MONASH University

Suicide in Victoria, Australia: Investigating the presence and nature of mental illness and exploring pathways to suicide

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Abstract

Aim

The aim of this thesis was to investigate the presence and nature of mental illness among persons who died by suicide in Victoria, Australia and to explore the pathways to suicide in this same population. The research aimed to examine the association between mental illness and suicide in the Victorian population and in the context of other distal and proximal factors and stressors.

Method

Four studies were conducted utilising data from the Victorian Suicide Register. Study 1 examined the proportion of people who died by suicide that had a diagnosed mental illness at the time of death and compared those cases to those without diagnosed mental illness. Study 2 investigated how the factors and stressors examined in Study 1 clustered together in those who died. Study 3 compared the prevalence of a range of factors in the suicide data to the prevalence of the same factors in a representative population survey. Study 4 examined the pathways to suicide among a sample of Victorians who had a diagnosed mental illness at the time of their death.

Results

Study 1: 2839 Victorians died by suicide over the study period (2009-2013) and 52% had a documented diagnosed mental illness. Significant differences were identified between people who died by suicide and had a diagnosed mental illness compared to those that did not have a diagnosed mental illness.

Study 2: Distinct clusters or groups of cases were identified in the Victorian suicide population and these groups fitted neatly into one major group of cases that did have evidence of a diagnosed mental illness and another major group that did not. Further, each of these initial groups then further broke down into subgroups.

Study 3: Half of the 14 stressors examined were associated with significantly increased suicide risk in the overall adult population: mental illness, relationship

separation, alcohol and other drug problems; involuntary loss of employment, exposure to violence/abuse; trouble with the police and removal of children. Mental illness was the only stressor associated with significantly increased suicide risk across all male and female age groups.

Study 4: The final study showed cases tended to group, in the first instance, into those whose diagnosis of mental illness appeared to follow life events/stressors and those whose diagnosis appeared to precede exposure to stressors and life events. A number of quite distinct life trajectories were then identified within these original two groups.

Conclusion

These studies have demonstrated people exposed to stressors other than mental illness are dying by suicide and this is, at least sometimes, in the absence of any diagnosed mental illness. Additionally, even within the population who have a diagnosed mental illness, these individuals are not a homogenous group and the pathways or life trajectories to suicide are complex and varied. Mental illness is a risk factor for suicide, so ignoring psychiatric interventions to prevent suicide would be negligent. However, the same can be said for ignoring psychological and social interventions.

Thesis including published works declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes three original papers published in peer reviewed journals and one submitted publication that is at the revisions stage of submission. The core theme of the thesis is suicide prevention. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the student, working within the Monash University Accident Research Centre under the supervision of Associate Professor Stuart Newstead.

The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.

In the case of chapters 7-10 my contribution to the work involved the following:

Thesis Chapter	Publication Title	Status	Nature and % of student contribution	Co-author name(s) Nature and % of Co-author's contribution*	Co-author(s), Monash student Y/N*
7	Differences in Characteristics and Exposure to Stressors between Persons with and without Diagnosed Mental Illness Who Died by Suicide in Victoria, Australia	Published	Concept, collecting data, analysis of data and writing manuscript 70%	S Newstead: input into manuscript 15% L Bugeja: input into manuscript 5% J Pirkis: input into manuscript 10%	No
8	Identifying Typologies of Persons Who Died by Suicide: Characterizing Suicide in Victoria, Australia	Published	Concept, collecting data, analysis of data and writing manuscript 70%	L Bugeja: input into manuscript 10% S Newstead: input into manuscript 10% J Pirkis: input into manuscript 10%	No
9	Relative risk of suicide following exposure to recent stressors, Victoria, Australia	Published	Concept, collecting data, analysis of data and writing manuscript 70%	S Newstead: input into analysis and manuscript 15% L Bugeja: input into manuscript 5% J Pirkis: input into manuscript 10%	No
10	Pathways to Suicide among Persons with a diagnosed mental illness, Victoria, Australia	Revision 1 submitted	Concept, collecting data, analysis of data and writing manuscript 70%	S Newstead: input into manuscript 10% L Bugeja: input into manuscript 5% C Frew: Data analysis, input into manuscript 5% J Pirkis: input into manuscript 10%	No

I have renumbered the pages of the submitted and published papers in order to generate a consistent presentation within the thesis. However, references have not been renumbered and are presented as they appear in the published works.

Student signature: Date: 6/03/2019

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. In instances where I am not the responsible author I have consulted with the responsible author to agree on the respective contributions of the authors.

Main Supervisor signature: **Date:** 6/03/2019

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To all who were involved in the conception and design of the Victorian Suicide Register and to the Coroners Court of Victoria, Australia. This research would not have been possible had it not been for the establishment of the Victorian Suicide Register. I am grateful that I was granted access to this rich and powerful data source and wish to thank the staff of the Coroners Prevention Unit for their critical contributions in collecting the data. Thank you in particular to Ciara Miller for her support during the early months of this PhD when I was coding cases into the Victorian Suicide Register and to Jeremy Dwyer for reading manuscripts prior to submission for publication.

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ABBREVIATIONS AND ACRONYMS

ABS	Australian Bureau of Statistics
CALD	Culturally and Linguistically Diverse
CCOV	Coroners Court of Victoria
COD	Cause of Death
CPU	Coroners Prevention Unit
DSM	Diagnostic and Statistical Manual of Mental Disorders
GSS	General Social Survey
ICD	International Classification of Diseases
IMVM	Integrated Motivational-Volitional Model
IPTS	Interpersonal Theory of Suicide
NCIS	National Coronial Information System
NVDRS	National Violent Death Reporting System
PA	Psychological autopsy
QSR	Queensland Suicide Register
RADL	Remote Access Data Laboratory
TSR	Tasmanian Suicide Register
VSR	Victorian Suicide Register
WHO	World Health Organization
WHS	World Health Statistics

Chapter 1: Introduction

1.1 Background and context

According to the World Health Organization (WHO), suicide is defined as "the act of deliberately killing oneself" [1]. Suicide is a major public health concern globally, with an estimated 804,000 suicides occurring worldwide in 2012 [1]. National statistics show that during 2016, at least 2,866 Australians died by suicide which equates to a national rate of 11.7 deaths per 100,000 population [2].

Suicide is a complex behaviour and as such the triggers or causes of suicide are also complicated. It is likely that most people who end their life do so for a number of reasons and as a result of a combination of factors potentially including financial, social, cultural and mental health issues. The major, albeit obvious, obstacle to better understanding why one takes their own life is that the deceased cannot be interviewed regarding the reasons for the suicide.

In a review of risk factors for suicide, some factors found to be associated with suicide included: mental illness; physical illness; previous suicide attempts; social isolation; unemployment; family conflict; family history of suicide; impulsivity; incarceration; hopelessness; serotonergic dysfunction; childhood abuse; previous exposure to suicide; homelessness; and combat exposure [3].

Psychiatric factors such as mental illness, can be thought of as distal risk factors, meaning they represent the foundation on which suicidal behaviour is built and therefore make an individual more vulnerable to suicide [4]. In addition, psychiatric factors can also be proximal whereby mental illness can act as a trigger for suicide [5]. The association between mental illness and suicide is one of the most researched topics in suicide research, with a significant body of research finding that mental illness is a major factor associated with suicide [6-9]. In fact, an often-quoted statistic in the research literature is that 90% of people who died by suicide had a mental illness. Most of the evidence for this 90% statistic has come from studies based on psychological autopsies (PA) whereby mental illness diagnosis is assigned to the deceased by means of interviewing one or more individuals bereaved after the suicide [10]. From this information, an assessment is often then made of the deceased's mental health (including assigning diagnoses of mental illness following the death), physical health, personality, experience of social adversity and social integration [8]. Reviews of PA studies, while recognising limitations with the method, have generally concluded it is a valid method of study and that associated methodological issues are only minor ones and readily correctable [6, 8, 11]. However, there have been some longstanding concerns regarding the method leading

some researchers to state that PA studies are flawed theoretically, methodologically, and analytically – especially when it comes to the retrospective diagnosis of a mental illness following a person's death [10, 12-14].

Importantly, in addition to findings from PA studies, there have been population-based studies using different methods which have consistently found mental illness to increase the risk of suicide [15-21]. Mishara and Chagnon [22] posited six models of the association between mental illness and suicide, some of which assign a direct causal link between mental illness and suicide and some of which do not. The first of the models posits that suicide and mental illness have the same common determinants. That is, the same factors that increase suicide risk are also factors associated with developing a mental illness. The second model suggests the association exists because factors associated with a greater suicide risk may lead either to suicidal behaviours or to mental illness (i.e., the mental illness may be an alternative outcome to suicide). For example, one might drink alcohol excessively (and eventually develop a substance use disorder) as a way of trying to avoid or diminish suicidal ideation. In the third model, suicide is seen as the direct consequence of the mental illness due to symptoms of mental illness being the key factor in the development of suicidal behaviours. The fourth model suggests it is the consequences of living with a mental illness such as stigma, hopelessness or underemployment that can result in suicide rather than simply the mental illness in and of itself. The fifth model proposes that people living with mental illness may be more likely to experience crisis situations (in addition to the other potential consequences of living with mental disorders), which can then lead to suicide. The final model suggests that suicide results from treatment for mental illness rather than the mental illness itself. The suicide is considered to be iatrogenic, or related to either inadequate, inappropriate or incomplete treatment.

Previous research in Victoria using data from suicide registers or coronial data sources, rather than psychological autopsy studies, has established that approximately half of Victorians who died by suicide had a diagnosed mental illness at the time of their death [23, 24]. The main reason for the discrepancy between these studies and previous PA studies is that researchers have not diagnosed or presumed mental illness in a person after their death. Many stressors such as interpersonal, personal and contextual/situational stressors, have also been found to be highly prevalent in Victorian suicides [23, 24]. There is general acknowledgement that psychosocial stressors must also be considered as determinants of suicide [25, 26]. In fact, highly influential early research on the topic of suicide such as Durkheim's "The Study of Suicide" [27] as well as more contemporary theories of suicide—such as Joiner's "Interpersonal Theory of Suicide"[28] and O'Connor's "Integrated Motivational-Volitional Model of Suicidal Behavior" [29]—while acknowledging the importance of mental illness, also emphasise these

life stressors and social context in influencing suicidal behaviour. Psychosocial factors shown to be associated with suicide include: interpersonal loss; conflict or rejection; loss of employment; economic problems; incarceration or legal problems; and physical illness [30-32].

Although suicide has a number of possible underlying causes, importantly it is recognised as being preventable. Research shows people contemplating suicide are often ambivalent, and they have often been in recent contact with health services [1]. The fact that studies have shown the vast majority of people who survive a suicide attempt live many more years and eventually die by causes other than suicide [33, 34] is also evidence of preventability. The public health intervention of reducing access to means has been found to reduce suicide [35-37] and recent research suggests the evidence for encouraging help-seeking and increasing the likelihood of intervention by a third party is also promising [35]. There is also some evidence that adequate prevention and treatment of mental disorders can reduce suicide rates [38].

The importance of studying suicide is clear, it is a leading cause of death in Australia and although a complex problem, it is preventable. An important component of preventing suicide is to be able to predict potential suicidal behaviour through understanding risk factors for suicide and the prevalence of risk factors both individually and in combination. Although suicide is a leading cause of death, it is also relatively rare, with fewer than 12 in 100,000 Australian's dying by suicide in 2016 [2]. Despite suicide being a rare act, if a better understanding of the risk factors, including proximal stressors and triggers for suicide, as well as how they potentially interact with underlying vulnerabilities such as mental illness can be gained, it follows that it will be possible to better predict who might be at risk of suicide and prevention strategies put in place.

1.2 Thesis aims and structure

The aim of this thesis was to investigate the presence and nature of mental illness among individuals who died by suicide in the Australian state of Victoria and to explore the pathways to suicide in this same population. The research aimed to extend on previous knowledge regarding the association between mental illness and suicide by examining this association in the Victorian population and in the context of other previously identified distal and proximal factors and stressors associated with suicide.

Four studies were conducted to address these stated aims and each was written up as a journal article for publication. The main data source was the Victorian Suicide Register (VSR) which has not previously been used to examine these questions making the findings of the four thesis studies novel in the Victorian context. Study 1 (Chapter 7) used the VSR data to examine the proportion of people who die by suicide in Victoria that have a diagnosed mental

illness at the time of death and compared those cases to those without diagnosed mental illness. Study 2 (Chapter 8) extended the findings of Study 1 by investigating how the factors and stressors examined in that study clustered together in those who died by suicide in Victoria. Study 3 (Chapter 9) compared the prevalence of a range of factors in the Victorian suicide data to the prevalence of the same factors in a representative population survey to determine whether mental illness and other previously identified stressors/triggers were risk factors in the Victorian context in the sense that the factor is over represented in people who die by suicide. Finally, Study 4 (Chapter 10) again used VSR data but was qualitative in nature, examining the pathways to suicide among a sample of Victorians who had a diagnosed mental illness at the time of their death using a life chart method.

The remainder of the thesis comprises introductory chapters (Chapters 2-5) which examine the epidemiology of suicide, major research approaches in suicide research, and risk factors for, and theories of, suicide. Chapter 6 provides a conceptual and methodological overview of the four studies and provides detailed aims and research questions. At the time of thesis submission, three of the papers have been published, and a first revision has been submitted for the final paper. The thesis concludes with a discussion chapter (Chapter 11) that provides a synthesis of the main results from the different studies and discusses the implications and recommendations of these findings for prevention and future research.

Chapter 2: Epidemiology of suicide

This chapter provides an overview of the epidemiology of suicide internationally and in Australia in order to define the context to which the research in this thesis applies.

2.1 Suicide globally

Globally, an estimated 804,000 deaths per annum are attributed to suicide and suicide is estimated to account for almost three-quarters of violent deaths among females and half of all violent deaths among males [1] . The World Health Organization (WHO) produces the World Health Statistics (WHS) 2017 [39] which bring together available data on health-related indicators, including suicide. The following overview of global suicide rates for the calendar year 2016 utilises data sourced from the WHS 2017.

Figure 1 shows crude suicide rates per 100,000 residents by WHO region. Rates were highest in Europe and South East Asia and lowest in the Eastern Mediterranean region.

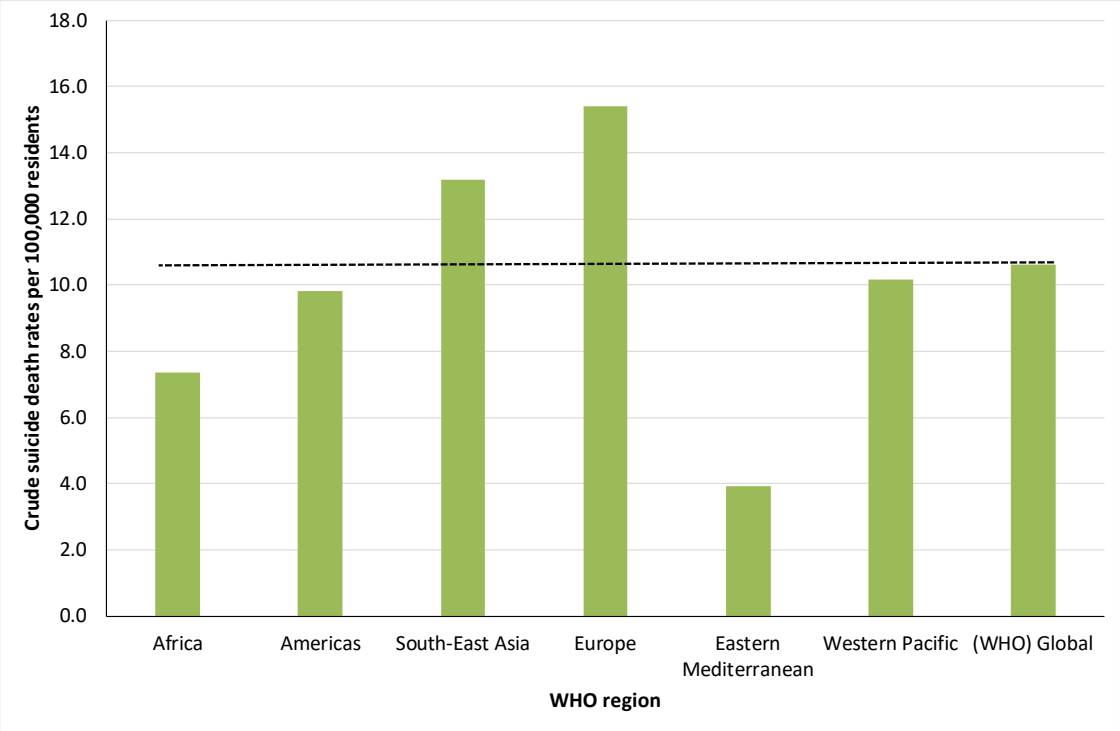


Figure 1 Crude suicide rates by World Health Organization region, 2016

Table 1 shows sex-specific suicide rates for the 50 countries with the highest rates of suicide.

Table 1 Crude suicide rates per 100,000 ppopulation for 50 countries with the highest rates, by sex, 2016

RANK	Males		Females		All	
	Country	**Rate**	**Country**	**Rate**	**Country**	**Rate**
1	Lithuania	58.1	Lesotho	24.4	Lithuania	31.9
2	Russian Federation	55.9	Republic of Korea	15.4	Russian Federation	31.0
3	Belarus	46.9	India	14.7	Guyana	29.2
4	Guyana	43.7	Guyana	14.4	Republic of Korea	26.9
5	Ukraine	41.1	Belgium	13.8	Belarus	26.2
6	Republic of Korea	38.4	Switzerland	12.4	Suriname	22.8
7	Kazakhstan	38.3	France	11.7	Kazakhstan	22.5
8	Latvia	37.6	Japan	11.4	Ukraine	22.4
9	Suriname	34.7	Suriname	10.9	Lesotho	21.2
10	Estonia	30.6	Sweden	10.5	Latvia	21.2
11	Slovenia	30.4	China	10.3	Belgium	20.7
12	Hungary	29.7	Hungary	9.6	Hungary	19.1
13	Uruguay	29.2	Myanmar	9.5	Slovenia	18.6
14	Poland	28.9	Lithuania	9.5	Japan	18.5
15	Republic of Moldova	27.9	Russian Federation	9.4	Uruguay	18.4
16	Belgium	27.8	Nigeria	9.2	Estonia	17.8
17	Japan	26.0	Uganda	9.1	France	17.7
18	Croatia	25.6	Netherlands	9.0	Switzerland	17.2
19	El Salvador	24.2	Bolivia	8.6	Croatia	16.5
20	Kiribati	24.1	Bhutan	8.5	Equatorial Guinea	16.4
21	Austria	23.9	DPR of Korea	8.5	India	16.3
22	Finland	23.9	Norway	8.4	Poland	16.2
23	France	23.9	Côte d'Ivoire	8.3	Finland	15.9
24	USA	23.6	Uruguay	8.3	Republic of Moldova	15.9
25	Equatorial Guinea	23.5	Luxembourg	8.3	Austria	15.6
26	Sri Lanka	23.5	Belarus	8.2	Serbia	15.6
27	Serbia	23.5	Denmark	8.2	USA	15.3
28	Thailand	23.4	Sierra Leone	8.1	Sweden	14.8
29	Trinidad and Tobago	23.0	Finland	8.1	Sri Lanka	14.6
30	Slovakia	22.7	Serbia	8.1	Côte d'Ivoire	14.5
31	Mongolia	22.6	Nepal	7.9	Thailand	14.4
32	Iceland	22.3	Croatia	7.9	Kiribati	14.4
33	Portugal	22.2	Equatorial Guinea	7.7	Iceland	14.0
34	Cuba	22.1	Austria	7.7	Portugal	14.0
35	Switzerland	22.0	Germany	7.7	Cuba	13.9
36	Czechia	21.4	Kazakhstan	7.6	El Salvador	13.7
37	Côte d'Ivoire	20.6	Swaziland	7.5	Trinidad and Tobago	13.6
38	Germany	19.7	Cameroon	7.4	Germany	13.6
39	Swaziland	19.5	Chad	7.4	Luxembourg	13.5
40	**Australia**	**19.5**	Latvia	7.3	Swaziland	13.3
41	Nicaragua	19.3	USA	7.2	**Australia**	**13.2**
42	Sweden	19.1	Canada	7.0	Czechia	13.1
43	South Africa	18.7	Bangladesh	7.0	Mongolia	13.0
44	Luxembourg	18.6	**Australia**	**7.0**	Denmark	12.8
45	Ireland	18.5	Slovenia	6.9	Slovakia	12.8
46	Bulgaria	18.2	Liberia	6.6	Netherlands	12.6
47	Canada	18.1	Estonia	6.6	Canada	12.5
48	Romania	17.9	New Zealand	6.6	Cameroon	12.2
49	New Zealand	17.9	Haiti	6.5	Bolivia	12.2
50	Lesotho	17.8	Paraguay	6.5	Nicaragua	12.2
-	**(WHO) Global**	**13.5**	**(WHO) Global**	**7.7**	**(WHO) Global**	**10.6**

The five countries with the highest overall rates are Lithuania, Russian Federation, Guyana, Republic of Korea and Belarus. Guyana is the only country to rank among the countries with the five highest suicide rates overall (3rd), and for both males (4th) and females (4th). Australia has the 40th highest ranked suicide rate per 100,000 residents for male suicide, the 44th for

females and the 41st overall. Although some of the variation in rates seen in Table 1 is likely to be genuine, care should still be taken when comparing rates across different countries due to differences in case ascertainment and data availability [1, 40, 41].

2.2 Suicide in Australia

The following overview of suicide in Australia and Victoria utilises published Australian Bureau of Statistics (ABS) data for the period 2007-2016 [2]. The ABS is Australia's national statistical agency.

2.2.1 Coding of suicide in Australia

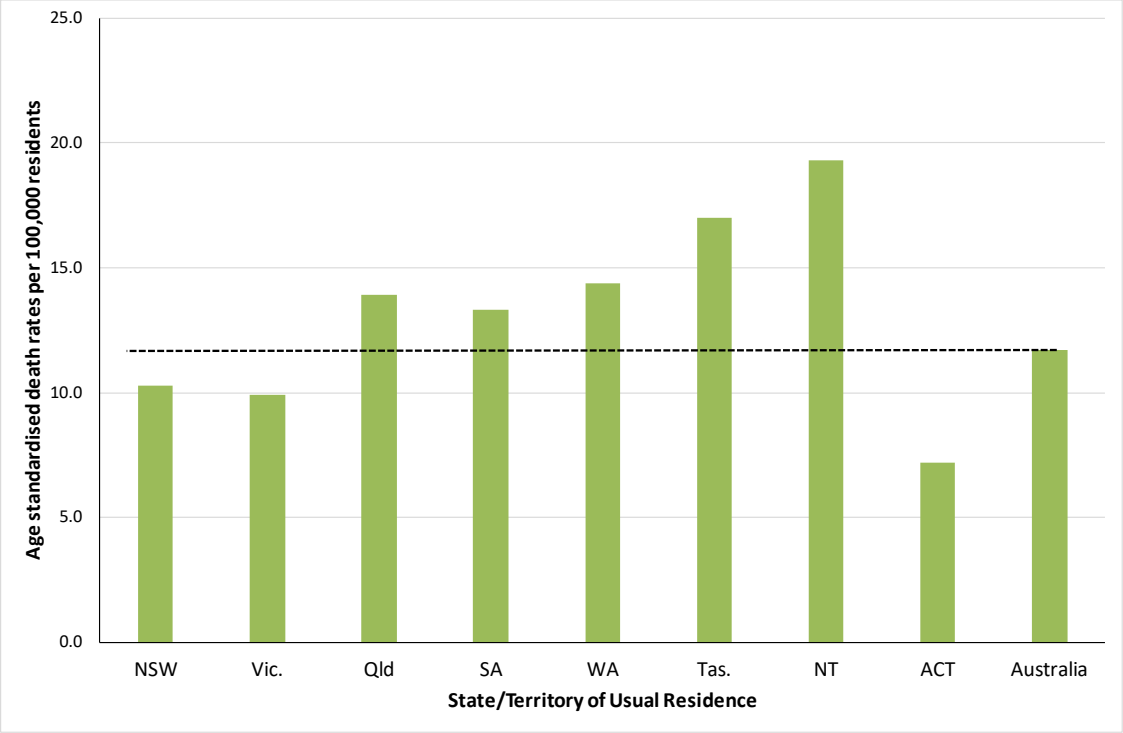
Across Australia, many parties are involved in the processes of death investigation, certification and data collection [42]. These include police, state and territory registries, coroners, forensic medical and scientific staff, the National Coroners Information System (NCIS) and the ABS. Coroners in Australia are required to investigate all "reportable deaths" but there are significant differences between Coroners Acts across state and territories that impact the determination of suicide. For example, the South Australia Coroners Act only permits a finding as to the cause, not circumstances, of a death if an inquest has not taken place, whereas other Australian statutes require coroners to determine "how" the person died regardless of whether an inquest has taken place [42].

Two initiatives introduced by the ABS in 2007 have improved the coding of suicides and addressed some known data quality issues such as the potential for underreporting and discrepancies between different states and territories [43-48]. The main way data quality has been improved is by the introduction of a revision process for coroner-certified deaths [42, 49]. This process is undertaken to improve the coding of cause of death for coroner-certified deaths as additional information becomes available. As a result of this process, data are deemed preliminary when first published, revised when published the following year and final when published after a second year [2]. In addition, new coding guidelines introduced in 2007 enable ABS staff to code deaths to suicide if evidence indicates the death was from intentional self-harm but the coroner had not made an explicit determination of intent. Previously, coding rules required a coroner to determine a death as intentional self-harm for it to be coded to suicide by the ABS [42].

2.2.2 Epidemiology of suicide in Australia

The latest ABS statistics show that during 2016, at least 2,866 Australians died by suicide, with 66.3% of deaths occurring among those aged 20-54 years (n=1,899). Across Australia in 2016, the highest number of suicides occurred in New South Wales (n=805), followed by

Queensland (n=674) and Victoria (n=624). Figure 2 shows age-standardised suicide rates, by state and territory of usual residence for the 2016 calendar year. Suicide rates for residents of New South Wales, Victoria and the Australian Capital Territory were lower than the national rate of 11.7 deaths per 100,000 population[1]. Rates for residents of all other jurisdictions were higher than the national rate. The highest jurisdiction-specific rate was for residents of the Northern Territory: 19.3 suicides per 100,000 population.



