

## Papers

# Occupational class suicide risk: 12-year study of national coronial data

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## Background

Previous research showed that the Global Financial Crisis (GFC) was associated with a widening disparity in suicide rates between lower-class occupations and the highest-class occupations in Australia. There has been no research investigating whether this trend continued post-GFC.

## Aims

This study aimed to investigate suicide rates by occupational class among employed Australians aged 15 years and over, between 2007 and 2018.

## Method

A population-level retrospective mortality study was conducted using data from the National Coronial Information System. Adjusted suicide rates were calculated over the period 2007 to 2018. Negative binomial regression models were used to assess the relationship between occupational class, gender and time, comparing post-GFC years (2010–2012, 2013–2015 and 2016–2018) with GFC years (2007–2009).

## Results

Relative to the GFC period of 2007–2009, a significant reduction in suicide disparity between managers and other

occupation groups was only observed among male labourers (rate ratios (RR) = 0.65, 95% CI 0.49–0.86) and male technicians/trades workers (RR = 0.73, 95% CI 0.56–0.96) for the period 2013–2015.

## Conclusion

Skilled manual and lower-skilled occupational classes remain at elevated risk of suicide in Australia. While a decreasing divergence in suicide rates was only observed between labourer and manager occupational classes post-GFC, this trend was not maintained over the later part of the study period (2016–2018). There is a need to further understand the relationship between contextual factors associated with suicide among the employed population, especially during periods of economic downturn.

## Keywords

Suicide; occupation; gender; skill level; intentional self-harm.

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## Background

In Australia, and internationally, suicide is the leading cause of death for people aged 15 to 44 years,<sup>1,2</sup> which coincides with the average age of the working population. Although employment is often regarded as having protective effect against suicide risk,<sup>3,4</sup> there is a body of research indicating specific occupations are at elevated risk of suicide among employed populations. Skilled manual and lower-skilled occupations, such as construction workers,<sup>5–8</sup> cleaners,<sup>7,9</sup> labourers,<sup>10</sup> miners,<sup>11</sup> transport workers<sup>12</sup> and farmers<sup>4,7</sup> are overrepresented in suicide statistics. By contrast, non-manual and higher skilled occupations, excluding health professionals,<sup>13,14</sup> veterinarians<sup>15</sup> and emergency service workers,<sup>16</sup> are typically underrepresented. These findings are supported by a meta-analysis of 34 studies that indicated a stepwise gradient of risk, where the lowest skilled occupations were at the greatest risk of suicide compared with the highest skill occupations.<sup>9</sup>

To date, evidence for the contextual drivers of suicide among skilled manual and lower-skilled workers is limited. The increased susceptibility of these occupations to suicide may be independently linked to significant occupational stress resulting from precarious employment,<sup>6</sup> socioeconomic factors<sup>17</sup> and poor psychosocial working conditions.<sup>18,19</sup> Past research also suggests that periods of population-level economic and labour market instability may exacerbate suicide risk, particularly among several lower-skilled occupations.<sup>10,20,21</sup> For example, in Australia, suicide rate ratios (RR) between labourers and managers almost doubled among men during the Global Financial Crisis (GFC) years of 2008 (RR = 6.12, 95% CI 4.06–9.22) and 2009 (RR = 5.92, 95% CI 3.76–9.32) compared with the pre-GFC period of 2001 to 2006 (RR = 3.76, 95% CI 3.12–4.53), however, there was less evidence of differences in occupational

disparity among women.<sup>20</sup> A South Korean study also reported an increase in the prevalence of depression, suicidal ideation and suicide attempts among lower-income groups following a period of economic crisis in the late 1990s.<sup>21</sup>

## Aims

Given evidence of occupational skill level disparity in suicide risk following periods of economic instability up to 2010,<sup>20</sup> further surveillance is needed to determine whether the economic recovery in Australia post-GFC resulted in a reversal of this emerging trend. The present study extends previous Australian research by Milner et al,<sup>20</sup> by reviewing the role of occupation skill classes in suicide for the period of 2007 to 2018, adding an additional 8 years of data on suicide and occupation in Australia and the potential long-term impact of the GFC.

Using national Australian coronial data over a 12-year period, we examined variations in occupational skill level suicide rates by gender, as well as changes in occupational skill level disparity trends by gender during and after the GFC.

We hypothesised that the suicide disparity between lower-skilled and the highest-skilled occupational classes reduced among males as a result of decreasing economic pressure post-GFC. We also examine whether this is the case for females. The rationale for this was based on past research demonstrating that male lower-skilled occupational classes were at increased risk of suicide during times of economic instability.<sup>20</sup> Such insights have important implications for how governments respond to economic threats in the context of suicide prevention into the future.

