

Relative risk of suicide following exposure to recent stressors, Victoria, Australia

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It is widely recognised that multiple, inter-related risk factors contribute to suicide. Evidence suggests that the more risk factors one is exposed to the higher the suicide risk¹ and factors associated with suicide can differ depending on a person's age and/or sex.²⁻⁵

The suicide risk factor with the most consistent empirical support in the literature is mental illness.⁶⁻⁸ However, contemporary theories of suicide, while acknowledging the importance of mental illness, also emphasise other life stressors in influencing suicidal behaviour.^{9,10} Some of these other stressors include: relationship breakdown¹¹/divorce²; conflict⁸; bereavement¹²; unemployment⁸; incarceration⁸; and physical illness.¹³ Although there is consistent support for certain stressors conferring risk for suicide in the literature, it is unknown to what extent the results can be generalised to Victoria as it is recognised that risk factors for suicide vary in kind from one context to the next.¹⁴

Stress-diathesis models of suicidal behaviour posit that the behaviour occurs as a consequence of the interaction between predisposing vulnerability factors and triggering stressors.¹⁵ According to some of these models, mental illness is conceptualised as a stressor, as are factors such as recent adverse life events.^{16,17} Diathesis components of some of these proposed models include factors such as impulsivity, pessimism or hopelessness¹⁷ or a person's genetics.¹⁶ Consistent with this interpretation, in this study mental illness is considered to be a stressor.

Previous research using coronial data sources has established that approximately

Abstract

Objective: This study aimed to identify stressors over-represented in the 12 months prior to death among 553 Victorian adults who died by suicide.

Methods: Age- and sex-specific suicide rates and relative risks of suicide were calculated using numerator data on suicides occurring in 2013 by people with a given exposure sourced from the Victorian Suicide Register and denominator data on the total Victorian population with that exposure sourced from the 2014 Australian Bureau of Statistics General Social Survey.

Results: Mental illness was associated with increased suicide risk among people of all age groups and both sexes. Alcohol and/or other drug problems were associated with increased risk for males and females of all ages, with the exceptions of the oldest males and females, and the youngest females. Trouble with the police was associated with increased risk among all but the oldest males, whereas among females it was associated with elevated risk in those aged 25-44 years and 65+ years.

Conclusions and Implications for public health: Males experiencing mental illness and alcohol and other drug problems should be a particular priority for suicide prevention initiatives but people exposed to other stressors such as contact with the police and divorce/relationship separation also warrant attention.

Key words: suicide, alcohol and other drugs, mental illness

half of Victorians who died by suicide had a diagnosed mental illness at the time of their death.^{18,19} Many additional stressors, such as interpersonal, personal and situational stressors, have also been found to be highly prevalent in Victorian suicides.^{18,19} However, these studies, and most register studies in general, are descriptive only and include no comparison group, meaning it is not possible to determine the risk conferred by exposures to stressors.

The current study extended this previous work and considered risk by including data from a large-scale Australian population survey to measure exposure to stressors (including mental illness) in the general adult population. The aim was to identify which stressors were over-represented in the 12 months prior to

death among those who died by suicide compared with the Victorian population.

Method

Data sources

Two data sources were used: (a) the Victorian Suicide Register (VSR); and (b) the Australian Bureau of Statistics (ABS) General Social Survey (GSS). Exposure to stressors among those who died by suicide was sourced from the VSR and exposure to stressors among the general population from the GSS.

VSR

The VSR is a purpose-built database of all suicides and suspected suicides that occur in Victoria. The VSR is supported by a

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coding manual, data dictionary and quality framework. Data in the VSR is coded by individuals with experience in the conduct of medico-legal investigations and trained in mortality review for the purposes of surveillance. Detailed coded and free text data is systematically recorded according to strict coding rules.²⁰

VSR data are coded based on review of all available information – typically the entire coronial file is available to coders, containing the coronial brief, forensic, medical and scientific reports and the coroners' finding. The coronial brief frequently includes statements from police and family members, copies of suicide notes, photographs taken at the scene of the suicide and medical records from general practitioners or psychiatrists/psychologists involved in treatment of the deceased.

Data items systematically recorded on the VSR include those related to the specific details of the suicide such as the method used, location of event and the cause of death. In addition, items related to specific known risk factors for suicide such as sociodemographic details; service contacts; information regarding physical illness, injury, pain or disability; other psycho-social stressors; and detailed information regarding any evidence of mental illness is also systematically recorded. The VSR comprises coded and free-text information. Data relevant to this study include sociodemographics (age and sex) and evidence of exposure to the following potential stressors: mental illness; relationship separation; bereavement; illness; accident/injury; disability; alcohol or other drug problems; violence/abuse; financial or work-related difficulties; bullying/harassment; and specific service contacts with police or child services. Data for all of these stressors are collected systematically in the VSR under the following variable names "diagnosed mental illness", "relationship", "death of a partner/family member", "physical illness", "physical injury", "disability", "substance abuse/use", "experience of abuse", "violence between deceased and partner/family member", "financial stressors", "work related stressors", "bullying" and "specific service contacts". The information is collected by first flagging a factor/stressor as relevant to that individual and then including notes to indicate why each factor/stressor was flagged (i.e. the coder enters the relevant information directly from the Coroners finding/police report/autopsy report/statement of a family member etc. into specific notes fields). More information about the VSR can be found elsewhere.²⁰

GSS

The GSS is a population survey designed to support the exploration of the links between different social and economic topics.²¹ The 2014 survey involved people aged 15 years or older who lived in 12,932 private dwellings. It had a response rate of 80.1% (20). GSS data can be extrapolated to the total population because of the way participants are sampled and the weights that are applied.²¹ Respondents were asked about exposure to stressors (occurring to the individual or a close family member) in the 12 months prior to the survey. The stressors for which equivalent data are captured in the VSR are: mental illness; divorce/relationship separation; death of a family member or close friend; physical illness; accident/injury; disability; alcohol or other drug problems; not able to get a job; involuntary loss of job; victim of abuse or violent crime; witness to violence; trouble with the police; gambling problem; bullying and/or harassment; and removal of children.