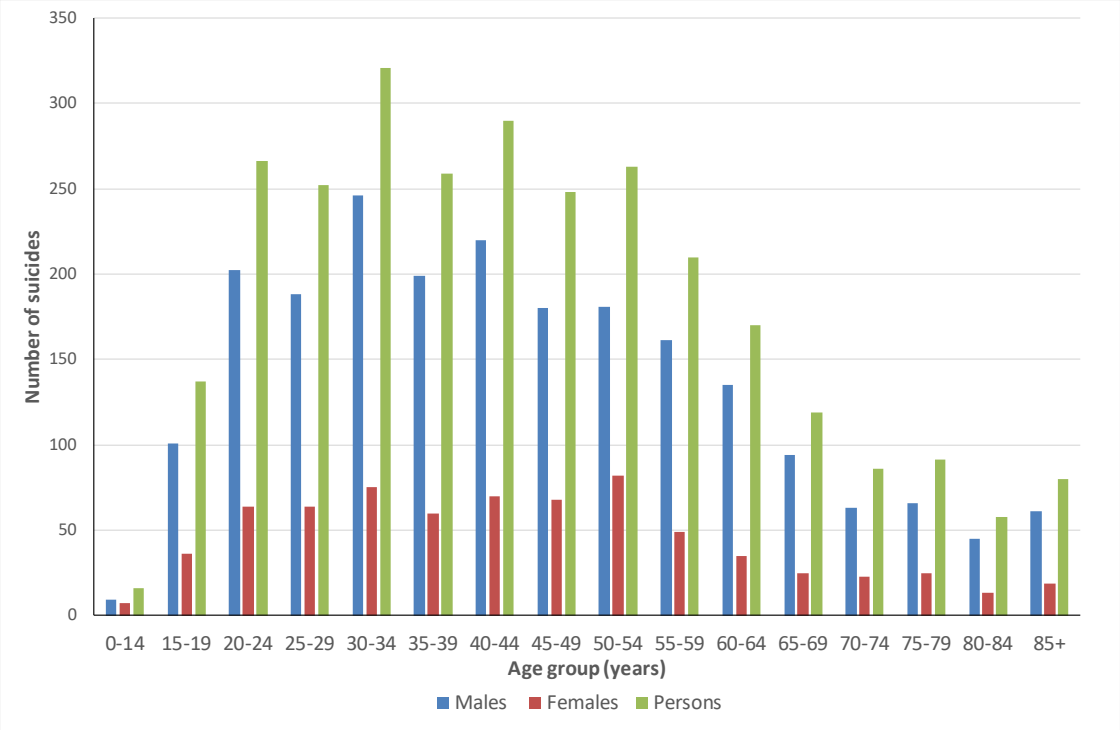
Note: 2016 data is preliminary.

Figure 2 Age standardised suicide rates, by state and territory of residence, Australia 2016

Figure 3 shows the number of suicides for Australia during 2016, by age group and sex. Males accounted for the majority of suicides (n=2,151, 75.1%) and accounted for more suicides than females in all specific age groups. The highest numbers of suicides occurred among males aged 30-34 years (n=246, 8.6%).

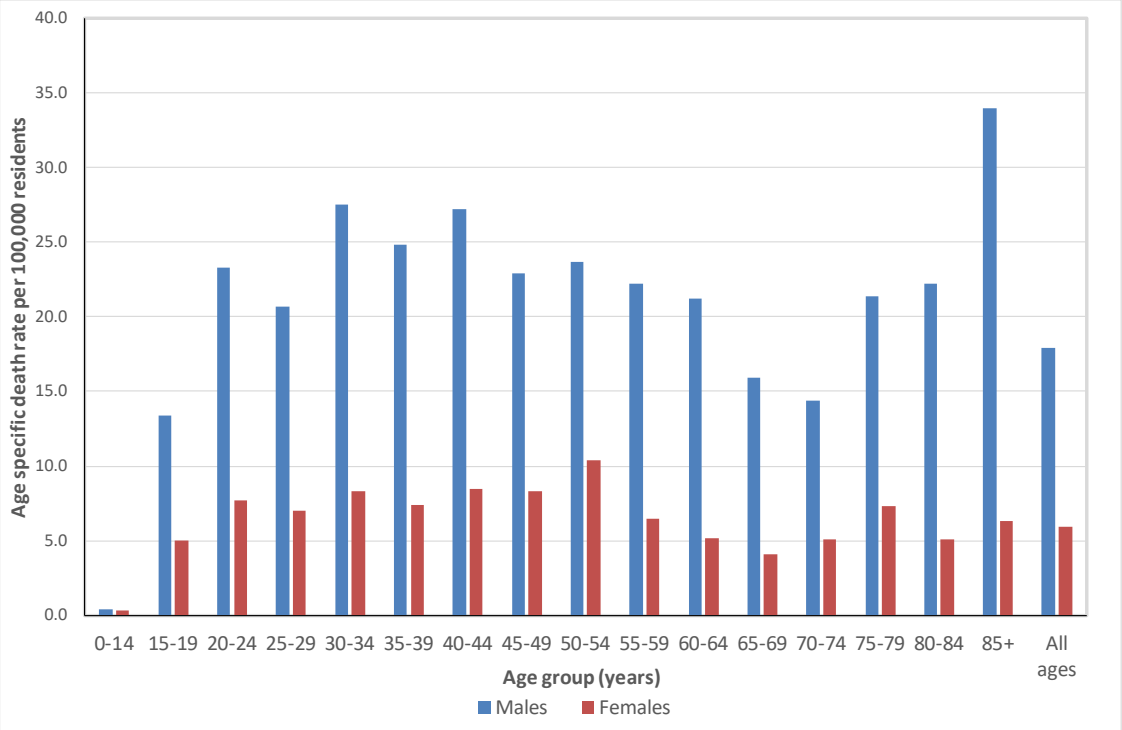
Figure 4 shows age-specific suicide rates, by sex, for Australia during 2016. Higher rates of suicide were recorded for males than for females in all age groups. Male rates were highest among those aged 85 years and over, whereas female rates were highest among those aged 50-54 years. Male rates were generally 3–5 times higher than female rates except among those aged 50-54 years (2.3 times) and among those aged younger than 15 years (1.3 times).

[1] This Australian suicide rate differs from the one presented in Section 2.1 because it is standardised to the Australian population whereas the other is a crude rate.



Note: 2016 data is preliminary.

Figure 3 Number of suicides, by age group and sex, Australia 2016

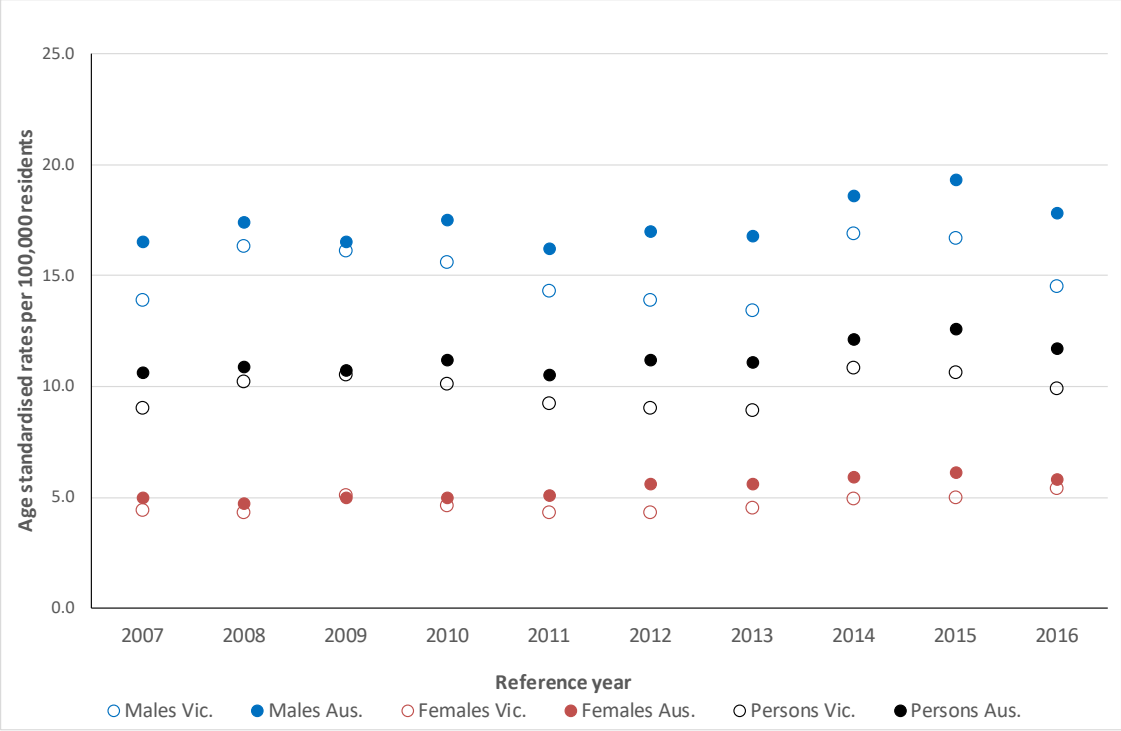


Note: 2016 data is preliminary.

Figure 4 Age-specific suicide rates, by sex, Australia 2016

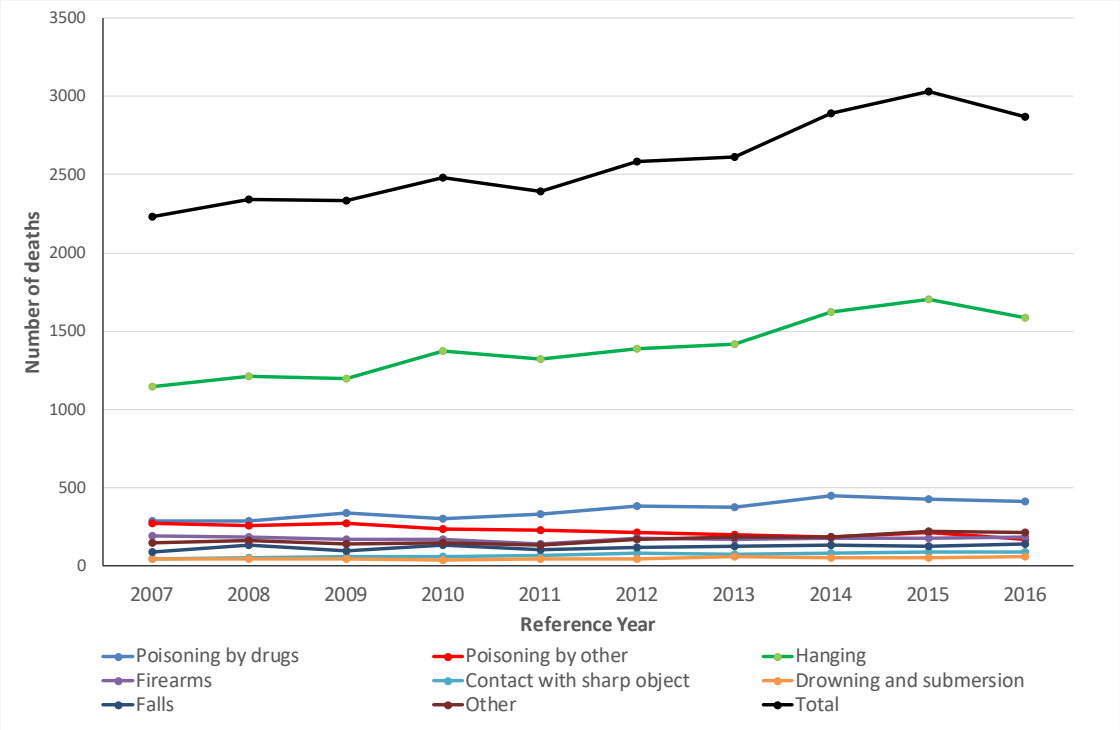
Figure 5 shows age standardised suicide rates per 100,000 population, by sex, for Australia and Victoria separately over the 10-year period 2007-2016. Victorian rates were generally slightly lower than Australian rates for all years of the period. Victorian rates generally followed the same trend over the 10-year period, peaking among males and females in 2015 before reducing slightly in 2016. All states and territories except South Australia reported a stable or increasing suicide rate from 2014 to 2015 [50] and recent research suggested the recorded increase was partly attributable to the rising suicide rate of indigenous children and younger adults [51].

Figure 6 shows hanging has been the leading method of suicide in Australia over the most recent ten-year period, 2007-2016. In 2016, hanging was the method used in more than half (55.2%) of all suicides. Poisoning by drugs was used in 14.3% of suicides, followed by firearms which accounted for 6.4% and poisoning by other methods including by alcohol and motor vehicle exhaust (6.1%). The remaining suicides included deaths from jumping from a high place (4.9%), contact with sharp object (3.3%) drowning (2.2%), and all other methods combined (7.6%).



Note: All causes of death data from 2006 onward are subject to a revisions process. Affected data in this figure are: 2007-2013 (final), 2014 (revised), 2015-2016 (preliminary).

Figure 5 Age standardised rate per 100,000 residents, Victoria and Australia 2007-2016



Note: All causes of death data from 2006 onward are subject to a revisions process. Affected data in this figure are: 2007-2013 (final), 2014 (revised), 2015-2016 (preliminary).

Figure 6 Number of suicides by methods of suicide over the 10-year period 2007-2016, Australia

2.3 Summary

Globally, more than 800,000 deaths per year are attributed to suicide, with around 3,000 of these occurring among Australians. Suicide is therefore a significant public health concern. When comparing across regions, suicide rates are highest in Europe, particularly in Lithuania, Russia and Belarus. Other countries with high suicide rates include Guyana and the Republic of Korea. Australian suicide rates, ranked 41st in the world, are largely comparable with those of other Western developed countries such as the United States, Canada, and New Zealand.

Currently almost 3,000 Australians die each year by suicide and males consistently account for approximately three-quarters of these deaths. Although Victoria accounts for the second highest number of suicides in Australia (n=624, 21.8% of Australian suicides), suicide rates for residents of Victoria are lower than the national rate. Hanging is the leading method of suicide in Australia, accounting for more than half of all suicides in 2016.

Chapter 3: Research approaches and methods in suicide research

Historically, researchers have used various methods to study characteristics of those who die by suicide and the potential risk factors associated with suicide. These include: analysis of national mortality statistics, psychological autopsies, review of information gathered through coronial investigations, research with suicide attempt survivors and studies of the content of suicide notes [52]. Two of these methods are examined in detail in this chapter as they are directly relevant to the thesis: psychological autopsy (PA) studies and reviews of coronial records (including registers created using coronial records).

3.1 Psychological autopsy

A PA is a common method of study in suicide research. It is essentially a retrospective study of a person who has died by suicide involving interviewing people who knew the deceased. The term "psychological autopsy" was coined by Edwin Shneidman who originally used the method to clarify the cause of death in cases where it was equivocal [53-55], however, this method has now become the prime approach in studying risk factors for suicide [10].

The PA method includes collecting all available information about the deceased via structured interviews of family members, relatives, friends, and health professionals in an attempt to reconstruct what the deceased may have been experiencing, thinking and feeling before the suicide [6, 10, 53]. From this information, an assessment is often then made of the deceased's mental health, physical health, personality, experience of social adversity and social integration [8].

It should be noted that the term ''psychological autopsy'' has sometimes been applied to studies using coronial/administrative records' data without direct interviews of relatives or friends of the deceased [8, 11]. However, when PA studies are referred to throughout this thesis the focus is those studies that include the use of research interviews with one or more proxy. An important component of PA studies is that they can involve the retrospective assessment of the presence of a mental illness following an individual's death. To do this, some PA studies have used standardised instruments but many have not [55]. Even in cases where standardised instruments have been used, importantly, most of these instruments have originally been applied to diagnosis of mental illness after speaking with a living person in whom the presence of a mental illness is being investigated. In the case of PA, these instruments clearly need to be revised to obtain the information from proxy informants [56].

Three reviews of PAs were completed in the late 1990s and early 2000s. Hawton, Appleby [11] and colleagues (1998) published a review of methodological issues associated with the PA approach. They concluded, that despite the methodological limitations inherent in the method it is still a valuable means of examining factors that contribute to suicide. Similarly, in 2001, Isometsä [6] undertook a review of 23 major PA studies concluding that overall the findings were highly consistent and provided an accumulating base of information concerning the factors related to suicide. A slightly later (2003) systematic review of 76 studies, again, concluded that PA findings were fairly homogeneous across studies [8]. Overall, the view of all these review authors was that the PA is a valid method that has few methodological issues or only minor ones that are readily correctable.

Another review was published in 2006 by Pouliot and De Leo [55] which detailed the presence of a number of methodological problems concerned with PA studies. The problems outlined included concerns regarding selection of control subjects, confounding influences of extraneous variables and the reliability of the assessment instruments used [55]. These authors concluded that despite their limitations, PA studies have contributed substantially to our understanding of suicide but emphasised that standardisation of PA procedures be reviewed.

More recently, some researchers have expressed longstanding concerns regarding the method. In recently published opinion pieces a number of researchers have made the claim that PA studies are flawed theoretically, methodologically, and analytically and the method leads to erroneous results and incorrect conclusions – especially when it comes to the retrospective diagnosis of a mental illness following a person's death [12, 13, 57].

The criticism stems from the fact that the method involves seeking information from third parties (i.e., family and friends) about the mental status of individuals following their death, which is seen by critics as inherently inaccurate and subject to bias [12-14]. Some argue that the methodological weaknesses of these studies are so severe that they undermine the reliability and validity of mental illness diagnoses because proxies simply cannot reliably answer many of the questions included in the standardised diagnostic instruments used (if standardised instruments are used) because the questions are actually exploring the informants' subjective opinions, feelings and experiences. They argue that the reason the results, particularly regarding the presence of mental illness among suicide decedents, are largely consistent is not because the method is accurate, but because each study that uses the method simply replicates the other flawed results. These authors feel so strongly regarding these flaws that they concluded PA studies "should now be abandoned" [10].

3.2 Coronial records

Another method for identifying factors associated with suicide is to use coronial information or purpose-built suicide registers/datasets based on information generated for the Coroner's investigation.

There are four main data sources in Australia which fall under this category: the National Coronial Information System (NCIS), and three purpose-built state-based suicide registers - the Victorian (VSR), Queensland (QSR) and Tasmania suicide registers (TSR) [58]. In addition the respective suicide prevention policy documents for New South Wales and the Northern Territory include actions to investigate the establishment of suicide registers [59, 60]. While the VSR was established in 2009 and published research using the VSR has only recently started to be published [61-63], research using the QSR dates back to 1990 [64]. The TSR has only just been implemented so no research using it has yet been published. Findings from research using the VSR and QSR, specifically in relation to mental illness as a risk factor for suicide will be outlined in Chapter 4.

Research based on coronial records have, what some would consider, the advantage of close consideration of relevant facts by a responsible person outside the medical system [13] and do not assign mental illness diagnoses after a person's death. For example, coders for the VSR only code a mental illness diagnosis if there is evidence that a medical or other mental health professional made a diagnosis prior to death – i.e., not because a family member or friends stated the person seemed 'depressed', or responded to a structured diagnostic type interview as is standard in many PA studies. An additional strength of research using coronial records is that, at least in most Western countries, Coroners must investigate all suspected suicides so it is likely that research based on these records represents the most accurate population of suicides available for analysis and not a sample of suicides as is common in PA studies.

Despite these strengths, there are also limitations with relying on coronial records as a primary source of information on factors related to suicide. The information available is limited to what is generated for the Coroner's investigation and as such it is not a wide ranging review of all possible information about the person [24]. For example, the absence of a factor in the coronial file does not guarantee that it was not present and, the presence of information does not necessarily mean it was contributory to the person's decision to die by suicide. Further to this, the volume of information varies between investigations depending on a number of factors including who was asked to provide information, what questions were asked and the willingness of individuals to disclose some or all of the information they had [24]. All the evidence provided in the coronial brief is not tested except when an Inquest is held and even

then, not all the evidence is tested, only factors the Coroner determines are within scope. In addition, for mental illness to be recognised as a factor in someone's death, datasets based on coronial information require a mental illness diagnosis to be made prior to death which is influenced by a range of factors, including accessibility of appropriate care and the diagnostic tools used in psychiatric examination in hospitals and other health care settings [65].

It should be noted that there is some cross-over between these methods as evidenced by the QSR which includes information gained in a PA. Specifically trained police officers administer a structured interview, usually to close proxies, and usually within 2–10 days from the discovery of the body if the case is suspected to be a suicide. The structured interview was developed by the Australian Institute for Suicide Research and Prevention in consultation with the Queensland Police Service and Coroners.[66] However, psychiatric diagnoses are not assigned post death.

3.3 Quantitative and qualitative research methods in suicidology

Much of the research published in suicidology, using the methods described here, has been quantitative. However, one of the leading suicide research journals, Archives of Suicide Research, published a special issue on "quantitative versus qualitative studies in suicidology" in 2002 where it was argued by a number of authors that both approaches were needed in the field of suicidology [67-69]. More recently, researchers have continued to argue for an increased focus on understanding suicidal behaviour by extending the use of qualitative methods which they believe is essential to the advancement of the discipline [70, 71]. Their view is that, like in many other areas of research, quantitative studies can provide a solid foundation for qualitative studies to then investigate factors in more depth, or to look at relationships between important factors, which would not be possible using quantitative methods [71]. Qualitative research may complement quantitative research by answering 'how' and 'why' questions, or findings from qualitative studies may inform the development of new quantitative studies [70]. As these same authors conclude, perhaps a combination of quantitative and qualitative methods is the most constructive approach.

Despite this push for increased qualitative studies, in the period following publication of the special issue on "quantitative versus qualitative studies in suicidology", research showed that less than 3% of the studies published in the three main international suicide journals had used qualitative methods [71].

3.4 Conclusion

This chapter outlined two approaches to studying risk factors related to suicide. It is apparent that the PA method of research has found largely consistent results across studies although methodological limitations of such studies have been outlined by both supporters and critics of the approach. The other approach is to use coronial records or purpose-built suicide registers to examine factors associated with suicide. In addition, there have been increasing calls for suicidology to embrace qualitative research to examine some factors related to suicide in more depth. The following chapter examines the findings of research using both these major approaches, with particular emphasis on research that examines mental illness as a risk factor for suicide.

Chapter 4: Risk factors for suicide and explanatory models of the association between mental illness and suicide

This chapter provides an overview of evidence from the existing literature regarding risk factors for suicide with a particular focus on mental illness. It also outlines some models that have been proposed to explain the strong association between mental illness and suicide.

4.1 Risk Factors for Suicide

The importance of examining risk factors in suicide research is that identified potential factors can be used in etiological models for why one might die by suicide [3] and knowledge of factors can practically inform the planning of suicide prevention programs. Consequently, considerable research has been undertaken to attempt to identify risk factors for suicide.

There is often a distinction made between distal and proximal risk factors in suicide prevention. Distal factors can be conceptualised as factors which imply an underlying vulnerability to suicide, while proximal factors can be seen as potential precipitants, or triggers, for suicide. A given distal factor's relationship to suicide is therefore indirect, in that the presence of the distal factor may be considered necessary, but not sufficient for suicide to occur, whereas, proximal risk factors are usually more closely related temporally to the suicidal event itself, acting as precipitants for the suicide [72]. This distinction between distal and proximal risk factors is important when planning prevention programs because effective programs are likely to differ depending on the nature or category of the specific risk factors that are targets of the prevention program. Another useful grouping of risk factors is to conceptualise them as psychiatric, biological, familial and situational [4], therefore they are seen as occurring in different but related (and not mutually exclusive) domains. Biological factors, such as serotonergic dysfunction, are outside the scope of this thesis so will not be discussed further.

Mental illness (a psychiatric factor), including substance abuse, is considered to be a strong risk factor for suicide [7, 26, 73-76] and has been conceptualised as both a distal [4] and a proximal risk factor [4] as have previous suicide attempts [77, 78]. Similarly, familial factors that could be considered both distal and proximal risk factors for suicide include family violence [79, 80], child abuse [81, 82] and family history of suicide [83]. Proximal risk factors are often situational factors such as relationship separation [84, 85], family conflict [3], unemployment [3] physical illness [17] and social isolation [77, 86]. Importantly, situational risk factors are likely to differ with age, gender and other sociodemographic factors [4].

4.1.1 Mental illness

"Mental illness" typically refers to a "clinically diagnosable illness that significantly interferes with an individual's cognitive, emotional or social abilities" [87]. The diagnosis of mental illness is generally made according to the classification systems of the Diagnostic and Statistical Manual of Mental Disorders (DSM) or the International Classification of Diseases (ICD). Findings from a nationally representative survey suggest 20% of Australians aged 16-85 experience a mental illness in any year and that 45% of Australians will experience a mental illness in their lifetime [88]. Throughout this thesis when the term mental illness/mental disorder or psychiatric condition is used, a clinically diagnosable illness is being referenced. This is different to a "mental health problem" which is defined as: "diminished cognitive, emotional or social abilities but not to the extent that the criteria for a mental illness are met" [87].

The association between mental illness and suicide is one of the most researched topics in suicidology [22], with a significant body of research finding that mental illness is a major factor associated with suicide [6-9]. An often-quoted statistic in the literature is that 90% of people who die by suicide have a mental illness. The approaches to suicide research previously outlined in Chapter 3, namely, PA studies and investigations of coronial records, have both been used to study the presence of mental illness among individuals who have died by suicide and as the following sections detail, depending on which method is employed (and even within methods) - results vary.

4.1.1.1 Findings from psychological autopsy (PA) studies

Early PA studies were remarkably consistent in their findings regarding the prevalence of mental illness among people who died by suicide. A US study published in 1959 determined that 94% of the 134 people who died by suicide in the City of St. Louis over a 12-month period were considered to be "psychiatrically ill". With regards to specific conditions, more than two-thirds were considered to have either "manic-depressive disease" or "chronic alcoholism" [89]. In 1960 Dorpat and Ripley [90] determined that of their sample of suicides that occurred in Seattle, "not one patient was found to have been without psychiatric illness" and that symptoms of depression were found in every case where adequate information was available. However, they also noted that no psychiatric information was available in six of the total sample of 114 cases studied. In the UK in 1974, Barraclough, Bunch [74] and colleagues determined that ninety-three of the 100 suicides they studied were "mentally ill" and the most common illnesses were "depressive illness" and "alcoholism".

Over the next few decades many PA studies were published and a comprehensive review of these studies was published by Isometsä [6] in 2001 which examined the methods and some

relevant findings from these studies. Overall, although the findings were not focused only on the association between mental illness and suicide, the author made the strong conclusion that more than 20 major projects they reviewed "documented that with rare exceptions, the presence of a mental illness is a necessary, although not a sufficient condition for a completed suicide to occur" [6]. Further to this, the two most prevalent categories of mental illness among suicides were mood disorders and substance use disorders. Major depression was determined to be the most important single mental illness related to suicide risk [6].

