



Original article

# Economically inactive, unemployed and employed suicides in Australia by age and sex over a 10-year period: what was the impact of the 2007 economic recession?

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## Abstract

**Background:** Suicide is higher among economically inactive and unemployed persons than employed persons. This paper investigates differences in this relationship by sex and age over the period 2001 to 2010 in Australia. It also examines changes in suicide among employed, unemployed and economically inactive persons during the recession of 2007–09.

**Method:** Suicide data from the National Coroners Information System were utilised for this retrospective study. Negative binomial and Poisson regression was used to estimate the association between suicide and employment status and to investigate differences in suicide rates over the period of the recession (2007–09) compared with the year before the recession (2006).

**Results:** Results suggest that during 2001–10 economically inactive/unemployed males had a suicide rate ratio (RR) of 4.62 [95% confidence interval (CI) 4.10, 5.19;  $P < 0.001$ ] compared with employed males (RR = 1.00), whereas economically inactive/unemployed females had a suicide RR of 8.44 compared with employed females (95% CI 7.38, 9.67;  $P < 0.001$ ). There was an increase in suicide among both employed (7% rise in 2007,  $P = 0.003$ ) and economically inactive/unemployed males during the GFC (22% in 2008,  $P < 0.001$ ). Suicide also increased among economically inactive/unemployed females (12% in 2007,  $P = 0.03$ ; 19% in 2008,  $P = 0.001$ ) but not among employed females.

**Conclusions:** These results suggest the need for adequate policy and social welfare responses to ameliorate the effects of the economic recession on the working age

population. Particularly, these should target unemployed and economically inactive men and women in Australia, who may be at higher risk of suicide than previously thought.

**Key words:** Recession, suicide, unemployment, employed, economic inactivity

#### Key Messages

- Over the period 2001 to 2010, economically inactive/unemployed males had a suicide rate ratio (RR) of 4.62 compared with employed males, whereas economically inactive/unemployed females had a suicide RR of 8.44 compared with employed females.
- Over the economic recession period (2007–09), suicide rates among employed males, economically inactive/unemployed males, and economically inactive/unemployed females increased compared with 2006.
- Studies on suicide and unemployment should also assess 'economic inactivity', as this category is likely to include a large number of 'hidden' unemployed suicides.

## Introduction

Unemployed and economically inactive people have been found to be at higher risk of mental health problems<sup>1–3</sup> and suicide.<sup>4–6</sup> These relationships are modified by age,<sup>5,6</sup> with the working age being disproportionately at risk compared with other age groups. Some research suggests that unemployed males are particularly vulnerable to suicide.<sup>7</sup> Fluctuations in the wider economic environment (e.g. recessions or economic downturns) have also been found to have a notable impact on suicide at the population level.<sup>8–10</sup> For example, the 1997 recession was associated with an increase in suicide in some countries of Asia.<sup>10</sup> There is also some ecological evidence that the Great Depression of the 1920s was associated with an increase in suicide mortality in the USA.<sup>9</sup> This area of research has ongoing relevance given the most recent 'great recession' (also called the 'global financial crisis' or GFC), which began in 2007, and its association with an increase in suicide in a number of countries.<sup>11–15</sup> However, it is not known whether GFC-related increases in suicide occurred more in the employed, unemployed or those who were otherwise without work at the time of death. This is because most past studies have only studied suicide in the general population, without examination of the labour force status of individual suicide cases.

The aim of this study was to assess the association between labour force status and suicide over the period 2001 to 2010, with a particular focus on the unemployed, the economically inactive who theoretically are able to work (e.g. those who are not out of work for a specified reason including illness, retirement, caring for children/home duties or study) and the employed. First, we examined

gender and age variations in suicide by labour force status over the entire range of data available from a national coronial database (2001 to 2010). Second, we focused specifically on the GFC period (2007, 2008, 2009) to assess changes in suicide rates by labour force status compared with years prior to the GFC. Based on the past research cited, the main hypotheses of the study were as follows.