Data extraction and inclusion criteria

Cases of suicide that occurred in 2013 were extracted from the VSR. For consistency with the GSS inclusion criteria, people aged younger than 15 years and those who were not usual residents of private dwellings (houses, flats, home units and any other structures used as private places of residence) were excluded. Cases coded as being exposed to a given stressor were examined by the first author through reading all the notes accompanying the flagging of that stressor to ensure the exposure occurred in the 12 months prior to death. For example, for the stressors injury and illness, the notes for each case with these variables flagged were read to confirm the injury or illness had been recorded as being an issue for the deceased in the 12 months prior to suicide. In addition, for people who had had contact with police prior to death, the record was only included if the deceased had what would be considered "trouble with the police" (i.e. they had been arrested, investigated, incarcerated, etc.) not if they simply had contact in the context of a suicide attempt. When substance use is mentioned in the coronial brief, VSR coders are instructed to code to the personal stressor category "substance use". Further, when there is evidence of a substance use disorder diagnosed by a medical professional, VSR coders are also instructed to code to the mental illness category "Mental or behavioural disorders due to psychoactive substance use". In the year of analysis, approximately one-quarter of cases with substance use recorded

as a stressor had a diagnosed substance use disorder. Consequently, the categories "mental illness" and "alcohol and/or other drug problems" in this study both included people with a diagnosed substance use disorder. Throughout the text, the phrase "alcohol and/or other drugs problems" is used when referring to cases where substance use has been flagged as a stressor in the VSR.

Weighted GSS data for Victoria were extracted by age group and sex using the Remote Access Data Laboratory (RADL) system. For analysis of co-occurring stressors, data were only extracted by sex due to suppression by the RADL of age- and sex-specific data because of small cell sizes and the potential for identifying an individual. GSS data for experiencing abuse/violent crime and/or witnessing violence were combined to allow comparison with VSR data.

Analysis methods

Suicide rates per 100,000 adults experiencing the different stressors in the 12-month period prior to death were calculated by sourcing the numerator from the VSR and the denominator from the GSS. Upper (+) and lower (-) 95% confidence intervals for the rates were calculated using the Poisson variance approximation formula:

$$=(100000 / n) (d \pm (1.96 \times \text{square root of } d))$$

Where: d=number of suicides with stressor recorded in 12 months prior to death and n=population experiencing the stressor in the 12 months prior to survey. In addition, we performed analyses of co-occurring stressors. Relative Risk was calculated as the ratio of the rate of suicide in the exposed group to that in the non-exposed group.

Ethics approval

Full approval for this research was granted by the Victorian Department of Justice and Regulation Human Research Ethics Committee (JHREC - reference number CF/15/16421).

Results

The final VSR dataset contained the records of 553 suicides. The GSS data have been weighted to represent the population of 4.6 million adults aged 15 years and over in Victoria. Table 1 shows the frequency and proportion of cases recorded to have been exposed to various stressors in the 12 months prior to suicide (for VSR cases) or to the survey (GSS cases).

Comparison of suicide risk among Victorians exposed to 12-month stressors

Table 2 shows suicide rates and relative risk of suicide among adults exposed to a given stressor. Of the 14 stressors examined in the study, half were associated with significantly increased suicide risk. The three stressors with the highest relative risk (RR) for suicide were alcohol and/or other drugs problems (RR: 7.24, 95% confidence intervals (CI), 6.09 to 8.61), mental illness (RR: 5.39, 95% CI 4.57, 6.37), and trouble with the police (RR: 4.83, 95% CI, 3.82, 6.11). Mental illness was the only stressor associated with significantly increased suicide risk across all age groups.

Three stressors were associated with significantly decreased suicide risk: death of a family member or close friend (RR: 0.31, 95% CI, 0.23 to 0.43), being not able to get a job (RR: 0.27, 95% CI 0.19, 0.39), and bullying and/or harassment (RR: 0.30, 95% CI, 0.18, 0.53).

Gender-based differences in rates and risk of suicide per exposure to 12-month stressors

Suicide rates per 100,000 exposed males were significantly higher than rates per 100,000 exposed females for all stressors except abuse/violence, bullying/harassment and removal of children. For none of the stressors was the suicide rate among exposed females significantly higher than the rate among exposed males. (Tables 3 and 4)

Among males, suicide risk was highest among those experiencing alcohol and other drug problems, mental illness and trouble with the police. Males who had experienced divorce/relationship separation or involuntary job loss also had increased risk of suicide. Among females, suicide risk was increased for those experiencing mental illness, removal of children, alcohol and/or other drug problems, abuse/violence, trouble with the police and divorce/relationship separation.

