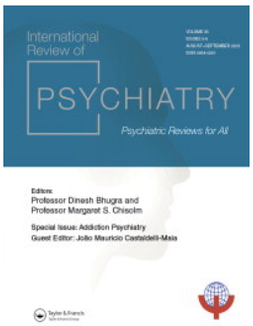

International Review of Psychiatry

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/iirp20

Age and sex differences in the annual and seasonal variation of Australia's suicide rate, 2000–2020

Richard Andrew Burns, Kerry Sargent, Peter Butterworth & Dimity Ann Crisp

To cite this article: Richard Andrew Burns, Kerry Sargent, Peter Butterworth & Dimity Ann Crisp (11 Dec 2023): Age and sex differences in the annual and seasonal variation of Australia's suicide rate, 2000–2020, International Review of Psychiatry, DOI: 10.1080/09540261.2023.2291416

To link to this article: https://doi.org/10.1080/09540261.2023.2291416

INTERNATIONAL REVIEW OF PSYCHIATRY
https://doi.org/10.1080/09540261.2023.2291416

Taylor & Francis
Taylor & Francis Group

RESEARCH ARTICLE

Age and sex differences in the annual and seasonal variation of Australia's suicide rate, 2000–2020

Richard Andrew Burns[a], Kerry Sargent[a], Peter Butterworth[a,b] and Dimity Ann Crisp[c]

[a]National Centre for Epidemiology and Population Health, Australian National University, Canberra, Australia; [b]Centre for Social and Early Emotional Development, School of Psychology, Deakin University, Geelong, Australia; [c]Discipline of Psychology, Faculty of Health, University of Canberra, Canberra, Australia

ABSTRACT

Suicide is a major public health concern both globally and in Australia. But in Australia the extent of substantive annual and seasonality trends since 2000 through the first two decades of the 21st Century, by age and sex, has not been formally reported. The current paper sought to identify annual and within-year (seasonality) trajectories in age-sex standardized suicide rates between 2000 and 2020. The annual and within-year (seasonality) trajectories of suicide were estimated from generalised regression analyses of Australia's mortality database. No systematic variation in Australia's suicide rate since 2000 was reported and was consistent between sex and age cohorts. Seasonal variation in rates were identified, with peaks in the new year (January), declines in late Summer/Autumn, stability in Winter, increases in Spring, but with a notable decline in early summer (November–December). These trends were driven men only. Interpretation of current suicide rates need to consider systematic long-term historical context. Despite a historical focus on youth suicide especially, working-aged and very old men have consistently reported higher standardized suicide rates over the first two decades of the 21st Century. Seasonal variation was reported but only reported by men, potentially because across the lifespan, suicide rates for females were a comparatively low incidence event. Particularly after recent successive national and international crises, we emphasise that surveillance and interpretation of current suicide rate requires careful consideration as to the extent any immediate variation may otherwise fall within otherwise normal historical norms.

ARTICLE HISTORY
Received 1 December 2023
Accepted 1 December 2023

KEYWORDS
Age; prevention; seasonality; sex; self-harm; suicide

Introduction

Suicide remains a significant global public health issue with approximately 800,000 deaths reported globally each year (Knox, 2014; Yip et al., 2022). There is some evidence that annual age-standardized rates are declining slowly although the extent of these changes is not consistent between nations (Naghavi, 2019; Yip et al., 2022; Yu et al., 2020). Analysis from the Global Burden of Disease 2019 study (Yip et al., 2022) identified that declining suicide rates over the period 1990–2019 were countered by increases in suicide incidence attributable to global changes in the population structure (increasing numbers of young and middle-aged adults who report higher incidence). The profile of suicides over time therefore likely varies between nations as a function of underlying differences in population structures and other social conditions. Low and middle income nations, with younger population profiles, report continued or increasing risk, while in high income regions overall declines are reported (Yip et al., 2022).