- The overall rate of suicide among economic inactive/unemployed persons will be greater than among employed persons.
- There will be a significant interaction between sex and employment status and between age and employment status with respect to suicide.
- There will be a significant rise in suicide among both the employed and economic inactive/unemployed populations during the GFC, defined in this study as beginning in 2007 and continuing to 2009.

## Methods

### Study design

This retrospective mortality study utilised data from the National Coroners Information System (NCIS) and focused on suicide by labour force status. Demographic characteristics such as age and sex were also examined.

### Data sources

The NCIS is a national internet-based data repository of Australian coronial cases, established in 2001.<sup>16,17</sup> NCIS includes basic demographic information such as age, sex,

marital status, country of birth, residential postcode and statistical local area (SLA). Each case on the NCIS routinely includes a police text description of the circumstances and background of the suicide, as well as information on employment status. The NCIS offers the best available national information on suicide mortality in the country and is used to compile those death statistics originating from coronial inquiries released by the Australian Bureau of Statistics (ABS).<sup>18</sup> However, the time needed for coronial processes means that the suicide data available in NCIS may be delayed by up to 3 years.<sup>19</sup> Hence, we examined the period for which there are reliable data only (2001 to 2010).

### Eligibility and data extraction of suicide cases

All cases officially recorded as occurring in 2001–10 as intentional self-harm in NCIS were extracted in January 2013. Text descriptions of employment status at the time of death were extracted for each case and used to classify cases into economically active or inactive. Data were also extracted on sex, method of death, age and marital status.

### Population data source

Population data for each year were obtained from the ABS *Labour Force, Australia, Feb 2014*<sup>20</sup> and *Persons Not in the Labour Force, Australia, September 2012*,<sup>21</sup> from 2001 to 2010.

### Definition of labour force status

For statistical purposes in Australia, an unemployed person is defined as someone who has been looking for work in the 4 weeks prior to the monthly labour market survey.<sup>22</sup> This classification excludes economically inactive long-term unemployed persons who may not report looking for work in the past month, but had been actively searching previously. Hence, this classification potentially underestimates the true extent of unemployment. As distinct from these ‘hidden’ unemployed, persons described as being economically inactive may also not be working due to illness, retirement, study or caring for children.<sup>23</sup> A recent national survey indicates that main reasons for economic inactivity among 15–64-year-olds in Australia include being on unspecified home duties (29.5%), followed by having a long-term health condition (18.3%), caring for children (16%) and being voluntarily inactive (12.8%).<sup>21</sup>

Those described as unemployed at the time of death would not necessarily have fulfilled the criteria of being unemployed as per the Australian Labour Market Statistics (e.g. actively looking for work in the past month and being

prepared or able to accept work if offered, as above).<sup>22</sup> The narrowness of the latter definition excludes discouraged job seekers who may have failed to look for work in the past month, and such background information is not recorded about suicide cases reported as unemployed. Because of this, we created an aggregate category of ‘economically inactive/unemployed’ suicides, which comprised suicides reported as unemployed ( $n=4697$ ) at the time of death or those on a government pension (i.e. receiving social security or welfare benefits) ( $n=2182$ ) and aged between 15 and 64 years. This latter group excluded those with a specified reason for being out of the labour force, such as being ill, retired, injured, studying or looking after children at the time of death. This group conceptually is different from economic inactivity described in previous studies.<sup>5,6,24,25</sup>

Thus, in order to adjust for differences in the definition of unemployment in suicide and population data, unemployed individuals and persons not in the labour force who were voluntarily inactive (aged 15–64 years) were combined in the yearly population data and in suicide data. Among the suicides, employed persons were those who were noted to be working for an income at the time of death, which closely corresponds to the definition in Labour Market Statistics data.