## Method

### Study design

This retrospective cohort design consisted of a time-trend analysis of suicide rates by occupational groups and gender using all closed cases of individuals where intent type at case completion was coded as 'intentional self-harm'. Data were acquired from the National Coronial Information System (NCIS) for the period from 1 January 2007 to 31 December 2018. The NCIS is an online database of all death investigation records provided by the coronial courts in Australia and New Zealand. The NCIS consists of information collected from source coronial file document including coronial findings, autopsy reports, police reports and toxicology reports. Fact of death and demographic information, including employment status and occupation at the time of death, are abstracted by NCIS custodians. The use of coronial data to understand suicide is not unique to the NCIS, with many overseas jurisdictions using information collected by the coroner for research purposes. For this study, suicide was classified according to the ICD-10 with method specific codes X60–X84.<sup>22</sup>

The study sample consisted of all employed people aged 15 years and older at the time of death with a known occupation and who died by suicide. Cases of individuals were excluded if they were not in paid employment at time of death, specific occupation information was unable to be coded, or if the age at time of death was less than 15 years. Suicide data were extracted from the NCIS online system on 1 September 2021.

Ethical approval was granted by the Victorian Justice Human Research Ethics Committee (CF/19/30711).

### Ascertainment of occupation groups

Occupation descriptions provided by the coroner in free text were coded according to the Australian and New Zealand Standard Classification of Occupations (ANZSCO).<sup>23</sup> Occupation descriptions were coded independently by three researchers to the most granular skill level possible. Agreement was established at the 4-digit unit group ANZSCO code between three coders, with disagreements resolved through discussion between all coders. Where a person had more than one occupation listed at time of death, they were allocated to the first occupation.

The analysis in this paper used ANZSCO major groups (ANZSCO level 1), which is representative of a combination of occupational class and skill specialisation across eight groups (ordered by highest to lowest skill level): 1 = managers, 2 = professionals, 3 = technicians/trades workers, 4 = community/personal service workers, 5 = clerical/administrative workers, 6 = sales workers, 7 = machinery operators/drivers, and 8 = labourers.<sup>23</sup> Consistent with Milner et al,<sup>20</sup> 'farmers' and 'farm managers' contained within the managers major group were analysed in a separate subgroup (9 = farmers/farm managers) because of the ambiguity of the term 'farmer' referring to either farm manager or farm labourer.

### Ascertainment of population size

Occupation populations were obtained from the 2011 ABS Census (the approximate midpoint of the study), by ANZSCO major group by main job, age and gender, using ABS TableBuilder.<sup>24</sup> Age was coded into 10-year age bands.

### Statistical analysis

Descriptive statistics were used to report summary characteristics of suicide mortality among employed individuals between occupation groups. Crude suicide rates per 100 000 people were calculated for

each group and stratified by gender. Rates were then age-standardised to the 2001 standard population,<sup>25</sup> limiting the population to those aged 15 years and older.

Negative binomial regression models were used to calculate RR for suicide deaths by ANZSCO major groups, with the highest-class group (managers) used as the reference. Negative binomial regression was chosen over Poisson regression after observing overdispersion in the Poisson regression model. The regression model controlled for age (15–24 years, 25–34 years, 35–44 years, 45–54 years, 55–64 years, 65 years and older) and gender (male, female), with occupation populations used as the offset. Variations between ANZSCO major group and gender, and between ANZSCO major groups, gender and time periods (2007–2009, 2010–2012, 2013–2015 and 2016–2018), were tested by including interaction terms in the regression model. The interactions were compared against a model with no interaction terms, with the significance of the interaction assessed using the likelihood ratio test (LRT) and by examining the significance of interaction terms in the model. If significant, negative binomial regression models were stratified by relevant factors where needed, and focused on relevant comparisons (for example comparing females with males, comparing GFC years (2007–2009) with post-GFC years (2010–2012, 2013–2015 and 2016–2018)). Coefficients were transformed into RRs to aid interpretation.

All analyses were undertaken using R Studio<sup>26</sup> with statistical significance established at  $p < 0.05$ .

## Results

Of the 31 667 suicides among people aged 15 years and older occurring between 2007 and 2018, 11 879 (37.5%) were in people recorded as being employed, 15 861 (50.1%) were in people recorded as not being in the workforce (for example unemployed, retired/pensioner, student) and 3927 (12.4%) in people where employment status was recorded as unlikely to be known by the NCIS custodians.