In addition to these long-term annual trends, there is some evidence of *seasonality* (patterns of within-year change) in suicide rates; suicide incidence peaks in spring and early summer, and less frequent in winter months, a pattern common in nations in both Northern and Southern Hemispheres with contrasting seasonal cycles (Ajdacic-Gross et al., 2003; Flisher et al., 1997; Massing & Angermeyer, 1985). However, there is evidence of considerable between-nation differences in the extent of this seasonal variation (Yu et al., 2020). Sex and age differences in suicide rates and seasonality have also been reported, although

CONTACT Burns Richard Andrew Richard.Burns@anu.edu.au National Centre for Epidemiology and Population Health, Australian National University, Building 54, Mills Road, Canberra, 0200 ACT, Australia.
Supplemental data for this article can be accessed online at https://doi.org/10.1080/09540261.2023.2291416.

patterns are not consistent (Naghavi, 2019; Yang et al., 2019; Yu et al., 2020). Seasonality has been reported across all age groups, although its effect appears particularly pronounced and consistent amongst older adults (65+ years) (Yang et al., 2019; Yu et al., 2020), and may be more pronounced amongst females (Yu et al., 2020). It is important therefore that any consideration of Australia's annual and seasonal trends in suicide rate consider how age and/or sex moderate these trends.

With mixed evidence for yearly and within-year variation, the current study examines long-term trends in annual suicide rates, and within-year seasonality effects, over the first two decades of the 21st Century to determine the extent of annualized and seasonality variations specifically in an Australian context. There is also a need to examine how age and sex may moderate these trends. Two main aims drive the paper. Our first aim will be to report annualized changes in suicide rates over a 21-year period. We then examine whether these trajectories are consistent between sex and age groups. Second, we then focus on suicide rate trajectories within-year (i.e. seasonality), and examine seasonal variation over this 2000–2020 period; that is, to what extent are there time-of-year effects on suicide rates within this period. Specifically, we will report on a) the extent to which trajectories of suicide within-year are consistent over the 2000–2020 observation period, and b) the extent to which within-year trajectories of suicide are consistent between sex and age-groups.

Methods

Data and procedure

Data on Australian suicide from 2000 to 2020 was requested from the Australian Institute of Health and Welfare (AIHW) and provided to the researchers. AIHW manage the Australian National Mortality Database. Explicit approval was provided for the data to be used for the current study. Registration of deaths is compulsory in Australia, and the AIHW collect certified death information from death certificates, via Registries of Births, Deaths and Marriages and the National Coronial Information system which includes pertinent information for this study: age, sex, and the cause and date of death (Australalian Bureau of Statistics, 2020). Ethics approval was not required under the conditions of use of the mortality data held by AIHW; data was not individual-level data.

All Cause of Death Unit Record Files (OD URF) include cause of death as coded by the Australian Bureau of Statistics (ABS). Causes are coded to the International Statistical Classification of Diseases and Related Health Problems (with suicide deaths classified as ICD-10, 2004: X60-X84, and Y87.0) by the ABS. Records of Coroner referred deaths of suicide are obtained through the National Coronial Information System (NCIS). There were changes in the recording of deaths over the time period in which the data used for this paper were collated. Before 2007, the ABS codes deaths according to the ICD with data drawn from coroners and the National Coroners Information System (NCIS), released annual cause of death 15 months (March) after the year the death was registered. Since 2007, a new death registry system allows causes of death to be amended for up to another 2 years, by which time coroner reports will have been completed and final cause of death confirmed. Consequently, while deaths registered prior to 2018 are based on the final version of cause of death. Deaths since 2018 in the current dataset are therefore subject to further revision by the ABS. Finally, new cause of death coding guidelines implemented in January 2007 provided deaths to be coded as suicide if there was evidence of intentional self-harm. This differed from previous coding practice where suicide was only coded if a coroner determined the death as intentional self-harm. Prior to 2006, suicide deaths may be under-estimated (Harrison, Poiner, et al., 2009; Harrison, Pointer, et al., 2009; Harrison & Henley, 2015).

The suicide data supplied by AIHW was aggregated into weekly (national) counts and grouped by sex (male, females) and age-groups (0–17 years, 18–24 years, 25–34 years, 35–44 years, 45–54 years, 55–64 years, 65–74 years, 75–84 years, and 85+ years). A week is defined from Sunday to the following Saturday (7 days) and coded by the week-start-date. Therefore Week 1 starts on the first Sunday of the year. Any days at the beginning of the year prior to the first Sunday were coded as Week 0. For years where the last week of the year (Week 52 or Week 53) and the first week of the following year (Week 0) made up a 7-day week starting from the Sunday – the data was coded with the same start date. For example, Week 52 in the year 2015 comprised Sunday 27, Monday 28, Tuesday 29, Wednesday 30 and Thursday 31 December; 2016 then began with 2 days in Week 0 (Friday 1 & Saturday 2 January 2016) which were both coded in the week with a start date 27-Dec-2015.

