lags. Thus, the reference year assigned to a death includes:

- deaths registered in Australia during the reference year and received by the ABS in the reference year;
- deaths registered in Australia during the reference year and received by the ABS in the first quarter of the subsequent year; and
- deaths registered in the years prior to the reference year but not received by ABS until the reference year or the first quarter of the subsequent year, provided that these records have not been included in any statistics from earlier periods.

For more information on scope and coverage of death statistics, see the ABS Causes of Death [methodology document](#).

In the bulletin, we report on number of deaths and age-standardised death rates per 100,000 population. The exception comprises where we report by age group (e.g., 15-64 years or in 10-year age groups); in these instances, we present age-specific rates calculated as population crude rates per 100,000 estimated resident population in the given age group at 30 June. When percentages are reported, the individual numbers may not total 100 due to rounding.

Our online data visualisation includes all three estimates where available: number of deaths, crude death rate and age-standardised death rate. Numbers and crude rates from small numbers of deaths less or equal to 5 are not presented in the bulletin or in the visualisation to protect the confidentiality of individuals.

Age-standardised death rates enable the comparison of death rates over time and between populations of different age-structures and were calculated using the [direct method](#) and the Australian Estimated Resident Population as at 30 June 2011 from the 2011 Census as the standard population. Rates may not be comparable to other sources where a different standard population may have been applied. 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 deaths was  $\leq 10$ . In this case, the reader should refer to other measures such as number of deaths or crude rate of deaths.

## Terminology

**Reference year** assigned to a death is determined by the scope of the collection and incorporates both the registration date (i.e., the date the death was registered with the relevant jurisdictional Births, Deaths and Marriages registry) and the date when a record is received by the ABS. Deaths assigned any given reference year will include:

- all deaths registered in Australia during the reference year and received by the ABS by the end of the March quarter of the subsequent year; and
- deaths registered prior to the reference year but not previously received from the Registry nor included in any statistics reported for an earlier period.

**Underlying cause of death (UCOD)** is the disease or condition which initiated the sequence of events resulting in death. There can be only one underlying cause of death.

**Associated causes of death (ACOD)** are any other diseases or conditions that contributed to the death but were not the underlying cause and are listed on the death certificate.

**Multiple causes of death (MCOD)** include all causes (both underlying and associated causes), diseases and conditions reported on the death certificate. For deaths where the underlying cause was identified as an external cause (for example, injury or poisoning, etc.), multiple causes include circumstances of injury and the nature of injury as well as any other conditions reported on the death certificate.

Deaths are considered '**drug-induced deaths**' if they are directly attributable to drug use (e.g., drug toxicity/overdose is the underlying cause of death).

They are considered '**drug-related deaths**' where drugs played a contributory role (i.e., listed as an associated cause of death) and the death was attributable to another cause (e.g., motor vehicle accident); these deaths are not reported here.

A [Tabulation list](#) of ICD-codes to identify causes of death attributable to drug-induced mortality was developed by the ABS based on a drug-induced death tabulation created by the United States Centre for Disease Control and Prevention (CDC). We have adopted these codes for our definition of all drug-induced deaths. This list excluded causes of deaths attributed to tobacco or alcohol (see below).

## Intent

As part of the coronial investigation of drug-related deaths, the coroner assigns the manner of intent to these deaths where there is sufficient information. The ICD-10 coding incorporates codes for the following categories of intent:

- **Unintentional**, where the coroner determines the manner/intent of the injury or poisoning which led to death was accidental (X40, X41, X42, X43, X44);
- **Intentional**, where the coroner determines that the manner/intent of the injury or poisoning which led to death was purposeful (X60, X61, X62, X63, X64);
- **Undetermined**, where there was insufficient information for the coroner to make a determination on the intent (Y10, Y11, Y12, Y13, Y14); and
- **Other**, where intent could not be classified to any of the above categories. Numbers in this category are very small and only presented for drug-induced deaths in the 15-64 years age group or for all ages.