Of the 11 879 employed people aged 15 years and older, 63 (0.5%) were excluded as the occupation text indicated that the person was no longer in the workforce (for example retired, pensioner, unemployed), 473 (4.0%) were excluded owing to specific occupation information being unavailable (for example unlikely to be known, not stated, employed) and 148 (1.2%) were excluded where reviewers could not allocate a corresponding code because of insufficient information. Overall, there were 11 195 suicides over the study period where an ANZSCO code could be allocated.

### Descriptive analysis and age-standardised suicide rates

Table 1 describes the number of suicides and age-standardised rates for males and females in each occupational group for the 2007 to 2018 period. For males, the highest suicide rates were among labourers, community/personal service workers, technicians/trades workers and machinery operators/drivers. For females, the highest suicide rates were among technicians/trades workers, community/personal service workers and machinery operators/drivers.

### Negative binomial analysis

The main effects model can be seen in Table 2. After controlling for gender, age and year of death, labourers (RR = 1.66, 95% CI 1.51–1.83,  $P < 0.001$ ), community/personal service workers (RR = 1.42, 95% CI 1.29–1.58,  $P < 0.001$ ), farmers/farm managers (RR = 1.35, 95% CI 1.16–1.57,  $P < 0.001$ ), technicians/trades workers (RR = 1.37, 95% CI 1.25–1.51,  $P < 0.001$ ) and machinery operators/drivers (RR = 1.33, 95% CI 1.20–1.48,  $P < 0.001$ ) were shown to

**Table 1** Age-standardised rates of suicide by employed people, aged 15 years and older, for ANZSCO major groups, Australia, 2007–2018

	All people	Males	Females
<b>Managers</b>			
Number of suicides	1293	1125	168
Mean age (years)	45.8	46.2	43.3
Population, <sup>a</sup> <i>n</i>	1 136 830	724 050	412 780
Adjusted suicide rate (95% CI) <sup>b</sup>	9.4 (8.0–9.9)	13.1 (12.3–13.8)	2.9 (2.4–3.3)
<b>Professionals</b>			
Number of suicides	1800	1264	536
Mean age (years)	44.3	44.9	42.9
Population, <sup>a</sup> <i>n</i>	2 145 446	989 542	1 155 904
Adjusted suicide rate (95% CI) <sup>b</sup>	7.0 (6.6–7.3)	10.4 (9.9–11.0)	3.7 (3.4–4.0)
<b>Technicians/trades workers</b>			
Number of suicides	2590	2456	134
Mean age (years)	38.8	38.9	36.5
Population, <sup>a</sup> <i>n</i>	1 425 140	1 213 165	211 975
Adjusted suicide rate (95% CI) <sup>b</sup>	14.9 (14.4–15.5)	16.6 (16.0–17.3)	4.7 (3.9–5.5)
<b>Community/personal service workers</b>			
Number of suicides	1012	649	363
Mean age (years)	38.9	38.9	39.0
Population, <sup>a</sup> <i>n</i>	971 898	299 836	672 062
Adjusted suicide rate (95% CI) <sup>b</sup>	8.7 (8.1–9.2)	17.5 (16.1–18.8)	4.6 (4.2–5.1)
<b>Clerical/administrative workers</b>			
Number of suicides	656	363	293
Mean age (years)	41.6	42.1	41.0
Population, <sup>a</sup> <i>n</i>	1 483 556	348 899	1 134 657
Adjusted suicide rate (95% CI) <sup>b</sup>	3.3 (3.0–3.6)	7.8 (7.0–8.6)	1.9 (1.7–2.1)
<b>Sales workers</b>			
Number of suicides	545	381	164
Mean age (years)	37.4	37.7	36.6
Population, <sup>a</sup> <i>n</i>	942 150	358 727	583 423
Adjusted suicide rate (95% CI) <sup>b</sup>	5.2 (4.8–5.7)	9.2 (8.3–10.2)	2.3 (2.0–2.7)
<b>Machinery operators/drivers</b>			
Number of suicides	1261	1227	34
Mean age (years)	41.7	41.8	37.6
Population, <sup>a</sup> <i>n</i>	659 556	594 315	65 241
Adjusted suicide rate (95% CI) <sup>b</sup>	15.2 (14.4–16.1)	16.4 (15.5–17.3)	4.0 (2.7–5.4)
<b>Labourers</b>			
Number of suicides	1785	1634	151
Mean age (years)	38.3	38.2	39.7
Population, <sup>a</sup> <i>n</i>	947 611	612 243	335 368
Adjusted suicide rate (95% CI) <sup>b</sup>	15.2 (14.5–15.9)	21.6 (20.6–22.7)	3.6 (3.0–4.1)
<b>Farmers/farm managers</b>			
Number of suicides	253	237	16
Mean age (years)	54.3	54.7	48.3
Population, <sup>a</sup> <i>n</i>	157 157	112 494	44 663
Adjusted suicide rate (95% CI) <sup>b</sup>	12.5 (11.0–14.1)	16.0 (14.0–18.0)	2.9 (1.5–4.3)

a. Australian Bureau of Statistics 2016 census data.  
b. Age-standardised rate per 100 000 person-years.