### Analysis

Rates of suicide among the economically inactive/unemployed and the employed were calculated using suicide counts as the numerator and the population data stratified as the denominator for the years 2001 to 2010. For descriptive purposes, annual age-specific rates were calculated for 15–24, 25–34, 35–44, 45–54 and 55–64 year age groups. Annual directly age-standardized rates of suicide (>15 years) were also calculated and described graphically.

Negative binomial regression analysis was then used to estimate the association between suicide and employment status after adjustment for age, sex and year of suicide occurrence. We chose negative binomial regression after assessing the extent of over-dispersion in Poisson regression models of suicide.

Evidence of interaction between sex and employment status was assessed by fitting the regression models with and then without the sex by employment status interaction term and performing a likelihood ratio test (LRT). Linear combinations were used to examine differences by sex and labour force status. Differences in labour force status by age were examined by including an age group by employment status interaction term in sex-specific regression models. If the interaction was found to be significant, the regression models were stratified. All coefficients were

exponentiated into rate ratios (RRs), and all negative binomial models used the log of the denominator population as the offset.

The possibility of a statistically significant difference in suicide rates over the period of the GFC (2007, 2008, 2009) compared with the year before the recession (2006) was tested using Poisson regression, as over-dispersion was not as identified as a problem in these models. Each of the years 2006, 2007, 2008 and 2009 were treated as categorical variables, with the year 2006 used as the reference year.

In a sensitivity test, we excluded economically inactive individuals from the analysis, leaving only unemployed suicides in order to assess possible differences in the direction and magnitude of effects. We also examined differences in suicide in the 2 years prior to the GFC (2005/06) to assess the robustness of modelled differences in suicide pre/post GFC if the baseline comparison period were changed to 2005–06.

## Results

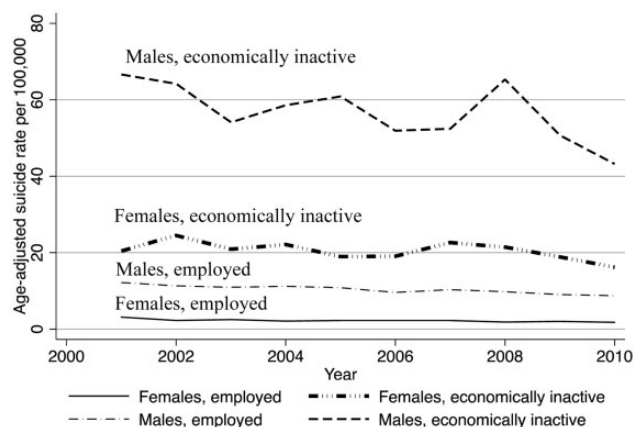
### Descriptive results

During 2001–10 the overall age-adjusted annual rate of suicide in economically inactive/unemployed males was 57.7 per 100 000 and 20.2 for corresponding females. Among the employed, the overall suicide rate was 10.5 per 100 000 males and 2.2 per 100 000 females. Economically inactive/unemployed males had the highest rates of suicide in 2001, corresponding to the general trend in Australia which reached a peak in the late 1990s and has been declining overall since. However, the decline was interrupted by a rise in 2008, which was more apparent among economically inactive/unemployed males (Figure 1).

### Differences in labour force status by sex and age

Overall, the RR of suicide among males was 3.7 compared with females (Table 1). Compared with those aged 15–24 years, the highest rate of suicide was among those aged 25–34 years and 35–44 years. And those economically inactive or unemployed had an RR of 6.02 times those who were employed.

The interaction between sex and employment status was statistically significant, as indicated by interaction terms and by the likelihood ratio test ( $\chi^2(1) = 39.21$ ,  $P < 0.001$ ). When combinations of coefficients from main effect and interaction terms were converted into rate ratios for each stratum, economically inactive/unemployed males had an adjusted RR of 4.62 (95% CI 4.10, 5.19;  $P < 0.001$ ) compared with employed males, whereas economically inactive/unemployed females had an RR of 8.44



**Figure 1.** Age-adjusted suicide rates among the employed and economically inactive by sex, 2001 to 2010.

compared with employed females (95% CI 7.38, 9.67;  $P < 0.001$ ). Moreover, economically inactive/unemployed women had an RR for suicide of 1.68 compared with employed males (95% CI 1.48, 1.90;  $P < 0.001$ ).