Rates and risk of suicide by age groups and gender

Among males and females, mental illness was the only stressor associated with significantly increased suicide risk across all age groups. Increased suicide risk was associated with: alcohol and/or other drug problems in males aged 15-64 years and females aged 25-44; trouble with the police in males aged 25-64 years and females aged 25-44 and 65 years and older; and divorce/relationship separation in males aged 25-44 years and females aged

Table 1: Frequency and proportion of people exposed to the stressor in the 12-months prior to suicide (VSR) or survey (GSS), Victorian adults

VSR (Suicides occurring in 2013)						
	Males n=410 (74.1%)		Females n=143 (25.9%)		All n=553 (100%)	
	n	%	n	%	n	%
Mental illness	178	43.4	91	63.6	269	48.6
Divorce/relationship separation	88	21.5	36	25.2	124	21.8
Death family/friend	29	7.1	16	11.2	45	7.9
Physical illness	100	24.4	40	28.0	140	24.6
Accident/injury	*	*	*	*	33	5.8
Alcohol and/or other drug problem	159	38.8	43	30.1	202	35.5
Not able to get a job	28	6.8	5	3.5	33	6.0
Involuntary loss of job	49	12.0	7	4.9	56	10.1
Violence/abuse	18	4.4	22	15.4	40	7.2
Trouble with the police	65	15.9	17	11.9	82	14.8
Gambling problem	*	*	*	*	13	2.4
Bullying/Harassment	8	2.0	5	3.5	13	2.4
Removal of children	*	*	*	*	10	1.8
Disability	*	*	*	*	25	4.5
GSS (Survey conducted March-June 2014)						
	Males n=2,303,526 (49.2%)		Females n=2,381,050 (50.8%)		All n=4,683,576 (100%)	
	n	%	n	%	n	%
Mental illness	288,791	12.54	410,812	17.25	699,603	14.94
Divorce/relationship separation	295,743	12.84	267,265	11.22	563,008	12.02
Death family/friend	420,877	18.27	610,698	25.65	1,031,575	22.03
Physical illness	513,605	22.30	582,869	24.48	1,096,474	23.41
Accident/injury	159,115	6.91	83,418	3.50	242,533	5.18
Alcohol and/or other drug problem	165,899	7.20	178,882	7.51	344,781	7.36
Not able to get a job	434,934	18.88	451,606	18.97	886,540	18.93
Involuntary loss of job	178,397	7.74	168,285	7.07	346,682	7.40
Violence/abuse	73,896	3.21	98,494	4.14	172,390	3.68
Trouble with the police	85,137	3.70	77,775	3.27	162,912	3.48
Gambling problem	43,946	1.91	76,507	3.21	120,453	2.57
Bullying/Harassment	123,168	5.35	220,938	9.28	344,106	7.35
Removal of children	22,113	0.96	17,932	0.75	40,045	0.86
Disability	103,969	4.51	139,470	5.86	243,439	5.20

Note:

*= cells suppressed for reasons of confidentiality

15-44. Physical illness was associated with increased suicide risk among males and among females only in those aged 65 years and older. Experience of violence/abuse was associated with increased suicide risk among females aged 15-44 and 65 years and older.

Co-occurring stressors

The majority of those who died by suicide were recorded to have been exposed to two or more of the stressors (57.1%, n=316/553) in the 12 months prior to death. Mental illness, alcohol or other drug problems, physical illness, divorce/relationship separation and trouble with the police were the most commonly reported stresses overall (Table 1) and in combination. Table 5 shows sex-specific rates and relative risk of suicide for

individuals experiencing the various possible combinations of these stressors. Males and females exposed to all combinations of the examined stressors had increased risk of suicide with the exception of females experiencing physical illness in combination with trouble with the police, and males and females experiencing physical illness in combination with divorce/relationship separation.

For males, the highest suicide risks were observed among those exposed to alcohol and/or other drug problems in combination with mental illness (RR: 6.85, 95% CI 5.34, 8.79), divorce/relationship separation (RR: 6.21, 95% CI 4.59, 8.42), or trouble with the police (RR: 5.55, 95% CI 3.96, 7.77). For females, the highest suicide risk was observed

Table 2: Exposure to stressors in the 12-months prior to suicide, suicide rates and relative risk of suicide, by age group, Victorian adults