Around the same time, Bertolote and Fleischmann [7] undertook a systematic review of PA studies reporting diagnoses of mental illness among those who had died by suicide. In all the examined studies, psychiatric diagnoses were established retrospectively. The review included 31 papers published between 1959 and 2001 worldwide, which in total encompassed data on 15,629 suicides. Papers focusing only on specific age groups, such as young people or the elderly, or only on specific illnesses such as depression or schizophrenia, were excluded and all diagnoses of mental illness were made on the basis of either of the two leading international classification systems (the ICD and the DSM) and converted to general categories common to both systems. The overall results showed that 98% of people who died by suicide had a diagnosable mental illness. When split by whether the study included cases from the psychiatric population or the general population, the proportion of cases considered not to have a mental illness was 0.1% and 3.2% respectively [7].

In 2003, 76 PA studies of people who died by suicide were included in a systematic review; 54 case series and 22 case-control studies [8]. The median proportion of cases with mental illness was 91% in the case series studies and in the case-control studies the figure was 90% in the cases and 27% in the controls. Depression accounted for the majority of the cases of mental illness in the case series [8].

A revisiting of the Bertolote and Fleischmann [7] review, again examined the proportion of suicide cases with psychiatric diagnosis but among the general population studies they also looked at whether one or multiple diagnoses were allowed [73]. When restricted to studies of suicide in the general population the no mental illness diagnosis group accounted for 12.0% of cases among main diagnosis only and 1.6% of cases among those with multiple diagnoses provided. For the psychiatric populations studied, mood disorders accounted for the highest proportion (30.2%) of all established mental illness diagnoses and in the general population mood disorders were again most common, accounting for 44.4% (one diagnosis only) and 34.3% (multiple diagnoses) of cases, respectively. The most common pattern of comorbidity was mood disorders in combination with substance-related disorders.

Since the large review studies published in the early 2000s [6-8] there have been a number of Australian studies published using the PA method but they have focussed on specific populations such as people who had been in contact with a health professional preceding their death [91, 92]; middle aged and older adults [93-95] or lesbian, gay, bisexual, transgender, and intersex (LGBTI) individuals [96] and as such are out of the scope of this discussion. However, one Victorian study published in 2000, that was not included in the mentioned reviews, was a study of suicides occurring between 1992 and 1996 in Ballarat, Victoria [97]. Information was obtained on socio-demographic variables, method and circumstances of suicide, and associated psychiatric illnesses in each case and subjected to PA (meaning that, where relevant, a mental illness diagnoses was arrived at retrospectively using the available information). Seventy-five cases of suicide were included and after PA, the authors concluded 60% were determined to have a psychiatric illnesses - mainly affective disorders (41%) [97].

It is important to note that 80% of the total cases included in the influential early reviews [7, 73] came from studies conducted in just three countries – Denmark, the United Kingdom and the United States of America. Due to issues specific to local contexts, it is quite possible that a different diagnostic distribution could be found in other countries or regions [7]. In fact a national case-control PA study in China, found that 63% of cases met the criteria of a psychiatric illness at time of death [98]. A more recent PA study from China found an even lower proportion of cases with current mental illness (48%)[99]. However, this study included young rural people only and just five categories of DSM-IV mental disorders (mood disorders, schizophrenia and other psychotic disorders, substance use disorders, anxiety disorders, and other axis I disorders). A recent meta-regression analysis was conducted to identify the potential effects of geographical regions on the PA determined prevalence of mental illness in people who had died by suicide. Studies from East Asia had a significantly lower mean prevalence (69.6%) than those in North America (88.2%) and South Asia (90.4%). The authors suggested the link between the risk factors and suicide in the absence of a mental disorder should be examined in different geographical and sociocultural contexts.[100]

A recent study by Milner, Sveticic [65] and colleagues reviewed international PA research on suicides occurring in the absence of psychiatric conditions and found that between 5.5% and 66.7% of suicides occurred in the apparent absence of Axis I conditions (Axis I includes all categories except mental retardation and personality disorder). The authors concluded that variation in the proportion of suicide cases without a psychiatric condition may reflect methodological and design-related differences between studies and cultural specificities in the conceptualization and diagnosis of mental disorder [65].

In many of the early PA studies in particular, suicide appears to be researched with respect to a medical model whereby suicide is conceptualised as a consequence of biologically based alteration of the brain i.e., mental illness [55]. However, there are some problems with using this model as the starting point for suicide research. Most people with a mental illness do not die by suicide and although common in those who die by suicide, mental illness in and of itself does not appear to be a sufficient condition for suicide to occur. In addition, the proportion of suicides with a diagnosable mental illness appears to differ depending on geographical and cultural contexts suggesting mental illness makes different contributions to suicide across different populations [101]. Due to the focus on mental illness and the medical model when conducting these studies, there has been a high emphasis of identification and treatment of psychiatric disorders as the main suicide prevention effort [102].

4.1.1.2 Findings from coronial reports or purpose-built suicide registers

The other method for identifying the prevalence of mental illness amongst those who die by suicide is to use coronial reports, or purpose-built suicide registers based on information gathered for coronial investigation.

As described in 3.2, there are currently three suicide registers in Australia - the Queensland Suicide Register (QSR), the Victorian Suicide Register (VSR) and the newly established Tasmanian Suicide Register (TSR). It is important to note that the QSR, established in 1990, includes a form called the "Report to the Coroner by Police Officer in the Event of a Possible Suicide" which involves a structured interview. These questionnaires are completed by specifically trained Police Officers, and usually involve close proxies. Although this is sometimes referred to as a Psychological Autopsy Report in published literature which uses the QSR as a data source (for example in De Leo and Klieve [66]) the results from studies using the QSR will be reviewed as being based on coronial information unless the research specifically states that a formal PA took place (for example after using the QSR to identify cases).

Many of the studies conducted using the QSR have focused on specific populations—such as farmers [103, 104]; medical doctors and nurses [105]; building industry workers [106]; indigenous adults or children [107-109]; people who have a diagnosis of schizophrenia [66]; or suicides occurring using a specific method [110]. For this reason, these studies are out of the scope of this review. However, a recent study using the QSR provided an updated profile of all suicide cases of Queensland residents between 2002 and 2011. A total of 5,752 suicides (77% male and 23% female) were included and 49% of the cases had a diagnosis of at least one psychiatric illness. Unipolar depression was the most frequent diagnosis (35%) followed by

psychotic disorders (6.8%), substance use disorders (5.4%), anxiety disorders (4.9%), bipolar depression (4.5%) and personality disorders (1.4%) [111].

Consistent with findings from these studies, a recently published report using the VSR [24]– a purpose-built database based on coronial information – again found the proportion of those who die by suicide that have a diagnosed mental illness appears to be much lower than previously reported in PA studies. The study, which had the focus of examining health service use and contact pathways among those who had died by suicide in Victoria, found 56% of those who died by suicide during 2009 and 2010 had a diagnosed mental illness (51% of males and 69% of females).

The National Coronial Information System (NCIS) is a national internet-based data storage and retrieval system for Australian coronial cases and as such includes information on all reportable deaths to Australian Coroners. NCIS data has been used in two recent Australian studies mentioned thus far, but for the purpose of identifying 'sudden death controls' to be used with QSR cases [103] or for cross checking of records [111]. However, there has been one published Victorian study using the NCIS as the main data source, which examined the role of psychosocial factors, physical and mental health in suicide. Results showed less than half of those who died had a diagnosis of mental illness (44%; 64% of women and 37% of men) or were currently receiving treatment for mental health problems at the time of death (42%; 61% of women and 37% of men) [23].

A similar data source to the NCIS exists in the United States. The National Vital Statistics System (NVDRS) aggregates data from death certificates, coroner/medical examiner reports (including toxicology), and law enforcement reports. A 2018 NVDRS study[112] of more than 20,000 suicides found less than half (46.0%) of suicide decedents had a known mental health condition at the time of death, a result that is very consistent with the above mentioned NCIS study [23].

In some Asian countries, an even lower proportion of people have been found to have a mental illness at the time of their death by suicide. An examination of Coroners records contained in the National Suicide Registry of Malaysia found reports of mental illness in only 22% of the 328 cases that occurred in 2009 [113]. The authors believed the low proportion of mental illness may have been due to the cultural belief systems about mental illnesses in Malaysia or that it may also suggest a more profound impact of psychosocial factors in developing countries [113].

Overall, in contrast to findings from PA studies, studies based on coronial information and suicide registers have generally reported a history of mental illness in approximately 50% or fewer cases [23, 24, 111, 113].

As mentioned in Chapter 3, there are also limitations of using purpose-built suicide registers or other coronial sources such as the NCIS. Although comprehensive, the available information contained in a suicide register such as the VSR is limited to what is generated for the coronial investigation and as such it is not a wide ranging review of all possible information about the person [24]. There is obviously the likelihood that studies using suicide registers or other coronial sources such as the NCIS, underestimate the prevalence of mental illness among people who die by suicide. This could occur either because that information is missing from the coronial file or because the person has an undiagnosed mental illness.

4.1.1.3 Other studies

Importantly, the evidence for the importance of mental illness as a factor related to suicide does not only come from descriptive studies such as those outlined above.

A 1997 meta-analysis of well over two hundred studies of suicides of patients with a known diagnosis found that almost all psychiatric disorders (36 of 44 disorders that were studied) conferred an increased risk of suicide [17]. These findings were confirmed by a more recent meta-review by Chesney, Goodwin [114] and colleagues in 2014 which included 20 systematic reviews and meta-analyses. This study found borderline personality disorder, depression, bipolar disorder, opioid use and schizophrenia, as well as anorexia nervosa and alcohol use disorder in women, conferred substantially increased suicide risks.

Multiple papers have presented results from the Lundby Study – a prospective cohort study involving 3563 participants from the Swedish general population – which examined mental health and suicide risk over a 54-64 year period. Long-term suicide risk for specific diagnoses was found to be 5.6% for depression [115], 6.3% for alcohol use disorders[116], and 3.3% for anxiety disorders [117]. Further analysis found the long long-term suicide risk in participants with no, one, or more mental disorders was 0.3%, 3.4% and 6.2% respectively – and each additional diagnosis was significantly related to increased risk of suicide [118].

4.1.1.4 Conclusion

Estimates of the proportion of people who die by suicide that have mental illness differ depending on whether PA studies or suicide registers are used. However, at least in Western countries, results are fairly internally consistent, suggesting that the methods used to examine suicide may be driving the results. Some have argued that PA studies overestimate the influence of mental illness, while studies using suicide registers which do not include retrospective diagnosis of mental illness are likely to underestimate the influence of mental illness. This suggests that rather than being universally present in people who die by suicide, the actual prevalence of mental illness among people who die by suicide (at least in Western

countries), would likely fall somewhere between 50%-90% of cases. Clearly this has important implications for suicide prevention.

4.1.2 Other risk factors for suicide

According to a comprehensive review by Van Orden, Witte et al. [3], in addition to mental illness, the literature shows the most consistent and robust support for the following risk factors: past suicide attempts, social isolation, family conflict, unemployment, and physical illness. The same review found support for additional factors such as family history of suicide, impulsivity, incarceration, hopelessness, serotonergic dysfunction, agitation/sleep, childhood abuse, exposure to suicide, homelessness and combat exposure.

Some of the risk factors, in addition to mental illness, most relevant to this thesis include:

- Past suicide attempts
- Divorce/relationship separation
- Family conflict
- Childhood trauma
- Physical illness
- Work-related stressors
- Violence and forensic/legal issues
- Bereavement.

4.1.2.1 Past suicide attempts

Past suicide attempts are considered to be one of the most reliable predictors of future suicidal ideation, attempts, and death by suicide. A Hawton and Fagg [119] 8-year follow-up study published in 1988 found suicide or probable suicide occurred in 2.8% of people who had been admitted to hospital following a suicide attempt and the rate of suicides was approximately 27 times the expected rate in this population. More recent studies have found similar results. A prospective cohort study found that individuals who had attended emergency departments for intentional self-harm had more than 30 times the number of suicides that would be expected in the general population [120]. A longitudinal study published in 2004 indicated that a history of a suicide attempt by self-poisoning was an indicator of high risk for completed suicide throughout the entire adult lifetime [34] and a population based cohort study found children and adolescents who had previously harmed themselves had increased suicide risk (hazard ratio 17.48, 95% confidence interval 7.55 to 40.46) [121].

4.1.2.2 Divorce/relationship separation

Divorce and relationship separation have been shown to be both a distal and proximal risk factors for suicide [79, 85]. Stack and Scourfield [85] found that recent divorce increases the odds

of death by suicide 1.6 times, compared with 1.3 times for distal divorce. Relationship separation has also been shown to contribute to higher rates of suicide [79, 84, 86]. In addition, relationship difficulties with a partner have also been reported as an important precipitating factor of suicidal behaviours. Appleby, Cooper [122] and colleagues found young people who had died by suicide were approximately ten times more likely than controls to have experienced recent moderate/severe interpersonal problems with a partner.

4.1.2.3 Family conflict

In addition to divorce and relationship separation, other family-related conflict has been shown to be a robust risk factor for suicide across the lifespan [3]. Data from the WHO multi-country study on women's health and domestic violence against women was used to examine relationships between suicide attempts and other variables. Results indicated that some of the most consistent risk factors for suicide attempts for women were having experienced intimate partner violence and having a mother who had experienced intimate partner violence [79]. Other family related conflict such as family discord has been shown to increase suicide risk after controlling for sociodemographic covariates and mental disorders [123].

4.1.2.4 Childhood trauma

Childhood trauma has been found to be associated with suicide and/or suicide attempts [79, 81, 82]. An Australian study found young people who had experienced childhood sexual abuse had a suicide rate that was more than 10 times the national Australian rate [124] and a recently published meta-analysis of 47 studies (25 cross-sectional, 14 cohort, 6 case-control and 2 twin studies) which included a total of 151,476 subjects by Ng, Yong [82] and colleagues (2018) found that childhood sexual abuse was consistently associated with increased risk of suicide attempts. In addition, poor parental relationship during childhood has been shown to be predictive of suicide [125] and an association has been found between suicidal behaviours and an experience of bullying [126, 127].

4.1.2.5 Physical illness

Certain physical illnesses and conditions have been shown to increase the risk of suicidal behaviour including HIV/AIDS [17], some cancers [128], multiple sclerosis [17], and Huntington's disease [129]. A review by Whitlock [130] in 1986 demonstrated that more than one-third of people who die by suicide had a medical illness at the time of their death and more recent research has found physical illness was mentioned as the main reason for suicide in almost 20% of cases [5].

4.1.2.6 Work-related stressors

Unemployment has consistently been linked to suicide and found to be associated with increased suicide risk [131, 132] as have adverse conditions in the workplace [133]. A German case-control PA study of 163 individuals who died by suicide found unemployment was associated with highly significantly increased risk of suicide [132]. Another German study followed up almost 7000 participants for an average of 12.6 years and found a negative working environment increased suicide mortality risk, even after controlling for relevant suicide-related risk factors [133]. In New Zealand, a study of 202 suicides, 275 medically serious suicide attempters, and 984 randomly selected controls (stratified by age and gender) found work-related stressors increased suicide risk (adjusted odds ratio [OR] 2.5) [125].

4.1.2.7 Violence and forensic/legal issues

Violence [134] (in addition to the family violence and childhood abuse already described), contact with police [134] and legal issues [125, 135] are often proximal events to suicide. A UK study examining factors related to suicide among 205 individuals who died over the three-year period 1999-2001 found 41 (20%) had police contact within 3 months of death either as victims (n=24) or as alleged perpetrators of violent and non-violent crime (n=24) or as both victims and perpetrators (n=7). The previously mentioned New Zealand study of 202 suicides, 275 medically serious suicide attempters, and 984 randomly selected controls found people who had experienced legal stressors in the previous 12-month period were at increased risk of suicide (adjusted OR 5.4) [125].

4.1.2.8 Bereavement

Bereavement has been found to be associated with increased risk of suicide [136], suicidal ideation [137, 138] and suicide attempts [139]. A nationwide Danish cohort study [136] examined suicide risk among people exposed to the loss of a child, spouse, sibling or parent compared to suicide risk among non-bereaved persons. Risk of suicide was found to be significantly increased for three of those cohorts (those who had lost a child, spouse or parent).

4.1.3 Conclusion

It has become generally accepted that 90% or more of people who die by suicide have a mental illness. This figure has originated from studies conducted using the PA method which has come under criticism especially in the most recent few years. In part this is because it involves diagnoses being made following a person's death based on the subjective opinions and memories of third parties. Recent evidence, particularly from Australian studies conducted using coronial information, suggests that people with a mental illness may comprise a lower proportion of suicides than has previously been thought [23, 24, 111].

Importantly, the proportion of suicides with a diagnosable mental illness appears to differ depending on geographical and cultural contexts (and this is found whether PA or coronial records are the source of information) suggesting mental illness makes different contributions to suicide across different populations [101].

In addition to mental illness, there are many other risk factors for suicide and some have suggested that the pervasive focus on mental illness in suicide research and prevention has meant that these risk factors are not getting the attention they deserve [10, 13]. While one would never seek to argue that mental illness does not infer a risk for suicide, or that it should not be a major component of any suicide prevention program, more research is required to establish the prevalence of mental illness in suicide and how it potentially interacts with other factors and stressors in specific populations. Likely variation in risk factors between jurisdictions means it is important to undertake studies in multiple jurisdictions. Victoria, Australia presents an excellent opportunity to conduct a jurisdictional based study due to the presence of an established suicide register within the coronial system. It is unknown to what extent the international results regarding factors associated with suicide, and even results from other parts of Australia, can be generalized to Victoria as it is well recognised that risk factors for suicide vary in kind from one cultural context to the next [30].

4.2 Explanatory models of the relationship between mental illness and suicide

To understand why the association between mental illness and suicide exists and to elucidate how mental illness contributes to suicide in the context of other risk factors, it is necessary to understand the mechanisms that explain *why* people with a mental illness appear to be at greater risk for suicide. Despite the need for such understanding, there is little research regarding these potential mechanisms. The following explanatory models of the relationship between mental illness and suicide have been proposed by Mishara and Chagnon [22].

4.2.1 Suicide and mental illness have a common aetiology

The first model suggests that the association between mental illness and suicide exists because factors that increase the risk of suicide are the same factors that increase the risk of a person developing a mental illness. Research shows a number of factors that have been found to be associated with suicide, such as biogenetic vulnerability and exposure to early negative events such as child abuse and parental divorce, have also been found to be associated with the development of a mental illness [81, 140-142]. Therefore, according to this model no direct causal link between mental illness and suicide exists—the association is because both suicide and mental illness have common determinants [22]. Consequently,

consistent with this model, suicide prevention efforts could focus on reducing the occurrence of, and adverse outcomes associated with, negative events in childhood.

4.2.2 Some mental illnesses are alternatives to suicide

The second explanatory model asserts that mental illness can develop as a means of trying to reduce suicidal ideation and impulses [22]. For example, one might drink alcohol excessively (and eventually develop a substance abuse disorder) as a way of trying to avoid or diminish suicidal ideation. Therefore, consistent with the first explanatory model, there is no direct causal link between mental illness and suicide—factors associated with a greater suicide risk may lead either to suicidal behaviours or to mental illness. In this way, the suicidal ideation is conceptualised as being present prior to the mental illness so it would follow that prevention of suicide should not simply be based on treatment of mental illness – reduction of suicidal ideation is what is required.

4.2.3 Suicide is a direct consequence of mental illness

In the third model, suicide is seen as a direct consequence of the mental illness due to symptoms of mental illness being the key factor in the development of suicidal behaviours. For example, psychotic command hallucinations where an individual may hear voices that tell them to kill themselves or depressive delusions when a person suffering from clinical depression perceives their current situation as being hopeless resulting in the belief that suicide is the only way to stop their current suffering [22]. Increasing access to effective treatment of mental illness would be the prevention intervention consistent with this explanatory model.

4.2.4 Suicide is a result of the consequences of living with a mental illness

People who live with a mental illness in society are more likely to have a number of important risk factors (or lack of protective factors) that have previously been found to be associated with suicide [143-145]. The fourth explanatory model posits that it is these risk factors that result in the increased risk of suicide among people with mental illness. In this way, it is not the symptoms of the mental illness that result in an increased suicide risk, but rather the effects of living with a mental illness in society [22]. Prevention interventions that would be consistent with this model would include better support for people with mental illness, education and awareness campaigns regarding mental illness, reducing stigma associated with mental illness and increasing employment opportunities for people who have mental illness.

4.2.5 Suicide results from treatment

According to this model, it is not the mental illness or the symptoms of illness that results in greater suicide risk, but the treatment. This could be because the treatment is inadequate, inappropriate or incomplete or that the treatment results in an iatrogenic effect [22]. In the last case, treatment could result in increased suicide risk by helping with organisational skills and the ability to mobilise sufficient energy to make an attempt on one's life. Similarly, at the beginning of treatment, before a person has experienced any decrease in symptoms of their illness, there could be an improvement to a person's cognitive abilities making it possible for them to realise they are suffering from a mental illness. This has the potential to make them feel hopeless about the current situation of living with a mental illness and therefore be at greater risk of suicide [22]. Increasing the quality of mental health treatment for people with mental illness is a suicide prevention strategy that is consistent with this model, including intensive monitoring of individuals when they begin treatment or have changes in medication.

4.2.6 Aspects of the crisis situation

The basics of this model are: (1) that suicide attempts often occur in a crisis [146]; and (2) people with a mental illness may be more likely to experience crisis situations. This could be due to their potentially fragile social supports and difficulties in coping with everyday problems [22]. Therefore, the association between mental illness and suicide exists because those with a mental illness may be more likely to experience crisis situations. Prevention of suicide according to this model could involve better support for individuals in crisis, controlling accesses to means and improving individual's coping skills in times of crises.

4.2.7 Conclusion

According to these six explanatory models, in only one instance is suicide considered to be a direct consequence of the mental illness. This has obvious implications for suicide prevention as prevention opportunities differ depending on which one or more of the explanatory models is endorsed.

It is clear that more investigation of the association between mental illness and suicide is needed, as is research that examines how mental illness interacts with other factors. Questions remain as to whether all these models are valid or whether some are more appropriate than others in certain populations. As Mishara and Chagnon [22] stated, the relative role of each of the explanatory models and factors within the models needs to be clarified in future research.

Chapter 5: Theories of suicide

This chapter introduces major theories of suicide in order to place the risk factors discussed in Chapter 4 into context. Further, the explanatory models described in Chapter 4, were proposed to explain associations between mental illness and suicide, whereas the theories presented here are attempts at explaining why someone might die by suicide. While most of these theories incorporate mental illness, mental illness is not the focus of these theories.

5.1 Introduction

Prevention of suicide, at least in part, relies on predicting those at risk of suicide. As the previous chapters have outlined, although suicide is a leading cause of death, ultimately it is still a rare event and thus difficult to predict. Even known risk factors do not make the prediction of suicide straightforward, for example although previous suicide attempts have been shown to be predictive of future suicide [120], most people who attempt suicide will not make another attempt that actually results in death by suicide [33, 34]. Similarly, although mental illness is a risk factor for suicide, the vast majority of people who have a mental illness do not die by suicide [18, 147]. There are many theories of suicide that attempt to elucidate the potential relationship between risk factors across individual, psychosocial and societal levels. The purpose of these theories is to increase understanding of why someone chooses to end their life and ultimately the aim of these theories is to increase prediction and subsequent prevention of suicide.

There have been many theories of suicide proposed and essentially those theories either generated by data grounded in reality [148] or those that are able to account for known suicide risk factors [149] have remained. For a theory of suicide to be useful with regards to understanding and preventing suicide, it needs to go beyond associations of suicide behaviours and focus on causal mechanisms [150, 151]. This chapter provides an overview of some influential theories of suicide with added emphasis placed on two contemporary and well supported theories – the Interpersonal Theory of Suicide and the Integrated Motivational-Volitional Model of Suicide.

5.2 Sociological theory of suicide

A theory of suicide proposed by Durkheim [27] more than 100 years ago is still quite influential. Unlike more contemporary theories of suicide, Durkheim's early theory is not an individualistic explanation as it emphasises social forces rather than focusing on individual factors. Durkheim's theory is mainly concerned with two concepts, or explanatory factors, and their relation to suicide: social integration and moral regulation.

The theory describes four types of suicide, egoistic, altruistic, anomic and fatalistic [27]. The first two are primarily related to the concept of integration (egoistic and altruistic suicide) while the second two are primarily related to regulation (anomic and fatalistic). Egoistic suicide can be thought of as resulting from a lack of social integration of an individual in society – in this way suicide results when people lack social bonds or are socially isolated. In contrast, altruistic suicide is conceptualised as resulting from excessive social integration which can lead people to lose themselves and become willing to sacrifice themselves to a group's interests (e.g., so called "suicide bombers" or instances of mass suicides occurring among cult members). Anomic suicide results from a lack of regulation, whereby among individuals who have previously had needs and satisfaction regulated by society encounter something that upsets this balance (e.g., divorce, economic trouble, loss of employment). Finally, Durkheim posited that fatalistic suicide occurred as a result of overregulation of the individual by society. Durkheim also proposed that there could be mixed types of suicide (e.g., ego-anomic, altruistic-anomic, ego-altruistic). Importantly, Durkheim believed the suicide rate could not be changed unless measures addressed the question of the social structure in which a person lives.

Although Durkheim clearly emphasised social causes of suicide, he did not dismiss entirely the importance of other factors such as mental illness, in fact he actually categorised deaths among people with a mental illness separately to the other categories of suicide he described. Durkheim described four types of suicide among people with a mental illness: "maniacal suicide" - due to hallucinations or delirious conceptions; "melancholy suicide" - connected with a general state of extreme depression and exaggerated sadness; "obsessive suicide" - caused by no real motive but solely by a fixation on death; and "impulsive" or "automatic suicide" - resulting from an abrupt and immediately irresistible impulse [27]. In this way, Durkheim acknowledged that mental illness played a role in some, but not all, suicides. However, he did believe that factors such as mental illness would not affect the suicide rate of whole societies and therefore should not be studied by sociologists [28].

5.3 Psychodynamic theories

Following on from Durkheim's theory published in the late 1800s, psychodynamic theories dominated the first half of the 1900s [28]. Psychoanalysts such as Freud and Menninger focused very much on aggression or hate when theorising on reasons one might die by suicide. Freud believed that the energy used to kill oneself derives from an earlier repressed desire to destroy another [152]. Menninger took this further and believed every suicide was an inverted homicide [153]. Contemporary researchers have expressed opposing views on the importance

of such early theories of suicide. Some believe these early theories were innovative and influential because of the importance they placed on concepts such as psychological distress or disorder [149]. In this way the psychodynamic theories could be seen as precursors to more contemporary theories of suicide which also emphasis these concepts. In contrast, others have argued these early theories did not make a lasting contribution to the understanding of suicide and may have even inhibited further understanding of suicide [28].

