



Supporting Information

Supplementary methods and results

**This appendix was part of the submitted manuscript and has been peer reviewed.
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Appendix to: Hill NTM, Witt K, Rajaram G, et al. Suicide by young Australians, 2006–2015: a cross-sectional analysis of national coronial data. *Med J Aust* 2021; doi: 10.5694/mja2.50876.

1. Supplementary methods

1.1. Case ascertainment

All suicides included in the analysis were based on closed cases in the NCIS where the date of death was between 1 January 2006 to 31 December 2015. Because of differences in coronial procedures, the completeness of data in the NCIS varies between jurisdictions.¹ For example, 93% of cases in 2015 had been closed by the time of analysis, compared with 50% of cases in 2018 that were closed at the time of analysis. For this reason, 2015 was selected as the temporal endpoint.²

Each case included in the NCIS is assigned a Quality Assured status that provides an indication of the reliability of data included for each case. The code is allocated by the NCIS Unit and only closed cases are assessed. Of the 3027 cases included in the free text analysis, 2696 (89%) had a quality assured status of 'Accepted.' The remaining 669 cases were 'Awaiting review.' A total of 351 cases (52.5%) that were assigned an 'Awaiting review' status involved suicides during the most recent time-points (2014 and 2015), suggesting a positive correlation between data recency and quality.

Table 1. Study variables

Variable	Definition and ascertainment	Categories
Age	NCIS core dataset	Continuous variable Also coded as a categorical variable: 1) 10–18 years 2) 19–24 years
Sex	NCIS core dataset	1) Male 2) Female
Remoteness	NCIS core dataset	1) Remote (people residing in regions that were recorded as remote or very remote) 2) Not remote (people residing in major cities or inner or outer regional areas)
Indigenous status	NCIS core dataset	1) Aboriginal or Torres Strait Islander 2) Not Aboriginal or Torres Strait Islander
Student	NCIS core dataset	1) Yes 2) No/unknown/not reported
Statistical Areas Level 2 (SA2)	NCIS core dataset. SA2s are broad area aggregations determined by the Australian Statistical Geography Standard. SA2s comprise 10 000–25 000 people who interact socially and economically. All SA2 data collected before 2011 were converted to 2011 SA2 (the study midpoint) by concordance data provided by the Australian Bureau of Statistics. ³	Categorical variable: 2310 area codes
Index of Relative Socio-economic Disadvantage (IRSD)	The IRSD ranks areas on a continuum from most disadvantaged to least disadvantaged, divided into 10 deciles based on SA2 for area of residence, with lower scores indicating greater disadvantage and higher scores least disadvantage. IRSD deciles were obtained from the 2011 Census data provided by the Australian Bureau of Statistics. ⁴	Ordinal variable (1 to 10) Also coded as a categorical variable: 1) Disadvantaged (deciles 1–3) 2) Less disadvantaged (deciles 4–10)
Employment status	NCIS core dataset	1) Employed 2) Not employed/unknown/not recorded
Method of suicide	Information recorded in the coroner’s report and ICD-10 code for cause of death.	1) Hanging or strangulation 2) Poisoning by gaseous substances 3) Fall from heights 4) Railway 5) Poisoning 6) Firearms 7) Crashed vehicle 8) Sharp object 9) Jumped in front of vehicle 10) Drowning 11) Immolation or thermal injury