Statistical analysis

The current sample comprised deaths in Australia, classified as deceased through intentional self-harm

by the ABS, and registered from 26 December 1999 to 31 December 2020. Suicide was the outcome measure and operationalized in terms of a rate per 100,000, standardized to sex and age-group mid-year populations reported by the ABS in each year of the observation period. To assess our two main aims, generalized regression models with a Poisson function and log link were estimated in Stata (StataCorp, 2021). First, we examined the trajectory of annual suicide rates over the 2000–2020 observation period. A main effect for year was incorporated into the model as a discrete predictor to identify potential variation over the 21-period. Models were then re-estimated with interactions between Year with sex (Male, Female) and 10-year age-groups (25–34 years, 35–44 years etc.; exceptions were for children/adolescents (coded: 0–17 years), young adults (coded: 18–24 years), and the very old (coded: 85 years and older)) to assess whether suicide rates over the 21 year period were consistent between sex and age groups.

For the second aim, we estimated within-year changes in weekly suicide rates. Analyses were of the weekly sex-age standardized rates per 100, 000. To identify systematic changes in suicide rates within year, we considered alternative time metrics, including weekly, 2- and 4-weekly time metrics. We chose a 2-weekly time metric as a balance between the weekly and 4-weekly time metrics which were either too fine or too broad to capture reliable/meaningful variation in suicide rates. Simply, weekly estimates would report too much non-systematic change whilst 4-weekly estimates failed to identify gradual systematic change. The 2-weekly (fortnightly) time metric was incorporated into the model as a discrete function and estimates reflect 2-weekly averages of the weekly standardized rates. Owing to the nature of the weekly reporting time period in the provided data, some years would include either week 0 or week 53. Week 0 was included in the first fortnight period (with weeks 1 and 2) and week 53 data was included in the last fortnight period of the year. Analyses first estimated within-year trajectories, but with all 21-years estimated concurrently; therefore, model estimates reflect 2-weekly averages over the 21-year observation period. Interactions between the within-year metric and year examined whether within-year trajectories were consistent between year. To examine whether the within-year trajectories were consistent between sex and age group, interactions between these measures and the within-year time metric were also estimated. Owing to substantive sex differences in suicide rates, all subsequent analyses of age group were stratified by sex. Robust standard errors were used for the analyses of the within-year trajectory models but not for the models examining yearly trajectories as robust standard error may be biased in data with smaller numbers of observations (Imbens & Kolesár, 2016).

Results

Suicide deaths in Australia, 2000–2020

Standardized yearly suicide rates per 100,000 over the 21-year period from 2000 to 2020 are shown in Figure 1 and stratified by sex. Annual rates remained relatively stable across the 21-year period (*Wald* χ^2 (20, N = 378) = 29.15; $p = 0.080$), ranging from a high of 15.64 p/100,000 (95% CI: 13.81; 17.47) in 2017 to 12.54 p/100,000 (95% CI: 10.92; 14.20) in 2007, and the year-on-year variation is consistent between these values (See Supplementary Table 1. Males consistently reported comparatively higher rates than females (*Wald* χ^2 (1, N = 378) = 1489.87, $p = < 0.001$); males reported an average suicide rate of 21.68 p/100,000 (95% CI: 21.02; 22.35) and females 5.83 (95% 5.49; 6.18) over the study period (See Supplementary Table 2 for annual estimates be sex). There was no evidence of sex differences in these trajectories over the 21-year period, as indicated by a non-significant sex–by-year interaction (*Wald* χ^2 (20, N = 378) = 9.12; $p = 0.982$).

Substantive differences between age-groups in yearly suicide rates were identified (*Wald* χ^2 (8, N = 378) = 318.376, $p = < 0.001$) ranging from 1.43 p/100,000 (95% CI: 1.07; 1.79) for those < 18 years to 20.55 p/100,000 (95% CI: 19.18; 21.93) for those aged 85+. Notably there was a substantive sex-by-age-group interaction (*Wald* χ^2 (8, N = 378) = 46.87; $p = < 0.001$). Figure 2 shows that suicide rates remain relatively stable for adult females (over 18 years of age) across age-groups, ranging from 5.08 p/100,000 (95% CI: 4.12; 6.04) for those aged 65–74 to 7.92 p/100,00 (95% CI: 6.72; 9.13) for those aged 45–54 years. For adult males, a cubic relationship is noted with peaks in working-aged and very old adults. Estimates are reported in Supplementary Table 3. Over the 21-year period, there was no evidence of variation in these age-group differences for either females (*Wald* χ^2 (160, N = 378) = 23.01; $p = 0.999$), or males (*Wald* χ^2 (160, N = 378) = 51.96; $p = 0.999$).