5.4 Escape, hopelessness and psychological pain theories

5.4.1 Suicide as an escape from the self

In 1990 Baumeister [154] emphasised escape from psychological pain as the main motivating factor in his theory of suicide. The reasoning behind this theory is that the most common motive reported by people for engaging in suicidal behaviour is to escape from an aversive situation and to obtain respite from unbearable pain [154]. The theory posits that there are six steps that lead to suicidality: (1) high standards and expectations combined with current, specific failures, setbacks, or stresses; (2) failure interpreted as a result of own characteristics; (3) negative affect then follows from the awareness of self as falling short of important standards; (4) self-awareness results in painful negative emotions; (5) individual attempts to escape by focusing only on concrete sensations and targeting only immediate goals; (6) behavioural inhibition and the emergence of suicide occur. Suicide becomes appealing when the aversive thoughts and feelings-and the associated implications-are neither adequately shut out nor removed [154]. According to this escape theory, the main appeal of suicide is that it offers oblivion and escape from aversive self-awareness.

5.4.2 Hopelessness theory of suicidal behaviour

According to Beck and colleagues, hopelessness is a proximal sufficient cause of suicidality, on a continuum from suicidal ideation to suicide [155]. Hopelessness results from the expectation that highly desired outcomes will not occur or that highly aversive outcomes will occur and that there is nothing one can do to change this situation. Empirical research that supports the theory include two prospective studies by Beck and colleagues, of 1,958 psychiatric outpatients [156] and 207 patients hospitalised for suicidal ideation [157] which both found that hopelessness was significantly related to eventual suicide. The theory posits that relatively generalised hopelessness and, subsequently, suicidality are likely to develop when negative life events are attributed to stable and global causes and perceived as likely to lead to other negative consequences or outcomes. This theory downplays the importance of

internal attributions (in contrast to escape theory) and instead emphasises stable, global attributions [155].

5.4.3 Psychache theory of suicide

In 1993 Shneidman published his theory of suicide which centres on the concept of *psychache* [158]. Psychache, as defined by Shneidman, is intense and intolerable psychological pain which stems from thwarted or distorted psychological needs. Psychache is considered to be a proximal cause of suicide and prior risk factors operate through increasing psychache, therefore it is psychache that predisposes one to suicide [28]. Shneidman believes that suicide results from severe psychache, coupled with dissatisfaction with life, limited perceptual range and the idea of death as being preferable to life [158]. Importantly, according to this theory psychache is conceptualised as different from depression and hopelessness. However recent research has shown very strong correlations among psychache, depression and hopelessness leading some researchers to conclude that they cannot be considered independent constructs [149, 159]. Nonetheless, Shneidman's theory of psychache has clearly influenced contemporary theories of suicide.

5.5 Stress-diathesis theories

Many previous theories of suicide outlined in this chapter, tend to focus on one single driving motivation for suicide for example the theories of suicide that focus on escape or psychological pain or the early psychodynamic theories that focussed on aggression. In contrast stress-diathesis models highlight vulnerabilities that become problematic when activated by stress/triggering stressors [149]. These models are based on the observation that stressful life events are often recognised as triggers of suicidal behaviour but that even extreme stress does not result in suicide in all exposed individuals [160]. It therefore follows that the development of suicidal behaviour must also involve a vulnerability as a distal risk factor.

5.5.1 Cognitive stress-diathesis models

Multiple theorists have described a diathesis for suicidal behaviour in terms of cognitive psychological vulnerabilities. An early example of such a model was proposed by Schotte and Clum [161] in 1982 and included rigidity or low capacity for divergent thinking as a vulnerability or diathesis. The model proposed that individuals with low capacity for divergent thinking are cognitively unable to cope with high levels of life stress and, as a result, are likely to become hopeless under such circumstances. This ensuing state of hopelessness resulting from the individual's inability to engage in effective problem-solving places the individual at risk for suicidal behaviour.

More recently, Wenzel and Beck [162] proposed a cognitive model of suicidal behaviour, grounded in earlier empirical literature on cognitive and behavioural correlates of and risk factors for suicidal behaviour. As mentioned in section 5.4.2, Beck and colleagues have consistently emphasised the cognitive aspect of suicidality, suggesting that the evidence showed that hopelessness accounted for the relationship between depression and suicidal intent [155] and they believe this occurred because hopelessness disrupted all components of an individual's beliefs about themselves, others, and the future [156]. The 2008 cognitive model of suicidal behaviour has three main constructs: (1) dispositional vulnerability factors; (2) cognitive processes associated with psychiatric disturbance; and (3) cognitive processes associated with suicidal acts. The model describes how cognitive processes associated with psychiatric disturbance and suicide-relevant cognitive processes are activated in the context of life stress. Wenzel and Beck [162] propose that attentional fixation interacts with state hopelessness to create a downward cognitive-affective spiral, exacerbating suicide ideation and creating a context in which the patient is drawn to the idea of suicide as a way out of their problems [156].

5.5.2 Clinical stress-diathesis models

Mann and colleagues [163, 164] proposed a stress-diathesis model in which psychiatric illness was conceptualised as the stress component along with other examples such as acute medical illness, and adverse life events. According to this theory, the risk for suicidal acts is determined not merely by the stressor (e.g., psychiatric illness) but also by diathesis (which can be influenced by early life experience, genetics, chronic illness etc.) and the diathesis may be reflected in tendencies to experience more suicidal ideation and to be more impulsive and, therefore, more likely to act on suicidal feelings [160].

Another example of a clinical street-diathesis model of suicide was proposed by McGirr and Turecki [165] in 2007. These authors also emphasise psychiatric disorder or psychopathology as the stressor and personality characteristics such as impulsivity and aggression as the stable risk factors (or diathesis) which result in suicide when they interact.

5.6 Contemporary theories of suicide

Although earlier theories focused on individual psychological factors they did not account for why most people who have thoughts about suicide do not make a suicide attempt [166] and therefore one of the major challenges in suicidology is to be able to predict not only who will develop suicidal thoughts, but who will act on these thoughts [29]. Two contemporary theories of suicide are notable because they do attempt to distinguish between suicide ideators and

those who make an attempt – Joiner's Interpersonal Theory of Suicide (IPTS) and O'Connor's Integrated Motivational-Volitional Model (IMVM) of suicide.

5.6.1 Interpersonal theory of suicide (IPTS)

Joiner's IPTS posits that there are three constructs central to suicidal behaviour. Two of these constructs are considered to be primarily related to suicidal desire—thwarted belongingness and perceived burdensomeness—and the third to be primarily related to an individual's capability of suicide—acquired capability [28]. Thwarted belongingness is essentially the individual's experience of loneliness/isolation; perceived burdensomeness is the individual's perception of being a burden on others; and acquired capability refers to the individual's habituation to self-harm by prior non-suicidal self-injury, suicidal behaviour, or other risk behaviours [3]. According to this theory the first two constructs (thwarted belongingness and perceived burdensomeness) act as proximal risk factors for suicide and serious suicidal behaviour only occurs when these co-occur with acquired capability [167]. In the simplest of terms, the theory posits that people die by suicide because they can (they have acquired the capability) and because they want to (they have the desire to do so).

This theory has much support, essentially because it is intuitive given the established risk factors for suicide. For example previous suicide attempts have been shown to increase the risk of suicide [120] and this is consistent with the concept of acquired capability being an essential component of suicide. Further, mental illness is a risk factor for suicide and this also fits with the IPTS theory of suicide as Joiner believes that some constructs of the IPTS may be common in those who have a mental illness (for a variety of reasons). For example, it is logical that many feelings and behaviours linked to depression could lead to increased feeling of IPTS constructs such as thwarted belongingness and perceived burdensomeness.

5.6.2 Integrated Motivational-Volitional Model (IMVM) of suicide

Another contemporary model of suicide is O'Connor's IMVM [29]. Consistent with Joiner's IPTS, one of the main aims of O'Conner's model was that it would assist in making predictions about the types of factors that distinguished between individuals with suicidal ideation and those who make a suicide attempt.

According to the IMVM, suicide is conceptualised as a behaviour which is the outcome of a complex interplay of factors, and a three-staged process: pre-motivational, motivational, and volitional [29]. At the pre-motivational phase, an individual has serious risk factors for suicide but is not suicidal. The motivational phase begins with suicidal ideation and ends with a

specific plan, and during the final volitional phase the individual's suicide plan is underway and death may be imminent.

This theory emphasises the importance of feelings of defeat and entrapment and posits that when an individual feels both defeated and trapped, the likelihood that suicidal ideation will emerge increases when motivational moderators are also present. Motivational moderators include factors such as low levels of social support and Joiner's concepts of thwarted belongingness and burdensomeness. Acquired capability (as also outlined in the IPTS) and other factors such as exposure to the suicidal behaviour of others, impulsivity, and access to the means of suicide, are examples of factors within this model posited to increase the likelihood of suicidal behaviour (i.e., volitional moderators that move someone from ideation through to making a suicide attempt).

This theory has been influenced by diathesis-stress theories of suicide some of which were presented in section 5.5. Importantly, according to this theory, mental illness may be a risk factor at the pre-motivational phase, but suicide is not seen simply as a by-product or symptom of mental illness [29, 147].

5.7 Mental illness and theories of suicide

Although Durkheim's theory of suicide was based around the influence of society on the individual, he did not dismiss the importance of mental illness and its relationship to suicide, categorising deaths among people with a mental illness separately to the other categories that he proposed [27].

More contemporary theories also acknowledge the importance of mental illness as a risk factor for suicide. Interestingly, according to some stress-diathesis models, mental illness is conceptualised as a stressor [164, 168] while in others it is considered as an underlying vulnerability or diathesis [162]. Mental illness as a risk factor for suicide is also consistent with the IPTS as Joiner believes that some of the constructs of the theory may be common in those who have a mental illness (for a variety of reasons). For example, he suggests that many feelings and behaviours linked to depression could lead to increased experience of constructs such as thwarted belongingness and perceived burdensomeness (the central constructs of his theory). However, the theory does not assign primacy to mental illness as the reason for suicide. Similarly, O'Connor states that according to his IMVM of suicide, mental illness may be a risk factor at the pre-motivational phase, but again, suicide is not seen simply as a by-product or symptom of mental illness [29, 147]. Shneidman more strongly separates suicide from mental illness (specifically depression) and talks of depression as being a serious psychiatric syndrome but emphasises that people do not die of depression, they die from suicide [158].

5.8 Summary

This chapter provided an overview of some influential theories of suicide. Durkheim's sociological theory of suicide was presented followed by early psychodynamic thoughts on the origins of suicide by Freud and Menninger. More contemporary psychological theories that focus on psychological pain and constructs such as escape from self and hopelessness were then presented. These theories move away from sociology and psychoanalysis and are instead based on more recent work in social and personality psychology. Cognitive and clinical stress-diathesis theories were presented and finally an overview of two contemporary theories that have garnered much support and driven future research was provided - Joiner's IPTS and O'Connor's IMVM of suicide.

Some of the theories have obvious similarities and focus on similar constructs. For example, social isolation is apparent in Durkheim's egoistic suicide type (whereby there is a lack of integration of the individual into society) and also in Joiner's concept of thwarted belongingness (one of the three major constructs of the IPTS). Similarly, Shneidman's concept of psychache which he believes stems from thwarted or distorted psychological needs also has similarities with Joiner's concepts of thwarted belongingness and perceived burdensomeness. O'Connor's IMVM of suicide, essentially builds on Joiner's IPTS by including more factors and more explicitly detailing how a person with thoughts of suicide may move to making a suicide attempt.

Advantages of theories of suicide are that they enhance our understanding of the mechanisms of suicidal behaviour [167] and can lead to conceptualisation of how suicide may be prevented. For example, prevention of suicide according to Durkheim's theory would involve societal rather than individualistic interventions. In contrast, according to other theorists such as Shneidman and Beck, prevention of suicide would involve decreasing an individual's feelings of psychache or hopelessness, respectively. Another example would be stress diathesis models which emphasise rigidity in thinking – they highlight intervention strategies that focus on interpersonal problem solving. Beck emphasised the importance of hopelessness being a modifiable risk factor [156] and others have highlighted other personality characteristics such as impulsivity and aggression, as they too are amenable targets for intervention [165].

Essentially, the most recent and widely accepted comprehensive theories of suicide acknowledge that mental illness can, and most often does, play a role in the onset of suicidality, but suicide is understood to be an outcome of a complex process which involves many factors and stressors and is not simply a result or by-product of mental illness. This is consistent with the explanatory models presented in Chapter 4 which emphasise the complex interplay

between mental illness and suicide risk and of which most do not emphasise a direct causal link between mental illness and suicide.

Chapter 6: Research aims and conceptual and methodological overview of the thesis

This chapter provides a conceptual and methodological overview of the four studies that comprise the publications included in this thesis. It argues that although a considerable knowledge base has emerged regarding the risk factors for suicide – in particular mental illness, there is some conjecture regarding methods used to determine their association. Further to this, risk factors are known to vary depending on cultural and geographical context [30, 169] so examining mental illness in Victoria, Australia and in the context of other potential risk factors is necessary. The chapter begins with a summary of the current knowledge, and identifying the knowledge gaps. The overall aim of the current thesis, as well as the specific research questions to be addressed are then presented. Potential data sources are critically appraised. It goes on to describe the overarching principles guiding the research, and the two data sources that were used in the four studies. A brief overview of the method of each of the studies and the potential contribution of their findings to prevention is provided.

6.1 Conceptual overview

Previous research using the PA method has consistently concluded that a high proportion of people in the Western world who die by suicide have a diagnosed or diagnosable mental illness [6, 7]. However, recent research based on coronial records suggests that among Victorians the proportion of suicides that have a diagnosed mental illness may be much lower [23, 24]. Further to this, the term 'mental illness' covers many different disorders and research has shown some mental illnesses (e.g., affective disorders) are more prevalent in studies of suicide cases than others [6-8, 73, 97, 111, 113]. This suggested the need for a thorough investigation into the prevalence and nature of mental illness among Victorian suicides. In addition, research was needed to explore whether individuals with mental illness are overrepresented in Victorian suicide cases or whether rates are simply a reflection of the presence of mental illness in the general population.

Some researchers have argued that the pervasive focus on mental illness in suicide research and prevention comes at the expense of other risk factors which have either been shown to be, or may be, associated with suicide [12, 13, 170-172] and that the issue of suicide actually gets lost and becomes about 'depression' or mental illness rather than being seen as an issue in and of itself [170]. Further, according to the modern theories of suicide, such as the interpersonal theory and the motivational-volitional theory, suicide is understood to be an outcome of a complex process which involves many factors and stressors and is not simply a result of mental illness.

Mental illness does infer a risk for suicide and therefore clearly should be a focus of any suicide prevention program, however an examination of factors and stressors other than mental illness, and their potential overrepresentation among Victorian suicides was also warranted. In addition, although the presence of a mental illness has been found to be associated with suicide, there is little research on the mechanisms regarding why people with a mental illness are at greater risk of suicide [10, 70]. Mishara and Chagnon [22], proposed a series of explanatory models for the relationship between mental disorders and suicide (which include other factors and stressors known to be associated with suicide). According to only one of these models is suicide considered to be a direct consequence of the mental disorder. This has important implications for prevention and challenges the notion that treating mental disorders is the only prevention strategy for suicide. To validate some or all of these proposed models, a detailed examination of factors and stressors related to suicide among individuals with mental illness was required including investigating potential clustering of influential factors and also by examining pathways to suicide among those with a mental illness. To examine these associations in depth, the use of a mixed methods approach (qualitative and quantitative studies) was deemed most appropriate.

6.2 Conceptual framework

The empirical literature on suicide risk factors draws from a broad range of disciplines, including, but not limited to, psychiatry, psychology, sociology, genetics, public health and economics. It is widely accepted that the causes of suicide are multifactorial and therefore it follows that an interdisciplinary theoretical framework is required to help understand the issue [173].

There are a number of models for suicide in the literature that attempt to elucidate the potential relationship between risk factors across individual, psychosocial and societal levels. While many theories have been proposed, essentially those theories generated by data grounded in reality have remained [148]. The major ones that have influenced the overall thesis are Durkheim's sociological theory [27]; Beck and colleague's hopelessness theory [155]; Shneidman's "psychache" theory [158]; Baumeister's escape theory [154]; stress-diathesis theories [161, 162], Joiner's interpersonal-psychological theory [28] and O'Connor's integrated motivational-volitional model [29]. These theories were all examined in detail in Chapter 5 and it was shown that these widely accepted contemporary comprehensive theories of suicide acknowledge that mental illness plays a role in the onset of suicidality, but suicide is seen as the outcome of a complex process which involves many factors and stressors and is not simply,

nor always, a result of the mental illness. It follows that an inclusive multifactorial theoretical framework of the determinants of suicide will inform this research.

The studies in this thesis were designed to address gaps with regard to factors and stressors. It was beyond the scope of the thesis to consider the full range of factors and stressors associated with suicide. Therefore, the analysis focused on factors and stressors that were able to be studied using a population-based data source, namely the socio-demographic and interpersonal and environmental/situational risk factors included in the Victorian Suicide Register (VSR).

6.3 Overall aim and specific research questions

The overall aim of the current thesis was to examine the presence and nature of mental illness among Victorians who die by suicide and to explore the pathways to suicide in this same population.

The research extended previous knowledge regarding the association between mental illness and suicide by examining the association in the Victorian population and in the context of other previously identified risk factors or factors/stressors associated with suicide. Furthermore, the research aimed to support, or possibly refute, previously proposed explanatory models of the association between mental illness and suicide in the Victorian context by using qualitative research methods.

The specific research questions were:

- What proportion of people who died by suicide in Victoria had a diagnosed mental illness and what types of mental illnesses were represented?
- What were the differences and similarities between people who died by suicide and had a diagnosed mental illness compared to those who died by suicide but did not have a diagnosed mental illness?
- Could meaningful clusters/groups of people (based on identifiable factors and exposure to stressors) be identified in the Victorian suicide data?
- Were people with a diagnosed mental illness significantly overrepresented in the population of people who died by suicide in Victoria, Australia?
- What other factors and stressors (e.g., relationship separation, unemployment, exposure to violence, physical illness, injury etc.) associated with suicide were present and overrepresented among Victorian suicides?
- What were some of the pathways to suicide among those who had a diagnosed mental illness?

Answering these questions was seen to have considerable public health significance, in that doing so could inform suicide prevention efforts, particularly in Victoria.

6.4 Methodological overview

6.4.1 Potential data sources for information on Victorian suicides

There are currently three main data sources that have the potential to be used for suicide research in Victoria, Australia – two national datasets (Australian Bureau of Statistics Causes of Deaths data and the National Coronial Information System) and one specific to Victoria (the Victorian Suicide Register). To answer the research questions, which include exploring factors and stressors related to suicide, it is necessary for any proposed data source to contain relevant data on these potential factors and stressors.

6.4.1.1 Australian Bureau of Statistics (ABS) Cause of Death (COD) data

Traditionally, the ABS COD data has been the main source of suicide statistics for Australia. However, there have been long-standing concerns with data quality regarding suicides, particularly the potential for underreporting [43-48]. Since 2007 the ABS has taken steps to improve the reliability of this data, mainly by introducing a revision process for these coroner-certified deaths [42, 49]. This process is undertaken to improve the coding of cause of death for coroner-certified deaths as additional information becomes available. As a result of this process, data are deemed preliminary when first published, revised when published the following year and final when published after a second year [2]. Despite this improvement to the data collection, the available information about suicides is still limited by the inherent nature of the data collection. The COD dataset is useful for long term monitoring of suicides and for use when comparing mortality data with other countries that use the same coding system. However, the COD dataset is administrative by nature and as such it contains very little information regarding the presence of known risk factors and stressors for suicide (such as social isolation, past suicide attempts, family conflict, unemployment etc.) because that kind of information is out of the scope of the collection.

6.4.1.2 National Coronial Information System (NCIS)

The second source of available data is the NCIS which is a national internet-based data storage and retrieval system of deaths investigated by Australian Coroners since 2000 and New Zealand cases have been added since 2007 [174]. The data collection contains more detailed information than the ABS COD data collection because in addition to available coded data, there are four full text reports generated for the coronial investigation that are attached on the NCIS. These reports can be accessed by users (as PDFs): the summary of

circumstances from the Police Report of Death to the Coroner form; the autopsy report; the toxicology report; and the Coroner's finding [175]. The NCIS has been used for many recent suicide-related research studies (see [23, 176-179] for some examples).

Although the NCIS unit undertakes quality assessment of all closed cases on the system to ensure accurate cause of death coding [180] there would still be limitations if the NCIS were to be used as a data source for this research. There is a significant lag between the death occurring, the closing of the case by the Coroner and the eventual coding and closing of the case on the NCIS [174]. Furthermore, although this dataset includes more detail on potential stressors and risk factors for suicide than the COD dataset does, it is still limited by the information contained in the reports available to researchers. For example, Coroners' findings and police reports do often contain some information regarding the presence of mental illness but these reports often lack detail regarding historical development of illness, treatments, and also the presence of other potential risk factors and stressors for suicide that may have been influential in the deceased's decision to take their life. In addition, suicide notes have previously been identified as rich sources of detail that can potentially aid in attempts to understand reasons and motivations for suicide [52, 53, 181]. Although the presence of a suicide note is often recorded in police summaries (as it is relevant to the police investigation of the death), there is often no detail regarding the content of such notes available in the reports. The police report is usually written at the time of the initial processing of the death and as such the police reports do not contain the detail generated at a later point of the investigations when statements from the deceased's family and friends and witnesses to the suicide are taken to compile the coronial brief. While information contained in the coronial brief, is sometimes referred to in a Coroner's finding, the brief itself is not attached to the NCIS. Finally, as the NCIS is not a suicide-specific dataset any information regarding exposures to stressors would need to be manually coded after reading through the documents contained within the NCIS.

6.4.1.3 The Victorian Suicide Register (VSR)

The Coroners Prevention Unit (CPU)—a multidisciplinary investigative support service of the Coroners Court of Victoria (CCOV)—developed and maintains the VSR. The aim of the VSR is to systematically record and be able to recall detailed information on suicide in Victoria, Australia. The VSR was developed to provide Victorian Coroners with data to support their suicide investigations and, where possible, to inform evidence-based recommendations for suicide prevention. In Victoria, all deaths where suicide is suspected are legally required to be investigated by the Coroner. Consequently, the information generated for these investigations represents the most comprehensive and reliable data source available on suicide in Victoria [24, 63]. Importantly, the VSR includes those deaths where the coroner did not make an explicit

determination of intent, but where the cause and circumstance surrounding the death are consistent with suicide. For example, this may be when a mechanism or method is strongly indicative of suicide [63]. 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. The VSR is supported by a coding manual, data dictionary and quality framework.

Data in the VSR are coded based on review of all available information - typically the entire coronial file is available to VSR coders, containing the coronial brief, forensic medical and scientific reports (i.e., autopsy and toxicology reports), and 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 in some cases medical records from general practitioners, psychiatrists or psychologists involved in treatment of the deceased. Data items recorded in 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, and in contrast to the other data sources presented in this chapter, items related to specific known risk factors for suicide such as sociodemographic characteristics, presence of physical illness, injury, pain, or disability; other psycho-social stressors; and detailed information regarding any evidence of mental illness is also recorded [24]. Detailed coded and free text data is systematically recorded according to strict coding rules [63]. Most information is collected by first flagging a factor as relevant to that individual and then including notes of the evidence and its source (i.e., the coder enters the relevant information from the Coroners finding / police report / autopsy report / statement of a family member etc. into specific notes fields).

6.4.1.4 Data sources summary

As the intention of this thesis is to examine factors and stressors related to suicide such as mental illness, relationship separation, physical illness etc., the information relevant to these factors has to be present in any potential data source. Although now comprehensive in terms of case capture, the official Australian COD dataset does not have information on factors such as social isolation, past suicide attempts, family conflict, unemployment, relationship separation etc. that are necessary to answer the research questions. While using the NCIS would be an improvement on the COD dataset for this proposed research, this data source still has limitations related to the lack of detail available regarding potential stressors and risk factors. To effectively examine potential pathways to suicide among individuals with mental illness the inclusion of medical records and statements by treating mental health practitioners is invaluable. While this information (if included in the coronial brief) is available to the VSR coders it is not available on the NCIS. Although Coroners' findings may reference some of information sourced from these documents—such as the presence of mental illness—the

detail regarding historical development of the illness and also the presence of other risk factors and stressors potentially related to the suicide is sometimes lacking in the documents that are included on the NCIS.

6.4.2 Main data source selected for the research

Many of the strengths of the VSR, relevant to this proposed research, were presented in section 6.4.1.3. Nevertheless, the VSR is not without limitations and these have been discussed in recent literature [24, 61, 63]. The key challenge identified in one study which evaluated the VSR was data quality, particularly around the fact that the data is collected in the course of death investigations that are not designed for surveillance purposes [63]. The information available is limited to what is generated for the coronial investigation and as such it is not a wide ranging review of all possible information about the person [24]. For example, the absence of evidence of a particular factor in the VSR may actually represent lack of reporting rather than the actual absence of exposure to that stressor/factor [24, 61]. Conversely, the presence of a factor does not necessarily imply contribution of that factor. Further to this, the volume of information varies between investigations depending on a number of factors including who was asked to provide information, what questions were asked and the willingness of individuals to disclose some or all of the information they had [24].

Despite these limitations, the VSR was selected as the data source for this research project since the advantages in using the data set outweighed the limitations. The CCOV granted access to the VSR for the purposes of the project and ethics approval was obtained from the Victorian Department of Justice and Regulation Human Research Ethics Committee and from Monash University Human Research Ethics Committee. The author established an agreement with the CPU that after coding 100 cases into the VSR, cases that occurred in Victoria during the period 2009-2013 would be extracted from the VSR and provided for analysis.

The VSR variables used for this research are shown in Table 2.