have significantly elevated rates of suicide compared with managers. Clerical/administrative workers (RR = 0.66, 95% CI 0.59–0.73,  $P < 0.001$ ) and sales workers (RR = 0.75, 95% CI 0.67–0.84,  $P < 0.001$ ) reported significantly lower rates of suicide compared with managers.

Suicide rates for employed males were 3.8-fold higher than that of females (RR = 3.81, 95% CI 3.59–4.05,  $P < 0.001$ ). Compared with the working population aged 15–24 years, suicide rates were highest among the working population aged 35–44 years (RR = 1.59, 95% CI 1.46–1.73,  $P < 0.001$ ), followed by those aged 45–54 years (RR = 1.54, 95% CI 1.41–1.68,  $P < 0.001$ ), 25–34 years (RR = 1.35, 95% CI 1.23–1.47,  $P < 0.001$ ) and 55 to 64 years (RR = 1.26, 95% CI 1.15–1.39,  $P < 0.001$ ).

Table 2 also shows the interaction model. The interaction tests indicated significant variation between occupation and suicide by gender (LRT  $\chi^2(8) = 58.24$ ,  $P < 0.001$ ). Results of the interaction tests examining variation in RRs in the ANZSCO major groups (with managers as the reference group) and gender (females as the reference group) were significant for technicians/trades

workers (RR = 1.63, 95% CI 1.28–2.06,  $P < 0.001$ ), community/person service workers (RR = 1.41, 95% CI 1.16–1.72,  $P < 0.001$ ), clerical/administrative workers (RR = 0.65, 95% CI 0.53–0.79,  $P < 0.001$ ) and sales workers (RR = 0.78, 95% CI 0.62–0.98,  $P = 0.033$ ).

However, the interaction between gender and ANZSCO major groups was only significant for male labourers (RR = 1.56, 95% CI 1.21–2.01,  $P < 0.001$ ) and male professionals (RR = 0.72, 95% CI 0.58–0.89,  $P = 0.003$ ). These interactions indicated that the RR for labourers compared with managers was higher for males (1.79) than females (1.15), and the RR for professionals compared with managers was higher for females (1.16) than males (0.83). It should also be noted that the significant main effects for labourers, farmers/farm managers and machinery operators/drivers reported previously in the main effects model became non-significant in the interactional model.

### Rate ratios over time

Results of the secondary interaction test indicated significant variation between occupation by time period and by gender

**Table 2** Main effects model and model with interaction terms, rate ratios with 95% confidence intervals comparing suicide rate of ANZSCO major groups, 2009–2018