Suicide seasonality in Australia, 2000–2020

Figure 3 outlines Australia's average fortnightly rates averaged over the 21-year observation period, and is reported by sex. Overall, there was a statistically significant 2-weekly effect for standardized suicide rates

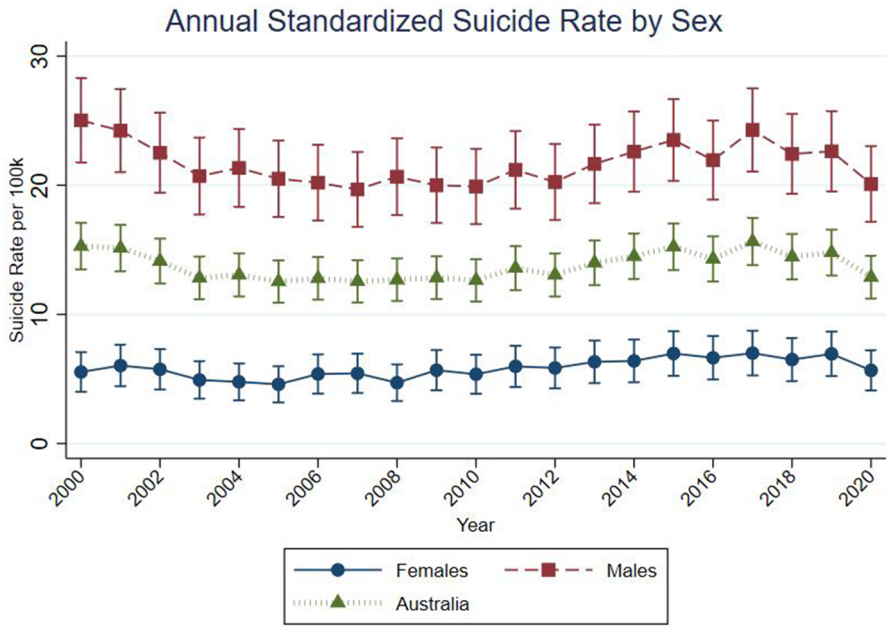

Figure 1. Standardized suicide rate per 100,000 by sex, Australia, 2000–2020.

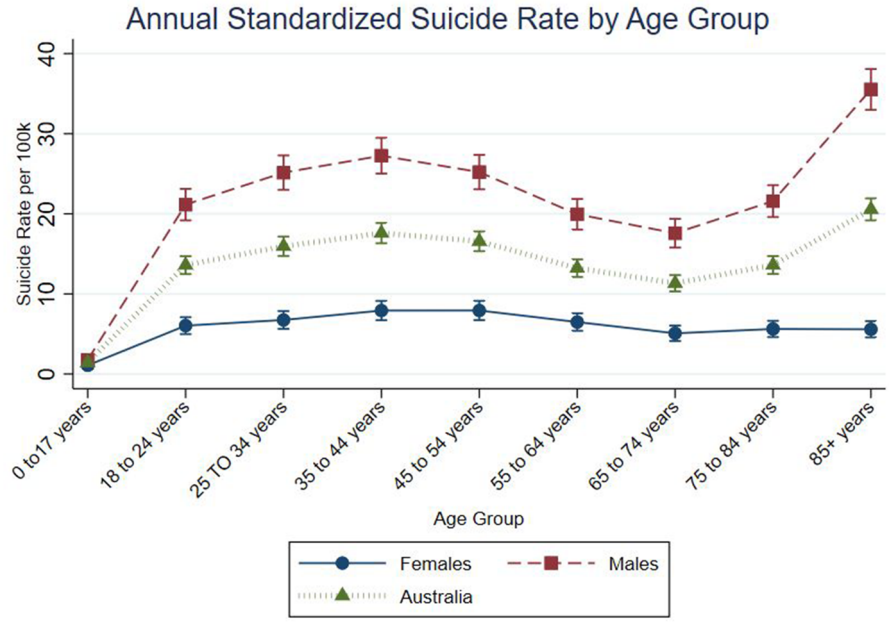

Figure 2. Average yearly suicide rate per 100,000 by age-group and sex, Australia 2000–2020.

per 100,000 (*Wald* χ^2 (25, N = 19,729) = 44.14; $p = 0.011$), suggesting 2-weekly suicide rates were not consistent within years although the range of rates varied from 0.23 p/100,000 (95% CI: 0.21; 0.25) to 0.28 p/100,000 (95% CI: 0.26; 0.31). Inspection of the figure shows a trend of decline in suicides between week 10 (mid-March) and 16 (May) followed by relatively stable rates from week 18 (mid-June) to week 40 (late October), increasing to a peak between week 42 (mid-October) and 44 (early November) with a substantive decline to the end of the year. The marginal means for the model are provided in Supplementary Table 4.