Table 2 VSR variables used for the studies included in this thesis

Variable category	Specific variables	
General	• Year reported • Circumstances of death	• Coroner intent • CPU intent
Location	• Residential Local Government Area (LGA)	
Socio-demographic	• Age • Sex • Evidence of LGBTI identification • Evidence of cultural and linguistic diversity	• Evidence of Indigenous status • Current employment status • Current relationship status • Notes on socio-demographic variables
Physical Illness	• Physical illness • Physical injury • Pain • Assessed physical disability	• Receiving current treatment • Other information potentially relevant to physical health • Notes relevant to physical health
Mental Illness	• Proximal versus other treatment • Presence of diagnosed mental illness • Voluntary versus involuntary treatment • Inpatient versus community patient • "Deceased treated by" variables	• Medications used in treatment • Non-drug treatment • Coder identified information • Evidence of deceased non-compliance with treatment • Notes for mental ill health
Indicators of intent	• Explicit written intent (note, social media, etc.) • Implicit written intent (note, social media, etc.) • Explicit verbal intent (in person, by phone, etc.) • Implicit verbal intent (in person, by phone, etc.) • Other potentially intent- related information	• Previous suicide attempt(s) • Previous self-harming behaviour • Suicidal ideation • Other historical suicide-related behaviour • Notes regarding intent
Interpersonal stressors	• Death of partner • Separation (actual or threatened) from partner • Conflict with partner • Partner health issues / need for carer • Violence between deceased and partner • Death of family member • Conflict with family member(s) •	• Family health issues / need for carer • Violence between deceased and family member • Death of acquaintance • Conflict with acquaintance(s) • Acquaintance health issues / need for carer • Other events, incidents, factors, etc. • Notes
Contextual stressors	• Work related stressors • Financial stressors • Legal stressors • Sexuality and gender • Isolation • Experiences of abuse • Stressors relating to education • Bullying (as victim or perpetrator)	• Substance abuse/use • Other stressors and factors • Suicide of family member / partner [exposure] • Suicide of friend [exposure] • Suicide of acquaintance, colleague, peer [exposure] • Suicide of stranger [exposure] • Notes

6.4.3 Additional data source for Study 3

Study 3 (Chapter 9) used the Australian Bureau of Statistics (ABS) General Social Survey (GSS) for exposure to stressors data. The GSS is a population survey designed to support the exploration of the links between different social and economic topics [(182)]. The 2014 survey included individuals aged 15 years or older who lived in 12,932 private dwellings and had a response rate of 80.1% [(182)]. Respondents were asked about exposure to issues/stressors in the 12 months prior to the survey. The stressors for which equivalent data is captured in the

VSR are: divorce/relationship separation; death of a family member or close friend; physical illness; accident/injury; alcohol or other drug-related problems; mental illness; disability; 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.

6.5 Detailed methods used for studies that constitute this thesis

6.5.1 Study 1: Differences in characteristics and exposure to stressors between persons with and without diagnosed mental illness who died by suicide in Victoria, Australia

6.5.1.1 Aim

To examine cases of suicide in Victoria by the presence or absence of a diagnosed mental illness (mental illness status) to identify differences in factors associated with suicide in the groups.

6.5.1.2 Case selection

A retrospective case series study was conducted of individuals who died by suicide in Victoria, Australia during the five-year period 1 January 2009 to 31 December 2013. A case was included if the death occurred in Victoria between 1 January 2009 and 31 December 2013, the coroner determined that the intent of the deceased was suicide, or (in circumstances where the coroner did not make an explicit determination of intent) the VSR coders classified the intent of the deceased as suicide in accordance with the rules contained in the VSR coding manual [(63)].

6.5.1.3 Variables included and analysis type:

The following data items recorded in the VSR were extracted into a unit record dataset. Mental illness diagnosis – defined as documented evidence of an active mental illness within 12 months of death that had been diagnosed by a medical professional. Socio-demographics characteristics included: sex; age; LGBTI status (individuals were classified as LGBTI if there was any information available anywhere in the Coronial Brief which indicated the person would themselves identify as LGBTI); employment status; relationship status; and location of usual residence. Physical health information included: physical illness; disability; or injury. Interpersonal stressors included: death; separation from or conflict with a partner or family member; or a partner or family member's illness. Personal stressors included those related to sexuality; isolation; or exposure to violence or abuse. Situational stressors included: work; financial; substance-related and legal stressors. Past exposure to suicide and previous history of suicide attempts were also collected.

Factors related to suicide among those with a diagnosed mental illness were examined by comparing factors present in cases of those with a diagnosed mental illness to those present in cases without a diagnosed mental illness (diagnosed mental illness status). Age was categorised into 6 age groups and all other variables were dichotomous (e.g., male/female, recorded presence of stressors as yes/no). Univariate and multivariate logistic regression analysis including main effects of all variables was conducted using IBM SPSS version 23 to determine the association between relevant variables and mental illness status (the outcome variable was diagnosed mental illness status yes/no). Unadjusted and adjusted odds ratios were calculated as the measures of association.

6.5.2 Study 2: Identifying typologies of persons who died by suicide in Victoria: Characterizing suicide in Victoria, Australia

6.5.2.1 Aim

To determine whether people who died by suicide in Victoria form groups based on demographic, psychosocial, mental and physical health factors and exposure to stressors.

6.5.2.2 Case selection

This study again comprised a retrospective case series review of individuals who died by suicide in Victoria, Australia during the period 1 January 2009 to 31 December 2013. The same 2,839 cases were included.

6.5.2.3 Variables included and analysis type:

A cluster analysis examining known suicide risk factors was performed to determine whether suicides separate into distinct and meaningful groups with similar characteristics. Initial analysis included the following variables:

- Socio-demographic characteristics (sex, age at death, employment status, relationship status, evidence of LGBTI identification, evidence of cultural and/or linguistic diversity (CALD) or community engagement, indigenous status and location of usual residence);
- mental health-related information such as the presence of a mental illness diagnosis (yes/no), the presence or absence of the most common mental illness diagnoses (mental and behavioural disorders due to psychoactive substance use; schizophrenia, schizotypal and delusional disorders; mood [affective] disorders; neurotic, stress-related and somatoform disorders; disorders of adult personality and behaviour), treatment in the previous 12 months for mental health issues;
- stressors related to physical health (any physical illness, disability or injury, presence of chronic pain);

- interpersonal stressors (including a stressor related to partner, family member or non-family member e.g., death, conflict, illness);
- personal stressors (including stressors related to sexuality, isolation, or exposure to abuse);
- situational stressors (including stressors related to work, finances, legal stressors, education, bullying, substance use);
- exposure to suicide (including exposure to the suicide of a family member, friend, acquaintance or stranger);
- a previous suicide attempt and expression of suicidal ideation.

To accommodate the mix of variable types a two-step clustering method combining the k-means and the hierarchical clustering analysis methods was used. Cluster distance was determined using the log-likelihood measure within IBM SPSS Statistics (V.22) and the number of clusters was determined automatically using the Bayesian information criterion. The average silhouette measure of cohesion and separation was used to indicate overall goodness of fit by providing a measure of the degree to which identified clusters were distinct. A generally accepted criterion is that if the silhouette measure is <0.2, then the quality of the average silhouette measure across the whole sample is considered poor, between 0.2 and 0.5 indicates a fair solution and >0.5 is a good solution [183]. This initial analysis separated cases into two distinct groups so additional cluster analyses were conducted on the two groups individually. For this second stage of analysis, the same variables were used and a criterion was added to allow a maximum of 10% of cases to be outliers and therefore not included in any of the determined clusters.

6.5.3 Study 3: Relative risk of suicide following exposure to recent stressors, Victoria, Australia

6.5.3.1 Aim

This study aimed to identify stressors overrepresented in the 12-months prior to death among 553 Victorian adults who died by suicide in 2013.

6.5.3.2 Case selection

6.5.3.2.1 Victorian Suicide Register (VSR)

Cases of suicide that occurred in Victoria in 2013 were extracted from the VSR. For consistency with the other data source used for this study (the General Social Survey GSS), 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. The final VSR dataset contained the records of 553 suicides.

6.5.3.2.2 General Social Survey (GSS)

Weighted Victorian GSS data were extracted using the ABS Remote Access Data Laboratory (RADL) system. Where possible data was extracted by age group and sex. For analysis of co-occurring stressors, data was only extracted by sex because age and sex-specific data were suppressed by the RADL.

6.5.3.3 Variables included

6.5.3.3.1 Victorian Suicide Register (VSR)

VSR cases coded as being exposed to a given stressor were examined through reading all the notes accompanying the flagging of that stressor to ensure the exposure occurred in the 12-months prior to death. 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”. In addition, when there is evidence of a diagnosed substance use disorder, 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, both the categories “mental illness” and “alcohol and/or other drug problems” in this study include 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.

6.5.3.3.2 General Social Survey (GSS)

GSS respondents were asked about exposure to stressors 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; alcohol or other drug problems; disability; 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. To allow comparison with VSR data, GSS data for victim of abuse/violent crime and/or witness to violence was combined.

6.5.3.4 Analysis type

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 ± (1.96 x 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, analyses of co-occurring stressors were performed.

Relative Risk was calculated as the ratio of the rate of suicide in the exposed group to that in the non-exposed group.

6.5.4 Study 4: Pathways to suicide among persons with a diagnosed mental illness, Victoria, Australia

6.5.4.1 Aim

To explore the pathways to suicide in a sample of Victorians who had a diagnosed mental illness.

6.5.4.2 Case selection

A death was included if it occurred in Victoria between 1 January and 31 December 2013, the coroner determined that the intent of the deceased was suicide, or in circumstances where the coroner did not make an explicit determination of intent, the VSR coders classified the intent of the deceased as suicide in accordance with the rules contained in the coding manual. These are deaths where the cause and circumstance surrounding the death are consistent with suicide. In addition, the death was only included if the VSR recorded that the deceased had a diagnosed mental illness at any time over the 12 months prior to the date of death. The rationale for this was that psychiatric illnesses can and do develop over time and can be cyclic. From this initial sample of 284 cases, a random 20% sample was selected for detailed analysis.

6.5.4.3 Variables included

Almost all available VSR variables were utilised for Study 4 with the exception of the method specific details and toxicology information. All coded and text-based information regarding socio-demographic characteristics of the deceased, and any information pertaining to the deceased's experiences of physical injury or illness, mental illness, and personal, interpersonal and situational/contextual stressors was included. In addition, all service contacts information as well as indicators of intent (including previous suicide attempt/s or instance/s of self-harm) was included.

6.5.4.4 Analysis type

The life chart template for this study was informed by previous research conducted in England [184] and Australia [185, 186]. The latter two studies were informed by the Paykel inventory of life events [187]. The first author (AC) read all VSR records for the sample to identify themes occurring and a life chart template was formulated which included the following categories: attachment, relationships, social circumstances, employment, education, physical health, substance use, financial events, forensic or legal events, previous self-harm (included suicide attempts and non-suicidal self-harm), psychiatric history, contact with services, exposure to suicide, and a residual category for other relevant information such as comments made about the personality of the deceased. Any event mentioned in an individual's VSR record that was relevant to any of the life chart categories was then plotted onto the individual's life chart. Following the creation of the life charts by the first author, two authors independently reviewed the life charts and attempted to group the suicides in a meaningful way placing emphasis on the chronology of events and the pathways or trajectories to suicide. The researchers then met to discuss and finalise the groups. Each author then independently classified each of the cases into the defined groups with an initial concordance of 86%. Discrepancies were mediated through discussion.

6.6 Summary

This chapter provides a conceptual and methodological overview of the four studies that make up the original work of this thesis. All studies used data from the VSR to explore the epidemiology of suicide in Victoria, Australia. Study 1 investigated what other factors are prevalent in cases of suicide occurring among people with diagnosed mental illness compared to those without mental illness. Study 2 extended the findings of Study 1 by seeing how factors and stressors cluster together in those who die by suicide in Victoria. Study 3 used an additional data source – data from the ABS General Social Survey – to examine suicide rates and relative risk of suicide for Victorians exposed to mental illness and other stressors in the 12-months prior to death. Finally, Study 4 examined pathways to suicide by examining the chronology of factors in a sample of Victorian suicides that occurred in the context of diagnosed mental illness. The findings were then interpreted in the context of previously proposed explanatory models for the association of mental illness with suicide.

The overall aim of these studies was to use a data source to describe the epidemiology of suicide in Victoria, in the context of mental illness and other stressors. The studies complement one another by examining related but distinct aspects of the epidemiology of suicide in Victoria, Australia.

Chapter 7: Study 1 – Differences in characteristics and exposure to stressors between persons with and without diagnosed mental illness who died by suicide in Victoria, Australia

7.1 Introduction

This chapter describes Study 1, which used VSR data to examine what other factors and stressors are prevalent among suicide cases that have a diagnosed mental illness compared to those who do not have a diagnosed mental illness. This was achieved by comparing socio-demographic characteristics and exposure to other factors/stressors between persons with and without diagnosed mental illness who died by suicide in Victoria, Australia.

This study was published in 2018 in *Crisis: The Journal of Crisis Intervention and Suicide Prevention* as a paper titled "Differences in Characteristics and Exposure to Stressors Between Persons With and Without Diagnosed Mental Illness Who Died by Suicide in Victoria, Australia"[62].

Differences in Characteristics and Exposure to Stressors Between Persons With and Without Diagnosed Mental Illness Who Died by Suicide in Victoria, Australia

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Abstract. *Background:* Mental illness is an established risk factor for suicide. To develop effective prevention interventions and strategies, the demographic characteristics and stressors (other than, or in addition to, mental illness) that can influence a person's decision to die by suicide need to be identified. *Aim:* To examine cases of suicide by the presence or absence of a diagnosed mental illness (mental illness status) to identify differences in factors associated with suicide in the groups. *Method:* Logistic regression analyses were used to investigate mental illness status and exposure to stressors among 2,839 persons who died by suicide in Victoria, Australia (2009–2013), using the Victorian Suicide Register. *Results:* Females, metropolitan residents, persons treated for physical illness/injury, those exposed to stressors related to isolation, family, work, education, and substance use and those who had made a previous suicide attempt had increased odds of having a diagnosed mental illness. Employed persons had decreased odds of having a diagnosed mental illness. *Limitations:* The retrospectivity of data collection as well as the validity and reliability of some of the data may be questionable owing to the potential for recall bias. *Conclusion:* The point of intervention for suicide prevention cannot always be a mental health professional; some people who die by suicide either do not have a mental illness or have not sought help.

Keywords: suicide, mental illness, suicide stressors, suicide epidemiology

An estimated 804,000 suicides occurred worldwide in 2012 (World Health Organization [WHO], 2014). Suicide is a complex behavior and as such the triggers or causes of suicide are also complicated. A factor established as particularly important in a number of previous studies is the presence of mental illness (Barraclough, Bunch, Nelson, & Sainsbury, 1974; Bertolote & Fleischmann, 2002; Isometsä, 2001; Lönnqvist et al., 1995).

Psychological autopsy (PA) studies have consistently found that 90% or more of suicides occur among persons with a diagnosed or diagnosable mental illness (Bertolote, Fleischmann, De Leo, & Wasserman, 2004; Isometsä, 2001). However, longstanding concerns regarding the method used for PA studies have led some to claim the method can lead to erroneous results and incorrect conclusions – especially when it comes to the retrospective diagnosis of a mental illness following a person's death (Pridmore, 2015; Shahtahmasebi, 2013) since the validity of assigning mental illness diagnoses by interviewing proxies is seen by critics as inherently inaccurate and subject to bias (Hjelmeland, Dieserud, Dyregrov, Knizek, & Leenaars, 2012; Pridmore, 2015; Selkin & Loya, 1979; Shahtahmasebi, 2013). By contrast, more recent Australian studies using data from purpose-built suicide registers or other coronial data sources – which do not make retrospective mental illness diagnosis following a person's death – have found that in approximately half of suicides, the deceased had a diagnosed mental illness (Bugeja, Milner, & Pirkis, 2015; Judd, Jackson, Komiti, Bell, & Fraser, 2012; Kolves, Potts, & De Leo, 2015), and internationally an examination of coroners records contained in the National Suicide Registry of Malaysia found reports of mental illness in only 22% of cases (Ali et al., 2014). These findings raise the possibility that mental illness is not present among those who die by suicide to the degree identified by the PA studies and lends support to the argument that

rather than suicidal behavior being seen as simply synonymous with mental illness it should be examined as a behavior that is related to but also distinct from mental illness. Individuals living with mental illness have a high risk of suicide but this may be because of exposure to many other risk factors, some of which are precipitated by mental illness or interact with it.

Further to this, a more comprehensive understanding of the potential differences in factors associated with suicide in those with mental illness and those without mental illness is still lacking. Recent published studies using suicide registers as data sources have compared suicide cases of one type (or among one group) with other suicide cases to attempt to gather important information regarding possible factors related to suicide among persons in a given group (Arnautovska, McPhedran, & De Leo, 2015; De Leo & Klieve, 2007; Paraschakis et al., 2012; Soole, Kolves, & De Leo, 2014). Any research that identifies differences in suicide profiles should increase the efficacy of suicide prediction (O'Connor & Sheehy, 1997) and developing effective prevention interventions and strategies is predicated upon understanding the stressors (other than, or in addition to, mental illness) that can influence a person's decision to die by suicide.

It is therefore important to examine suicides by the presence or absence of a diagnosed mental illness to gain a more comprehensive understanding of the potential differences in factors associated with suicide in these two groups and to determine whether persons with mental illness and those without mental illness may warrant separate consideration in future research.

This study compares the sociodemographic characteristics and exposure to potential stressors between Victorians who died by suicide where there was, and was not, evidence available of a diagnosed mental illness prior to the death by suicide.

Method

Research Design

A retrospective case series study was conducted of persons who died by suicide in Victoria, Australia, during the 5-year period January 1, 2009 to December 31, 2013.

Data Source

The Victorian Suicide Register (VSR) was established in 2009 by the Coroners Prevention Unit (CPU) – a specialist investigative service of the Coroners Court of Victoria (CCOV) – with the aim of providing detailed and up-to-date information on all people who die by suicide in Victoria, Australia (Sutherland et al., 2018). In accordance with the *Coroners Act 2008* (Vic), all deaths where suicide is suspected must be investigated by the coroner. The information generated for these investigations comprises the most comprehensive and reliable data source available on Victorian suicides. Data in the VSR are coded based on a review of all available information. Typically, the entire coronial file is available to coders. It contains the coronial brief, forensic medical and scientific reports (i.e., autopsy and toxicology reports), and coroners' finding. Data are coded by persons with experience in the conduct of medicolegal investigations and trained in mortality review for the purposes of surveillance, and the VSR is supported by a coding manual, data dictionary, and quality framework (Bugeja et al., 2015; Sutherland et al., 2018).

Inclusion Criteria

A case was included if the death occurred in Victoria between January 1, 2009 and December 31, 2013, and the coroner determined that the intent of the deceased was suicide, or (in circumstances where the coroner did not make an explicit determination of intent) the VSR coders classified the intent of the deceased as suicide in accordance with the rules contained in the VSR coding manual; see Sutherland et al. (2018) for more information.

Data Collection

The following data items recorded in the VSR were extracted into a unit record dataset. Mental illness diagnosis – was defined as documented evidence of an active mental illness within 12 months of death that had been diagnosed by a medical professional (see Table 1 for mental illness categories). Sociodemographics characteristics included: sex; age; LGBTI status (persons were classified as LGBTI if there was any information available anywhere in the Coronial Brief that indicated the person would themselves identify as LGBTI); employment status; relationship status; and location of usual residence. Physical health information included: physical illness; disability; or injury. Interpersonal stressors included: death of, separation from, or conflict with a partner or family member; or a partner or family member's illness. Personal stressors included those related to sexuality, isolation, or exposure to violence or abuse. Situational stressors included: work, financial, substance-related, and legal stressors. Past exposure to suicide and previous history of suicide attempts were also included. See Table 2 and Table 3 for a full list of included variables.

Data Analysis

Factors related to suicide among those with a diagnosed mental illness were examined by comparing factors present in cases of those with a diagnosed mental illness with those present in cases without a diagnosed mental illness (diagnosed mental illness status). Age was categorized into six age groups and all other variables were dichotomous (e.g., male/female, recorded presence of stressors as *yes/no*).

Univariate and multivariate logistic regression analysis including main effects of all variables was conducted using IBM SPSS version 23 to determine the association between relevant variables and mental illness status (the outcome variable was diagnosed mental illness status *yes/no*). Unadjusted and adjusted odds ratios were calculated as the measures of association. The final model demonstrated a good fit with nonsignificant Hosmer–Lemeshow test results, $\chi^2(8) = 5.139$, $p = .743$. The model explained between 13.1% (Cox–Snell R^2) and 17.5% (Nagelkerke R^2) of the variance in the outcome variable, and 65.7% of cases were classified correctly using the variables in the multivariate analysis.

Results

Almost 3,000 suicide cases were recorded in the VSR during the study period (n = 2,839). Males comprised three quarters of cases (n = 2,135, 75.2%) and the mean age at the time of death was 45.5 years. In all, 52% of cases (n = 1,482) had a documented diagnosed mental illness and 1,357 cases had no documented diagnosed mental illness (47.8%). Table 1 shows the frequency and proportion of cases assigned to each category of mental illness. A mean of 5.7 stressors were recorded per case (range = 0–20, SD = 3.4); 2.7% of cases had no stressors recorded, and 14.0% had more than 10 stressors recorded. Cases with a diagnosed mental illness had a higher number of stressors recorded (M = 6.39, SD = 3.56) than cases without a mental illness (M = 5.00, SD = 2.98; $t(2,837) = -11.221$, $p < .001$).

The 10 most common specific stressors recorded for both groups were the same although the ranking differed slightly. A substance-related stressor was the most common specific stressor documented for both groups and overall, recorded for 44.0% of cases (49.5% of cases among persons with a diagnosed mental illness and 38.1% of cases among persons with no documented diagnosed mental illness). Separation from and/or conflict with a partner were also very commonly recorded stressors, as were family conflict, current treatment for a physical condition (injury and/or illness), and stressors related to work, finances, and legal issues (Table 3).

Univariate Analysis

The association of various demographic and other characteristics with diagnosed mental illness status is shown in Table 2. Compared with those aged 40–54 years, those aged 10–24 years, 70–84 years, and 85+ years were significantly less likely to have a diagnosed mental illness at the time of their death by suicide. A significantly higher proportion of mental illness cases than non-mental illness cases were female. Those with a diagnosed mental illness were significantly more likely than those without a diag-

Table 1. Presence of mental illness diagnosis and categories of mental illness among persons who died by suicide, Victoria 2009–2013 (n = 2,839)

Mental illness diagnosis	*n*	%
At least one diagnosed mental illness	1,482	52.2
Mood [affective] disorders	1,191	42.0
Organic, including symptomatic, mental disorders	24	0.8
Mental and behavioral disorders due to psychoactive substance use	247	8.7
Schizophrenia, schizotypal, and delusional disorders	198	7.0
Neurotic, stress-related, and somatoform disorders	424	14.9
Behavioral syndromes (associated with physiological disturbances and physical factors)	38	1.3
Disorders of adult personality and behavior	174	6.1
Disorders of psychological development	17	0.6
Mental retardation	5	0.2
Behavioral and emotional disorders (onset usually occurring in childhood and adolescence)	36	1.3
Unspecified mental disorder	7	0.2
No diagnosed mental illness	1,357	47.8

Table 2. Demographic characteristics associated with diagnosed mental illness status among persons who died by suicide in Victoria 2009–2013

	No mental illness diagnosis		Mental illness diagnosis		Unadjusted *OR*	Adjusted *OR*
Characteristics	*n*	%	*n*	%	(95% CI; *p*)	(95% CI; *p*)
Age: 10–24	204	15.0	159	10.7	0.6 (0.5–0.7; $p < .001$)*	0.4 (0.3–0.5; $p < .001$)*
25–39	349	25.7	424	28.6	0.9 (0.7–1.1; $p = .322$)	0.8 (0.7–1.0; $p = .050$)
40–54	376	27.7	504	34.0	1.0	1.0
55–69	248	18.3	276	18.6	0.8 (0.7–1.0; $p = .093$)	0.9 (0.7–1.1; $p = .221$)
70–84	133	9.8	97	6.5	0.5 (0.4–0.7; $p < .001$)*	0.7 (0.5–0.9; $p < .020$)*
85+	47	3.5	22	1.5	0.3 (0.2–0.6; $p < .001$)*	0.4 (0.2–0.7; $p < .001$)*
Male	1,112	81.9	1023	69.0	1.0	1.0
Female	245	18.1	459	31.0	2.0 (1.7–2.4; $p < .001$)*	1.9 (1.5–2.3; $p < .001$)*
LGBTI person	28	2.1	62	4.2	2.1 (1.3–3.3; $p = .002$)*	1.6 (0.9–2.7; $p = .106$)
Indigenous person	11	0.8	15	1.0	1.3 (0.6–2.7; $p = .574$)	0.9 (0.4–2.0; $p = .782$)
Metropolitan resident	802	59.1	1058	71.4	1.7 (1.5–2.0; $p < .001$)*	1.5 (1.3–1.8; $p < .001$)*
Employed	696	51.3	622	42.0	0.7 (0.6–0.8; $p < .001$)*	0.7 (0.6–0.8; $p < .001$)*
In a relationship	569	41.9	554	37.4	0.8 (0.7–1.0; $p = .013$)*	0.9 (0.8–1.1; $p = .256$)
Previous suicide attempt	117	8.6	316	21.3	2.9 (2.3–3.6; $p < .001$)*	2.4 (1.9–3.1; $p < .001$)*

Note. LGBTI = lesbian, gay, bisexual, transgender, and intersex. * = statistically significant.

nosed mental illness to be members of the LGBTI community, metropolitan residents, and have made a previous suicide attempt but less likely to be employed or in a relationship.

The association of exposure to various stressors with diagnosed mental illness status is shown in Table 3. Cases with a mental illness were significantly more likely than cases without a diagnosed mental illness to have documented evidence of at least one personal stressor, interpersonal stressor, physical stressor, situational stressor, and to have been exposed to another's suicide. With regard to specific stressors recorded, those with a mental illness were significantly more likely than those without a diagnosed mental illness to have been exposed to the following personal stressors: sexuality, isolation, abuse; interpersonal stressors: family-related and non-family-related; physical stressors: injury, current treatment for a physical condition; situational stressors: work, financial, legal, education, bullying, substance-related; and to have been exposed to a family member's suicide (Table 3).

Multivariate Analysis

Results of the multivariate analysis are also shown in Table 2 and Table 3. Two demographic factors identified in the univariate analysis were no longer significant in the multivariate analysis – LGBTI and relationship status. Compared with those aged 40–54 years, those in the youngest and oldest age groups (10–24, 70–84, and 85+) were significantly less likely to have a diagnosed mental illness at the time of their death by suicide. Females and metropolitan residents had increased odds of having a diagnosed mental illness compared with males and residents of rural and regional areas, respectively. Persons who had made a previous suicide attempt had 2.4 times the odds of having a diagnosed mental illness compared with those with no documented history of suicide attempts. Conversely, employed persons had decreased odds of having a diagnosed mental illness compared with unemployed persons (Table 2).

Several stressors were also no longer significant in the multivariate analysis. The final model identified six stressors that reached statistical significance as independently associated with mental illness status. Persons exposed to isolation, family-related, work, educational, and substance-related stressors and those receiving current treatment for a physical condition were more likely to have a diagnosed mental illness compared with people who had not been exposed to these potential stressors (Table 3).