	15-24 years	25-44 years	45-64 years	65+ years	ALL
Suicide rate per 100,000					
95% CI (LCI, UCI)					
Mental illness	27.23 (16.96, 37.51)	31.21 (25.13, 37.30)	44.75 (35.89, 53.61)	74.31 (52.10, 96.52)	38.45 (33.86, 43.05)
Divorce / relationship separation	29.57 (15.91, 43.23)	27.25 (20.57, 33.92)	18.34 (12.58, 24.09)	5.50 (-0.72, 11.72)	22.02 (18.15, 25.90)
Death: family member/close friend	4.77 (1.24, 8.30)	1.85 (0.57, 3.13)	6.35 (3.63, 9.06)	7.45 (2.58, 12.31)	4.36 (3.09, 5.64)
Physical illness	4.73 (0.95, 8.52)	7.34 (4.57, 10.11)	11.87 (8.58, 15.17)	31.53 (23.35, 39.72)	12.77 (10.65, 14.88)
Accident/injury	20.13 (2.48, 37.77)	11.43 (5.22, 17.64)	19.49 (8.89, 30.08)	5.37 (-2.07, 12.82)	13.61 (8.96, 18.25)
Alcohol and/or other drug problem	43.81 (26.97, 60.65)	73.33 (59.50, 87.17)	63.78 (47.77, 79.78)	16.46 (4.27, 28.66)	58.59 (50.51, 66.67)
Not able to get a job	1.69 (0.03, 3.35)	2.90 (1.10, 4.69)	6.77 (3.55, 9.99)	3.72 (-1.44, 8.87)	3.72 (2.45, 4.99)
Involuntary loss of job	9.19 (0.18, 18.19)	11.83 (6.64, 17.01)	27.84 (18.19, 37.48)	0.00 (0.00, 0.00)	16.15 (11.92, 20.38)
Violence/abuse	25.53 (3.15, 47.91)	32.41 (18.87, 45.95)	13.57 (5.16, 21.98)	26.73 (-3.52, 56.98)	23.20 (16.01, 30.39)
Trouble with the police	26.72 (9.26, 44.17)	61.50 (44.62, 78.38)	59.69 (34.16, 85.23)	8.99 (-8.63, 26.61)	50.33 (39.44, 61.23)
Gambling problem	6.37 (-6.11, 18.85)	7.45 (0.15, 14.75)	13.49 (2.70, 24.28)	30.41 (-11.74, 72.55)	10.79 (4.93, 16.66)
Bullying and/or harassment	5.51 (0.11, 10.90)	3.57 (0.44, 6.71)	3.32 (0.07, 6.58)	0.00 (0.00, 0.00)	3.78 (1.72, 5.83)
Removal of children	57.84 (-55.52, 171.20)	41.42 (12.72, 70.13)	6.00 (-5.76, 17.76)	0.00 (0.00, 0.00)	24.97 (9.49, 40.45)
Disability	0.00 (0.00, 0.00)	7.43 (1.49, 13.38)	15.30 (7.56, 23.04)	9.53 (0.19, 18.87)	10.27 (6.24, 14.30)
All	8.53 (6.46, 10.60)	11.32 (9.72, 12.92)	14.53 (12.55, 16.51)	8.85 (7.01, 10.69)	11.81 (10.82, 12.79)
Relative risk					
95% CI (LCI, UCI)					
Mental illness	4.75 (2.90, 7.78)	4.71 (3.55, 6.25)	4.95 (3.77, 6.50)	15.31 (10.10, 23.20)	5.39 (4.57, 6.37)
Divorce / relationship separation	4.41 (2.56, 7.59)	3.11 (2.30, 4.20)	1.32 (0.93, 1.87)	0.61 (0.19, 1.92)	2.12 (1.73, 2.58)
Death: family member/close friend	0.51 (0.23, 1.11)	0.13 (0.06, 0.26)	0.37 (0.24, 0.59)	0.82 (0.41, 1.64)	0.31 (0.23, 0.43)
Physical illness	0.51 (0.22, 1.18)	0.59 (0.39, 0.89)	0.76 (0.55, 1.04)	8.13 (5.27, 12.53)	1.11 (0.92, 1.34)
Accident/injury	2.47 (0.99, 6.16)	1.01 (0.58, 1.77)	1.36 (0.78, 2.39)	0.60 (0.15, 2.43)	1.16 (0.82, 1.65)
Alcohol and/or other drug problem	7.89 (4.81, 12.97)	13.52 (10.17, 17.98)	5.81 (4.31, 7.83)	1.93 (0.89, 4.18)	7.24 (6.09, 8.61)
Not able to get a job	0.15 (0.05, 0.40)	0.21 (0.11, 0.41)	0.42 (0.25, 0.69)	0.41 (0.10, 1.65)	0.27 (0.19, 0.39)
Involuntary loss of job	1.08 (0.39, 2.98)	1.05 (0.66, 1.67)	2.08 (1.43, 3.04)	0 ND	1.41 (1.07, 1.86)
Violence/abuse	3.16 (1.27, 7.87)	3.10 (1.99, 4.84)	0.93 (0.49, 1.76)	3.09 (0.98, 9.77)	2.04 (1.48, 2.81)
Trouble with the police	3.47 (1.72, 7.02)	7.04 (5.11, 9.69)	4.46 (2.84, 7.00)	1.02 (0.14, 7.29)	4.83 (3.82, 6.11)
Gambling problem	0.74 (0.10, 5.35)	0.65 (0.24, 1.75)	0.93 (0.41, 2.09)	3.49 (0.86, 14.18)	0.91 (0.53, 1.58)
Bullying and/or harassment	0.62 (0.23, 1.71)	0.30 (0.12, 0.72)	0.21 (0.08, 0.57)	0 ND	0.30 (0.18, 0.53)
Removal of children	6.87 (0.95, 49.5)	3.77 (1.86, 7.66)	0.41 (0.06, 2.93)	0 ND	2.14 (1.14, 3.99)
Disability	0 ND	0.65 (0.29, 1.46)	1.06 (0.63, 1.79)	1.08 (0.40, 2.94)	0.86 (0.58, 1.29)
All	1	1	1	1	1

Note:

ND = confidence intervals not defined given the relative risk was zero (i.e. zero cases of suicide were exposed to that stressor in the 12 months prior to death).

among those exposed to divorce/relationship separation in combination with trouble with the police (RR: 24.88, 95% CI 12.20, 50.75).