Variable	Definition and ascertainment	Categories
LGBTI status	Determined by informant reports or autopsy findings indicating gender diversity. If LGBTI status was not described, information on the sex of a current or former partner was used as a proxy measure of sexuality.	1) Yes 2) No/unknown/not reported
Parents separated or divorced	Based on an informant description indicating that the person's biological or adoptive parents were divorced or separated at the time of death. If the relationship status of the young person's parents was not described, evidence of parental separation (eg, narrative descriptions indicating the young person lived with their single mother) was used as a proxy measure.	1) Yes 2) No/unknown/not reported
Living alone at the time of death	Based on an informant report or other documented evidence (eg, police observation) that the person lived alone (eg, absence of roommates or other cohabitating household members).	1) Yes 2) No/unknown/not reported
Social isolation at the time of death	Based on an informant report that the person had isolated themselves more than usually expected (eg, isolating themselves in their bedroom, not showing at social events, withdrawal from friendship circle or extracurricular activities).	1) Yes 2) No/unknown/not reported
Communicated about suicidal ideation	Based on an informant report that the person expressed suicidal ideation or indicated that they wanted to take their own life or die. Includes written, verbal communication, text communication and email communication.	1) Once 2) More than once 3) None/unknown/not reported
Communicated about suicide on social media	Based on an informant report or evidence of online activity that was reported in the police or coroner investigation that showed the young person had posted content about suicide or expressed suicidal ideation on social media (eg, posted a suicide note on Facebook, or shared a post that indicated they were suicidal).	1) Yes 2) No/unknown/not reported
Searched the internet for information on suicide methods	Based on information in the police or coroner report that described the young person had made internet queries about suicide or suicide methods prior to their suicide.	1) Yes 2) No/unknown/not reported
Exposure to suicide of another	Based on an informant report that the person knew of the suicide of a relative (eg, parent, step-parent, sibling), friend or peer (eg, student from the same school or social circle). Includes exposure to suicide of a work colleague.	1) Week prior to death 2) Month prior to death 3) Year prior to death 4) More than one year, or time not known 5) None/unknown/not reported

Variable	Definition and ascertainment	Categories
Diagnosed mental disorder	Based on evidence that the young person: 1) had a psychiatric diagnosis prior to their suicide; <i>OR</i> 2) the young person was being treated by a medical practitioner (eg, general practitioner, psychologist, psychiatrist) for a mental disorder or mental illness; <i>OR</i> 3) an informant reported that the young person was being treated for a mental health disorder <i>AND</i> results from the NCIS toxicology report described the presence of therapeutic levels of psychotropic medication (eg, antidepressants) at the time of death.	1) Yes 2) No/unknown/not reported
Possible mental health disorder	Based on an informant report that: 1) the young person displayed emotional or behavioural symptoms that were consistent with a mental illness (eg, the person was depressed or exhibited low mood, was anxious or paranoid) but had not received treatment or an official diagnosis; <i>OR</i> 2) the young person told an informant that they had mental health problems but it was not otherwise verified by official records during the police or coroner investigation. For examples, see section 1.3 below.	1) Yes 2) No/unknown/not reported
Suicide attempt or self-harm (irrespective of intent)	Based on an informant report or documented medical evidence that the person had made a suicide attempt or had self-harmed in their lifetime. Includes presenting to health care services (eg, emergency department) for a suicide attempt, informant descriptions of self-harm or suicide attempts, as well as indirect evidence from autopsy reports (eg, the autopsy reported evidence of self-inflicted injuries or evidence of healing wounds from self-inflicted injuries, such as abrasions to the wrist or injuries consistent with cutting). Does not include informant reports of suspected self-harm or suicide attempt.	1) Week prior to death 2) Month prior to death 3) Year prior to death 4) More than one year or time not known 5) None/unknown/not reported
Presentation to an emergency department (ED) for mental-health symptoms	Based on an informant report or documented medical evidence that the person presented to the ED prior to their suicide for reasons primarily related to mental health symptoms (including self-harm) and was discharged from the ED. Excludes presentations to the ED for reasons unrelated to mental health (eg, suspected appendicitis) or informant reports of ED presentations for unknown reasons.	1) Week prior to death 2) Month prior to death 3) Year prior to death 4) More than one year or time not known 5) None/unknown/not reported
Hospital or inpatient admission	Based on an informant report or documented medical evidence that the person was admitted to the hospital for treatment relating to their mental health symptoms (includes inpatient admission, drug and alcohol rehabilitation, and private residential treatment for mental health symptoms).	1) Week prior to death 2) Month prior to death 3) Year prior to death 4) More than one year or time not known 5) None/unknown/not reported