We have disaggregated by intent type where numbers are sufficient to protect confidentiality of individuals. By '**all intents**' we mean unintentional, intentional, undetermined or other intent.

## Coding of deaths

### Drug-induced deaths

In accordance with ABS reporting, causes of drug-induced death presented in this report exclude accidents, homicides, and other causes indirectly related to drug use. We have also excluded newborn deaths associated with mother's drug use, and deaths related to tobacco (e.g., F17) or alcohol (e.g., F10).

#### **Underlying cause of death (UCOD):**

- D52.1 – Drug-induced folate deficiency anaemia;
- D59.0 – Drug-induced haemolytic anaemia;
- D59.2 – Drug-induced nonautoimmune haemolytic anaemia;
- D61.1 – Drug-induced aplastic anaemia;
- D64.2 – Secondary sideroblastic anaemia due to drugs and toxins;
- E06.4 – Drug-induced thyroiditis;
- E16.0 – Drug-induced hypoglycaemia without coma;
- E23.1 – Drug-induced hypopituitarism;
- E24.2 – Drug-induced Cushing's syndrome;
- E27.3 – Drug-induced adrenocortical insufficiency;
- E66.1 – Drug-induced obesity;

- F11.0-F11.5 – Use of opioids causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F11.7-F11.9 – Use of opioid causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- F12.0-F12.5 – Use of cannabis causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F12.7-F12.9 – Use of cannabis causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- F13.0-F13.5 – Use of sedative or hypnotics causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F13.7-F13.9 – Use of sedative or hypnotics causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- F14.0-F14.5 – Use of cocaine causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F14.7-F14.9 – Use of cocaine causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- F15.0-F15.5 – Use of caffeine causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F15.7-F15.9 – Use of caffeine causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- F16.0-F16.5 – Use of hallucinogens causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F16.7-F16.9 – Use of hallucinogens causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- F18.0-F18.5 – Use of volatile solvents causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F18.7-F18.9 – Use of volatile solvents causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- F19.0-F19.5 – Use of multiple drugs and other psychoactive substances causing intoxication, harmful use (abuse), dependence, withdrawal or psychosis;
- F19.7-F19.9 – Use of multiple drugs and other psychoactive substances causing late onset psychosis, other mental and behavioural disorders and unspecified behavioural disorders;
- G21.1 – Other drug-induced secondary Parkinsonism;
- G24.0 – Drug-induced dystonia;
- G25.1 – Drug-induced tremor;
- G25.4 – Drug-induced chorea;
- G25.6 – Drug-induced tics and other tics of organic origin;
- G44.4 – Drug-induced headache, not elsewhere classified;
- G62.0 – Drug-induced polyneuropathy;
- G72.0 – Drug-induced myopathy;
- I95.2 – Hypotension due to drugs;
- J70.2 – Acute drug-induced interstitial lung disorders;
- J70.3 – Chronic drug-induced interstitial lung disorders;
- J70.4 – Drug-induced interstitial lung disorder, unspecified;
- L10.5 – Drug-induced pemphigus;

L27.0 – Generalized skin eruption due to drugs and medicaments;  
L27.1 – Localized skin eruption due to drugs and medicaments;  
M10.2 – Drug-induced gout;  
M32.0 – Drug-induced systemic lupus erythematosus;  
M80.4 – Drug-induced osteoporosis with pathological fracture;  
M81.4 – Drug-induced osteoporosis;  
M83.5 – Other drug-induced osteomalacia in adults;  
M87.1 – Osteonecrosis due to drugs;  
R78.1 – Finding of opiate drug in blood;  
R78.2 – Finding of cocaine in blood;  
R78.3 – Finding of hallucinogen in blood;  
R78.4 – Finding of other drugs of addictive potential in blood;  
R78.5 – Finding of psychotropic drug in blood;  
X40-X44 – Accidental poisoning by and exposure to drugs, medicaments and biological substances;  
X60-X64 – Intentional self-poisoning (suicide) by and exposure to drugs, medicaments and biological substances;  
X85 – Assault (homicide) by drugs, medicaments and biological substances; and  
Y10-Y14 – Poisoning by and exposure to drugs, medicaments and biological substances, undetermined intent.

