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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

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ABSTRACT

Despite significant investment in mental health and suicide intervention strategies in Australia, the extent of change in suicide rates over the last decade is unclear. This paper analyses sex and age trajectories in suicide rates over the last decade in Australia. Age Standardized Suicide Rates from 2004 to 2013 were obtained from the Australian Bureau of Statistics and reflect rates of suicide per 100,000 within age and sex cohorts. Age-related suicide rates were consistent over the last decade. For both males and females, there were increases in mid-life suicide rates before declining around 55–65 years of age. However, rates of suicide in men increased in late-life with rates for those aged 70–79 comparable with those in mid-life. Rates amongst men aged 85+ were consistently the highest rates over the decade. Positively, there was decline in suicide rates among younger men aged 20–34 years. However, more consistently, for both sexes across most age cohorts, there were either increases or no change in suicide rate. Apart from declines in younger-adult males, analysis of age-standardized suicide rates indicate no improvement in suicide rates. High suicide rates amongst middle-aged and older males remain a significant public health issue that needs to be addressed.

1. Introduction

In many nations, suicide is frequently cited as a major public health issue. Annually, suicide accounts for approximately 1 million deaths worldwide and for the largest share of the intentional injury burden (Nock et al., 2008; Spiers et al., 2014; Wang et al., 2014). It is well established that risk for suicide has been linked with a range of social, demographic and economic characteristics (e.g. sex, marital status, employment status, work stress, financial stress), environmental conditions (e.g. drought, rurality), and individual factors (e.g. mental health, physical health status, health behaviours) (Alston, 2012; Bogers et al., 2013; Denney et al., 2009; Hanigan et al., 2012; Jahn et al., 2015; Kapusta et al., 2008; Laszlo et al., 2015; Law et al., 2015; Milner et al., 2013; Roberts et al., 2013; Routley and Ozanne-Smith, 2012; Schneider et al., 2011; Wong et al., 2011). Similarly, it is known that suicide is a leading cause of mortality, although this is moderated by age. Amongst younger adults, suicide is a leading cause of death. Although not a leading cause of death in older adults, a number of findings have identified high suicide rates in older adults (Chan et al., 2007; Conwell et al., 2011; De Leo et al., 2013; Erlangsen et al., 2011; Fassberg et al., 2012; Hoxey and Shah, 2000; Power and Brophy, 2008; Shah et al., 2008; Stanley et al., 2015; Wang et al., 2014). This has considerable implications given an ageing population, particularly as a greater proportion of the adult population age as a consequence of a large baby-boomer cohort and increased life expectancy.

Within an Australian context, the Australian National Suicide Prevention Strategy (NSPS) was established to address increases in rates and numbers of suicide (Australian Bureau of Statistics, 2000, 2008; Mitchell, 2000). The objectives of the NSPS were targeted on building individual resilience, increasing access to quality-assured and evidenced-based suicide prevention activities, raising public awareness and reducing stigma of suicide, and improving the evidence-base. Concerted national effort and substantial financial investment in addressing mental health and suicide burden has been made (Commonwealth Government, 2010; Department of Health and Ageing, 2014). There is however continued debate as to the extent to which these types of strategies have improved the suicide burden in particular. Whilst successful outcomes of suicide interventions are frequently reported, their efficacy appears directly related to the extent to which an intervention is targeted and delivered, and the extent to which interventions are integrated into existing social and public health systems (Bertolote, 2004; Fleischmann et al., 2008; Milner et al., 2015; Pirkis et al., 2013). However, with regards the impact of NSPS in Australia, whilst there is evidence for a decline in age-standardized rates

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since the 1990s – mostly attributable to declines in suicide rates amongst males, the actual case number of suicides appears stable (Australian Bureau of Statistics, 2013; Page et al., 2010; Snowdon, 2016). Therefore, quantifying the extent to which suicide rates have been moderated is important. As it stands, comparison of 5-year mean suicide rates between the mid/late-1990s and those rates between 2009 and 2013, indicate that female suicide rate was quite stable between these periods (Snowdon, 2016) . The particularly high rate of suicide amongst older males over this time appears substantive and unchanged although a decline in male suicide rates, particular in those aged 20–39 and 60–84, was reported. However, by only comparing two discrete periods of times, the extent to which these declines reflect an actual trend of decline, between the peaks of the 1990's levels with those rates reported in 2009–2013, is unclear. It may well be that most of the decline could have occurred at the turn of the century and have remained stable since then (Page et al., 2010). There is a need therefore for close examination of the recent changes in rates of suicide and to determine the extent to which these changes are consistent across the lifecourse.