Variable	Definition and ascertainment	Categories
Alcohol detected at time of death	Based on toxicology findings that indicated blood alcohol at time of death. Excludes alcohol readings from urine samples and toxicology reports that indicated that alcohol detection was explained by post mortem changes (eg, decomposition).	1) Yes 2) No or post mortem artefact
Alcohol intoxication	Based on toxicology findings that indicated a blood alcohol concentration > 1500 mmol/L. Excludes alcohol readings from urine samples and toxicology reports that indicated that alcohol detection was explained by post mortem changes (eg, decomposition).	Continuous variable. Also coded as a categorical variable: 1) Yes (> 150 mg/dL) 2) No (≤ 150 mg/dL) and none
Illicit substances detected in toxicology report	Based on toxicology findings that indicated the presence of illicit substances (eg, methamphetamine, cannabis, cocaine, MDMA) or their metabolites. Includes substances of misuse (eg, taurine from paint, petroleum from petrol).	1) Yes 2) No
Mental health treatment	Based on an informant report or documented medical evidence that 1) the person had received counselling/therapy or pharmacological treatment for mental health symptoms; <i>OR</i> 2) the person was known to have a mental-health diagnoses <i>AND</i> there was evidence of therapeutic levels of psychotropic medication (eg, antidepressants) in the toxicology report.	1) Medication 2) Therapy/case management 3) Medication and therapy/case management 4) Yes, but type of treatment not reported 5) None/unknown/not reported
Death of a parent	Based on an informant report that the person had experienced the death of parent or primary caregiver (eg, adopted parent). Excludes death due to suicide (reported separately).	1) Yes 2) No/unknown/not reported
Peer conflict (past 12 months)	Based on an informant report that the person experienced relationship problems (eg, arguments or physical confrontations) with their peers, or those in their friendship circle in the 12 months prior to their death.	1) Yes 2) No/unknown/not reported
Family conflict (past 12 months)	Based on an informant report that the person had experienced relationship problems (eg, arguments or physical confrontations) with their family members. Includes conflicts in the family environment that described the person had feelings that they were not able to meet family expectations.	1) Yes 2) No/unknown/not reported
Relationship breakdown with spouse	Based on an informant report that the person had a relationship breakdown with their spouse or intimate partner in the month prior to their suicide. Includes teenage boyfriend/girlfriend relationships and online relationships.	1) Yes 2) No/unknown/not reported

Variable	Definition and ascertainment	Categories
History of abuse or neglect	Based on an informant report or other documented evidence (eg, police statements) that the person had been sexually, physically or emotionally abused, or that the person had experienced neglect in their family home. Excludes informant reports of suspected abuse or neglect.	1) Yes 2) No/unknown/not reported
Exposure to domestic violence	Based on an informant report or documented police statements that the person had experienced violence in the home. Includes exposure during childhood to domestic violence between parents.	1) Yes 2) No/unknown/not reported
History of being bullied	Based on an informant report that the person experienced verbal or physical harassment by school peers or work colleagues during their lifetime.	1) Yes 2) No/unknown/not reported
Difficulty finding employment	Based on an informant report that the person had difficulty finding work in the year prior to their suicide or had been actively searching for employment without success during the 12 months prior to their death.	1) Yes 2) No/unknown/not reported
Job loss	Based on an informant report that the person had become unemployed in the month prior to their suicide. Includes self-termination (eg, quitting), being fired, or being made redundant.	1) Yes 2) No/unknown/not reported
Financial problems at time of death	Based on an informant report that the person had experienced trouble with finances. Includes reports of problematic gambling resulting in financial hardship, or difficulties meeting child support obligations, bills or other financial responsibilities.	1) Yes 2) No/unknown/not reported

ICD-10 = International Statistical Classification of Diseases and Related Health Problems, tenth revision; LGBTI = lesbian, gay, bisexual, transgender, intersex; MDMA = 3,4-methylenedioxymethamphetamine (“ecstasy”); NCIS = National Coronial Information System.