To investigate if the seasonality in suicide rates was constant over the 21-year period, within-year time was modelled as a continuous variable (including linear and non-linear terms) and included as an interaction with year. A likelihood ratio test comparing the log likelihood of the discrete (LL = −10960.80) and continuous measure (LL = −10964.65) of fortnight showed

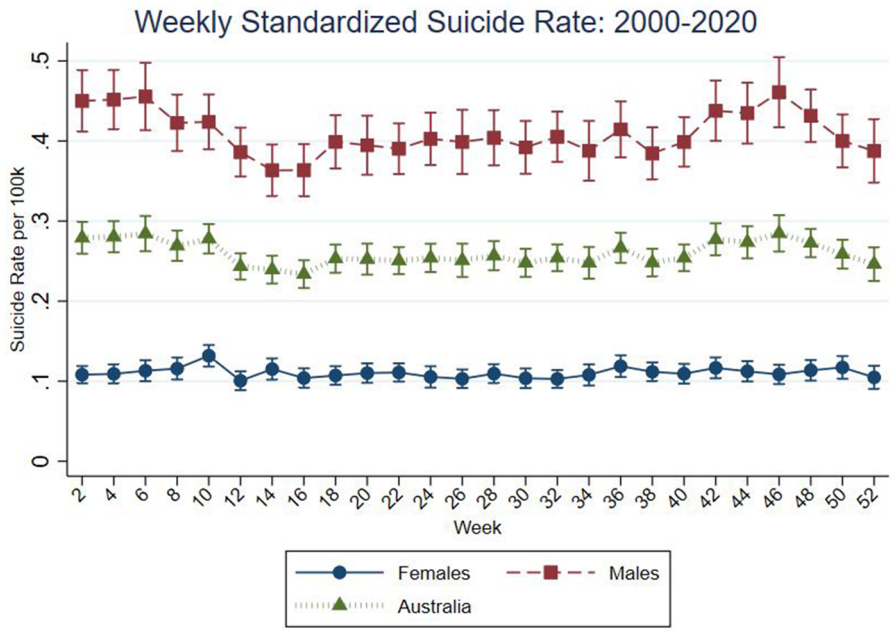

Figure 3. Weekly estimates of standardized suicide rate per 100,000 over 21 years plotted by fortnight and stratified by sex, 2000–2020.

model fit was comparable between the two models (χ^2 (22, N = 19,729) = 7.69; $p = 0.997$), indicating variance captured in the models is also comparable. None of the interaction terms between year and linear, (year X fortnight - *Wald* χ^2 (20, N = 19,729) = 9.36; $p = 0.978$), quadratic (year X fortnight^2 - *Wald* χ^2 (20, N = 19,729) = 12.68, $p = 0.891$) and cubic terms for fortnight (year X fortnight^3 - *Wald* χ^2 (20, N = 19,729) = 16.57; $p = 0.681$) were significant providing evidence that within-year trajectories of suicide rates were consistent across the 21 year observation period.

Sex differences in suicide seasonality

Males showed significantly higher fortnightly standardized rates (*Wald* χ^2 (1, N = 19,729) = 8412.52; $p < 0.001$) over the 21-years (Figure 3). The interaction effects between sex and within-year time (*Wald* χ^2 (1, N = 19,729) = 26.28; $p = 0.393$) were not significant, however, stratifying models by sex revealed significant variability in fortnightly rates (Wald χ^2 (25, N = 9864) = 53.60; p = 0.001) for males, but not for females (Wald χ^2 (25, N = 9865) = 26.32; $p = 0.391$) averaged over the 21 year period. There is a clear and emerging pattern of weekly rates for males. A decline in male suicide rates emerges from week 6 onwards, reflecting the period mid-March to mid-April, or Autumn in Australia. A peak in rates can then be seen in week 46, corresponding with mid-November/early summer in Australia. The marginal means for female and male suicide rates are provided in Supplementary Tables 5 and 6.