### ***Drug-induced deaths by drug class and drug type***

The following ICD-10 codes were used to identify any drug-induced death where each drug type listed in the first column was considered a contributory cause of death (e.g., drug-induced death involving benzodiazepines, drug-induced death involving antidepressants). Note here that in some cases we have looked at the broader drug class (e.g., drug-induced deaths involving opioids) and then the specific types of substances within that class (e.g., drug-induced deaths involving methadone, drug-induced deaths involving heroin). Numbers do not add up to the total number of drug-induced deaths as there could be more than one drug class involved in one death.

Drug class and type	Examples of drugs commonly assigned to ICD-10 category	UCOD	MCOD
<b>ANTIEPILEPTIC, SEDATIVE-HYPNOTIC AND ANTIPARKINSONISM DRUGS</b>		Drug-induced deaths*	T42.0-T42.8
Barbiturates	Pentobarbital, phenobarbital	Drug-induced deaths*	T42.3
Benzodiazepines	Alprazolam, Diazepam, Oxazepam, Clonazepam, Clozapine, Temazepam, Oxazepam	Drug-induced deaths*	T42.4
Antiepileptic and sedative-hypnotic drugs, unspecified	Pregabalin	Drug-induced deaths*	T42.7
<b>OPIOIDS</b>		Drug-induced deaths*	T40.0-T40.4, T40.6
		F11	any
Heroin		Drug-induced deaths*	T40.1
Natural and semi-synthetic opioids	Oxycodone, Morphine, Codeine	Drug-induced deaths*	T40.2
Methadone		Drug-induced deaths*	T40.3
Synthetic opioids	Fentanyl, Tramadol, Pethidine	Drug-induced deaths*	T40.4
<b>AMPHETAMINES</b>		Drug-induced deaths*	T43.6
	Amphetamine, Methamphetamine, 3,4-methylenedioxy-methamphetamine (MDMA)	F15	any
<b>ANTIDEPRESSANTS</b>		Drug-induced deaths*	T43.0-T43.2
Tricyclic and tetracyclic antidepressants	Imipramine, Amitriptyline, Mianserin	Drug-induced deaths*	T43.0
Other and unspecified antidepressants	Sertraline, Citalopram, Venlafaxine, Fluoxetine, Mirtazepine, Fluvoxamine, Paroxetine, Duloxetine,	Drug-induced deaths*	T43.2
<b>ANTIPSYCHOTICS AND NEUROLEPTICS</b>		Drug-induced deaths*	T43.3-T43.5
Other and unspecified antipsychotics	Quetiapine, Olanzapine, Risperidone	Drug-induced deaths*	T43.5
<b>NON-OPIOID ANALGESICS, ANTIPYRETICS AND ANTIRHEUMATICS</b>		Drug-induced deaths*	T39.0-T39.9
4-Aminophenol derivatives	Paracetamol	Drug-induced deaths*	T39.1
Other nonsteroidal anti-inflammatory	Ibuprofen, aspirin	Drug-induced deaths*	T39.3
<b>ALCOHOL</b>		Drug-induced deaths*	T51.0, T51.9
<b>CANNABIS DERIVATIVES</b>		Drug-induced deaths*	T40.7
		F12	any
<b>COCAINE</b>		Drug-induced deaths*	T40.5
		F14	any

\*Mortality tabulations and methodologies in Causes of Death, Australia, 2019 (cat. no. 3303.0). Deaths caused by tobacco (ICD-10 – F17) or alcohol (ICD-10 – F10) have been excluded from the analysis.

## Opioid-induced deaths

The following ICD-10 codes have been used to extract and examine deaths where opioid toxicity was considered to be the underlying cause of death (i.e., 'opioid-induced deaths').