Discussion

The stressors determined to be over-represented among Victorian suicides were largely consistent with existing literature. A wealth of research has identified mental illness, substance use and recent stressful life events to be commonly present in the histories of people who have died by suicide.^{6,7,8} Although these same stressors have been found to be prevalent in Victorian cases of suicide^{18,19} this study extended on that research by identifying which stressors are over-represented at different stages of life and for males and females separately.

Suicide risk was highest in those experiencing alcohol and/or other drugs problems, mental illness, and those who experienced trouble with the police in the 12 months prior to death. However, it is important to note that there were significant differences between males and females whereby male suicide rates were significantly higher than female suicide rates for those experiencing most of the studied stressors, and that age also impacted suicide rates and risk.

Mental illness was associated with increased suicide risk among individuals of all age groups and for both sexes. In contrast to a recent Queensland study, which found the prevalence of diagnosed psychiatric disorders was lower in older adults than middle-aged adults who died by suicide,²² the current study found significantly higher relative risk of suicide among the oldest Victorians when compared to their younger counterparts.

Alcohol and/or other drug problems were associated with increased risk for males and females of all ages, with the exceptions of the oldest males and females, and the youngest females. Trouble with the police was associated with increased risk among all but the oldest males, whereas among females it was associated with elevated risk in those aged 25-44 years and those aged 65 years and older.

Mental illness and substance abuse are two of the most recognised risk factors for suicide and have been found to be associated with suicide among males and females.⁸ In fact, findings from the Global Burden of Disease study suggest mental and substance use disorders were found to be responsible for two-thirds of the suicide burden in 2010.²³

Although police contact proximal to suicide has previously been identified^{19,24} it has not received the same attention as mental illness and substance abuse. The Victorian Suicide Prevention Framework²⁵ acknowledges the need for appropriate training for police when responding to people with mental illness and/or people who may be suicidal. While it is important for police to be aware of appropriate action in these situations, findings from the current study suggest there also appears to be an association between suicide risk and people being in contact with police for other reasons. Consequently, police training should also emphasise the risk of suicide among those who may be in contact with police for other reasons such as drink driving offenses or interpersonal violence issues.

Consistent with previous research, in this study some of the other life events found to increase suicide risk in certain populations include divorce/relationship separation, involuntary loss of a job and experience of violence/abuse. Studies have suggested divorce increases the odds of suicide,² and a Queensland study showed relationship separation created a risk of suicide at least four times higher than any other marital status.²⁶ While the Queensland study determined that the risk was particularly high for males aged 15-24 years the current study found the highest risk was among young females aged 15-24 years. Unemployment has been found to be associated with increased suicide risk.²⁷ A study from Western Australia found unemployment was significantly greater in younger people who died by suicide (those aged 15-19 years and 20-24 years) when compared to those aged 45-59 years.²⁸ In contrast the current study found involuntary loss of job was associated with highest suicide risk among men aged 45-64 years.

People exposed to all examined combinations of stressors had significantly increased suicide risk except for females experiencing physical illness in combination with trouble with the police, and males and females experiencing physical illness in combination with divorce/relationship separation. For males, the highest suicide risks were observed among those exposed to alcohol and/or other drug problems in combination with all other stressors except for physical illness. For females, the highest suicide risk was observed among those exposed to divorce/relationship separation and trouble with the police.

Three stressors were associated with significantly decreased suicide risk: death of a family member or close friend, being unable

Table 3: Exposure to stressors in the 12-months prior to suicide, suicide rates and relative risk of suicide, by age group, Victorian adult males.