A likelihood ratio test was conducted to further assess a possible interaction between age group and employment status and was found to be significant ( $\chi^2(4) = 34.40$ ;  $P < 0.001$ ). Economically inactive/unemployed males and females had the greatest RR compared with employed males and females in those aged 25–34 years and 35–44 years (Table 2). This was particularly apparent for females in these age groups, who had more than an 11-fold excess in those who were economically inactive/unemployed compared with those who were employed. The RR of economically inactive/unemployed compared with the employed was lowest in older male and female age groups (45–54 years and 55–64 years).

### Differences in labour force status during the GFC

The difference in suicide rates from 2006 to 2008 was found to be significant for economically inactive males, with no difference for 2007 or 2009 compared with 2006 (Table 3). Suicide rates in economically inactive/unemployed females rose in 2007 and 2008. Rates were much more stable for employed males, but results of the Poisson regression suggest that suicide increased by about 7% in 2007 from 2006 and was 4% higher (non-significant) in 2008 compared with 2006. In contrast, suicide rates in employed females were not significantly different in 2007 but were significantly lower in 2008 and 2009 compared with 2006.

### Sensitivity analyses

The sensitivity analysis showed some differences when 2005/06 was used instead of 2006 as the baseline reference

**Table 1.** Rate ratios (RRs) of suicide in economically inactive and employed individuals, computed with negative binomial regression models

Variable	Suicides 2001–10	Pop (000) 2001–10	Main effects model			Interaction terms model		
			RR	95% CI	P-value	RR	95% CI	P-value
Economically inactive	6879	12 482	6.02	5.45, 6.65	<0.001	8.45	7.38, 9.67	<0.001
Employed (referent)	8929	76 426	1.00			1.00		
Male	12 895	46 329	3.68	3.33, 4.06	<0.001	5.03	4.42, 5.72	<0.001
Female (referent)	2913	40 579	1.00			1.00		
Labour force*Sex (Referent = employed & female)						0.55	0.46, 0.65	<0.001
55–64 yrs	2145	11 329	1.13	0.97, 1.33	0.125	1.08	0.93, 1.26	0.285
45–54 yrs	3547	18 601	1.53	1.31, 1.78	<0.001	1.52	1.33, 1.75	<0.001
35–44 yrs	4245	21 106	1.99	1.71, 2.32	<0.001	2.00	1.74, 2.30	<0.001
25–34 yrs	3854	19 619	2.00	1.71, 2.34	<0.001	2.02	1.76, 2.33	<0.001
15–24 yrs (referent)	2017	16 253	1.00					
Year (2001–2010)			0.97	0.96, 0.99	0.001	0.97	0.96, 0.99	<0.001

RR, rate ratio; CI, 95% confidence interval.

**Table 2.** Rate ratios (RRs) of suicide in economically inactive and employed individuals, computed with negative binomial regression models, by sex

Age	Labour force status	Females			Males		
		RR	95% CI	P-value	RR	95% CI	P-value
15–24 yrs	Economically inactive	10.03	8.09, 12.45	<0.001	4.84	4.37, 5.36	<0.001
	Employed	1.00			1.00		
25–34 yrs	Economically inactive	11.28	9.70, 13.13	<0.001	7.96	7.32, 8.65	<0.001
	Employed	1.00			1.00		
35–44 yrs	Economically inactive	11.85	10.27, 13.68	<0.001	6.68	6.07, 7.36	<0.001
	Employed	1.00			1.00		
45–54 yrs	Economically inactive	8.58	7.40, 9.96	<0.001	4.72	4.37, 5.09	<0.001
	Employed	1.00			1.00		
55–64 yrs	Economically inactive	3.06	2.49, 3.76	<0.001	1.53	1.38, 1.69	<0.001
	Employed	1.00			1.00		

RR, rate ratio compared with the employed; CI, 95% confidence interval.