1.2. Cases not included in free text analysis

A total of 3365 closed cases of suicide in young people aged 10–24 were included in the analysis of the core NCIS dataset. Of these, 338 (10%) could not be included in the free text analysis of the demographic, social, and clinical risk factors: for 98 cases, coroners' and police reports were not available, while for all 240 cases in South Australia, information in the police and coroner's reports was insufficient (most described only the method of death). The excluded cases were comparable with included cases with regard to sex and remoteness, but the proportion of Aboriginal and Torres Strait Islander Australians was lower and that of people residing in the most disadvantaged Statistical Areas 2 (SA2s) higher (table 1).

Table 2. Comparison of cases excluded from or included in the free text analysis

Variable	Excluded (South Australia)	Excluded (other)	Included	P (χ^2)
Number of people	240	98	3027	
Sex (male)	190 (79%)	69 (70%)	2214 (73.1%)	0.36
Aboriginal and Torres Strait Islander	20 (8%)	6 (6%)	458 (15.1%)	0.001
Remote/very remote*	15 (6%)	5 (5%)	235 (7.8%)	0.47
IRSD, deciles 1–3*	123 (51%)	43 (44%)	1126 (37.2%)	< 0.001

IRSD = Index of Relative Socio-economic Disadvantage.

* 2011 Statistical Area Level 2 for place of residence.

1.3. Coding of diagnosed and possible mental health disorders

Evidence of a diagnosed mental health disorder was determined if the following evidence was reported in the free text of the police or coroner’s report:

- 1) the young person had psychiatric diagnosis prior to their suicide; *OR*
- 2) the young person was being treated by a medical practitioner (eg, GP, psychologist, psychiatrist) for a mental disorder or mental illness; *OR*
- 3) an informant reported that the young person was being treated for a mental health disorder *AND* results from the NCIS toxicology report described the presence of therapeutic levels of psychotropic medication (eg, antidepressants) at or around the time of death.

Evidence of a possible mental health disorder was determined if the following evidence was reported in the free text of the police or coroner’s report:

- 1) an informant described that the young person displayed emotional or behavioural symptoms that were consistent with a mental illness (eg, the person was depressed or exhibited low mood, anxious or paranoid) but had not received treatment or an official diagnosis); *OR*
- 2) the young person told an informant that they had mental health problems, but it was not otherwise verified by official records during the police or coroner investigation.

Common examples that were used to determine a possible mental health disorder are provided in table 3.

Table 3. Coding of possible mental health disorders

Mental health disorder category	Specific diagnoses	Examples from the NCIS used to determine a possible mental health disorder
Disruptive behavioural disorders	Gambling disorder Reactive attachment disorder Oppositional defiant disorder Conduct disorder	The young person was described as <i>“a loose cannon and had a gambling addiction”</i> The young person was described as having <i>“used all his money to gamble”</i>
Bipolar disorder	Bipolar disorder Manic depression	<i>“The deceased had stated they had suffered from extreme highs and lows”</i> The young person had informed others <i>“I have bipolar. This condition was not treated.”</i> The young person was described as having <i>“dramatic mood swings and goes through periods of extreme highs and lows.”</i>
Depressive disorder	Depression Dysthymia Adjustment disorder	The young person was described as having <i>“a history of depression. This condition had not been diagnosed or treated.”</i> The young person <i>“told their friend they felt depressed.”</i> The young person was described as having <i>“undiagnosed depression.”</i> The young person was described as having <i>“expressed that <they> were feeling depressed.”</i>