	15-24 years	25-44 years	45-64 years	65+ years	ALL
Suicide rate per 100,000					
95% CI (LCI, UCI)					
Mental illness	64.86 (35.70, 94.03)	43.54 (33.19, 53.88)	86.73 (65.81, 107.66)	91.86 (55.85, 127.87)	61.64 (52.58, 70.69)
Divorce / relationship separation	24.13 (9.87, 38.40)	41.22 (29.31, 53.13)	25.98 (16.68, 35.28)	4.33 (-4.16, 12.81)	29.76 (23.54, 35.97)
Death: family member/close friend	9.41 (1.88, 16.94)	1.72 (-0.23, 3.66)	12.33 (6.09, 18.57)	8.26 (1.02, 15.50)	6.89 (4.38, 9.40)
Physical illness	7.35 (0.15, 14.55)	12.25 (7.01, 17.49)	17.42 (11.65, 23.19)	46.07 (31.79, 60.35)	19.47 (15.65, 23.29)
Accident/injury	22.49 (2.78, 42.20)	14.65 (6.36, 22.94)	39.58 (16.19, 62.97)	3.68 (-3.53, 10.89)	18.23 (11.59, 24.86)
Alcohol and/or other drug problem	78.73 (47.23, 110.22)	114.35 (88.81, 139.89)	114.03 (83.33, 144.74)	23.15 (2.86, 43.44)	95.84 (80.94, 110.74)
Not able to get a job	3.53 (0.07, 6.98)	5.54 (2.11, 8.97)	10.52 (4.57, 16.47)	7.43 (-2.87, 17.72)	6.44 (4.05, 8.82)
Involuntary loss of job	9.06 (-1.19, 19.31)	25.87 (14.24, 37.50)	42.26 (26.32, 58.20)	0.00 (0.00, 0.00)	27.47 (19.78, 35.16)
Violence/abuse	16.76 (-2.21, 35.73)	30.68 (10.64, 50.72)	24.75 (3.06, 46.44)	15.48 (-14.87, 45.83)	24.36 (13.11, 35.61)
Trouble with the police	35.41 (12.27, 58.54)	95.07 (64.84, 125.29)	194.03 (104.39, 283.66)	0.00 (0.00, 0.00)	76.35 (57.79, 94.91)
Gambling problem	20.31 (-19.50, 60.11)	13.50 (-1.78, 28.77)	30.31 (0.61, 60.00)	55.57 (-21.45, 132.59)	22.76 (8.65, 36.86)
Bullying and/or harassment	8.37 (-1.10, 17.84)	6.07 (-0.80, 12.94)	5.92 (-2.28, 14.12)	0.00 (0.00, 0.00)	6.50 (1.99, 11.00)
Removal of children	57.84 (-55.52, 171.20)	16.53 (-6.38, 39.45)	16.81 (-16.14, 49.76)	0.00 (0.00, 0.00)	18.09 (0.36, 35.82)
Disability	0.00 (0.00, 0.00)	14.57 (2.91, 26.23)	33.06 (14.35, 51.76)	19.26 (0.39, 38.13)	21.16 (12.32, 30.00)
All	12.85 (9.29, 16.42)	16.99 (14.21, 19.78)	22.03 (18.55, 25.51)	13.16 (9.91, 16.41)	17.81 (16.08, 19.53)
Relative risk					
95% CI (LCI, UCI)					
Mental illness	7.53 (4.25, 13.32)	3.98 (2.87, 5.52)	6.14 (4.46, 8.45)	10.91 (6.59, 18.07)	5.35 (4.40, 6.50)
Divorce / relationship separation	2.13 (1.09, 4.15)	3.10 (2.18, 4.41)	1.22 (0.82, 1.82)	0.32 (0.04, 2.29)	1.85 (1.46, 2.35)
Death: family member/close friend	0.70 (0.30, 1.63)	0.08 (0.03, 0.26)	0.51 (0.30, 0.87)	0.60 (0.24, 1.48)	0.34 (0.23, 0.50)
Physical illness	0.53 (0.19, 1.48)	0.67 (0.42, 1.07)	0.73 (0.50, 1.06)	7.85 (4.70, 13.11)	1.12 (0.90, 1.41)
Accident/injury	1.83 (0.73, 4.62)	0.85 (0.47, 1.53)	1.86 (1.01, 3.43)	0.27 (0.04, 1.93)	1.03 (0.70, 1.50)
Alcohol and/or other drug problem	10.86 (6.23, 18.90)	13.41 (9.66, 18.63)	7.37 (5.28, 10.27)	1.82 (0.73, 4.55)	8.16 (6.69, 9.95)
Not able to get a job	0.21 (0.08, 0.59)	0.28 (0.14, 0.52)	0.43 (0.24, 0.78)	0.55 (0.13, 2.25)	0.31 (0.21, 0.46)
Involuntary loss of job	0.69 (0.21, 2.20)	1.60 (0.99, 2.60)	2.11 (1.39, 3.20)	0 ND	1.62 (1.20, 2.18)
Violence/abuse	1.32 (0.41, 4.25)	1.86 (0.95, 3.65)	1.13 (0.46, 2.75)	1.18 (0.16, 8.50)	1.38 (0.86, 2.22)
Trouble with the police	3.14 (1.53, 6.46)	7.26 (5.01, 10.52)	9.84 (6.02, 16.08)	0 ND	4.91 (3.76, 6.39)
Gambling problem	1.59 (0.22, 11.53)	0.79 (0.25, 2.48)	1.39 (0.51, 3.74)	4.33 (1.06, 17.69)	1.28 (0.69, 2.41)
Bullying and/or harassment	0.63 (0.20, 2.02)	0.34 (0.11, 1.08)	0.26 (0.06, 1.04)	0 ND	0.35 (0.17, 0.71)
Removal of children	4.57 (0.63, 33.09)	0.97 (0.24, 3.93)	0.76 (0.11, 5.44)	0 ND	1.02 (0.38, 2.72)
Disability	0 ND	0.85 (0.38, 1.93)	1.54 (0.86, 2.78)	1.49 (0.54, 4.11)	1.20 (0.78, 1.84)
All	1	1	1	1	1

Note:

ND = confidence intervals not defined given the relative risk was zero (i.e. zero cases of suicide were exposed to that stressor in the 12 months prior to death).

Table 4: Exposure to stressors in the 12-months prior to suicide, suicide rates and relative risk of suicide, by age group, Victorian adult females.