To examine if the seasonality trend found in standardized suicide rates per 100,000 for males was consistent over time, linear and non-linear fortnight by year effects were examined. None of the interaction terms between year and linear, (year X fortnight *Wald* χ^2 (20, N = 9864) = 13.47; $p = 0.856$), quadratic (year X fortnight^2 - *Wald* χ^2 (20, N = 9864) = 15.16; $p = 0.767$), and cubic terms for fortnight (year X fortnight^3 - *Wald* χ^2 (20, N = 9864) = 17.77; $p = 0.603$) were significant providing evidence that the trend of suicide rates reported within-years were consistent across the 21 year observation period.

Age-group differences in suicide seasonality – stratified by sex

To examine potential age-group differences in seasonality (within-year) trends, analyses were stratified by sex. Age-by-within-year interactions were not significant for females (*Wald* χ^2 (200, N = 9865) = 197.26, $p = 0.542$) or males (*Wald* χ^2 (200, N = 9865) = 232.36; $p = 0.058$), suggesting the seasonal pattern of suicides is consistent between age-groups for both sexes.

Discussion

The first point to emphasise is that our findings remain consistent with current understanding of the

demography of suicide in Australia; suicide rates are consistently higher for males than females, and particularly so for males of working age and very old age (Burns, 2016; De Leo et al., 2013; Judd et al., 2012). Although there was some minor variation in annualized suicide rates between years, our findings provide evidence that age-standardized rates have been relatively stable, or have reported consistent degrees of variation from year-to-year, over the first two decades of the 21st Century. Otherwise, there was simply no evidence of systematic changes in standardized annual suicide rate over time. This pattern was generally consistent for both males and females, and for the different age groups examined.

We found evidence of seasonality in suicide rates; within year variation was comparable with other nations (Flisher et al., 1997; Preti & Miotto, 1998; Räsänen et al., 2002; Yang et al., 2019; Yu et al., 2020). Patterns generally reflect a trend of declining rates in the autumn months, and troughs in the winter months followed by small increases over Spring and into the summer months. Notably, there were declines in the final weeks of the calendar year with sudden increases in the first weeks of the new calendar year. Our analyses identified that these seasonality patterns are consistent between age groups, but were only reported amongst males.

That the seasonality patterns for the overall population were consistent over the 21-year period contrasts to other studies on seasonality in suicide rates. For example, Ajdacic-Gross et al. (2010) has argued that seasonality is declining over time in Western nations and corresponds with other reports of overall declines in annual rates. These declines could in part be explained by improvements in key social risk factors as well as social policies to reduce stigma and accessibility to lethal methods. Indeed, it has been argued that seasonality is in part driven by suicide method; notably hanging and drowning show peaks in warmer summer months, although there is considerable variation between studies in terms of which methods show peaks and when peaks may occur. (Ajdacic-Gross et al., 2010; Preti & Miotto, 1998; Räsänen et al., 2002).

We recognise issues of data accuracy. As explained in the method section, there were changes in how deaths were recorded in Australia with additional time for death to be corrected following coronial inquest. Consequently, prior to 2007 it is argued that the proportion of death attributed to suicide may be under-reported, but the extent of the impact of these changes in reporting methods on suicide rates is unclear. Some state-based reports suggest corrections to suicide being cited as a source of death is small (NSW-Health, 2023) while a major examination by the Australian Institute of Health and Welfare (AIHW) identified that rates prior to 2007 may under-report between 3 and 16% (Harrison, Pointer, et al., 2009). However, there still remains no apparent substantive change in the rates either prior or post-this period from our analyses. It may be that underestimation has no substantive impact on the standardized rates given the relatively low prevalence of suicide. At the very least, there has been no major substantive change since the new reporting methods were introduced.