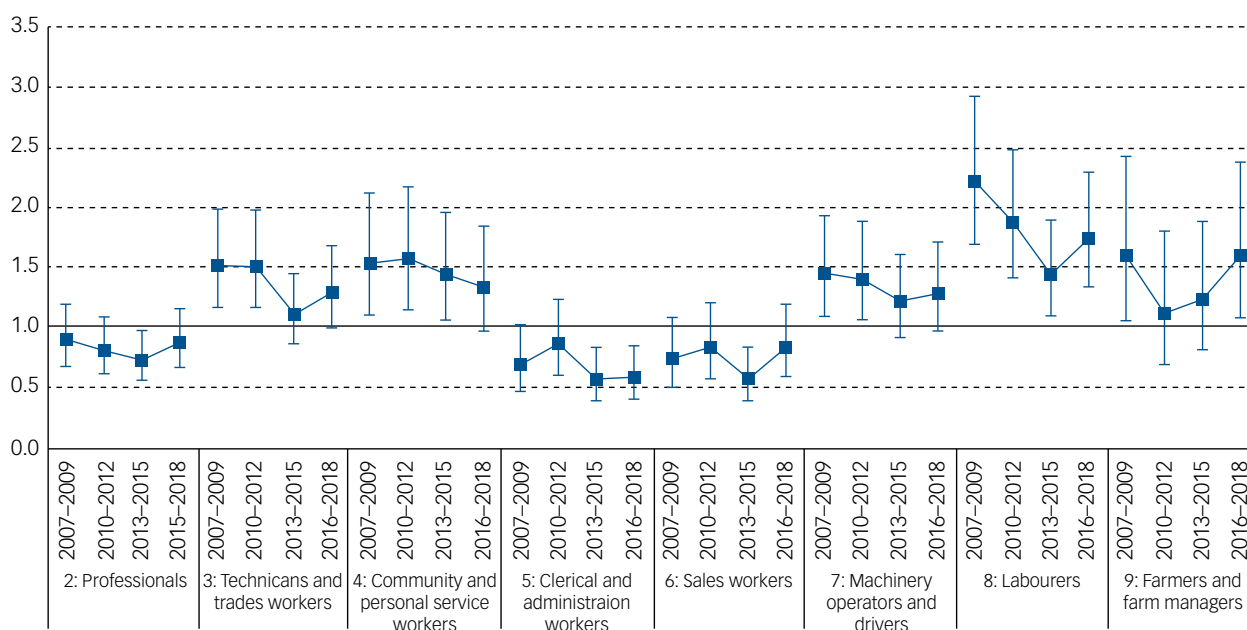
	Main effects model, rate ratio (95% CI)	P	Interaction model, rate ratio (95% CI)	P
Occupation				
Managers	Reference		Reference	
Professionals	0.93 (0.85–1.03)	0.151	1.16 (0.96–1.40)	0.117
Technicians/trades workers	1.37 (1.25–1.51)	<0.001	1.63 (1.28–2.06)	<0.001
Community/personal service workers	1.42 (1.29–1.58)	<0.001	1.41 (1.16–1.72)	<0.001
Clerical/administrative workers	0.66 (0.59–0.73)	<0.001	0.65 (0.53–0.79)	<0.001
Sales workers	0.75 (0.67–0.84)	<0.001	0.78 (0.62–0.98)	0.033
Machinery operators/drivers	1.33 (1.20–1.48)	<0.001	1.30 (0.88–1.86)	0.174
Labourers	1.66 (1.51–1.83)	<0.001	1.15 (0.91–1.45)	0.231
Farmers/farm managers	1.35 (1.16–1.57)	<0.001	0.93 (0.53–1.51)	0.776
Sex				
Females	Reference		Reference	
Males	3.81 (3.59–4.05)	<0.001	3.89 (3.27–4.66)	<0.001
Age group				
15–24 years	Reference		Reference	
25–34 years	1.35 (1.23–1.47)	<0.001	1.34 (1.23–1.46)	<0.001
35–44 years	1.59 (1.46–1.73)	<0.001	1.59 (1.47–1.73)	<0.001
45–54 years	1.54 (1.41–1.68)	<0.001	1.55 (1.43–1.69)	<0.001
55–64 years	1.26 (1.15–1.39)	<0.001	1.28 (1.17–1.40)	<0.001
≥65 years	1.13 (0.99–1.29)	0.072	1.15 (1.00–1.31)	0.041
Year	1.01 (1.00–1.01)	0.074	1.01 (1.00–1.01)	0.076
Occupation × gender (interaction)				
Managers × Females	–	–	Reference	
Professionals × Males	–	–	0.72 (0.58–0.89)	0.003
Technicians/trades workers × Males	–	–	0.83 (0.64–1.07)	0.151
Community/personal service workers × Males	–	–	1.03 (0.82–1.30)	0.770
Clerical/administrative workers × Males	–	–	1.05 (0.82–1.34)	0.700
Sales workers × Males	–	–	0.95 (0.73–1.24)	0.719
Machinery operators/drivers × Males	–	–	1.03 (0.70–1.54)	0.888
Labourers × Males	–	–	1.56 (1.21–2.01)	<0.001
Farmers/farm managers × Males	–	–	1.51 (0.90–2.68)	0.137

(LRT  $\chi^2(59) = 115.00$ ,  $P < 0.001$ ). Based on these results (see Supplementary File 1 available at <https://doi.org/10.1192/bjp.2023.22>), RR were calculated for each occupation group (with managers as the reference group) and time period (with the period 2007–2009 as the reference group), stratified by gender.

Figure 1 shows the stratified RR for male occupation groups compared with the managers for each time period. The results

reported focus on those occupation groups with elevated RRs compared with managers.