UCOD	MCOD
F11	No other drug T-codes present
F19	F11 and no other drug T-codes present
F11-15 or F19	(T40.0-T40.4 or T40.6) with (X42, X62, Y12, X44, X64 or Y14) [Excl. if T40.6 with (T40.5, T40.8 or T40.9) with (X42, X62 or Y12)]
X42, X62 or Y12	T40.0-T40.4 or T40.6 [Excl. if T40.6 with (T40.5, T40.8 or T40.9) with (X42, X62 or Y12)]
X44, X64 or Y14	T40.0-T40.4 or T40.6
X41, X61 or Y11	(T40.0-T40.4 or T40.6) and no other T-codes present

## Opioid-induced deaths by opioid type\*

Cause of death	UCOD	MCOD
<b>Heroin</b>	Opioid-induced death	T40.1
<b>Natural and semi-synthetic opioids</b> (include morphine, oxycodone and codeine)	Opioid-induced death	T40.2
<b>Methadone</b>	Opioid-induced death	T40.3
<b>Synthetic opioids</b> (include pethidine, tramadol, fentanyl)	Opioid-induced death	T40.4
<b>Other and unspecified opioids</b> (analgesics NEC)	Opioid-induced death	T40.6
<b>Opioid-induced deaths involving illicit opioids only – Heroin and/or opium</b>	Opioid-induced death	T40.0 or T40.1 and no T40.2-T40.4, T40.6 present
<b>Opioid-induced deaths involving illicit opioids and pharmaceutical opioids**</b>	Opioid-induced death	(T40.0 or T40.1) and (T40.2 T40.3 or T40.4)

\*Data on opium only (T40.0) is not included because of small numbers of deaths related to opium.

\*\*Pharmaceutical opioids include natural and semi-synthetic opioids (T40.2), methadone (T40.3) and synthetic opioids (T40.4)



***Opioid-induced deaths where other drugs were reported as being a contributory cause***

Contributory cause of death	Additional MCODE
<b>All opioid-induced deaths where below drugs were reported as being a contributory cause:</b>	
<b>4-Aminophenol derivatives (e.g., paracetamol)</b>	T39.1
<b>Benzodiazepines</b>	T42.4
<b>Antiepileptic and sedative-hypnotic drugs, unspecified (e.g., pregabalin)</b>	T42.7
<b>Antidepressants</b>	T43.0, T43.1 or T43.2
<b>Antipsychotics and neuroleptics</b>	T43.3, T43.4 or T43.5
<b>Amphetamines</b>	T43.6
<b>Alcohol</b>	R78.0, T51, X45 or Y15

## Age and sex

Age at death is provided by the ABS in the COD URF. In the bulletin and in the online data visualisation we report on findings for Australians of all ages, adults aged 15-64 years (as this is the population at greatest risk of experiencing these deaths) and by 10-year age groups (15-24 to 74-84), where data allows for such disaggregation. Sex (biological) is reported as male and female, as provided by the ABS in the COD URF.

## Jurisdiction and remoteness area

Data on state and territory is defined by the place of usual residence of the deceased person regardless of where in Australia the death occurred. Deaths occurring outside of Australia (even where usual residence is within Australia) are generally excluded. Deaths registered in Australia of persons usually residing overseas have been classified according to the state or territory in which the death was registered. Proportion of closed cases and document types attached to each death record can vary between jurisdictions. For more information on jurisdictional differences see NCIS [Operation Statistics](#) and [Explanatory Notes](#).

In the COD URF from 2011 onwards, data on the geographic location of usual residence of a deceased person is available at the Statistical Area 2 (SA2) level from the Australian Statistical Geography Standard (ASGS) (cat. no. 1270.0.55.001). Data from 2009 and 2010 were originally coded using the Australian Standard Geographic Classification (ASGC) (cat no 1216.0), while data from 2011 to 2015 were coded using ASGS 2011 and from 2016 onwards, ASGS 2016 was used. Correspondence was applied to the 2009 and 2010 ASGC codes by ABS to obtain corresponding ASGS 2011 codes, which could have introduced some inaccuracies and should be considered when interpreting the data.