**Table 3.** Rate ratios (RRs) for suicide during years of the Global Financial Crisis (GFC) (2007, 2008, 2009) compared with 2006, computed with Poisson regression models, by sex

Labour force status	Year	Females			Males		
		RR	95% CI	P-value	RR	95% CI	P-value
Economically inactive	2009	1.05	0.95, 1.16	0.345	0.98	0.93, 1.04	0.546
	2008	1.19	1.08, 1.32	0.001	1.22	1.15, 1.29	<0.001
	2007	1.12	1.01, 1.23	0.030	0.98	0.93, 1.04	0.610
	2006	1.00			1.00		
Employed	2009	0.87	0.79, 0.97	0.012	0.94	0.90, 0.99	0.013
	2008	0.78	0.70, 0.87	<0.001	1.04	0.99, 1.09	0.124
	2007	0.99	1.10, 0.84	0.843	1.07	1.02, 1.12	0.003
	2006	1.00			1.00		

RR, rate ratio compared with 2006; CI, 95% confidence interval.

period from which the effects of the GFC were measured. Suicide in economically inactive/unemployed males increased by 13% compared to 2005/06 (95% CI 1.09, 1.19;  $P < 0.001$ ). Among economically inactive/unemployed females, compared with 2005/06, suicide rates increased 14% in 2007 (95% CI 1.05, 1.24;  $P = 0.003$ ), and by 21% in 2008 (95% CI 1.12, 1.33;  $P < 0.001$ ). For employed males, suicide rates increased non-significantly by 1% in 2007 and decreased significantly by 12% in 2009 (95% CI 0.84, 0.91;  $P < 0.001$ ) compared with 2005/2006. Decreases were noticeable and significant among employed females [21% in 2008 (95% CI 0.72, 0.87;  $P < 0.001$ ), 12% in 2009 (95% CI 0.80, 0.97;  $P < 0.001$ )].

Sensitivity analysis examining unemployed vs employed suicides revealed a similar direction of effects as in the main analysis for economically active vs inactive. Unemployed males had a suicide RR of 10.64 compared with those employed (95% CI 8.78, 12.80;  $P < 0.001$ ), whereas unemployed females had an RR of 5.47 compared with employed females (95% CI 3.63, 8.25;  $P < 0.001$ ). However, it should be acknowledged that definitions of unemployed in the population data and the suicide data differ, as indicated in the methods section and as discussed further below.

## Discussion

Overall, during 2001 to 2010, economically inactive/unemployed males had over four times the suicide rates of employed males, whereas suicide rates of economically inactive/unemployed females were eight times higher than those of employed females. There was a suicide increase in economically inactive/unemployed males and females during the global financial crisis of 2007–09. There was evidence of a small increase in employed males and a decrease in employed females. However, we acknowledge that the trend results for males (particularly in the employed) are somewhat sensitive to the baseline years chosen for measuring against, whereas trends for females were similar. Results also suggest that economically inactive/unemployed males and females aged 25–44 years had the highest RRs of suicide compared with those employed.

Previous studies have shown a relationship between rising mortality and economic recessions.<sup>8–10</sup> More recently, there have been a number of papers on the potential effect of the 2007 recession on suicide rates.<sup>11–15</sup> These studies are based on an aggregate relationship between the unemployment rate in an area and the general suicide rate, and are therefore unable to distinguish suicides occurring in working vs non-working individuals. This makes it difficult to know whether those actually employed or

economically inactive/unemployed were more detrimentally affected by the most recent global economic recession. The present study has been able to distinguish between suicides occurring in economically inactive/unemployed and employed individuals in relation to the GFC of 2007–09.