Mental health disorder category	Specific diagnoses	Examples from the NCIS used to determine a possible mental health disorder
Anxiety disorder	Anxiety Separation anxiety Obsessive compulsive disorder Panic attack disorder Attachment disorder	The young person was described as having <i>“a history of depression and anxiety.”</i> The young person was described as having <i>“suffered from anxiety.”</i> The young person <i>“was known to suffer from depression and anxiety however is not known to be medicated for these conditions.”</i>
Personality disorders	Borderline Antisocial Narcissistic Not otherwise specified	The young person was described as <i>“having dependent-personality disorder”</i>
Eating disorder	Eating disorder	None
Post-traumatic stress disorder	Post-traumatic stress disorder	None
Attention deficit/hyperactivity disorder	Attention deficit/hyperactivity disorder	None
Psychotic disorder	Psychosis Schizophrenia Schizophreniform disorder Schizoaffective disorder	<i>“The police informed by the deceased that he had schizophrenia.”</i> The young person was described as <i>“becoming increasingly paranoid and thought people were living in their roof.”</i> The young person was described as <i>“becoming increasingly paranoid believing the government was making contact through electronic devices.”</i>
Substance misuse disorder	Substance misuse disorder Cannabis dependence Alcohol dependence	The young person <i>“was an illicit drug user, smoking marijuana daily.”</i> The young person was described as having <i>“an alcohol and gambling addiction.”</i> <i>“The family reported concerns about the deceased mental health in relation to drug abuse”.</i>

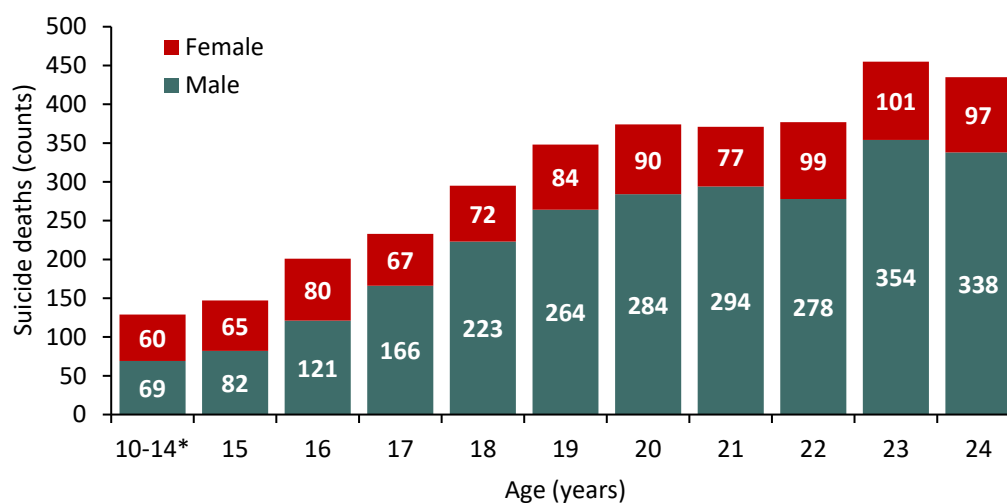
References

- 1 De Leo D, Dudley MJ, Aebersold CJ, et al. Achieving standardised reporting of suicide in Australia: rationale and program for change. *Med J Aust* 2010; 192: 452-456. <https://www.mja.com.au/journal/2010/192/8/achieving-standardised-reporting-suicide-australia-rationale-and-program-change>
- 2 National Coroners Information System. Operational statistics: case closure. <https://www.ncis.org.au/about-the-data/operational-statistics/> (viewed Oct 2019).
- 3 Australian Bureau of Statistics. 1270.0.55.001. Australian Statistical Geography Standard (ASGS): volume 1. Main Structure and Greater Capital City Statistical Areas. <https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.001July%202016?OpenDocument> (viewed July 2019).
- 4 Australian Bureau of Statistics. 2033.0.55.001 Census of Population Housing: Socio-Economic Indexes for Areas (SEIFA) Australia 2011. <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/2033.0.55.001main+features100052011> (viewed Nov 2019).

2. Supplementary results

Between 1 January 2006 and 31 December 2015, there was a total of 3365 suicide deaths in young people aged 10–24 years (Figure 1). Age-specific rates of suicide were highest in the Northern Territory (27.45 per 100,000), followed by Western Australia (10.12 per 100,000), Queensland (9.7 per 100,000), Tasmania (7.8 per 100,000), South Australia (7.72 per 100,000), Victoria (6.78 per 100,000), New South Wales (5.33 per 100,000; Figure 2).