Compared with managers, the RR among labourers declined from 2007–2009 (RR = 2.23, 95% CI 1.70–2.91,  $P < 0.001$ ) through to 2013–2015 (RR = 1.45, 95% CI 1.11–1.89,  $P = 0.002$ ), followed by an increase during 2016–2018 (RR = 1.75, 95% CI 1.34–2.28,  $P < 0.001$ ). Relative to the GFC period of 2007–2009, there was

**Fig. 1** Rate ratios with 95% confidence intervals comparing male occupation groups with the suicide rate in male managers.

only a significant reduction in the disparity between managers and labourers in terms of RRs for the period 2013–2015 (RR = 0.65, 95% CI 0.49–0.86,  $P = 0.002$ , see Supplementary File 2).

The RR among technicians/trades workers remained consistent from 2007–2009 (RR: 1.52, 95% CI 1.17–1.98,  $P < 0.001$ ) through to 2010–2012 (RR: 1.52, 95% CI 1.17–1.98,  $P < 0.001$ ), followed by a decrease in 2013–2015 (RR: 1.12, 95% CI 0.87–1.44,  $P = 0.737$ ). The RR then increased to 1.30 in 2016–2018 (95% CI 1.01–1.68,  $P = 0.043$ ). Relative to the GFC period of 2007–2009, there was only a significant reduction in the disparity between managers and technicians/trades workers in terms of RRs for the period 2013–2015 (RR = 0.73, 95% CI 0.56–0.96,  $P = 0.023$ ).

For the remaining occupation groups with elevated RRs compared with managers, no significant changes in RRs relative to the GFC years were found. For community and personal service workers, RRs remained relatively consistent between 2007–2009 (RR = 1.54, 95% CI 1.11–2.12,  $P = 0.003$ ) and 2010–2012 (RR = 1.57, 95% CI 1.14–2.17,  $P = 0.001$ ), followed by a slight decline during 2013–2015 (RR = 1.44, 95% CI 1.06–1.96,  $P = 0.010$ ). The rates for machinery operators/drivers also remained relatively consistent between 2007–2009 (RR = 1.46, 95% CI 1.10–1.94,  $P = 0.003$ ) and 2010–2012 (RR = 1.41, 95% CI 1.06–1.88,  $P = 0.009$ ), with no significant differences following the period of 2013–2015 and 2016–2018. Among farmers and farm managers, there was a non-significant decrease following the GFC period 2007–2009 and 2010–2012. There were subsequent non-significant increases through to the period of 2016–2018 (RR = 1.60, 95% CI 1.08–2.38,  $P = 0.010$ ).

Figure 2 shows the stratified RR for female occupation groups compared with managers for each time period. As a result of low counts of suicide across time for some occupational groups, several RR estimates were unstable, and result should be interpreted with caution. Relative to the GFC period of 2007–2009, there was only a significant increase in the disparity between managers and other occupation groups in terms of RRs for community and personal service workers (RR = 1.93, 95% CI 1.11–3.39,  $P = 0.021$ ) and labourers (RR = 1.95, 95% CI 1.00–3.84,  $P = 0.050$ ) for the period 2016–2018 (see Supplementary File 3).

## Discussion

### Main findings

This study used national Australian coronial data to provide updated population-level suicide rates for major occupational skill classes and to uncover new information on suicide trends following the year 2010. We found there was limited evidence of a reduction in disparity trends between lower-skilled occupation classes and the highest-skilled class of managers following the GFC. Our hypothesis was therefore only partially supported, with the finding that among males there was a significant reduction in the disparity between managers and labourers and technicians/trades workers for the period 2013–2015, relative to the GFC period of 2007–2009.

### Interpretation of our findings

Although there have been several reports of increased suicide among the general population in response to the GFC in England,<sup>27</sup> Spain<sup>28</sup> and the USA<sup>29</sup> up to 2010, as well as reports of increased disparity between lower-class and the highest-class occupations in Australia,<sup>20</sup> follow-up studies beyond this period are limited. Extending this research, this study showed a decrease in the divergence in suicide rates among the employed population was largely not observed beyond the initial GFC period with the exception of male labourers and technicians/trades workers over the period 2013–2015. This finding aligns with past research from Australia regarding the GFC among construction workers, which described a peak in suicide risk among machine operators and labourers relative to skilled trade workers in 2008 followed by a decline between 2009 and 2010.<sup>10</sup> It is thought that the higher burden of suicide among labourers and other low-skilled workers may reflect population-level risk associated with lower socio-economic status and social disadvantage.<sup>17,30</sup>

Although it is reasonable to assume that the effect of the GFC on the employed population was heterogeneous, having an impact on different groups at different times, the reduction in suicide risk among male labourers and technicians/trades workers may be