It is important to address the impact of recent and successive crises including Australia's 2019–2020 summer bushfire events, the COVID pandemic, international political unrest, and a global economic downturn which may have subsequently impacted on suicidal behaviour. Since 2021, preliminary data from state-based suicide monitoring services have reported an increase in the number of suicides in Australia. In the state of Victoria (Court, 2023), the number of suicides ranged from 693 to 700 between 2018 and 2021 but jumped to 756 in 2022; on our review of the data, this increase could be wholly attributed to increases in middle-aged (45–54 years of age) and older men (aged 65+), demographic groups already identified as reporting the highest standardized rates. Indeed, increases for older men represented the greatest increase with an approximate 52% increase in the 2022 suicide incidence compared to 2017 incidence. We argue this data needs to be interpreted cautiously and with the benefit of further follow-up. Indeed, from this Victorian data, other male age cohorts reported no apparent change (e.g. 25–44 year olds) and even decline declines (e.g. 18–24 year olds who reported declines of 62 suicides in 2018 to 52 and 50 in 2021 and 2022 respectively) whilst for females the pattern in rates of suicide appear to be stable. And in comparison, NSW surveillance data (NSW-Health, 2023) also reveals no systematic or consistent story about variation since 2019–2020. Overall there were declines in 2020 and 2021, while the overall 2022 incidence rate was comparable to 2019. Similarly, changes in female suicide was not reported in the NSW data as was reported in Victoria; however, NSW did report increases amongst men but in different age cohorts (35–44 and 55–64 years) (NSW-Health, 2023). Clearly, whilst monitoring systems may have their uses to monitor current patterns, these patterns need to be interpreted in terms of the long-term surveillance which can accurately assess the extent to which any reported variations are a form of normal variation in behaviour, or a systematic change owing to

adverse social contexts. From what we can interpret, it is difficult to draw any inferences about systemic variation in age-sex suicide rates in the post-pandemic and global inflationary contexts people find themselves up to the end of 2022.

In conclusion, suicide remains a major public health issue, both globally and in Australia. There has been no overall improvement or worsening of suicide rates in Australia. As expected, there are substantive differences by sex and age-groups. Males, and specifically working-aged and very old males report comparably higher rates; these patterns are found both in the annualized and within-year trajectories. Notably, there was no evidence of seasonality reported by females whilst males reported substantive seasonality; this could be partly attributed to higher rates of suicide amongst males and therefore greater likelihood of variation. Simply, variation in female suicide rates may be bounded by floor effects. Noting that seasonality variation identifies the latter half of summer and spring as notable periods of increased risk for men especially, public health initiatives may well increase their public health messaging around such key times.

Declarations

Author contributions

All authors contributed to the study conception and design, material preparation, and data collection. KS led the analysis and interpretation of the results. The first draft of the manuscript was written by RAB. All authors made substantial contributions to the final version of the manuscript. All authors have read and approved the final manuscript for publication.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Data was obtained from the Australian Institute of Health and Welfare, with access funded by an Australian National University, College of Health and Medicine Transform Fellowship grant awarded to RAB.

ORCID

Richard Andrew Burns http://orcid.org/0000-0002-7750-4341
Kerry Sargent http://orcid.org/0000-0002-9495-7879
Peter Butterworth http://orcid.org/0000-0002-1531-3881
Dimity Ann Crisp http://orcid.org/0000-0003-0241-1121

References

Ajdacic-Gross, V., Bopp, M., Ring, M., Gutzwiller, F., & Rossler, W. (2010). Seasonality in suicide–a review and search of new concepts for explaining the heterogeneous phenomena. *Social Science & Medicine (1982)*, *71*(4), 657–666. doi: 10.1016/j.socscimed.2010.05.030.

Ajdacic-Gross, V., Wang, J., Bopp, M., Eich, D., Rössler, W., & Gutzwiller, F. (2003). Are seasonalities in suicide dependent on suicide methods? A reappraisal. *Social Science & Medicine (1982)*, *57*(7), 1173–1181. doi: 10.1016/s0277-9536(02)00493-8.

Australalian Bureau of Statistics. (2020). *Causes of death, Australian methodology*. Australian Government. https://www.abs.gov.au/methodologies/causes-death-australia-methodology/2020

Burns, R. A. (2016). Sex and age trends in Australia's suicide rate over the last decade: Something is still seriously wrong with men in middle and late life. *Psychiatry Research*, *245*, 224–229. doi: 10.1016/j.psychres.2016.08.036.

Court, C. (2023). *Coroners court monthly suicide data report: December 2022 update*. https://www.coronerscourt.vic.gov.au/sites/default/files/2023-02/Coroners%20Court%20Suicide%20Data%20Report%20December%202022.pdf

De Leo, D., Draper, B. M., Snowdon, J., & Kõlves, K. (2013). Suicides in older adults: A case-control psychological autopsy study in Australia. *Journal of Psychiatric Research*, *47*(7), 980–988. doi: 10.1016/j.jpsychires.2013.02.009.