Discussion

Almost 3,000 suicide cases were recorded in the VSR for the study period and just over half had a documented diagnosed mental illness. Findings show there are clear differences between cases with and without a diagnosed mental illness at the time of death and demonstrate that there is

Table 3. Stressors associated with diagnosed mental illness status among persons who died by suicide in Victoria, 2009–2013

	No mental illness diagnosis		Mental illness diagnosis		Unadjusted *OR* (95% CI; *p*)	Adjusted *OR* (95% CI; *p*)
Stressors	*n*	%	*n*	%		
Personal stressor	474	34.9	705	47.6	1.7 (1.5–2.0; $p < .001$)*	
Sexuality	34	2.5	71	4.8	2.0 (1.3–3.0; $p = .002$)*	1.3 (0.8–2.2; $p = .288$)
Isolation	175	12.9	266	17.9	1.8 (1.5–1.2; $p < .001$)*	1.3 (1.0–1.6; $p = .038$)*
Experience of abuse	312	23.0	507	34.2	1.7 (1.5–2.1; $p < .001$)*	1.2 (1.0–1.5; $p = .098$)
Interpersonal stressor	1100	81.1	1291	87.1	1.6 (1.3–1.9; $p < .001$)*	
Partner	749	55.2	848	57.2	1.1 (0.9–1.3; $p = .277$)	0.9 (0.8–1.1; $p = .244$)
Family	551	40.6	857	57.8	2.0 (1.7–2.3; $p < .001$)*	1.5 (1.3–1.8; $p < .001$)*
Non-family	277	20.4	380	25.6	1.3 (1.1–1.6; $p = .001$)*	0.9 (0.7–1.1; $p = .278$)
Physical stressor	588	43.3	760	51.3	1.4 (1.2–1.6; $p < .001$)*	
Physical illness	367	27.0	440	29.7	1.1 (1.0–1.3; $p = .119$)	1.0 (0.8–1.2; $p = .771$)
Injury	160	11.8	219	14.8	1.3 (1.0–1.6; $p = .020$)*	1.0 (0.8–1.3; $p = .914$)
Pain	251	18.5	309	20.9	1.2 (1.0–1.4; $p = .116$)	0.9 (0.7–1.2; $p = .446$)
Treatment	408	30.1	549	37.0	1.4 (1.2–1.6; $p < .001$)*	1.5 (1.2–1.8; $p = .001$)*
Disability	42	3.1	56	3.8	1.2 (0.8–1.9; $p = .320$)	1.1 (0.7–1.7; $p = .771$)
Situational stressor	982	72.4	1205	81.3	1.7 (1.4–2.0; $p < .001$)*	
Work	380	28.0	522	35.2	1.4 (1.2–1.6; $p < .001$)*	1.4 (1.1–1.7; $p = .001$)*
Financial	392	28.9	532	35.9	1.4 (1.2–1.6; $p < .001$)*	1.1 (0.9–1.3; $p = .344$)
Legal	312	23.0	395	26.7	1.2 (1.0–1.4; $p = .024$)*	0.9 (0.8–1.1; $p = .539$)
Education	54	4.0	124	8.4	2.2 (1.6–3.1; $p < .001$)*	2.6 (1.7–3.9; $p < .001$)*
Bullying	154	11.3	247	16.7	1.6 (1.3–1.9; $p < .001$)*	1.1 (0.9–1.5; $p = .348$)
Substance related	517	38.1	733	49.5	1.6 (1.4–1.9; $p < .001$)*	1.4 (1.2–1.7; $p < .001$)*
Exposure to suicide	130	9.6	201	13.6	1.5 (1.2–1.9; $p = .001$)*	
Family	90	6.6	158	10.7	1.7 (1.3–2.2; $p < .001$)*	1.2 (0.9–1.6; $p = .252$)
Friend	29	2.1	29	2.0	0.9 (0.5–1.5; $p = .735$)	0.8 (0.4–1.4; $p = .430$)
Acquaintance	11	0.8	20	1.3	1.7 (0.8–3.5; $p = .172$)	1.6 (0.7–3.6; $p = .262$)
Stranger	3	0.2	8	0.5	2.5 (0.7–9.3; $p = .186$)	1.5 (0.4–6.0; $p = .575$)

Note. * = statistically significant.

a group of persons who die by suicide in Victoria who potentially require increased or varied support and intervention in the context of their mental illness, but there is also a group of persons that require prevention strategies outside this mental illness/health context.

To develop effective prevention interventions and strategies, it is essential to understand the stressors (other than, or in addition to, mental illness) that can influence a person's decision to die by suicide. On average, suicide cases among those with a diagnosed mental illness had a significantly higher number of specific stressors recorded compared with cases among those with no diagnosis of mental illness. However, the stressors recorded for each group were very similar, even though the ranking of their prevalence differed. A substance-related stressor was the most common specific stressor documented for both groups but was significantly more common among the mental illness group. This finding was expected given that previous evidence shows comorbidity between mental and substance use disorders is highly prevalent (Jane-Llopis & Matytsina, 2006; Laudet, Magura, Vogel, & Knight, 2004).

Relationship separation is also a known risk factor for suicide (Ide, Wyder, Kolves, & De Leo, 2010; Stack & Scourfield, 2015; Sweeper & Halford, 2006) and previous research has found relationship separation or difficulties are common stressors experienced by those who die by suicide (Judd et al., 2012; O'Neill, Ennis, Corry, & Bunting, 2018). More than one third of those in each of the two groups in the current study had been through a relationship separation in the period prior to their suicide. However, no significant difference in the frequency of exposure

to this stressor between the mental illness and non-mental illness groups was found.

Family conflict, physical treatment or illness, and stressors related to work, finances, and legal issues were also very common among Victorian suicide cases. Strengthening an individual's personal resources to help cope with difficulties associated with stressors such as these may represent an important component of suicide prevention programs (Arnautovska et al., 2015). In addition, effective social support within communities could help protect vulnerable persons from suicide by building and improving social connectedness and skills to cope with difficulties when they inevitably occur (WHO, 2014).

Females, persons not in the labor force, and metropolitan residents who died by suicide in Victoria were more likely to have a diagnosed mental illness at the time of their death. Presumably, to have a mental health diagnosis these people had been in contact with mental health professionals in the time prior to their suicide, suggesting traditional mental health treatment is not always effective for the prevention of suicide – at least among some Victorians who die by suicide. A recent study, also using VSR data, found 94% of the cases with a diagnosed mental illness had contact with a health service for treatment of mental health-related issues in the 12 months leading up to their death from suicide (Bugeja et al., 2015). These findings emphasize that improving the quality of care for people seeking help is a factor for consideration in reducing suicides that arise as a result of, or in the context of, mental illness. Conversely, results from the current study suggest males, employed persons, and rural/regional residents who die by suicide in Victoria are unlikely to come into contact with mental health professionals prior to their death. Therefore, opportunities for prevention of suicide among these people should be considered in a context other than through traditional established mental health channels. Promising interventions include restricting access to lethal means (Mann et al., 2005) and a public health intervention – a three-part documentary called *Man Up* that explored the relationship between masculinity and mental health, well-being, and suicidality – which was found to significantly increase males' intentions to seek help for personal and emotional problems (King, Schlichthorst, Spittal, Phelps, & Pirkis, 2018).

Those with a mental illness were significantly more likely to have been found to be exposed to a number of personal, interpersonal, physical, and situational stressors. None of the stressors investigated showed reduced odds of being associated with mental illness. This is somewhat surprising as it could reasonably be hypothesized that during a police or coronial inquiry, investigators may be less likely to attempt to identify additional stressors among persons who had a recorded mental illness as the mental illness may be considered to be a likely and/or sufficient reason for the suicide. However, a model previously proposed to account for the relationship between mental illness and suicide (Mishara & Chagnon, 2011) may provide insight into the associations identified in this study. The model suggests that people who live with a mental illness in society are more likely to have a number of important risk factors (or lack of protective factors) that have previously been found to be associated with suicide. The explanatory model posits that it is these risk factors that result in the increased risk of suicide among persons with mental illness. Therefore, it is not the symptoms of the mental illness that result in an increased suicide risk, but rather suicide is seen as the consequence of the effects of living with a mental illness in society (Mishara & Chagnon, 2011). While findings from this study could be perceived as preliminary support for this explanatory model, this cannot be confirmed with a study such as this one – the chronology, and potentially the contribution of factors, would need to be examined.

The results presented regarding the presence of mental illness among female versus male suicide cases and employed versus unemployed cases may provide valuable guidance for the development of intervention and prevention practices. Females who died by suicide had almost twice the odds of having a diagnosed mental illness compared with males, and employed persons had decreased odds of having a diagnosed mental illness compared with unemployed persons. These findings may simply reflect the prevalence of mental illness in the general population, considering an Australian population survey found being female or not being in the labor force was associated with experience of mental illness in the 12 months prior to the survey (Slade et al., 2009). However, the findings could suggest that when compared with suicide among males, suicide among females is more likely to occur in the context of mental illness. Similarly, when compared with suicide among the employed, suicide among the unemployed may also be more likely to occur in the context of mental illness.

Available evidence suggests there is little difference in the proportion of Australians in different regions who meet the criteria for a 12-month mental illness (20% of major urban residents vs. 19% of other residents; Australian Bureau of Statistics [ABS], 2008). Findings from the current study suggest that people who die by suicide in metropolitan areas as opposed to rural/regional areas have an increased likelihood of having a diagnosed mental illness. It is unclear whether this is a result of better access to – and/or quality of – mental health care (and therefore better access to potential diagnosis). However, given the evidence of little difference in the proportion of metropolitan and rural/regional residents that meet the criteria for a mental illness diagnosis, this may be a significant finding.

Limitations

In Victoria, all deaths where suicide is suspected are legally required to be investigated by the coroner, and therefore the information generated for these investigations comprises the most comprehensive and reliable data source available on suicide in Victoria. However, there are problems inherent in studies of this nature. Limitations include retrospectivity of data collection and because these data are often supplied by family members, relatives or friends, as well as emergency services and medical personnel, the validity and reliability of some of the data may be questionable as it is subject to recall bias and potential subjective views of the persons providing information. In addition, the absence of information in the coronial file does not guarantee that the factor of interest was not present. Detailed information regarding psychosocial and precipitating events is available for both categories of suicides (i.e., suicides among persons who have a mental illness and those who do not) and therefore there is no reason potential biases should differ between the categories – consequently, the comparisons should represent real differences. Nevertheless, the associations found in this research may not be specific for suicides but related to the differences between those with and without mental illness in the general population. A further limitation of the study relates to the classification of persons into the diagnosed mental illness and no mental illness groups. It is possible that some individuals in the no mental illness group may have had a mental illness that was yet to be diagnosed. In addition, mental illnesses can develop over time, be cyclic, go through several iterations and treatments, or have a precipitous onset (Bugeja et al., 2015), and for this study, the classification of a diagnosed mental illness only included persons with an active mental illness within 12 months of death.

Conclusion

In summary, this study suggests that suicide among Victorians with a mental illness may be associated with being female, unemployed, and a resident of metropolitan areas. In addition, being treated for physical illness or injury, being exposed to stressors related to isolation, family, work, education, and substance use, and having made a previous suicide attempt may also be associated with suicide among those with a mental illness. While some of these findings may simply reflect the typical life course of those with a mental illness, future research could examine potential reasons for these discrepancies.

The research adds to the existing body of knowledge by showing that persons with mental illness and those without mental illness warrant separate consideration in future research and with regard to suicide prevention initiatives. The association between mental illness and suicide has been determined previously (Bertolote & Fleischmann 2002; Bertolote, 2003; Van Orden et al., 2010), meaning that the prevention and treatment of mental illness in the prevention of suicide is uncontested (Bertolote et al., 2004). However, the findings from this study imply that suicide prevention initiatives in Victoria should be tailored to those with diagnosed mental illness but also to those without, as these groups seem to exhibit different suicide risk factors.

Almost half of all people in this case series did not have a diagnosed mental illness at the time of their death, but almost all had multiple other suicide stressors recorded in the VSR. These findings lend support to the argument that suicidal behavior should be examined as a behavior that is related to, but also distinct from, mental illness and therefore should not be seen as simply synonymous with mental illness. Individuals with mental illness have a high risk of suicide but this may be because of exposure to many other risk factors, some of which are precipitated by mental illness or which interact with it.

In addition, those with a mental illness had higher odds of having a number of other stressors recorded, suggesting that it was likely that the combined effect of a number of stressors had led to the person's decision to die by suicide. Consequently, for effective prevention of suicide, practitioners working with people with mental illness need to be aware of the burden placed on their patients when they are exposed to multiple personal, interpersonal, and situational stressors and recognize that this may be a time to be vigilant regarding potential signs that the person may be contemplating and/or planning to die by suicide.

Practitioners and the general public need to be aware that some persons are dying by suicide as a response to other stressors and not in the context of a diagnosed mental illness. The message should be reinforced that simply because someone is not – or does not be appear to be – experiencing symptoms of a mental illness they may still be at risk of dying by suicide, especially if they are experiencing multiple stressors. The point of intervention for prevention of suicide cannot always be a mental health professional because these people either do not have a mental illness or they have not sought help. Increasing and facilitating community engagement in suicide prevention is clearly needed to attempt to reduce suicide deaths.

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References

Ali, N. H., Zainun, K. A., Bahar, N., Haniff, J., Hamid, A. M., Bujang, M. A., … Kuoppasalmi, K. I. (2014). Pattern of suicides in 2009: Data from the National Suicide Registry Malaysia. *Asia-Pacific Psychiatry, 6*(2), 217–225. https://doi.org/10.1111/j.1758-5872.2012.00227.x

Arnautovska, U., McPhedran, S., & De Leo, D. (2015). Differences in characteristics between suicide cases of farm managers compared to those of farm labourers in Queensland, Australia. *Rural and Remote Health, 15(3)*, 3250.

Australian Bureau of Statistics. (2018). *National Survey of Mental Health and Wellbeing: Summary of Results, 2007*. Canberra, Australian Bureau of Statistics. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/mf/4326.0

Barraclough, B., Bunch, J., Nelson, B., & Sainsbury, P. (1974). A hundred cases of suicide: Clinical aspects. *The British Journal of Psychiatry, 125*(587), 355–373.

Bertolote, J. M. (2003). Suicide and mental disorders: Do we know enough? *The British Journal of Psychiatry, 183*(5), 382–383. https://doi.org/10.1192/bjp.183.5.382

Bertolote, J. M., & Fleischmann, A. (2002). Suicide and psychiatric diagnosis: A worldwide perspective. *World Psychiatry, 1*(3), 181–185.

Bertolote, J. M., Fleischmann, A., De Leo, D., & Wasserman, D. (2004). Psychiatric diagnoses and suicide: Revisiting the evidence. *Crisis, 25*(4), 147–155. https://doi.org/10.1027/0227-5910.25.4.147

Bugeja, L., Milner, A., & Pirkis, J. (2015). *Identification and analysis of health service use and pathways to health service contact amongst persons who died from suicide in Victoria, 2009–2010*. Melbourne, Australia: Coroners Court of Victoria.

De Leo, D., & Klieve, H. (2007). Communication of suicide intent by schizophrenic subjects: Data from the Queensland Suicide Register. *International Journal of Mental Health Systems, 1*(1), 6–14. https://doi.org/10.1186/1752-4458-1-6

Hjelmeland, H., Dieserud, G., Dyregrov, K., Knizek, B. L., & Leenaars, A. A. (2012). Psychological autopsy studies as diagnostic tools: Are they methodologically flawed? *Death Studies, 36*(7), 605–626. https://doi.org/10.1080/07481187.2011.584015

Ide, N., Wyder, M., Kolves, K., & De Leo, D. (2010). Separation as an important risk factor for suicide: A systematic review. *Journal of Family Issues, 31*(12), 1689–1716. https://doi.org/10.1177/0192513x10365317

Isometsä, E. T. (2001). Psychological autopsy studies – a review. *European Psychiatry, 16*(7), 379–385. https://doi.org/10.1016/S0924-9338(01)00594-6

Jane-Llopis, E., & Matytsina, I. (2006). Mental health and alcohol, drugs and tobacco: A review of the comorbidity between mental disorders and the use of alcohol, tobacco and illicit drugs. *Drug and Alcohol Review, 25*(6), 515–536. https://doi.org/10.1080/09595230600944461

Jorm, A. F., Korten, A. E., Rodgers, B., Jacomb, P. A., & Christensen, H. (2002). Sexual orientation and mental health: Results from a community survey of young and middle-aged adults. *The British Journal of Psychiatry, 180*(5), 423–427.

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. https://doi.org/10.1007/s00127-010-0306-z

King, K. E., Schlichthorst, M., Spittal, M. J., Phelps, A., & Pirkis, J. (2018). Can a documentary increase help-seeking intentions in men? A randomised controlled trial. *Journal of Epidemiology and Community Health, 72*(1), 92–98. https://doi.org/10.1136/jech-2017-209502

Kolves, K., Potts, B., & De Leo, D. (2015). Ten years of suicide mortality in Australia: Socio-economic and psychiatric factors in Queensland. *Journal of Forensic and Legal Medicine, 36*, 136–143. https://doi.org/10.1016/j.jflm.2015.09.012

Laudet, A. B., Magura, S., Vogel, H. S., & Knight, E. L. (2004). Perceived reasons for substance misuse among persons with a psychiatric disorder. *American Journal of Orthopsychiatry, 74*(3), 365–375. https://doi.org/10.1037/0002-9432.74.3.365

Lonnqvist, J. K., Henriksson, M. M., Isometsa, E. T., Marttunen, M. J., Heikkinen, M. E., Aro, H. M., … Kuoppasalmi, K. I. (1995). Mental disorders and suicide prevention. *Psychiatry and Clinical Neurosciences, 49*(Suppl 1), S111–116.

Mann, J. J., Apter, A., Bertolote, J., Beautrais, A., Currier, D., Haas, A., … Hendin, H. (2005). Suicide prevention strategies: A systematic review. *JAMA, 294*(16), 2064–2074.

Mishara, B. L., & Chagnon, F. (2011). Understanding the relationship between mental illness and suicide and the implications for suicide prevention. In R. C. O'Connor, S. Platt, & J. Gordon (Eds.), *International handbook of suicide prevention: Research, policy and practice* (pp. 609–623). West Sussex, UK: Wiley-Blackwell.

O'Connor, R. C., & Sheehy, N. P. (1997). Suicide and gender. *Mortality, 2*(3), 239–254.

O'Neill, S., Ennis, E., Corry, C., & Bunting, B. (2018). Factors associated with suicide in four age groups: A population based study. *Archives of Suicide Research, 22*, 128–138. https://doi.org/10.1080/13811118.2017.1283265

Paraschakis, A., Michopoulos, I., Douzenis, A., Christodoulou, C., Koutsaftis, F., & Lykouras, L. (2012). Differences between suicide victims who leave notes and those who do not: A 2-year study in Greece. *Crisis, 33*(6), 344–349. https://doi.org/10.1027/0227-5910/a000150

Pridmore, S. (2015). Mental disorder and suicide: A faulty connection. *Australian and New Zealand Journal of Psychiatry, 49*(1), 18–20. https://doi.org/10.1177/0004867414548904

Selkin, J., & Loya, F. (1979). Issues in the psychological autopsy of a controversial public figure. *Professional Psychology, 10*(1), 87–93.

Shahtahmasebi, S. (2013). Examining the claim that 80–90% of suicide cases had depression. *Frontiers in Public Health, 1*, 62.

Slade, T., Johnston, A., Teesson, M., Whiteford, H., Burgess, P., Pirkis, J., & Saw, S. (2009). *The mental health of Australians 2. Report on the 2007 National Survey of Mental Health and Wellbeing*. Canberra, ACT: Department of Health and Ageing.

Soole, R., Kolves, K., & De Leo, D. (2014). Factors related to childhood suicides: Analysis of the Queensland Child Death Register. *Crisis, 35*(5), 292–300. https://doi.org/10.1027/0227-5910/a000267

Stack, S., & Scourfield, J. (2015). Recency of divorce, depression, and suicide risk. *Journal of Family Issues, 36*(6), 695–715. https://doi.org/10.1177/0192513x13494824

Sutherland, G., Milner, A., Dwyer, J., Bugeja, L., Woodward, A., Robinson, J., & Pirkis, J. (2018). Implementation and evaluation of the Victorian Suicide Register. *Australian and New Zealand Journal of Public Health, 42*(3), 296–302. https://doi.org/10.1111/1753-6405.12725

Sweeper, S., & Halford, K. (2006). Assessing adult adjustment to relationship separation: The Psychological Adjustment to Separation Test (PAST). *Journal of Family Psychology, 20*(4), 632–640. https://doi.org/10.1037/0893-3200.20.4.632

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E. (2010). The interpersonal theory of suicide. *Psychological Review, 117*(2), 575–600. https://doi.org/10.1037/a0018697

World Health Organization. (2014). *Preventing suicide: A global imperative*. Retrieved from http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/

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7.2 Conclusion

Study 1 showed that 2,839 Victorians died by suicide over the five-year study period 2009-2013 and 52% of these individuals had a documented diagnosed mental illness recorded in the VSR. There were differences between suicide cases that had a diagnosed mental illness and those that did not. For example, females and metropolitan residents had increased odds of having a diagnosed mental illness compared to males and residents of rural and regional areas, respectively. Individuals who had made a previous suicide attempt had 2.4 times the odds of having a diagnosed mental illness compared to those with no documented history of suicide attempts. Conversely, employed persons had decreased odds of having a diagnosed mental illness compared to unemployed persons.

Cases with a diagnosed mental illness had a higher number of additional stressors recorded than the non-mental illness cases. In addition, six stressors reached statistical significance as independently associated with mental illness status. Persons exposed to isolation, family-related, work, educational, and substance-related stressors and those receiving current treatment for a physical condition, were more likely to have a diagnosed mental illness compared to people who had not been exposed to these stressors.

A US study, published after the current manuscript was accepted, examined 20,000 suicides in 27 states in 2015 found some consistent and some contrasting results with the current study. For example, consistent with the current study, less than half (46.0%) of suicide decedents had a known mental health condition at the time of death. However, in contrast to findings from the current study the researchers found that among decedents with available information, several circumstances were significantly more likely among those without known mental health conditions than among those with mental health conditions, including relationship problems/loss, life stressors, and recent/impending crises [112].

Chapter 8: Study 2 – Identifying typologies of persons who died by suicide: Characterizing suicide in Victoria, Australia

8.1 Introduction

This chapter describes Study 2 and builds on the findings of Study 1 (Chapter 7) by examining how the factors and stressors investigated in that study cluster together in those who die by suicide in Victoria.

This study was published in 2018 in *Archives of Suicide Research* as a paper titled “Identifying typologies of persons who died by suicide: Characterising suicide in Victoria, Australia” [188].

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Identifying Typologies of Persons Who Died by Suicide: Characterizing Suicide in Victoria, Australia

Angela Clapperton, Lyndal Bugeja, Stuart Newstead, and Jane Pirkis

The objective of the study was to determine whether people who died by suicide form groups based on demographic, psychosocial, mental and physical health factors and exposure to stressors. A retrospective case series review of 2,839 individuals who died by suicide in Victoria, Australia over the period 2009–2013 was conducted. A two-stage cluster analysis was performed. Diagnosis of mental illness was present in 52% of cases and initial cluster analysis determined two groups with the main predictor of group membership being the presence of diagnosed mental illness. Further analysis identified four subgroups within the mental illness group and two within the non-mental illness group. The study demonstrates that suicide does not always occur in the context of mental illness; people who die by suicide cannot be considered a homogenous group.

Keywords epidemiology, mental illness, suicide

INTRODUCTION

It has been established that people who choose to end their lives do so for a number of reasons and as the result of a complex combination of factors including financial, social, cultural, and mental health issues. Previous research has consistently shown that a high proportion of people in the Western world who die by suicide have a diagnosed or diagnosable mental illness (Bertolote & Fleischmann, 2002; Bertolote, Fleischmann, De Leo, & Wasserman, 2003; Bertolote, Fleischmann, De Leo, & Wasserman, 2004; Isometsä, 2001) and this is considered one of the strongest risk factors for suicide (Haw & Hawton, 2015). However, some have argued that the role of mental illness in suicide is overstated (Braithwaite, 2012; Pridmore, 2015; Pridmore & Walter, 2013) and that because of the focus on mental illness, the role of other potential triggers, stressors, and risk factors is potentially neglected (Pridmore, 2015; Shahtahmasebi, 2013; Walter & Pridmore, 2012). It has been suggested that suicide prevention programs will fail if this focus remains on mental illness at the expense of other potential contributory

factors (Braithwaite, 2012). In a comprehensive review of risk factors for suicide, some of the other factors found to be associated with suicide included previous suicide attempts, social isolation, physical illness, unemployment, family conflict, family history of suicide, impulsivity, incarceration, hopelessness, serotonergic dysfunction, childhood abuse, previous exposure to suicide, homelessness, and combat exposure (Van Orden et al., 2010).

Studies have attempted to identify different pathways to suicide by examining patterns of factors and stressors common to groups of people who die by suicide to improve understanding of typologies of those at risk. Previous studies in England (Bagley, Jacobson, & Rehin, 1976), Scotland (Ovenstone & Kreitman, 1974), Ireland (O'Connor, Sheehy, & O'Connor, 1999), Hong Kong (Chen et al., 2007), the United States (Logan, Hall, & Karch, 2011), and Canada (Sinyor, Schaffer, & Streiner, 2014) all identified subgroups among cases of suicide in those specific areas. The number of subgroups identified ranged from two in Hong Kong and Scotland (Chen et al., 2007; Ovenstone & Kreitman 1974) to nine in the United States (Logan et al., 2011) and although it is difficult to directly compare results from all the studies there were some similarities identified. Multiple studies found at least one subgroup with low prevalence of diagnosed mental illness (Bagley et al., 1976; Chen et al., 2007; Logan et al., 2011; O'Connor et al., 1999; Ovenstone & Kreitman 1974; Sinyor et al., 2014) and many found at least one subgroup with high rates of mental illness and previous suicide attempts (Bagley et al., 1976; Logan et al., 2011; O'Connor et al., 1999; Ovenstone & Kreitman 1974; Sinyor et al., 2014). A group characterized by older age was identified in England (Bagley et al., 1976) and the United States (Logan et al., 2011). Studies of suicide in Canada (Sinyor et al., 2014), the United States (Logan et al., 2011), and Ireland (O'Connor et al., 1999) found more men than woman in all subgroups identified whereas in Scotland one of the two groups identified had a fairly similar proportion of females to males (Ovenstone & Kreitman 1974). Most studies found that in all subgroups individuals were exposed to at least one stressor prior to suicide (Bagley et al., 1976; Logan et al., 2011; O'Connor et al., 1999; Ovenstone & Kreitman, 1974; Sinyor et al., 2014).