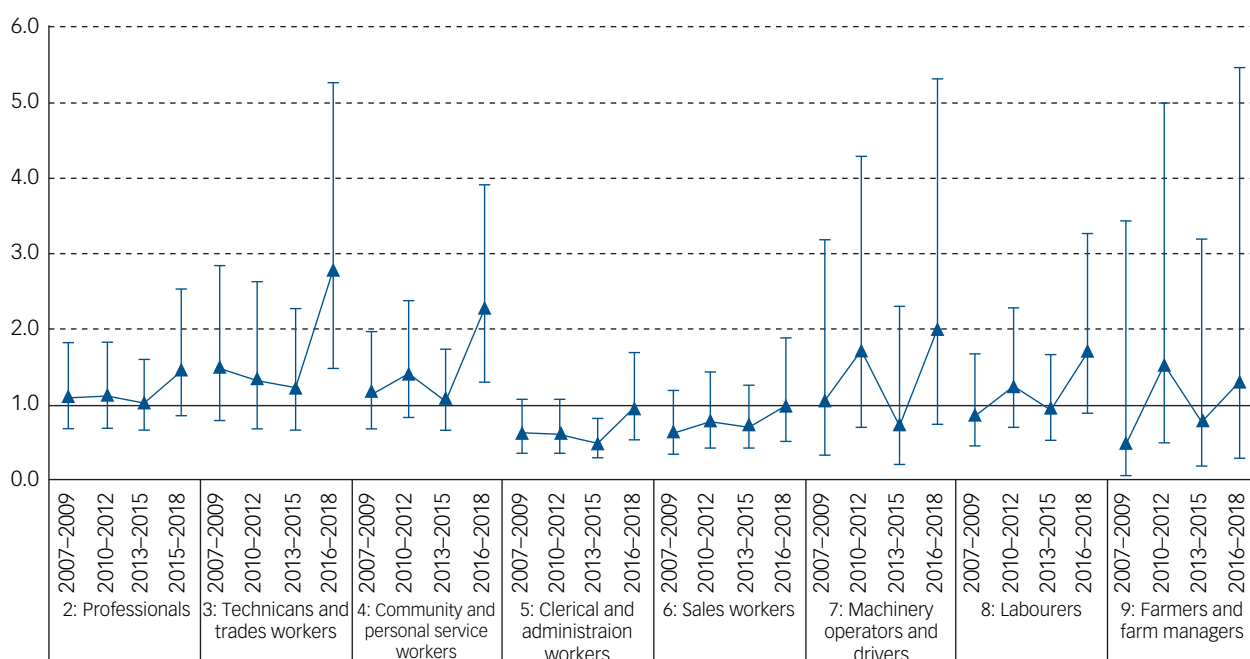


Fig. 2 Rate ratios with 95% confidence intervals comparing female occupation groups with the suicide rate in female managers.

related to government initiatives during a period of economic uncertainty. During the period 2008–2009, the Australia government implemented the \$10.4 billion Economic Security Strategy and the \$42 billion National Building and Jobs Plan stimulus initiatives.<sup>31</sup> Although it is beyond the scope of this study to determine whether the relationship between such significant stimulus initiatives and the reduction in suicide among these groups is causal, the initiatives gave preference to direct cash payments to low- and middle-income households over tax cuts, as well as a focus on long-term construction projects. For example, the National Building and Jobs Plan supported extensive construction projects commissioning an estimated 10 000 new school buildings and 20 000 new social housing dwellings.<sup>32</sup> Indeed, data from the Australian Institute of Health and Welfare supports increased commencement and completion of construction projects between 2013 and 2015.<sup>33</sup> Such investments in construction infrastructures may have helped to retain construction employment opportunities across different communities, reducing levels of job insecurity and household economic stress, which are known risk factors for suicidal behaviour.<sup>17,34,35</sup>

Another possible explanation for the observed risk reduction among male labourers and technicians/trades workers is the development of a construction industry-specific suicide prevention and early intervention programme, MATES in Construction, established in 2008 by the Building Employees Redundancy Trust.<sup>36</sup> The programme was designed to improve mental health and suicide prevention literacy and connect workers to available help and support services.<sup>36</sup> An evaluation of MATES in Construction has shown the programme to be effective in reducing suicide risk, with male suicide rates in the Queensland construction industry reduced by 7.9% during the first 5 years of the implementation against an overall increasing rate of male suicide.<sup>37</sup>