Figure 1. Number of suicides by age and sex in young people aged 10-24 years in 2006-2015



* Aggregated because of small numbers.

Figure 2. Average annual rate of suicide by Australians aged 10–24 years, 2006–2015, by state and territory

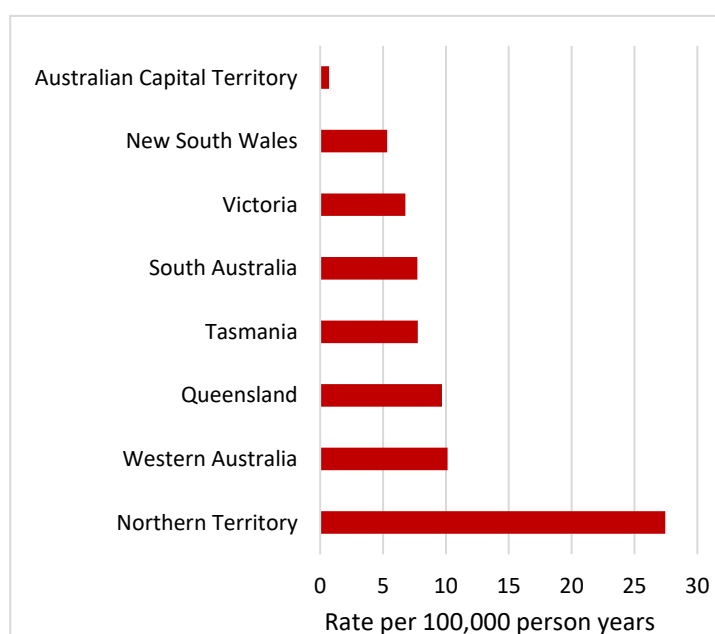


Figure 3. Suicide by people aged 10–24 years, Australia, by state and year

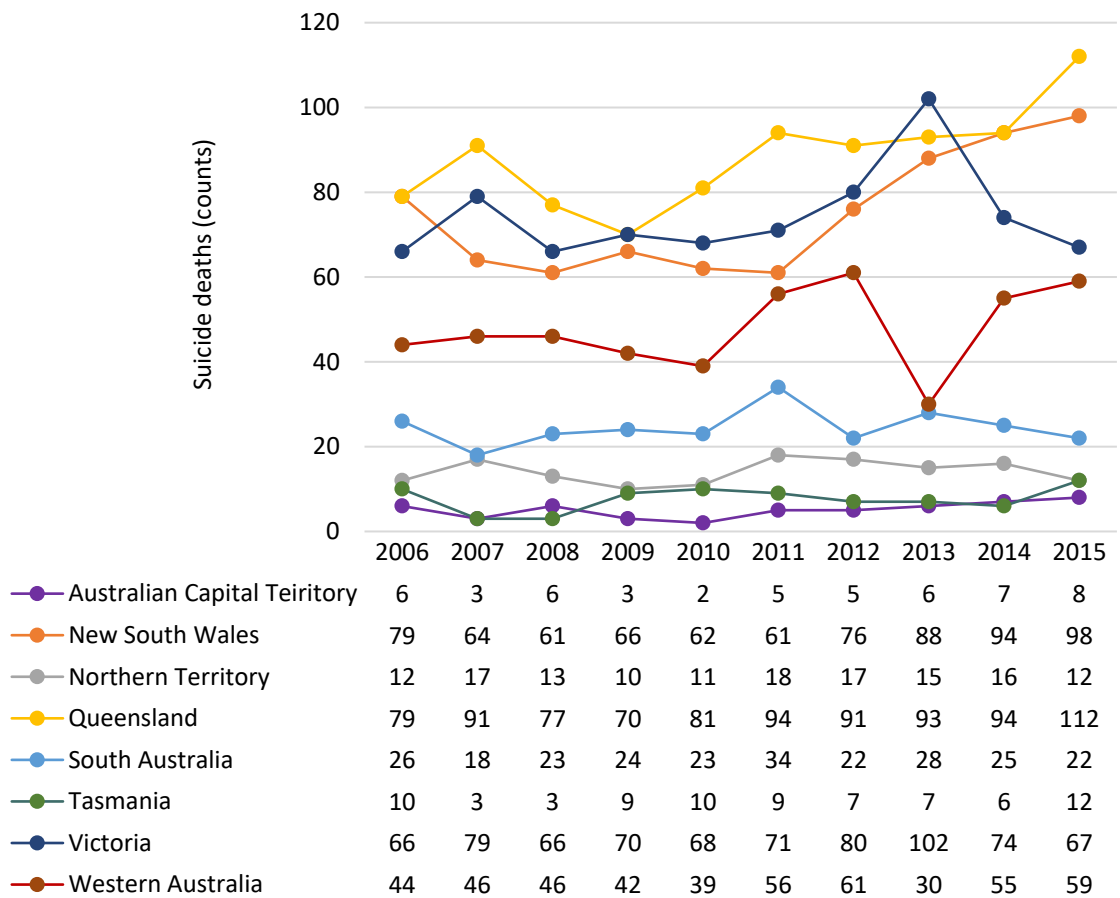
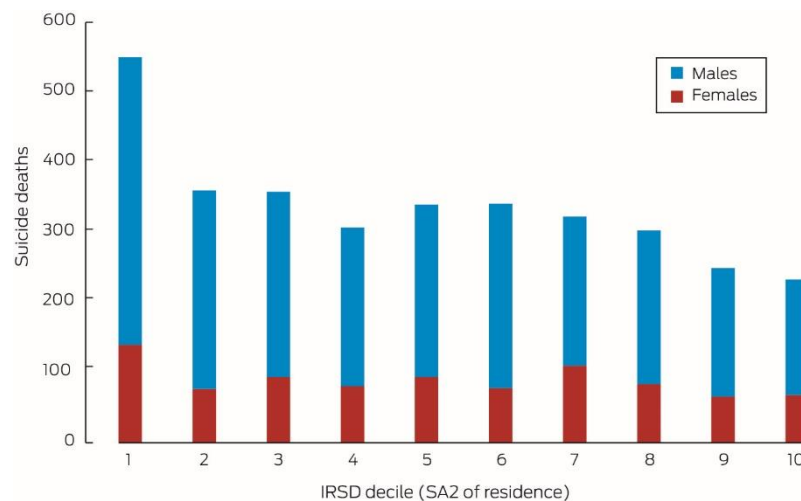


Figure 4. Suicide by people aged 10–24 years, Australia, 2006–2015, by Index of Relative Socio-economic Disadvantage (IRSD) and sex



SA2 = Australian Bureau of Statistics Statistical Area 2.

Table 4. Mental health disorders of 3027 people who died by suicide in Australia, 2006–2015, by possible and diagnosed mental health disorder status

Mental health disorder	Possible mental health disorder	Diagnosed mental health disorder
Total number of people	475 (15.7%)	1237 (40.9%)
Depression	354 (11.7%)	902 (29.8%)
Anxiety	19 (0.6%)	238 (7.9%)
Substance misuse or dependence	44 (1.4%)	164 (5.4%)
Psychotic disorders	17 (0.6%)	175 (5.8%)
Personality disorder	< 5	94 (3.1%)
Bipolar disorder	< 5	74 (2.4%)
Attention deficit/hyperactivity disorder	< 5	73 (2.4%)
Post-traumatic stress disorder	< 5	39 (1.2%)
Eating disorder	< 5	39 (1.2%)
Autism spectrum disorder	< 5	41 (1.4%)
Disruptive behaviour disorders	6 (0.2%)	17 (0.6%)
Other	82 (2.7%)	54 (1.8%)