Considerable attention has been paid to the heightened risk of male suicide in relation to unemployment in Australia,<sup>26–28</sup> but less to what happens to employed males during economic recessions. It is possible that the small rise observed in this paper may be among a subset of males who experienced adversity during the recession, such as those in low-skilled jobs who experienced a decrease in income or employment conditions (e.g. move towards contract or casual work from permanent employment) during the GFC. It is also possible that employed males were adversely impacted by changes in psychosocial job stressors such as job insecurity,<sup>10,29</sup> as well as wider governmental austerity measures and reduced access to preventive social and health services.<sup>14,15</sup> However, it is clear that the rise in suicide among employed males during the GFC was very small and transient.

Females who were economically inactive/unemployed were particularly vulnerable and had suicide rates over eight times those of their employed counterparts. This is in direct contrast to recent ecological research on the GFC in England, which suggests that females are resilient to the adverse effects of unemployment,<sup>14</sup> but is consistent with the findings of a similarly designed study in Ireland.<sup>6</sup> The latter study suggests that elevated suicide rates among females without a job is indicative of the increased importance of a paid job for women. The same explanation is used for the relationship between male suicide and unemployment.<sup>30</sup> However, as there has been limited focus on suicide among unemployed women using national mortality data sets in past studies, more work is needed to assess whether this is a genuine result or statistical artefact. Employed women experienced a small but significant decline in suicide rates during the recession, which may suggest that they were less likely to be adversely affected by the recession than those not working and males generally. Also, consistently with past research, economically inactive/unemployed males and females in the prime of their working life had significantly heightened risk of suicide.<sup>5,6</sup> Older workers had significantly lower risk of suicide compared with younger workers, which may indicate a reduced salience for risk factors related to employment as 55–64 years olds begin to transition to retirement, as well as other positive life changes such as paying off housing loans.

The limitations of the present study include under-reporting of suicide data due to coronial delays and misreporting of suicides as other causes of death (e.g. 'undetermined' intent).<sup>19,31,32</sup> We should also acknowledge a

caveat in the sensitivity analysis of unemployed suicides vs unemployed in the population (excluding those otherwise economically inactive). As we explained in the methods section of the paper, population data on unemployment only includes those who have been looking for work in the past month, which tends to under-report the long-term unemployed, many of whom have given up looking for work (i.e. discouraged job seekers). In contrast, those classed as unemployed in the suicide data include both those who fit the narrower population definition of 'unemployment' and the discouraged job seekers that would not fit the population definition. Consequently, the sensitivity analysis will tend to over-inflate suicide rates among unemployed persons. This was particularly the case for males, of whom a greater number are recorded as being unemployed at the time of suicide death. There was apparently less numerator/denominator bias among females recorded as being unemployed, which partly explains why the RR for being unemployed was lower than for being economically inactive/unemployed.

The GFC is likely to have had variable impacts on different groups of people over time and location.<sup>33</sup> The complexity of these effects on society and suicide are unlikely to have been captured in our relatively crude before-after yearly measure of the recession. Further, the economic impact of the GFC has been muted in Australia (evident in only small increases in unemployment) compared with Europe and the USA, mainly due to continued economic growth in China, Australia's largest trading partner. For example, unemployment rates in Australia during the GFC ranged between 4.4 in May 2007 to a peak 5.5 in May 2009.<sup>21</sup> This means that our results may not generalize to other contexts. However, it is also important to consider that the impact of the GFC may operate through mechanisms other than overall unemployment at the national level, as discussed above. Also, our study was unable to measure the health status or psychiatric conditions of suicide cases and therefore was unable to account for possible health selection effects. However, as shown in a recent meta-analysis of cohort studies, unemployment is still associated with a considerably heightened risk of suicide after controlling for pre-existing psychiatric conditions.<sup>34</sup> We also acknowledge the inability to control for confounders that may precede or co-exist with labour force status and suicide, such as significant life events.<sup>35</sup>

A strength of this study is that it is based on the best available national data set and can provide information on the employment status of individual suicide cases. The use of these data contributes substantially to current research on suicide, as most studies hitherto have been conducted at an ecological level and have been unable to examine the labour force status of individual suicide cases.