	15-24 years	25-44 years	45-64 years	65+ years	ALL
Suicide rate per 100,000					
95% CI (LCI, UCI)					
Mental illness	11.45 (3.52, 19.39)	19.71 (12.99, 26.44)	22.39 (14.63, 30.15)	58.73 (31.60, 85.86)	22.15 (17.60, 26.70)
Divorce / relationship separation	45.76 (11.86, 79.66)	14.60 (7.85, 21.34)	9.26 (3.21, 15.30)	6.36 (-2.45, 15.17)	13.47 (9.07, 17.87)
Death: family member/close friend	1.21 (-1.16, 3.57)	1.94 (0.24, 3.63)	2.87 (0.57, 5.16)	6.63 (0.13, 13.13)	2.62 (1.34, 3.90)
Physical illness	2.76 (-1.07, 6.59)	3.06 (0.61, 5.50)	6.81 (3.37, 10.26)	18.09 (9.49, 26.70)	6.86 (4.74, 8.99)
Accident/injury	0.00 (0.00, 0.00)	3.14 (-3.01, 9.29)	5.14 (-1.98, 12.26)	9.96 (-9.56, 29.49)	4.80 (0.10, 9.49)
Alcohol and/or other drug problem	6.93 (-2.67, 16.54)	38.78 (25.13, 52.43)	16.27 (5.00, 27.55)	9.56 (-3.69, 22.81)	24.04 (16.85, 31.22)
Not able to get a job	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	3.65 (0.45, 6.84)	0.00 (0.00, 0.00)	1.11 (0.14, 2.08)
Involuntary loss of job	9.59 (-9.21, 28.39)	1.05 (-1.00, 3.09)	9.79 (1.21, 18.37)	0.00 (0.00, 0.00)	4.16 (1.08, 7.24)
Violence/abuse	118.62 (-45.78, 283.03)	33.73 (15.39, 52.07)	9.35 (1.15, 17.54)	41.97 (-16.20, 100.14)	22.34 (13.00, 31.67)
Trouble with the police	0.00 (0.00, 0.00)	30.27 (13.81, 46.72)	11.58 (-1.52, 24.69)	153.14 (-147.01, 453.29)	21.86 (11.47, 32.25)
Gambling problem	0.00 (0.00, 0.00)	3.18 (-3.05, 9.41)	6.39 (-2.47, 15.25)	0.00 (0.00, 0.00)	3.92 (-0.52, 8.36)
Bullying and/or harassment	2.72 (-2.61, 8.05)	2.21 (-0.85, 5.27)	2.31 (-0.89, 5.51)	0.00 (0.00, 0.00)	2.26 (0.28, 4.25)
Removal of children	NA NA	83.14 (16.61, 149.66)	0.00 (0.00, 0.00)	NA NA	33.46 (6.69, 60.23)
Disability	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	4.86 (-0.64, 10.36)	0.00 (0.00, 0.00)	2.15 (-0.28, 4.59)
All	4.02 (1.99, 6.05)	5.73 (4.13, 7.34)	7.30 (5.34, 9.27)	4.93 (3.04, 6.83)	6.01 (5.02, 6.99)
Relative risk					
95% CI (LCI, UCI)					
Mental illness	4.96 (1.80, 13.68)	8.47 (4.66, 15.39)	6.22 (3.58, 10.78)	36.43 (15.84, 83.79)	8.39 (5.97, 11.80)
Divorce / relationship separation	20.47 (7.42, 56.43)	3.44 (1.93, 6.16)	1.32 (0.65, 2.71)	1.31 (0.31, 5.56)	2.66 (1.82, 3.88)
Death: family member/close friend	0.25 (0.03, 1.90)	0.26 (0.10, 0.66)	0.32 (0.13, 0.74)	1.41 (0.48, 4.08)	0.37 (0.22, 0.61)
Physical illness	0.64 (0.14, 2.83)	0.47 (0.20, 1.10)	0.91 (0.50, 1.65)	8.71 (3.88, 19.53)	1.20 (0.83, 1.73)
Accident/injury	0 ND	0.54 (0.07, 3.90)	0.69 (0.17, 2.84)	2.06 (0.28, 15.20)	0.79 (0.29, 2.14)
Alcohol and/or other drug problem	1.84 (0.41, 8.13)	16.69 (9.34, 29.84)	2.45 (1.15, 5.19)	2.02 (0.48, 8.53)	5.29 (3.70, 7.57)
Not able to get a job	0 ND	0 ND	0.45 (0.18, 1.12)	0 ND	0.15 (0.06, 0.38)
Involuntary loss of job	2.48 (0.33, 18.89)	0.17 (0.02, 1.20)	1.38 (0.55, 3.46)	0 ND	0.68 (0.32, 1.45)
Violence/abuse	33.89 (7.65, 150.08)	7.65 (4.06, 14.42)	1.31 (0.52, 3.29)	9.13 (2.16, 38.63)	4.21 (2.68, 6.64)
Trouble with the police	0 ND	6.82 (3.62, 12.87)	1.62 (0.51, 5.20)	32.24 (4.37, 237.59)	4.00 (2.41, 6.63)
Gambling problem	0 ND	0.55 (0.08, 3.95)	0.87 (0.21, 3.58)	0 ND	0.65 (0.21, 2.03)
Bullying and/or harassment	0.65 (0.09, 4.97)	0.36 (0.09, 1.48)	0.29 (0.07, 1.19)	0 ND	0.35 (0.15, 0.86)
Removal of children	NA NA	16.39 (6.98, 38.48)	0 ND	NA NA	5.77 (2.55, 13.07)
Disability	0 ND	0 ND	0.65 (0.20, 2.07)	0 ND	0.34 (0.11, 1.08)
All	1	1	1	1	1

Note: NA = GSS data not available.

ND = confidence intervals not defined given the relative risk was zero (i.e., zero cases of suicide were exposed to that stressor in the 12-months prior to death).

to secure employment, and experiencing bullying and/or harassment. However, the significantly decreased risk was not found consistently across age groups. Nonetheless these findings do seem counterintuitive. One possible explanation could be that when people initially experience these stressors, suicide risk is decreased in the short-term (potentially due to people having increased support when the exposure occurs) but suicide risk may be increased over a longer time period than the 12 month period included in this study. Further study of these factors to validate and understand the associations identified is warranted.