It is unknown to what extent the international results can be generalized to Australia as it is well recognized that risk factors for suicide vary in kind from one cultural context to the next (Vijayakumar, John, Pirkis, & Whiteford, 2005). An Australian study which examined the role of psychosocial factors and physical and mental health in suicide identified four distinct groups of people who had died by suicide (Judd, Jackson Komiti, Bell, & Fraser, 2012). Two groups were characterized by mental illness (one of which also had high levels of additional drug, alcohol, and relationship problems), the third group was marked by older age and physical illness, and the final group was characterized by high proportions of relationship and financial difficulties. Importantly, the data source was the National Coronial Information System (NCIS) and not a purpose-built suicide register. While the NCIS contains information based on the coronial process, the entire coronial brief is not available to users of the NCIS.

This study sought to determine whether people who have died by suicide in Victoria, Australia form meaningful groups based on sociodemographic, psychosocial,

mental and physical health factors and exposure to potential stressors, using a new data source not previously used for this kind of research—the Victorian Suicide Register (VSR). Cases were profiled to identify characteristics which may be specific to Victoria and to examine in greater detail the presence of mental illness in suicide, in particular, to determine whether there is a group who died by suicide who did not have a history of mental illness or whether mental illness cuts across multiple or all identified subgroups. Although a similar study has been conducted previously in Victoria (Judd et al., 2012), the data sources used differ in detail so this current study will aim to confirm, refute, or add to findings from that study.

Identifying subgroups of people who die by suicide allows a more sophisticated understanding of potential pathways to suicide and how these pathways may differ in certain populations.

METHOD

Research Design

This study comprised a retrospective case series review of persons who died by suicide in Victoria, Australia during the period January 1, 2009 to December 31, 2013.

Data Source

The primary data source for this study was the Victorian Suicide Register (VSR). The VSR is an ongoing register established by the Coroners Court of Victoria (CCOV) to collate detailed information on suspected suicides to assist coroners with their investigations and support their prevention mandate. As all suspected suicides are legally required to be investigated by coroners, the population of these deaths are captured in the VSR.

Coded and free text data are stored in the VSR based on a review of the information generated for the coroners' investigation. This usually includes the police report notifying the coroner of the death, forensic medical and scientific report (i.e., autopsy report, toxicology report), the coronial brief, and coroners' finding. The coronial brief frequently includes statements taken by police from family members, friends, employers, and witnesses, copies of suicide notes, scene photographs, and records of health service contact. Data items recorded in the VSR include those related to the specific details of the suicide such as the method used, location, the cause of death, and information related to known risk factors for suicide such as socio-demographic characteristics, presence and nature of physical illness, injury, pain, or disability, and detailed information regarding any evidence of mental illness. The VSR is coded by persons with experience in the conduct of medico-legal investigations and trained in mortality review for the purposes of surveillance. The VSR is supported by a coding manual, data dictionary, and quality framework. Detailed coded and free text data are systematically recorded according to strict coding rules. Mental illness in the VSR is coded according to the International Classification of Diseases version 10 (ICD-10) framework (World Health Organization, 1992).

Case Inclusion Criteria

A death was included in the study where it met the following criteria:

- the death occurred in Victoria and an investigation was

commenced by the CCOV between January 1, 2009 and December 31, 2013; and
- the coroner determined that the intent of the deceased was suicide (coroner determined suicide), or (in circumstances where the coroner did not make an explicit determination of intent) the Coroners Prevention Unit (CPU) suspected that the intent of the deceased was suicide (CPU determined suicide), see Sutherland et al. (2017) for more information.

Case Identification

Full unit record information of cases that met the inclusion criteria as at June 2016 was supplied to a member of the research team (AC) in Microsoft Access by the CCOV.

Data Analysis

A cluster analysis examining known suicide risk factors was performed to determine whether suicide deaths separate into distinct and meaningful groups with similar characteristics. Initial analysis included the following variables:

- **Socio-demographic characteristics** (sex, age at death, employment status, relationship status, evidence of LGBTI identification, evidence of cultural and/or linguistic diversity (CALD) or community engagement, indigenous status and location of usual residence);
- **Mental health-related information** such as the presence of a mental illness diagnosis (yes/no), the presence or absence of the most common mental illness diagnoses (mental and behavioral disorders due to psychoactive substance use; schizophrenia, schizotypal, and delusional disorders; mood [affective] disorders; neurotic, stress-related, and somatoform disorders; disorders of adult personality and behavior), treatment in the previous 12 months for mental health issues;
- Stressors related to **physical health** (any physical illness, disability, or injury, presence of chronic pain);
- **Interpersonal stressors** (including a stressor related to partner, family member, or non-family member, e.g., death, conflict, illness);
- **Personal stressors** (including stressors related to sexuality, isolation, or exposure to abuse);
- **Situational stressors** (including stressors related to work, finances, legal stressors, education, bullying, substance use);
- **Exposure to suicide** (including exposure to the suicide of a family member, friend, acquaintance, or stranger);
- A **previous suicide attempt** and **expression of suicidal ideation**.

To accommodate the mix of variable types a 2-step clustering method combining the k-means and the hierarchical clustering analysis methods was used. Cluster distance was determined using the log-likelihood measure within IBM SPSS Statistics (v.22) and the number of clusters was determined automatically using the Bayesian information criterion. The average silhouette measure of cohesion and separation was used to indicate overall goodness of fit by providing a measure of the degree to which identified clusters were distinct. A generally accepted criterion is that if the silhouette measure is

<0.2, then the quality of the average silhouette measure across the whole sample is considered poor, between 0.2 and 0.5 indicates a fair solution, and >0.5 is a good solution (Mooi & Sarstedt, 2011). This initial analysis separated cases into two distinct groups so additional cluster analyses were conducted on the two groups individually. For this second stage of analysis, the same variables were used and a criterion was added to allow a maximum of 10% of cases to be outliers and therefore not included in any of the determined clusters.

RESULTS

The sample comprised 2,839 persons who died by suicide in Victoria during the period 2009–2013. Three-quarters of cases were male ($n = 2,135$) and the median age at the time of death was 45.5 years (interquartile range 32 to 57 years). Sixty-six percent of cases were residents of the Melbourne Metropolitan area and 46% were employed at the time of death. A diagnosis of mental illness was present in just over half of all cases (52%), most commonly a mood (affective) disorder (42% of the total sample) and almost two-thirds of the total cases had some treatment in the past 12 months for their mental health (63%) (Table 1).

Initial cluster analysis determined two distinct clusters (average silhouette measure of 0.3) and variables that contributed strongly to cluster membership were all related to mental health—the presence of any mental illness diagnosis, the presence of a mood disorder diagnosis, and whether the deceased had been treated for mental health problems in the previous 12 months. Group A will be referred to herein as the mental illness group considering 100% of the cases in this group had a mental illness diagnosis ($n = 1,477$).

When cluster analysis was re-run separately on the two groups, four subgroups within the mental illness group and two subgroups within the non-mental illness group were identified. The variables that contributed strongly to cluster membership within the mental illness group were employment status, age, whether the deceased had a diagnosed mood (affective) disorder, and whether they had a diagnosed schizophrenia, schizotypal, or delusional disorder. The main predictors of group membership within the non-mental illness group were whether the person had one or more situational stressors coded, employment status, age, and whether they had one or more interpersonal stressors coded. Table 1 shows results for the final six groups identified via the two-stage cluster analysis.

Mental Illness Subgroups

Group A1. The largest of the mental illness groups was Group A1 ($n = 499$), which had a median age of 43.3 years and was 82% male. Sixty-nine percent of cases were employed (the highest proportion of all identified subgroups) and 98% had a diagnosed mood (affective) disorder. Interpersonal (88% of cases) and situational stressors (85%) were commonly recorded for this group. The most common interpersonal stressors were partner (61%) and family related (51%). Situational stressors were most commonly work related (48%), substance-related (44%), and/or financial related (41%).

Group A2. The smallest of the mental illness groups was Group A2 ($n = 267$), which had the oldest median age (65.1 years) and was 65% male.

TABLE 1. **Victorian Suicide Cases: Distribution of Variables Across Identified Mental Illness and Non-Mental Illness Groups and Subgroups**

	Group A Subgroups (Mental Illness)					Group B Subgroups (Non-mental Illness)			
	Group A1	**Group A2**	**Group A3**	**Group A4**	**All Group A**	**Group B1**	**Group B2**	**All Group B**	**All Cases***
Number of cases	499	267	284	419	**1477**	565	779	**1362**	**2839**
Median age	43.3	65.1	39.7	37.3	**44.9**	57.2	38.3	**46.1**	**45.5**
	%	%	%	%	%	%	%	%	%
Male	82.4	61.4	82.0	48.9	**68.9**	79.5	85.1	**82.0**	**75.2**
Female	17.6	38.6	18.0	51.1	**31.1**	20.5	14.9	**18.0**	**24.8**
LGBTI identification	1.8	0.7	4.2	9.1	**4.2**	0.5	2.4	**2.1**	**3.2**
CALD and/or evidence of community engagement	16.6	31.1	20.4	19.3	**21.0**	22.8	18.1	**20.7**	**20.9**
Indigenous	0.2	0.0	2.1	0.7	**1.0**	0.0	0.9	**0.8**	**0.9**
Melbourne Metropolitan area	66.7	67.0	69.7	82.3	**71.6**	55.0	62.4	**59.0**	**65.5**
Regional/Rural Victoria	32.3	30.7	27.8	13.8	**26.1**	43.5	34.9	**38.5**	**32.0**
Interstate/Overseas/Unknown	1.0	2.2	2.5	3.8	**2.4**	1.4	2.7	**2.6**	**2.5**
Employed	68.9	3.4	28.5	44.2	**41.9**	33.8	64.2	**51.3**	**46.4**
Retired/unable to work	2.6	87.3	31.0	17.9	**28.0**	50.8	2.7	**22.7**	**25.5**
Unemployed	26.9	5.2	33.8	31.7	**25.7**	10.8	29.5	**21.7**	**23.8**
Other & unknown	1.6	4.1	6.7	6.2	**4.3**	4.6	3.6	**4.3**	**4.3**
In a relationship	45.3	49.8	15.5	34.4	**37.3**	44.6	39.9	**42.0**	**39.6**
At least one mental illness diagnosed	100.0	100.0	100.0	100.0	**100.0**	0.7	0.1	**0.4**	**52.2**
Mood [affective] disorders	97.8	95.5	28.2	86.4	**80.6**	0.0	0.0	**0.0**	**42.0**
Organic, including symptomatic, mental disorders	1.0	3.7	1.4	0.7	**1.5**	0.4	0.0	**0.1**	**0.8**
Mental and behavioral disorders due to psychoactive substance use	4.2	1.5	39.4	25.3	**16.7**	0.0	0.0	**0.0**	**8.7**
Schizophrenia, schizotypal and delusional disorders	0.8	3.7	56.0	5.0	**13.4**	0.0	0.0	**0.0**	**7.0**

(*Continued*)

TABLE 1. **(Continued).**

	Group A Subgroups (Mental Illness)					Group B Subgroups (Non-mental Illness)			
	Group A1	**Group A2**	**Group A3**	**Group A4**	**All Group A**	**Group B1**	**Group B2**	**All Group B**	**All Cases***
Neurotic, stress-related and somatoform disorders	19.2	25.8	20.4	47.5	**28.7**	0.0	0.0	**0.0**	**14.9**
Behavioral syndromes (assoc. with physiological disturbances & physical factors)	1.0	2.6	2.1	4.8	**2.6**	0.0	0.0	**0.0**	**1.3**
Disorders of adult personality and behavior	1.2	2.2	7.7	32.2	**11.8**	0.0	0.0	**0.0**	**6.1**
Mental retardation	0.0	0.0	1.4	0.2	**0.3**	0.0	0.0	**0.0**	**0.2**
Disorders of psychological development	0.8	0.0	2.8	0.7	**1.0**	0.2	0.1	**0.1**	**0.6**
Behavioral & emotional disorders (onset usually occurring in childhood and adolescence)	0.8	0.4	4.2	4.3	**2.4**	0.2	0.0	**0.1**	**1.3**
Unspecified mental disorder	0.6	0.0	0.7	0.5	**0.5**	0.0	0.0	**0.0**	**0.2**
Family history of mental illness	18.2	14.2	18.7	32.9	**21.7**	3.9	7.2	**5.9**	**14.2**
Treated in the last 12 months for mental health	90.4	85.8	92.6	98.8	**92.2**	23.9	36.8	**31.6**	**63.1**
At least one Physical stressor	40.7	86.5	40.1	49.2	**51.3**	55.4	34.5	**43.3**	**47.5**
At least one Interpersonal stressor	88.4	71.9	82.7	99.0	**87.3**	57.3	98.2	**80.9**	**84.2**
At least one Personal stressor	30.9	30.3	42.6	82.6	**47.7**	18.1	46.2	**34.8**	**41.5**
At least one Situational stressor	84.8	45.7	85.2	97.9	**81.5**	34.7	99.6	**72.2**	**77.0**
At least one Suicide Exposure stressor	9.4	5.2	7.7	27.9	**13.6**	5.3	11.7	**9.5**	**11.7**
History of previous suicide attempt	5.8	8.2	16.5	51.1	**21.4**	2.1	12.5	**8.6**	**15.3**
Expressed ideation	45.3	46.4	45.8	63.2	**50.6**	16.5	22.6	**20.2**	**36.0**

*The total columns ($n = 2,839$) includes 26 outliers (8 in the mental illness group and 18 in the non-mental illness group).

Approximately one-third of cases in this group were of a CALD background or had documented evidence of community engagement (31%), 87% were either retired or unable to work (the highest proportion of all identified subgroups), half were in a relationship (50%), and 96% had a diagnosed mood (affective) disorder. This group had the highest proportion of cases with at least one physical stressor coded (87% of cases), most commonly a physical illness (62%) and/or pain (43%), and three-quarters of this group were being treated for some kind of physical condition (75%). A much lower proportion of these cases than cases in other groups, had a situational stressor recorded (46% of cases).

Group A3. Group A3 ($n = 284$) had a median age of 39.7 years and was 82% male. More than one third were unemployed (34%) and a further 31% were retired/unable to work. This group had the highest proportion of indigenous cases among the groups (2%). Only 16% were in a relationship at the time of death (the lowest proportion of all groups). This group had a much lower proportion of cases with a diagnosed mood disorder (28%) than the other mental illness subgroups but a much higher proportion of persons with schizophrenia, schizotypal, and delusional disorders (56%), and mental and behavioral disorders due to psychoactive substance use (39%). Interpersonal (83% of cases) and situational stressors (85%) were commonly recorded for this group. The most common interpersonal stressors were family (58%) and partner-related (45%). Situational stressors were most commonly substance-related (68%), legal (31%), financial (31%), and work-related (29%).

Group A4. Group A4 comprised 419 cases and has a median age of 37.3 years. In contrast to all other subgroups, females comprised more than half of these cases (51%) and nine percent of cases were coded as being LGBTI. More than 80% of cases were residents of metropolitan Melbourne (82%) and 44% were employed. Eighty-six percent had a diagnosed mood (affective) disorder, 48% a neurotic, stress-related and somatoform disorders (much higher than all other mental illness subgroups), 32% a diagnosed disorder of adult personality and behavior and 25% a diagnosed mental and behavioral disorders due to psychoactive substance use. Almost all members of this group had been treated for a mental health issue in the 12 months prior to death (99%) and had at least one interpersonal stressor (99%) and one situational stressor recorded (98%). The most common interpersonal stressors were family (76%) and partner-related (71%) while the most commonly recorded situational stressors were substance (62%) or financial related (45%). A high proportion of these cases also had a personal stressor recorded (83%) – most commonly abuse (either as a victim and/or perpetrator; 67%) or isolation (24%) and this group also had the highest proportion of cases with sexuality recorded as a personal stressor (11%). Exposure to suicide was common in this group (28%, most often another family member - 22%), and a high proportion of cases in this group had a family member with a recorded mental illness (33%). The group had a very high history of previous suicide attempts (51% of cases), and the highest proportion of cases who had expressed suicidal ideation (63%).

Non-Mental Illness Subgroups

Group B1. The non-mental illness group B1 ($n = 565$) had a median age of

57.2 years and was 80% male. This group had the highest proportion of regional/rural residents (44%), slightly more than half (51%) were either retired or unable to work and half were in a relationship (50%). Around one-quarter of these cases had been treated for mental health problems in the 12 months prior to death (24%) but had no documented history of a mental illness diagnosis. Fifty-five percent of cases in this group had at least one physical stressor coded (the second highest proportion of cases found among all groups), most commonly a physical illness (41%) and/or pain (28%) and 45% of this group were being treated for some kind of physical condition. Most strikingly, this group had the lowest proportion of cases with a recorded interpersonal stressor (57%), personal stressor (18%), and situational stressor (35% of cases). This group also had the lowest recorded history of previous suicide attempts of all groups (2% of cases), and the lowest proportion who had expressed suicidal ideation (17%).

Group B2. The largest of all groups (Group B2 $n = 779$) had a median age of 38.3 years and was 85% male (the highest proportion of males among all the groups). Almost two-thirds of cases in this group were residents of metropolitan Melbourne (62%) and a high proportion were employed (64%). More than a third of these cases had been treated for mental health problems in the 12 months prior to death (37%) but had no documented history of a mental illness diagnosis. Interpersonal (98% of cases) and situational stressors (100%) were extremely common among cases in this group. The most common interpersonal stressors were partner (68%) and family related (51%). Situational stressors were most commonly substance-related (57%), work-related (42%), and financial (41%). Almost half of these cases also had a personal stressor recorded (46%)—most commonly abuse (either as a victim and/or perpetrator; 34%). This group had a relatively low history of previous suicide attempts (13% of cases).

DISCUSSION

Summary of Key Findings

This study reports on a case series of 2,839 suicides in Victoria that occurred over the 5-year period 2009–2013. The aim was to classify cases into subtypes with similar characteristics and examine the presence of mental illness among any identified suicide subtypes. The median age of cases was 45.5 years and consistent with other recent Australian studies males comprised three-quarters of cases (Bugeja, Milner, & Pirkis, 2015; De Leo, Sveticic, & Kumpula, 2013; Judd et al., 2012; Kolves, Potts, & De Leo, 2015).

Despite mental illness having long been considered the single most common risk factor for suicide (Haw & Hawton, 2015), almost half of the cases in this study had no documented diagnosis of mental illness (48%). This prevalence is fairly consistent with three recent Australian studies which used data from suicide registers or the National Coronial Information System (NCIS) and found 43.9% (Judd et al., 2012), 49.2% (Kolves et al., 2015), and 55.0% (Bugeja et al., 2015) of cases had a diagnosed mental illness at the time of death.

The presence of a mental illness was the strongest differentiator of suicide subgroups. Initial cluster analysis separated the cases into two distinct groups—one composed of persons who had a diagnosed

mental illness and one composed of persons who did not have a diagnosed mental illness. A previous study by the authors of the current paper has broadly examined the differences between persons with and without a diagnosed mental illness using this same sample of suicides (Clapperton, Newstead, Bugeja, & Pirkis, 2018). That study found clear differences between the two groups whereby females, metropolitan residents, persons treated for physical illness/injury, those exposed to stressors related to isolation, family, work, education, and substance use, and those who had made a previous suicide attempt had increased odds of having a diagnosed mental illness. Further analysis for this current study identified six subgroups within these two primary groups; four mental illness and two non-mental illness subgroups. These results reinforce the point that while mental illness is clearly a risk factor for suicide, there is a need to look beyond mental illness as the only risk factor for suicide—those who die by suicide cannot be considered a homogenous group.

The majority of the largest subgroup composed of those with a diagnosed mental illness (group A1, 28% of total cases) had a diagnosed mood (affective) disorder and more than two-thirds were employed—the highest proportion employed of all identified subgroups (including the non-mental illness groups). It is plausible to hypothesize that the commonly reported interpersonal and situational stressors recorded among these cases may have influenced their decision to die by suicide or may have exacerbated the symptoms associated with their mental illness. This group also had a low proportion of cases with a history of previous suicide attempts, which further supports this interpretation. Treating health professionals should be mindful that even in the absence of prior suicidal behavior and in individuals with seemingly stable mental illness, exposure to stressors—particularly multiple stressors—in this population can leave individuals vulnerable to suicide.

The smallest of the subgroups made up of persons with a diagnosed mental illness (A2) was characterized by older age (median age of 65 years), the presence of physical stressors and diagnosed mood (affective) disorders. It is out of the scope of this study to examine whether the diagnosis of mood disorder came before or after the commonly recorded physical stressors among persons in this subgroup, although physical illness is a known risk factor for depression/mental illness, especially among older persons (Cole & Dendukuri, 2003). A much lower proportion of these cases than all other groups had a situational stressor recorded suggesting the recorded physical and mental issues may have been likely to be the triggers for suicide among persons in this group. Health professionals need to be aware of the association between physical illness, mood disorders, and suicidal behavior, especially in older populations, and ensure that in addition to treating physical aspects of an individual's health, focus is also placed on their mental health.

Almost all cases in these first two subgroups had a diagnosed mood disorder ($n = 743/766$, 97%), sometimes diagnosed in combination with a neurotic, stress-related, or somatoform disorder. In fact, only 11% of cases in these two groups combined had a diagnosis of a disorder other than one from these two categories ($n = 86$). In contrast, the mental illnesses recorded for the other two subgroups included more diverse conditions (i.e., just 9% of group A3 and 43% of group A4 had either a mood or neurotic disorder only, or in combination). Essentially these

two subgroups could be said to be characterized by complex mental health needs as well as a high number of stressors, particularly interpersonal and situational stressors. The most noteworthy findings regarding subgroup A3 were that when compared with the other groups, a much lower proportion of cases had been diagnosed with a mood disorder (28%) but a much higher proportion had been diagnosed with schizophrenia, schizotypal, and delusional disorders (56%). Substance abuse appears to be associated with a marginal increase in risk for suicide among those with chronic psychotic disorders (Hor & Taylor, 2010) and therefore it was not unexpected that more than two-thirds of this group had substance use documented as a stressor. Clinicians treating those with schizophrenia, schizotypal and delusional disorders should be cognizant of suicide risk, especially when patients have comorbid substance abuse.

Among the most striking findings regarding subgroup A4 were that females comprised more than half of cases and almost one in ten cases were coded as being LGBTI (compared with just 3% of suicide cases overall). While mood disorder was still the most commonly recorded diagnosis, almost half of cases had a diagnosed neurotic, stress-related, or somatoform disorder and around a third had a diagnosed disorder of adult personality and behavior—much higher proportions than those found in any of the other subgroups. It is likely that many persons in this group had complex mental health needs as evidenced by persons having various combinations of disorders recorded, almost all having been treated for mental health problems in the past 12 months and more than half having made a previous suicide attempt. There is some evidence that forms of interpersonal contact following discharge from psychiatric hospitalizations provide reductions in subsequent suicidal behavior (Luxton et al., 2012; Luxton, June, & Comtois, 2013) suggesting outreach to those who have attempted suicide would appear to be a promising intervention in this population. Importantly, persons in this group typically had many other stressors documented in addition to mental illness. In fact, this group had the highest recorded prevalence of interpersonal (99%) and personal stressors (83%) and the second highest recorded prevalence of situational stressors (98%).

The non-mental illness subgroups (B1 & B2) were quite distinct, particularly in regard to age, employment status, and exposure to potential stressors and previous suicidal behavior. Group B1 was older (median age was 57 years compared to 38 years), less likely to be employed (34% vs 64%), more likely to have at least one physical stressor coded (55% vs 35%), and less likely to have any of the other stressors recorded (interpersonal, personal, and situational stressors). The most common specific physical stressors recorded among this group were a physical illness (41%) and/or pain (28%). This group had the lowest recorded history of previous suicide attempts of all groups (2% of cases) and the lowest proportion who had expressed suicidal ideation (17%). Many of these findings are not surprising given the older median age of the group (i.e., it would be expected that individuals would be less likely to be working and more likely to have physical health issues). Increased awareness by health professionals regarding the importance of screening for suicidal ideation and plans in those who are older and dealing with significant physical stressors may prove beneficial for this population.

The largest of all groups was Group B2, which was 85% male (the highest proportion of males among all the groups). Persons in this group were almost universally experiencing multiple stressors as evidenced by interpersonal stressors being recorded in 98% of cases and situational stressors recorded for all cases. It is apparent that there were a significant number of suicide cases in Victoria, including in this group, that did not occur in the context of a diagnosed mental illness and therefore the deceased would not have come to the attention of mental health workers prior to their death. Consequently, although increasing access to effective treatment is important, community awareness of other potential suicide stressors and advice regarding how to intervene if one suspects another may be at risk is also imperative. Considering the situational stressors recorded were mostly related to substance use, work, and finances, it is likely that many in this population may be in contact with other services, such as drug and alcohol, human resources, or workplace counseling services. These services need to be aware of this group's vulnerability to suicide even in the absence of diagnosed mental illness.

Previous Australian and international studies have used similar data sources and methods to examine subtypes of suicide (Bagley et al., 1976; Chen et al., 2007; Judd et al., 2012; Logan et al., 2011; O'Connor et al., 1999; Ovenstone & Kreitman 1974; Sinyor et al., 2014). It was expected that groups found in the current study would be broadly similar to those found by Judd et al. (2012) given the population for both studies is Victoria, Australia. However, the current study used a more detailed data source. Although the data sources used for both studies were based on data gained through the coronial investigation process, the VSR is a purpose-built suicide register which is populated following a detailed examination of the entire coronial file and therefore contains information not available to researchers using the NCIS as in the previous study. Judd et al. (2012) found four groupings of suicide cases in their study, two of which could be considered mental illness subgroups (87% and 95% of cases in these groups had a diagnosed mental illness) and two non-mental illness subgroups (0% and 0.2% of cases in these groups had a diagnosed mental illness). Although it is difficult to directly compare these groups to those identified in the current study due to inconsistency in both the number of groups identified and the variables included across the two studies, the largest groups identified were similar—both had a mean age of 38 years, were approximately 85% male, and contained either no or a very small number of cases with diagnosed mental illness (group B2 in this study). Similarly, Judd et al. (2012) identified an older group (median age 66 years), 80% male with very low incidence of mental illness (2%) which is comparable with group B1 identified in this study (B1: median age 57 years, 80% male and 0.7% of cases had a diagnosed mental illness). Judd et al. (2012) identified two mental illness subgroups whereas the current study identified four, which in addition to making it difficult to directly compare groups, suggests there is more variation among persons who have a diagnosed mental illness who die by suicide than could be determined by Judd et al. (2012).