Future research could examine differences in the extent to which different working and non-working groups were affected by changes in the industrial landscape during the GFC: for example, whether there were occupational skill level or industrial sector differences in the extent to which suicide among employed groups were affected. Future research could also examine the extent to which suicide rates in the long-term economically inactive/unemployed population changed in response to the GFC, compared with those who lost their jobs during the economic recession. From a policy perspective, our results suggesting that both the employed and unemployed populations were affected by the recession indicate that the greatest public health benefit will be gained by targeting the entire working-age population in suicide prevention activities. However, special attention is needed for unemployed and economically inactive working-age men and women in Australia, who may be at higher risk of suicide than previously thought.

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## Contributorship statement

A.M. conceived the article, downloaded data, conducted analysis, retrieved all references and wrote the initial draft. S.M. and A.D.L. helped with the statistical design, interpretation of results and drafts of the paper. All authors made substantial contributions to the final draft.

**Conflict of interest:** None declared.

## References

1. Flint E, Bartley M, Shelton N, Sacker A. Do labour market status transitions predict changes in psychological well-being? *J Epidemiol Community Health* 2013;**67**:796–802.
2. Milner A, Spittal MJ, Page A, Lamontagne AD. The effect of leaving employment on mental health: testing 'adaptation' versus 'sensitisation' in a cohort of working-age Australians. *Occup Environ Med* 2014;**71**:167–74.
3. McKee-Ryan F, Song Z, Wanberg CR, Kinicki AJ. Psychological and physical well-being during unemployment: a meta-analytic study. *J Appl Psychol* 2005;**90**:53–76.
4. Ahs A, Westerling R. Mortality in relation to employment status during different levels of unemployment. *Scand J Work Environ Health* 2006;**34**:159–67.