Whilst data on the rates of suicide in Australia are publicly available, there has been little quantifiable examination of the differences in trajectories of suicide rates between age and sex cohorts over the last decade. Consequently, the current paper specifically examines age-cohort trends in suicide rates over the last full decade of available suicide data, from 2004 to 2013. The study will determine whether the differences reported by Snowdon (2016) has been consistent over the last decade or simply reflects a change in rates from a period in the mid-late 1990s where suicide rates were particularly high to a period in 2009–2013. Analyses will examine whether trajectories of suicide rates are consistent between age and sex cohorts, particularly given established sex differences in suicide rates.

2. Methods

2.1. Data and analysis

Publicly available data on the national rates of suicide per 100,000 by sex and 5-year age group for the period 2004–2013 were obtained from the Australian Bureau of Statistics (2015). This data reflects the most recent complete decade of available suicide rate data in Australia. Age-standardized rates were used in analyses to compare suicide rates over time, as age-standardized rates adjust for changes in the population's age structure over time.

2.2. Statistical analyses

Due to expected sex differences in the rates of suicide across the lifecourse, analyses were stratified by sex. All analyses were undertaken within a Generalized Linear Modelling framework and specified with a Gaussian distribution and Identity Link to derive Maximum Likelihood (ML) estimates. In early data exploration, non-Gaussian distributions were tested, but in all models, model fit indicated superior fit for the model with the Gaussian distribution. The analytical strategy employed three main steps. First, ML estimates of the 10-year average suicide rates for each 5-year age cohort were obtained. Second, ML estimates of the association between age and suicide rates for each sex-cohort were then estimated from a series of regression models which tested for linear, quadratic and cubic trajectories in suicide rate. Model fit of these separate analyses (Table 1) indicated that the model with all three time parameters reported superior fit for the model; the results of this final model will be presented in this paper. Third, ML estimates of the decadal (10-year) trend in suicide rates for each age-cohort were then estimated from a regression model separately for each age-cohort with a simple slope for time in order to capture the overall decadal trend. All analyses were undertaken and graphs created in STATA SE v.14 (StataCorp, 2015).

3. Results

3.1. Suicide rates across the lifespan

Age Standardized Suicide Rates are presented for males (Table 2) and females (Table 3). A review of the raw suicide rates in each year indicated a consistent age-related pattern for both males and females. For males, there were lower rates of suicide for those aged 15–19 years of age in comparison with other age groups. Generally, there was an overall trend of increasing rates of suicide for men with age, peaking between the ages of 30–44 before declining slightly for the 55–69 year age group. Another substantial increase in suicide rates was identified from ages 70–75, with the highest suicide rates over the last decade amongst those aged 85+. Observation of the suicide rates for females revealed substantially lower rates over the 10-year period in comparison with males. Overall these rates appeared to be stable over the lifespan.

Regression analysis confirmed these age-related patterns in men. For males, the 10-year average ranged from an average rate of 10.67 (SE=0.57) suicides per 100,000 for the age group 15–19, peaking at 24.79 (SE=0.75), 25.72 (SE=0.75), and 24.89 (SE=0.93) for age groups 35–39, 40–44, and 45–49 respectively. A trough in the late 60s (M=15.96; SE=0.76) was followed by substantive increases in late life from age 70, with the highest 10-year average consistently indicated by those aged 85+(M=33.44; SE=1.43). For females, the 10-year average ranged from a Mean of 4.73 (SE=0.45) suicides per 100,000 for the age group 15–19, peaking at 7.20 (SE=0.23), 7.44 (SE=0.34), 7.04 (SE=0.30) and 7.41 (SE=0.36) for age groups 35–39, 40–44, 45–49 and 50–54, respectively. After this, the suicide rate appeared to decline and stabilise between 4.20 (SE=0.22) and 5.35 (SE=0.25) in the older age groups.

Average 10-year suicide rates and their standard error, by age and sex, are plotted in Fig. 1. For males, the full model, which included linear, quadratic and cubic trends between suicide rate and age, was statistically significant ($F(3, 146)=157.31$; $p<0.001$) confirming a non-linear association with age and suicide rate. Specifically, there was a linear increase ($\beta=9.02$ (SE=0.47), $p<0.001$) reflecting the large increase from the age group 15–19 to the early adult age cohorts, followed by a significant quadratic

Table 1
Comparison of regression models that compared the non-linear association between age and age-standardized suicide rate.

	Men			Female		
	Linear	Quadratic	Cubic	Linear	Quadratic	Cubic
Log Likelihood	−468.88	−468.85	−367.33	−274.58	−260.60	−252.79
AIC	6.28	6.29	4.95	3.69	3.51	3.41