To reassign data from ASGS to Remoteness Areas (RA), we applied appropriate correspondences (SA2 2011 to RA 2016 for data between 2009 and 2015, and SA2 2016 to RA 2016 for data from 2016 onwards). Five classes of remoteness area are defined nationally for Australia – Major cities, Inner regional, Outer regional, Remote and Very remote. We have disaggregated by Major cities versus Regional and Remote for reporting by jurisdiction for New South Wales, Victoria, Queensland, South Australia and Western Australia. There are no Major cities in Tasmania and Northern Territory and numbers in Regional and Remote areas are too small for reporting in Australian Capital Territory.

Please refer to the Australian Statistical Geography Standard (ASGS): [Remoteness Structure, 2016](#) for further information on remoteness areas including details of the nature of the changes between the ASGS 2011 and ASGS 2016.

## Psychosocial risk factors

In 2020, [a pilot study](#) was undertaken by the ABS coding team to capture information on psychosocial risk factors for deaths referred to a coroner (i.e., including drug-induced deaths) in the 2017 reference year to extend the utility of the national mortality dataset by presenting information on risk factors in a nationally consistent way. Psychosocial risk factors identified in coronial, police and pathology reports were coded according to ICD-10 and added to the 2017 Causes of Death dataset. Psychosocial factors were defined as “social processes and social structures which can have an interaction with individual thought or behaviour and health outcomes” and captured only those factors which were identified to have a negative effect on the death. Protective factors were not in the scope of this study. Following on from the pilot study, psychosocial factors were further identified and added to 2018 and 2019 datasets. It is important to note that there is no national standard for the collection of data on psychosocial factors and that information relating to coroner-certified deaths can differ by jurisdiction. In particular, there might be under-reporting of psychosocial factors that were not recorded during the course of investigation. Further, coronial investigations are an iterative process undertaken by a multitude of agencies and coding of risk factors is thus an ongoing process. More information on the pilot study can be found in the [ABS research paper](#).

In this bulletin, we present data on the psychosocial risk factors as a percentage of the total drug-induced deaths in a selected intent, sex and age group, noting that drug-induced deaths are usually referred to a coroner in Australia, and thus would have been recorded in NCIS and reviewed for psychosocial risk factors in 2017-2019.

ICD-10 Z-codes for the most common psychosocial risk factors identified in the drug-induced deaths are presented in the table below:

Z-code	Description
Z56.0	Unemployment, unspecified
Z56.2	Threat of job loss
Z56.6	Other physical and mental strain related to work
Z59.0	Homelessness
Z59.8	Other problems related to housing and economic circumstances
Z61.4	Problems related to alleged sexual abuse of child by person within primary support group
Z63.0	Problems in relationship with spouse or partner
Z63.3	Absence of family member
Z63.4	Disappearance and death of a person in the primary support group
Z63.5	Disruption of family by separation and divorce
Z63.8	Other specified problems related to primary support group
Z65.2	Problems related to release from prison
Z65.3	Problems related to other legal circumstances
Z73.6	Limitation of activities due to disability
Z81.8	Family history of other mental and behavioural disorders
Z91.5	Personal history of self-harm

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## Related links

- Data visualisations: [https://drugtrends.shinyapps.io/Deaths\\_2019](https://drugtrends.shinyapps.io/Deaths_2019)
- Methods document: <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 ABS, go to: <http://www.abs.gov.au>
- For more information on ICD coding go to: <http://www.who.int/classifications/icd/en/>
- For more information on the Remoteness Areas Structure within the Australian Statistical Geography Standard (ASGS), go to: <https://www.abs.gov.au/ausstats/abs@.nsf/mf/1270.0.55.005>
- For more research from the Drug Trends program and to subscribe to our newsletter go to: <https://ndarc.med.unsw.edu.au/program/drug-trends>
- For details on the collection, organisation and interpretation of NCIS data go to <https://www.ncis.org.au/about-the-data/explanatory-notes/>
- For statistics about case closure and document attachment go to <https://www.ncis.org.au/about-the-data/operational-statistics/>

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