5. Blakely TA, Collings SC, Atkinson J. Unemployment and suicide. Evidence for a causal association? *J Epidemiol Community Health* 2003;57:594–600.
6. Corcoran P, Arensman E. Suicide and employment status during Ireland's Celtic Tiger economy. *Eur J Public Health* 2011;21:209–14.
7. Morrell S, Taylor R, Quine S, Kerr C. Suicide and unemployment in Australia 1907–1990. *Soc Sci Med* 1993;36:749–56.
8. Ruhm CJ. Are recessions good for your health? *Q J Econ* 2000;115:617–50.
9. Tapia Granados JA, Diez Roux AV. Life and death during the Great Depression. *Proc Natl Acad Sci U S A* 2009;106:17290–95.
10. Chang S-S, Gunnell D, Sterne JAC, Lu T-H, Cheng ATA. Was the economic crisis 1997–1998 responsible for rising suicide rates in East/Southeast Asia? A time-trend analysis for Japan, Hong Kong, South Korea, Taiwan, Singapore and Thailand. *Soc Sci Med* 2009;68:1322–31.
11. Chang S-S, Stuckler D, Yip P, Gunnell D. Impact of 2008 global economic crisis on suicide: time trend study in 54 countries. *BMJ* 2013;347:f5238.
12. Reeves A, Stuckler D, McKee M, Gunnell D, Chang S-S, Basu S. Increase in state suicide rates in the USA during economic recession. *Lancet* 2012;380:181–84.
13. Stuckler D, Basu S, Suhrcke M, Coutts A, McKee M. Effects of the 2008 recession on health: a first look at European data. *Lancet* 2011;378:124–25.
14. Barr B, Taylor-Robinson D, Scott-Samuel A, McKee M, Stuckler D. Suicides associated with the 2008–10 economic recession in England: time trend analysis. *BMJ* 2012;345:e5142.
15. Saurina C, Bragulat B, Saez M, Lopez-Casasnovas G. A conditional model for estimating the increase in suicides associated with the 2008–2010 economic recession in England. *J Epidemiol Community Health* 2013;67:779–87.
16. Bugeja L, Clapperton AJ, Killian JJ, Stephan KL, Ozanne-Smith J. Reliability of ICD-10 external cause of death codes in the National Coroners Information System. *HIMJ* 2010;39:16–26.
17. Daking L, Dodds L. ICD-10 mortality coding and the NCIS: a comparative study. *HIMJ* 2007;36:11–23.
18. Australian Bureau of Statistics (ABS). *Suicides, Australia, 2010*. Cat. no. 3309.0. Compilation of suicide data: sources of suicide data. Canberra: Australian Bureau of Statistics, 2010.
19. 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;192:452–56.
20. Australian Bureau of Statistics (ABS). *Labour Force, Australia, Feb 2014*. Cat. No. 6202.0. Canberra: Australian Bureau of Statistics, 2014.
21. Australian Bureau of Statistics (ABS). *Persons Not in the Labour Force, Australia, September 2012*. Canberra: Australian Bureau of Statistics, 2013.
22. Australian Bureau of Statistics (ABS). *Labour Statistics: Concepts, Sources and Methods*. Catalogue number 6102.0.55.001. Canberra: Australian Bureau of Statistics, 2007.
23. Bartley M, Ferrie J. Glossary: unemployment, job insecurity, and health. *J Epidemiol Community Health* 2001;55:776–81.
24. Bartley M, Sacker A, Clarke P. Employment status, employment conditions, and limiting illness: prospective evidence from the British household panel survey 1991–2001. *J Epidemiol Community Health* 2004;58:501–06.
25. Martikainen P, Valkonen T. Bias related to the exclusion of the economically inactive in studies on social class differences in mortality. *Int J Epidemiol* 1999;28:899–904.
26. Morrell S, Taylor R, Quine S, Kerr C, Western J. A case-control study of employment status and mortality in a cohort of Australian youth. *Soc Sci Med* 1999;49:383–92.
27. Morrell S, Page AN, Taylor RJ. The decline in Australian young male suicide. *Soc Sci Med* 2007;64:747–54.
28. Milner A, Page A, LaMontagne AD. Duration of unemployment and suicide in Australia over the period 1985–2006: an ecological investigation by sex and age during rising versus declining national unemployment rates. *J Epidemiol Community Health* 2012;67:237–44.
29. Milner A, Kavanagh A, Krnjacki L, Bentley R, LaMontagne AD. Area-level unemployment and perceived job insecurity: evidence from a longitudinal survey conducted in the Australian working-age population. *Ann Occup Hyg* 2014;58:171–81.
30. Moller-Leimkuhler AM. The gender gap in suicide and premature death or: why are men so vulnerable? *Eur Arch Psychiatry Clin Neurosci* 2003;253:1–8.
31. Simon-Davies J. *Suicide in Australia*. Canberra: Parliament of Australia, 2011.
32. Australian Bureau of Statistics (ABS). *Information Paper: External Causes of Death, Data Quality, 2005*. Cat. no. 3317.0.55.001. Canberra: Australian Bureau of Statistics, 2007.
33. Labonte R, Schrecker T. Globalization and social determinants of health: Introduction and methodological background (part 1 of 3). *Global Health* 2007;3:5.
34. Milner A, Page A, Lamontagne AD. Cause and effect in studies on unemployment, mental health and suicide: a meta-analytic and conceptual review. *Psychol Med* 9 July 2013:1–9. Epub ahead of print. PMID: 23834819.
35. Cavanagh JTO, Owens DGC, Johnstone EC. Life events in suicide and undetermined death in south-east Scotland: a case-control study using the method of psychological autopsy. *Soc Psychiatry Psychiatr Epidemiol* 1999;34:645–50.