Some limitations of this study should be noted. First, the data regarding the circumstances surrounding the life events prior to death were based on coronial files, which can be variable and are dependent in part on the availability of key informant and clinical records. In addition, due to the population survey inclusion criteria, people who were not usual residents of private dwellings could not be included in the current study. The specific question regarding stressors in the 12 months prior to the population survey, asked whether the stressor occurred to the individual or a close family member and therefore results would not pertain exclusively to the individual's experience of the stressor. However, the impact of this is that the calculated rates and relative risks for any stressors that are over-represented among the suicide cases are likely to be underestimated. Another limitation in using population-level exposure data is that it does not relate to individual-level exposures. Finally, the risk estimates for each factor could not be adjusted for the influence of other factors and as such all estimates are unadjusted.

Implications for public health

This study has important implications for public health and suicide prevention. In addition to focusing on people experiencing mental illness, suicide prevention programs and initiatives should focus on individuals experiencing other significant life stressors and should be targeted based on stressors found to be associated with increased suicide risk in certain populations. While results were largely consistent with existing literature, importantly, some differences were identified with regards to the risk conferred by different stressors in the Victorian population when compared to published Queensland^{22,26} and Western Australian²⁸ studies.

Males experiencing mental illness and/or alcohol and other drug problems should be a particular priority but those exposed to other stressors such as contact with the police and divorce/relationship separation also warrant attention. In addition, certain combinations of co-occurring stressors were associated with elevated rates among men and women and there were some significant differences between these which should be considered in any suicide prevention initiatives.

The Victorian Suicide Prevention Framework²⁵ outlines two major initiatives that are currently being implemented in Victoria; place-based suicide prevention trials and hospital outreach programs. Place-based trials in six communities involve a local suicide prevention group developing a plan to reduce suicides in the area through the implementation of nine proven suicide prevention interventions such as awareness programs, general practitioner support, gatekeeper training and reducing access to means. Hospital outreach programs being implemented at 12 health services aim to provide practical, psychosocial support in addition to direct mental health or other medical treatment to people who have made a suicide attempt. These objectives and programs are consistent with findings from this current study given people exposed to the stressors found to increase suicide risk such as mental illness, alcohol and/or other drug problems and other psychosocial stressors, may be supported by some of these interventions. If shown to be effective in reducing suicide these programs could be extended across Victoria to ensure all Victorians who are at risk for suicide have access to the support they may need.

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Table 5: Rates and relative risk of suicide for selected combinations of co-occurring stressors, by sex, Victorian adults

	Suicide rates 95% CI (LCI, UCI)			Relative risk of suicide 95% CI (LCI, UCI)		
	Males	Females	All	Males	Females	All
Mental illness &						
Alcohol &/ other drug problem	102.67 (79.59, 125.76)	40.69 (26.13, 55.25)	71.74 (58.08, 85.40)	6.85 (5.34, 8.79)	8.31 (5.56, 12.42)	7.28 (5.89, 9.00)
Divorce / relationship sep.	43.63 (29.76, 57.50)	45.93 (27.92, 63.93)	44.51 (33.52, 55.51)	2.60 (1.86, 3.63)	9.06 (5.88, 13.94)	4.13 (3.17, 5.36)
Physical illness	46.83 (34.10, 59.56)	21.44 (13.04, 29.85)	33.83 (26.27, 41.38)	2.87 (2.14, 3.83)	4.11 (2.67, 6.33)	3.17 (2.49, 4.03)
Trouble with the police	71.66 (46.83, 96.48)	32.88 (15.65, 50.10)	52.73 (37.49, 67.97)	4.28 (2.98, 6.14)	5.96 (3.43, 10.34)	4.78 (3.54, 6.46)
Alcohol other drug problem &						
Divorce / relationship sep.	100.01 (71.42, 128.60)	28.89 (13.75, 44.02)	63.90 (47.86, 79.93)	6.21 (4.59, 8.42)	5.22 (3.01, 9.07)	5.96 (4.57, 7.77)
Physical illness	42.41 (25.78, 59.03)	14.04 (4.87, 23.22)	27.63 (18.35, 36.92)	2.47 (1.65, 3.70)	2.43 (1.24, 4.77)	2.43 (1.72, 3.44)
Trouble with the police	91.45 (61.98, 120.92)	31.58 (13.71, 49.44)	62.45 (44.96, 79.94)	5.55 (3.96, 7.77)	5.65 (3.13, 10.20)	5.71 (4.26, 7.65)
Divorce / relationship sep. &						
Physical illness	12.64 (5.77, 19.52)	6.72 (1.34, 12.10)	9.89 (5.44, 14.34)	0.70 (0.40, 1.22)	1.12 (0.50, 2.55)	0.83 (0.53, 1.31)
Trouble with the police	77.15 (44.15, 110.15)	141.42 (43.42, 239.42)	88.21 (56.10, 120.32)	4.51 (2.91, 7.00)	24.88 (12.20, 50.75)	7.83 (5.39, 11.38)
Physical illness &						
Trouble with the police	36.27 (12.57, 59.97)	13.22 (-1.74, 28.18)	25.26 (10.97, 39.55)	2.06 (1.06, 3.99)	2.23 (0.71, 6.99)	2.16 (1.22, 3.84)
Overall	17.81 (16.08, 19.53)	6.01 (5.02, 6.99)	11.81 (10.82, 12.79)	1	1	1

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