Although, to our knowledge, this study provides the most up-to-date examination of suicide by occupation class in Australia, the findings still confirm the results previously reported by Milner et al,<sup>20</sup> indicating that overall suicide rates remain highest among machinery operators/drivers, labourers, technicians/trades workers and farmers/farm managers and that this risk was elevated among males. Associations between potential forces exerted by social, workforce, interpersonal and economic stressors that may have influenced suicide risk in these occupations were not examined in this study as such variables are not routinely coded in NCIS data. Previous studies have shown that both work (for example low job control or poor co-worker and supervisor support) and non-work factors (such as relationship breakdown or conflict) are associated with psychological distress and suicide.<sup>38–40</sup> These factors align with past research on suicide among males employed in construction,<sup>5</sup> mining<sup>11</sup> and agricultural industries.<sup>41</sup> For example, male construction workers in Queensland, Australia, who died by suicide were more likely to have reported recent relationship problems and multiple stressful life events preceding death, compared with males who died by suicide in other occupations.<sup>5</sup> Issues such as long working hours, workplace pressure, job insecurity, non-disclosure of personal problems to colleagues and marital breakdown were also identified as potential contributing factors to suicide among construction workers.<sup>5</sup> Future studies exploring occupation-specific psychosocial job stressors are needed to improve current understandings of the relationship between the contextual factors related to occupation and suicide.

## Limitations

In terms of limitations, we acknowledge the complexities of coronial determinations regarding suicide. In some instances, it may not be possible for a coroner to make a finding of suicide because of legal

evidence thresholds required to make such a finding, and there may be differing practices within and between coronial jurisdictions in Australia. Additionally, because of the substantial time required for the coronial process to make a final determination for suicide deaths, and for these cases to be updated in the NCIS database, this study only included closed cases up to and including 2018 (2018 captured 99.4% of closed NCIS intentional self-harm cases at the time of extract). By choosing the most recent year with the highest proportion of closed cases, this study was unable to examine the impact of the COVID-19 pandemic on the Australian workforce. Given the significant economic and mental health impact of the public health measures taken during the COVID-19 pandemic, future studies should examine the potential toll on suicides across occupations at a more granular level than major occupational skill classes, such as among specific healthcare, retail, hospitality and creative arts occupations.

Although it would have been desirable to analyse occupation categories by indigenous status and country of birth, this was not possible because of the small number involved even after combining 3 years of cases. Future occupational-specific suicide research should incorporate both indigeneity and migrancy to explore their influence on the role of occupational class disparity in suicide.



It is also necessary to comment on the finding that rates of female suicide over the entire study period were highest among the male-dominated occupational class of technician/trades worker, as well as evidence of increasing disparity between female managers and female labourers and community/personal service workers for the period 2016–2018 relative to the GFC period of 2007–2009. However, we acknowledge these findings may be spurious because of the small number of female suicides in these occupational classes. In stating this, there is evidence that female technicians/trades workers report experiencing discrimination in hiring practices, male-dominated workplace culture, sexual harassment, negative attitudes from male co-workers, fewer career opportunities and poor working conditions.<sup>41</sup> Specific data on these factors are needed and future studies should apply novel mixed-methods approaches to understand the influence of the workplace environment on females who engage in antecedent behaviours to suicide, that is, self-harm and suicidal ideation.

Finally, it is possible that occupation-related free-text fields may have been misreported in coronial documents or miscoded by investigators, the latter of which may have occurred despite coding by three independent researchers and the replication of a structured approach used in a previous study.<sup>20</sup>

## Implications

Together, these findings show that skilled manual and lower-skilled work is enduringly associated with a considerable risk of suicide compared with other non-manual and higher skilled occupational groups. Machinery operators/drivers, labourers, technicians/trades workers and farmers/farm managers were particularly at high risk, compared with managers. Although this study demonstrated some evidence to support a reduction in the suicide rate disparity between the lowest- and highest-occupational classes following the GFC, disparities remain.

To better inform workplace suicide prevention activity, future research should seek to understand and address the contextual drivers associated with suicide among the employed population most at risk at a more specific level of occupation classification. This information could in turn provide helpful information to help guide government policy, particularly during periods of economic instability.

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## Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1192/bjp.2023.22>

## Data availability

Data may be obtained from a third party and are not publicly available as per our ethics requirements. Researchers can apply for approval to access the coronial data presented in this study by contacting the Australian National Coronial Information System.

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## Author contributions

Conceptualisation, A.C.R.B. and M.T.; formal analysis, A.C.R.B. and Q.W.; methodology, A.C.R.B., M.T. and Q.W.; writing – original draft, A.C.R.B., M.T., Q.W., S.Z. and M.D. Writing – review and editing, A.C.R.B., M.T., Q.W., S.Z. and M.D.; supervision, M.T.

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## Declaration of interest

The authors declare that they have no conflict of interest.

## Ethical standards

This study was approved by the Department of Justice and Community Safety Human Research Ethics Committee (CF/19/30711)

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