Flisher, A. J., Parry, C. D., Bradshaw, D., & Juritz, J. M. (1997). Seasonal variation of suicide in South Africa. *Psychiatry Research*, *66*(1), 13–22. doi: 10.1016/s0165-1781(96)02974-5.

Harrison, J. E., Poiner, S., & Elnour, A. A. (2009). *A review of suicide statistics in Australia. Injury research and statistics series no. 49.* (Cat. no INJCAT 121). Australian Institute of Health and Welfare. https://www.aihw.gov.au/getmedia/8d8a8344-59b4-43a7-8bd9-f4827a6105bb/injcat-121-10754.pdf.aspx?inline=true

Harrison, J. E., Pointer, S., & Elnour, A. A. (2009). *A review of suicide statistics in Australia.* (INJURY RESEARCH AND STATISTICS SERIES). Australian Institute of Health and Welfare.

Harrison, J. E., & Henley, G. (2015). *Injury deaths data, Australia: Technical report on issues associated with reporting for reference years 1999–2010. Injury research and statistics series no. 94. Cat. No. INJCAT 170.* Australian Institute of Health and Welfare. https://www.aihw.gov.au/getmedia/8e2f977a-2bd9-41b7-9999-02114b016449/15549.pdf.aspx?inline=true

Imbens, G. W., & Kolesár, M. (2016). Robust standard errors in small samples: Some practical advice. *Review of Economics and Statistics*, *98*(4), 701–712. doi: 10.1162/REST_a_00552.

Judd, F., Jackson, H., Komiti, A., Bell, R., & Fraser, C. (2012). The profile of suicide: Changing or changeable? *Social Psychiatry and Psychiatric Epidemiology*, *47*(1), 1–9. doi: 10.1007/s00127-010-0306-z.

Knox, K. (2014). Approaching suicide as a public health issue. *Annals of Internal Medicine*, *161*(2), 151–152. doi: 10.7326/M14-0914.

Massing, W., & Angermeyer, M. C. (1985). The monthly and weekly distribution of suicide. *Social Science & Medicine (1982)*, *21*(4), 433–441. doi: 10.1016/0277-9536(85)90223-0.

Naghavi, M. (2019). Global, regional, and national burden of suicide mortality 1990 to 2016: Systematic analysis for the Global Burden of Disease Study 2016. *BMJ (Clinical Research ed.)*, *364*, l94. doi: 10.1136/bmj.l94.

NSW-Health. (2023). *NSW suicide monitoring system*. New South Wales Ministry of Health. https://www.health.nsw.gov.au/mentalhealth/resources/Publications/sums-report-dec-2022.pdf

Preti, A., & Miotto, P. (1998). Seasonality in suicides: The influence of suicide method, gender and age on suicide distribution in Italy. *Psychiatry Research*, *81*(2), 219–231. doi: 10.1016/s0165-1781(98)00099-7.

Räsänen, P., Hakko, H., Jokelainen, J., & Tiihonen, J. (2002). Seasonal variation in specific methods of suicide: A national register study of 20,234 Finnish people. *Journal of Affective Disorders*, *71*(1-3), 51–59. doi: 10.1016/s0165-0327(01)00411-6.

StataCorp. (2021). *Stata statistical software: Release 17*. In StataCorp LLC.

Yang, C. T., Yip, P. S. F., Cha, E. S., & Zhang, Y. (2019). Seasonal changes in suicide in South Korea, 1991 to 2015. *PloS One*, *14*(6), e0219048. doi: 10.1371/journal.pone.0219048.

Yip, P. S. F., Zheng, Y., & Wong, C. (2022). Demographic and epidemiological decomposition analysis of global changes in suicide rates and numbers over the period 1990–2019. *Injury Prevention: Journal of the International Society for Child and Adolescent Injury Prevention*, *28*(2), 117–124. doi: 10.1136/injuryprev-2021-044263.

Yu, J., Yang, D., Kim, Y., Hashizume, M., Gasparrini, A., Armstrong, B., Honda, Y., Tobias, A., Sera, F., Vicedo-Cabrera, A. M., Kim, H., Íñiguez, C., Lavigne, E., Ragettli, M. S., Scovronick, N., Acquaotta, F., Chen, B., Guo, Y. L., de Sousa Zanotti Stagliori Coelho, M., … Chung, Y. (2020). Seasonality of suicide: A multi-country multi-community observational study. *Epidemiology and Psychiatric Sciences*, *29*, e163. doi: 10.1017/S2045796020000748.