While it is not feasible to directly compare the groups found in this study with those identified in previous international studies due to differences in methodology, variables included, and the number of groups identified, there are some

important similarities and differences between the identified groups. Consistent with findings from this study, international studies have found that subtypes or groups of persons who died by suicide differ with regard to proportions of cases with mental illness (Bagley et al., 1976; Chen et al., 2007; O'Connor et al., 1999; Ovenstone & Kreitman 1974) and in addition to the previous Victorian study, two international studies also found that the largest groups identified had the lowest rates of identified mental illness (O'Connor et al., 1999; Sinyor et al., 2014). Suicide in the context of physical illness is a recognized issue (Bagley et al., 1976; Judd et al., 2012) and was a feature in the current study. A group characterized by a high proportion of females, with diagnosed mental illness and high numbers of previous suicide attempts as identified in this study was also identified in a Canadian study (Sinyor et al., 2014). Finally, many studies found that in cases with and without diagnosed mental illness, individuals were usually exposed to at least one, if not multiple, other stressors prior to the suicide (Bagley et al., 1976; Judd et al., 2012; Logan et al., 2011; O'Connor et al., 1999; Ovenstone & Kreitman, 1974; Sinyor et al., 2014). The high prevalence of stressors documented in almost all cases in this study emphasizes the complex interplay between factors associated with suicide—especially given that most cases were characterized by exposure to multiple stressors.

Strengths and Limitations

In Victoria, all deaths where suicide is suspected are legally required to be investigated by the coroner. Consequently, the information generated for these investigations comprises the most comprehensive and reliable data source available on suicide in Victoria. Although comprehensive, the information available is limited to what is generated for the coronial investigation and as such, it is not a wide-ranging review of all possible information about the person (Bugeja et al., 2015). For example, the absence of a factor in the coronial file does not guarantee that it was not present, and the presence of a factor does not necessarily imply contribution of that factor. Further, the volume of information varies between investigations depending on a number of factors including who was asked to provide information, what questions were asked, and the willingness of persons to disclose some or all of the information they had (Bugeja et al., 2015).

A further limitation relates to the recording of a mental illness diagnosis as it is likely that some of these cases in this study had an undiagnosed mental illness at the time of their suicide or a diagnosis that was undocumented in the VSR. In fact, around one-third of cases without a diagnosed mental illness had some kind of treatment in the 12 months prior to their death for a mental health-related issue (32%) although importantly, having treatment designated as mental health-related does not necessarily imply mental illness. It is unsurprising that 82% of the cases without a diagnosed mental illness were male as it is known that depression is often unrecognized and untreated among men (Roche et al., 2016). In addition, other populations, for example those who have a significant physical illness, often have undiagnosed mental illness (Kelly & Turner, 2009). Evidence also suggests that among individuals with schizophrenia the period of greatest risk for suicide is early in the course of the disorder (McGirr & Turecki, 2011)—therefore it could be that some individuals simply did not have the opportunity to be diagnosed prior to their

death by suicide. This potential for underdiagnosis of mental illness should be taken into account when examining the implications of this study.

Finally, the study lacks a population-based control group—it may be that certain variables cluster together in the population and this is why they cluster in the current analysis.

CONCLUSION

The results of this study provide a complex picture of suicide and suggest that many people who died by suicide in Victoria did not conform to the traditional understanding that suicide almost always occurs in the context of a diagnosed mental illness. Overall, the most striking findings from this study were that diagnosed mental illness did not cut across all identified groups and that even within the mental illness subset of cases there was much variation with regard to types of illnesses and prevalence of different stressors. Importantly, the groups identified in this study appear consistent with existing knowledge in suicide research and also make clinical sense, e.g., older persons with physical problems with or without an accompanying mental illness diagnosis, younger persons with complex mental health needs often in combination with significant and multiple life stressors, and younger males experiencing significant stressors without a diagnosed mental illness. Clearly, to view those who die by suicide as a single population without recognizing these apparent subpopulations would be to ignore useful information that may be pertinent to success in decreasing the frequency of suicide in Victoria.

Mental health services in Australia have enhanced their awareness and support services to include suicide prevention (whether this occurs in the context of mental illness or not), for example beyondblue—an Australian, independent nonprofit organization working to address issues associated with depression, anxiety disorders, and related mental disorders—now includes suicide as an additional focus to depression and anxiety. While the link between other stressors and suicide has been recognized by other support services, it has not manifested to the same extent as the link between mental illness and suicide. It is crucial that these support services focus on suicide prevention within the context of their service, whether it be services relating to relationship breakdown, financial hardship, legal, or work-related issues. It is essential to ensure that regardless of their mental illness status, people reaching out to all relevant services are able to access support.

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REFERENCES

Bagley, C., Jacobson, S., & Rehin, A. (1976). Completed suicide: A taxonomic analysis of clinical and social data. *Psychological Medicine, 6*(3), 429–438. doi:10.1017/S0033291700015877

Bertolote, J. M., & Fleischmann, A. (2002). Suicide and psychiatric diagnosis: A worldwide perspective. *World Psychiatry, 1*(3), 181–185.

Bertolote, J. M., Fleischmann, A., De Leo, D., & Wasserman, D. (2003). Suicide and mental disorders: Do we know enough?. *The British Journal of Psychiatry: The Journal of Mental Science, 183*(5), 382–383. doi:10.1192/bjp.183.5.382

Bertolote, J. M., Fleischmann, A., De Leo, D., & Wasserman, D. (2004). Psychiatric diagnoses and suicide: Revisiting the evidence. *Crisis, 25*(4), 147–155. doi:10.1027/0227-5910.25.4.147

Braithwaite, R. (2012). Suicide prevention and mental illness. *BMJ (Clinical Research Ed.), 345*, e8201. doi:10.1136/bmj.e8201

Bugeja, L., Milner, A., & Pirkis, J. (2015). *Identification and analysis of health service use and pathways to health service contact amongst persons who died from suicide in Victoria, 2009–2010.* Melbourne: Coroners Court of Victoria.

Chen, E. Y. H., Chan, W. S. C., Chan, S. S. M., Liu, K. Y., Chan, C. L. W., Wong, P. W. C., … Yip, P. S. F. (2007). A cluster analysis of the circumstances of death in suicides in Hong Kong. *Suicide Life Threat Behav, 37*(5), 576–584. doi:10.1521/suli.2007.37.5.576

Clapperton, A., Newstead, S., Bugeja, L., & Pirkis, J. (2018). Differences in characteristics and exposure to stressors between suicide cases of persons with and without diagnosed mental illness, Victoria, Australia. Crisis (in press).

Cole, M. G., & Dendukuri, N. (2003). Risk factors for depression among elderly community subjects: A systematic review and meta-analysis. *American Journal of Psychiatry, 160*(6), 1147–1156. doi:10.1176/appi.ajp.160.6.1147

De Leo, D., Sveticic, J., & Kumpula, E. (2013). Suicide in Queensland, 2008–2010: Mortality Rates and Related Data. Brisbane.

Haw, C., & Hawton, K. (2015). Suicide is a complex behaviour in which mental disorder usually plays a central role. *Australian & New Zealand Journal of Psychiatry, 49*(1), 13–15. doi:10.1177/0004867414555419

Hor, K., & Taylor, M. (2010). Suicide and schizophrenia: A systematic review of rates and risk factors. *Journal of Psychopharmacology (Oxford, England), 24*(4 Suppl), 81–90. doi:10.1177/1359786810385490

Isometsä, E. T. (2001). Psychological autopsy studies-a review. *European Psychiatry: The Journal of the Association of European Psychiatrists, 16*(7), 379–385. doi:10.1016/S0924-9338(01)00594-6

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

Kelly, B. J., & Turner, J. (2009). Depression in advanced physical illness: diagnostic and treatment issues. *The Medical Journal of Australia* 190(7 Supplement), S90–S93.

Kolves, K., Potts, B., & De Leo, D. (2015). Ten years of suicide mortality in Australia: Socio-economic and psychiatric factors in Queensland.

Journal of Forensic and Legal Medicine, *36*, 136–143. doi:10.1016/j.jflm.2015.09.012

Logan, J., Hall, J., & Karch, D. (2011). Suicide categories by patterns of known risk factors. *Archives of General Psychiatry*, *68*(9), 935–941. doi:10.1001/archgenpsychiatry.2011.85

Luxton, D. D., June, J. D., & Comtois, K. A. (2013). Can postdischarge follow-up contacts prevent suicide and suicidal behavior? A review of the evidence. *Crisis*, *34*(1), 32–41. doi:10.1027/0227-5910/a000158

Luxton, D. D., Kinn, J. T., June, J. D., Pierre, L. W., Reger, M. A., & Gahm, G. A. (2012). Caring letters Project: A military suicide-prevention pilot program. *Crisis*, *33*(1), 5–12. doi:10.1027/0227-5910/a000093

McGirr, A., & Turecki, G. (2011). Schizophrenia, other psychotic disorders, and suicidal ehaviour. In R. C. O'Connor, S. Platt, & J. Gordon (Eds.), International handbook of suicide prevention: Research, policy and practice (pp. 75–94). West Sussex, England: Wiley.

Mooi, E., & Sarstedt, M. (2011). A concise guide to market research: The process, data, and methods using IBM SPSS Statistics. Berlin: Springer. doi:10.1007/978-3-642-12541-6

O'Connor, R. C., Sheehy, N. P., & O'Connor, D. B. (1999). The classification of completed suicide into subtypes. *Journal of Mental Health*, *8*(6), 629–637.

Ovenstone, I. M. K., & Kreitman, N. (1974). Two Syndromes of Suicide. *The British Journal of Psychiatry: The Journal of Mental Science*, *124*(581), 336–345. doi:10.1192/bjp.124.4.336

Pridmore, S. (2015). Mental disorder and suicide: A faulty connection. *The Australian and New Zealand Journal of Psychiatry*, *49*(1), 18–20. doi:10.1177/0004867414548904

Pridmore, S., & Walter, G. (2013). Psychological autopsies. *The Australian and New Zealand Journal of Psychiatry*, *47*(9), 878–879. doi:10.1177/0004867413495929

Roche, A. M., Pidd, K., Fischer, J. A., Lee, N., Scarfe, A., & Kostadinov, V. (2016). Men, work, and mental health: A systematic review of depression in male-dominated industries and occupations. *Safety and Health at Work*, *7*(4), 268–283. doi:10.1016/j.shaw.2016.04.005

Shahtahmasebi, S. (2013). De-politicizing youth suicide prevention. *Frontiers in Pediatrics*, *1*, 8. doi:10.3389/fped.2013.00008

Sinyor, M., Schaffer, A., & Streiner, D. L. (2014). Characterizing suicide in Toronto: An observational study and cluster analysis. *The Canadian Journal of Psychiatry*, *59*(1), 26–33. doi:10.1177/070674371405900106

Sutherland, G., Milner, A., Dwyer, J., Bugeja, L., Woodward, A., & Robinson, J. (2017). Implementation and evaluation of the Victorian Suicide Register. *Australian and New Zealand Journal of Public Health*. doi:10.1111/1753-6405.12725

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E. (2010). The interpersonal theory of suicide. *Psychological Review*, *117*(2), 575–600. doi:10.1037/a0018697

Vijayakumar, L., John, S., Pirkis, J., & Whiteford, H. (2005). Suicide in developing countries (2): Risk factors. *Crisis*, *26*(3), 112–119. doi:10.1027/0227-5910.26.3.112

Walter, G., & Pridmore, S. (2012). Suicide is preventable, sometimes. *Australasian Psychiatry: Bulletin of Royal Australian and New Zealand College of Psychiatrists*, *20*(4), 271–273. doi:10.1177/1039856212449880

World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines*. Geneva: World Health Organization.

8.2 Conclusion

The total sample for Study 2 comprised the same 2839 individuals as Study 1 and evidence of a diagnosis of mental illness was present in 52% of cases. This study determined that there were distinct clusters or groups of cases that could be identified in the Victorian suicide population and that these fitted neatly into one major group of cases that did have evidence of a diagnosed mental illness and another major group that did not. Further, each of these initial groups then further broke down into subgroups, four groups composed of individuals who had diagnosed mental illness and two groups composed of individuals who did not. The final six groups all had different characteristics.

Chapter 9: Study 3 – Relative risk of suicide following exposure to recent stressors, Victoria, Australia

9.1 Introduction

Chapters 7 and 8 of this thesis have established that there is a significant proportion of suicide cases in Victoria where the deceased does not have a diagnosed mental illness at the time of their death. It has also been established that many other stressors - such as interpersonal, personal and situational stressors - are highly prevalent in the VSR data. However, Studies 1 and 2 have only identified factors present in suicide cases which does not establish factors as impacting risk of suicide. Risk factors can only be identified by looking at population prevalence of a factor and relating this to the presence of the factor in the suicide cases. Therefore, the purpose of this chapter is to build on the previous two chapters by examining factors associated with suicide, including mental illness, in relation to exposure to see which are over or under exposed compared to population prevalence.

This study has been published in 2019 in the *Australian and New Zealand Journal of Public Health* as a paper titled “Relative risk of suicide following exposure to recent stressors, Victoria, Australia”[189].

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

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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

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 risk[1] 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 breakdown[11]/divorce[2]; conflict[8]; bereavement[12]; unemployment[8]; incarceration[8]; 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 hopelessness[17] or a persons' 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 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 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.

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*

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 Framework[25] 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 Australian[28] 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 Framework[25] 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.

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

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References

1. Mościcki EK. Identification of suicide risk factors using epidemiologic studies. *Psychiatr Clin North Am*. 1997;20(3):499-517.
2. Stack S, Scourfield J. Recency of divorce, depression, and suicide risk. *J Fam Issues*. 2015;36(6):695-715.
3. Donker T, Batterham PJ, Van Orden KA, Christensen H. Gender-differences in risk factors for suicidal behaviour identified by perceived burdensomeness, thwarted belongingness and acquired capability: Cross-sectional analysis from a longitudinal cohort study. *BMC Psychol*. 2014;2(1):20.
4. Lee H, Seol KH, Kim JW. Age and sex-related differences in risk factors for elderly suicide: Differentiating between suicide ideation and attempts. *Int J Geriatr Psychiatry*. 2018;33(2):e300-e6.
5. Eisen RB, Perera S, Bawor M, et al. Sex differences in social risk factors for suicidal behaviour. *Ment Health Prev*. 2017;8:1-6.
6. Bertolote JM, Fleischmann A. Suicide and psychiatric diagnosis: A worldwide perspective. *World Psychiatry*. 2002;1(3):181-5.
7. Isometsä ET. Psychological autopsy studies - a review. *Eur Psychiatry*. 2001;16(7):379-85.
8. Van Orden KA, Witte TK, Cukrowicz KC, et al. The interpersonal theory of suicide. *Psychol Rev*. 2010;117(2):575-600.
9. Joiner TE. *Why People Die by Suicide*. Cambridge (MA): Harvard University Press; 2005.
10. O'Connor RC. The integrated motivational-volitional model of suicidal behavior. *Crisis*. 2011;32(6):295-8.
11. Evans R, Scourfield J, Moore G. Gender, Relationship Breakdown, and Suicide Risk: A Review of Research in Western Countries. *J Fam Issues*. 2014;37(16):2239-64.
12. Rostila M, Saarela J, Kawachi I. Suicide following the death of a sibling: a nationwide follow-up study from Sweden. *BMJ open*. 2013;3(4).
13. Fassberg MM, Cheung G, Canetto SS, Erlangsen A, Lapierre S, Lindner R, et al. A systematic review of physical illness, functional disability, and suicidal behaviour among older adults. *Aging & mental health*. 2016;20(2):166-94.
14. Vijayakumar L, John S, Pirkis J, Whiteford H. Suicide in developing countries (2): Risk factors. *Crisis*. 2005;26(3):112-19.
15. Barzilay S, Apter A. Psychological models of suicide. *Arch Suicide Res*. 2014;18(4):295-312.
16. Mann JJ. The neurobiology of suicide. *Nat Med*. 1998;4(1):25-30.
17. van Heeringen K, Mann JJ. The neurobiology of suicide. *Lancet Psychiatry*. 2014;1(1):63-72.
18. Judd F, Jackson H, Komiti A, et al. The profile of suicide: Changing or changeable? *Soc Psychiatry Psychiatr Epidemiol*. 2012;47(1):1-9.
19. Bugeja L, Milner A, Pirkis J. *Identification and Analysis of Health Service Use and Pathways to Health Service Contact amongst Persons Who Died from Suicide in Victoria, 2009-2010*. Melbourne (AUST): Coroners Court of Victoria; 2015.
20. Sutherland G, Milner A, Dwyer J, et al. Implementation and evaluation of the Victorian Suicide Register. *Aust N Z J Public Health*. 2018;42(3):296-302.
21. Australian Bureau of Statistics. *4159.0 - General Social Survey Summary Results, Australia: Explanatory Notes*. Canberra (AUST): ABS; 2014.
22. Koo YW, Kolves K, De Leo D. Suicide in older adults: A comparison with middle-aged adults using the Queensland Suicide Register. *Int Psychogeriatr*. 2017;29(3):419-30.
23. Ferrari AJ, Norman RE, Freedman G, et al. The burden attributable to mental and substance use disorders as risk factors for suicide: Findings from the Global Burden of Disease Study 2010. *PLoS One*. 2014;9(4):e91936.
24. Linsley K, Johnson N, Martin J. Police contact within 3 months of suicide and associated health service contact. *Br J Psychiatry*. 2007;190:170-1.
25. Victorian Department of Health and Human Services. *Victorian Suicide Prevention Framework 2016–25* [Internet]. Melbourne (AUST): State Government of Victoria; 2016 [cited 2018 Jun 3]. Available from: www.mentalhealthplan.vic.gov.au
26. Wyder M, Ward P, De Leo D. Separation as a suicide risk factor. *J Affect Disord*. 2009;116(3):208-13.
27. Schneider B, Grebner K, Schnabel A, et al. Impact of employment status and work-related factors on risk of completed suicide. A case-control psychological autopsy study. *Psychiatry Res*. 2011;190(2-3):265-70.
28. Graham C, Burvill PW. A study of coroner's records of suicide in young people, 1986-88 in Western Australia. *Aust N Z J Psychiatry*. 1992;26:30-9.

9.2 Conclusion

Relative risk of suicide in the Victorian population was calculated for 14 stressors. Half of these stressors were associated with significantly increased suicide risk in the whole adult population: alcohol and other drug problems, mental illness, trouble with the police, relationship separation, involuntary loss of employment, exposure to violence/abuse, and removal of children. The three stressors with the highest relative risk for suicide were alcohol and/or other drugs problems, mental illness and trouble with the police. The analysis showed mental illness was associated with increased suicide risk among people of all analysed age groups and for both sexes.

An additional component of Study 3 was to examine suicide risk among people experiencing different combinations of stressors. Results showed 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.

Chapter 10: Study 4 – Pathways to suicide among persons with a diagnosed mental illness, Victoria, Australia

10.1 Introduction

The purpose of this chapter is to explore in detail a random sample of cases with a diagnosed mental illness using the life charts method.

None of the studies presented thus far examined chronology of exposure to stressors and factors. Given that mental illness was shown in Study 3 to be the only stressor associated with significantly increased suicide risk across all age groups and in both men and women, examining the chronology of exposure to stressors in this population was deemed to be beneficial. Study 4 therefore examines pathways to suicide in a sample of suicides that occurred among people with diagnosed mental illness. Analysis of this population also allowed the proposed explanatory models of the association between mental illness and suicide [22] (described in Chapter 4) to be examined in a sample of people who died by suicide in Victoria.

A first revision of this paper, titled “Pathways to suicide among people with a diagnosed mental illness, Victoria, Australia”, was submitted in February 2019 to *Crisis: The Journal of Crisis Intervention and Suicide Prevention* and is currently under review.

Pathways to suicide among people with a diagnosed mental illness, Victoria, Australia

ABSTRACT

Background

People who have mental illness are at increased risk of suicide. Therefore, identifying 'typical' trajectories to suicide in this population has the potential to improve the effectiveness of suicide prevention strategies.

Aim

The aim of this study was to explore the pathways to suicide among a sample of Victorians with a diagnosed mental illness.

Method

Victorian Suicide Register (VSR) data was used to generate life charts and identify typical life trajectories to suicide among 50 Victorians.

Results

Two distinct pathways to suicide were identified: (1) where diagnosis of mental illness appeared to follow life events/stressors; and (2) where diagnosis appeared to precede exposure to life events/stressors. Some events acted as distal factors related to suicide, other events were more common as proximal factors and yet others appeared to act as both distal and proximal factors.

Limitations

The data source might be biased due to the potential for incomplete information, or alternatively, the importance of some factors in a person's life may have been overstated.

Conclusions

Strategies to reduce suicide need to consider the chronology of exposure to stressors in people's lives and clearly need to be different depending on whether proximal or distal risk factors are the target of a given strategy or intervention.

Introduction

Suicidal behaviour results from complex interactions between a range of risk factors and stressors spanning multiple domains of a person's life. Pathways to suicide can be examined by analysing the chronology of these factors and stressors in the lives of people who have died by suicide. An influential early study from the US examined these pathways by comparing life histories in three groups; a group who died by suicide; a group who had made a non-fatal suicide attempt; and a group who died of natural causes (Maris, 1981). The author concluded that developing life histories of people who have died by suicide is central to understanding suicide.

Although there is some conjecture regarding the contribution that mental illness makes to suicide risk (Hjelmeland & Knizek, 2017; Pompili, 2018), studies, at least in Western developed countries, have consistently shown that a high proportion of people who die by suicide have a diagnosed, or diagnosable mental illness at the time of death (Bertolote & Fleischmann, 2002; Isometsä, 2001). The most commonly recorded mental illness diagnoses in these populations are typically affective disorders, substance use disorders, and schizophrenia (Arsenault-Lapierre, Kim, & Turecki, 2004). A recent meta-review found borderline personality disorder, anorexia nervosa, depression and bipolar disorder had the highest calculated risks of suicide (Chesney, Goodwin, & Fazel, 2014) and an Australian study that examined suicide risk following recent exposure to 14 different stressors (of which mental illness was included) found mental illness to be the only stressor that significantly increased suicide risk for both males and females across all examined age groups (Clapperton, Newstead, Bugeja, & Pirkis, in press).

In addition to mental illness, there are other factors and stressors that have consistently been found to be associated with suicide. Some of these are distal factors which imply

underlying vulnerability, while others are proximal factors and are seen as potential precipitants and triggers for suicide. Some examples of other widely accepted risk factors are previous suicide attempts (Beautrais, 2002; Haw, Bergen, Casey, & Hawton, 2007), physical illness (Harris & Barraclough, 1997), social isolation (Beautrais, 2002; Wyder, Ward, & De Leo, 2009), family history of suicide (Agerbo, Nordentoft, & Mortensen, 2002), relationship separation (Ide, Wyder, Kolves, & De Leo, 2010; Stack & Scourfield, 2015) and substance use (Poorolajal, Haghtalab, Farhadi, & Darvishi, 2016). The likelihood of suicide or suicidal behaviour has also been shown to increase with an increasing number of risk factors (Mościcki, 1997). Despite this, there is a lack of research detailing the chronology of other potential risk factors and stressors that people with mental illness experience prior to suicide and how these interact with, precipitate or follow a diagnosis of mental illness.

The life charts method allows identification of life trajectories to suicide, taking into account the chronology, and combinations of factors that may contribute to suicide. Prior studies have used this method to examine pathways to suicide among Australian male farmers (Kunde, Kolves, Kelly, Reddy, & De Leo, 2017), lesbian and gay Australians (Skerrett, Kolves, & De Leo, 2016) and English adolescents (Fortune, Stewart, Yadav, & Hawton, 2007).

The objective of this study was to explore the pathways to suicide among Victorians with a diagnosed mental illness by using the generation and analysis of life charts. Given previous studies have successfully used this method to identify specific pathways to suicide among specific populations it was hypothesised that we would be able to identify 'typical' trajectories to suicide among people with mental illness.

Methods

Data source and variables

The Victorian Suicide Register (VSR) was established by the Coroners Prevention Unit (CPU) which is a specialist investigative service of the Coroners Court of Victoria (CCOV). It is a state-based surveillance system that contains detailed information on all suspected suicides that have occurred since 2009 in Victoria, Australia. The VSR coders typically have access to the entire coronial file, containing the coronial brief, forensic medical and scientific reports (i.e., autopsy and toxicology reports), and the coroners' finding(s) when coding data into the VSR. The VSR is supported by a coding manual, data dictionary and quality framework (Sutherland et al., 2018).

Almost all available VSR variables were utilised for this study with the exception of the method specific details of the suicide and toxicology information. All coded and text based information regarding socio-demographic characteristics of the deceased, and any information pertaining to the deceased's experiences of physical injury or illness, mental illness, and personal, interpersonal and situational or contextual stressors were included. In addition, all information about service contacts was included, as were indicators of intent (including previous suicide attempt/s or instance/s of self-harm).

Case inclusion criteria

A death was included if it occurred in Victoria between 1 January and 31 December 2013, the Coroner determined that the intent of the deceased was suicide, and the deceased had a diagnosed mental illness at any time over the 12 months prior to the date of death. From this initial group of 252 cases, a random sample of 20% of cases was selected for detailed analysis.

Data analysis

The life chart template for this study was informed by previous research conducted in England (Fortune et al., 2007) and Australia (Kunde et al., 2017; Skerrett et al., 2016). The first author read all VSR records for the sample to identify themes occurring and a life chart template was formulated which included the following categories: history of mental illness and mental health service use, attachment, intimate relationships, social circumstances, employment, education, physical health, substance use, financial events, forensic or legal events, previous self-harm (included prior suicide attempts and non-suicidal self-harm), exposure to suicide, and a residual category for other relevant information such as information about the personality of the deceased. Any event mentioned in an individual's VSR record that was relevant to any of the life chart categories was then plotted onto the individual's life chart. For this study, any substance use mentioned in the VSR was plotted on the life chart under the category "substance use". If evidence of a diagnosis of psychoactive substance use disorder was also present it was recorded in the "history of mental illness and mental health service use" life chart category. Throughout the text, the phrase "substance use" is used when referring to cases where substance use has been flagged as a stressor in the absence of a diagnosed disorder due to psychoactive substance use.

Following the creation of the life charts for each case by the first author, two authors independently reviewed the life charts and generated potential trajectories to suicide through categorisation of the cases in a meaningful way, placing emphasis on the chronology of stressors and major events in the individual's lives . These same authors then met to discuss and finalise the groups. The two authors then independently classified each of the cases into the defined groups with an initial concordance of 92%. Discrepancies were resolved through discussion. Typical life charts for each group were created as a visual illustration of the representative features of the lives of the individuals in each group. Typical rather than actual

charts were created for ethical reasons and the charts do not contain any identifiable information).

Results

The study sample comprised 50 cases. The mean age was 47.7 years (range 20-77 years) and males accounted for 66.0% of cases (n=33). The 50 cases were representative of the 252 cases of suicide from which they were selected (i.e., all suicides occurring in 2013 among persons with a diagnosed mental illness - mean age of 45.7 years and 63.6% male).

Cases were found to group, in the first instance, into those whose diagnosis of mental illness appeared to follow life events or stressors (n=20) and those whose diagnosis appeared to precede exposure to stressors and life events (n=30). A number of quite distinct life trajectories were then identified within these original two groups (three in the first group and four in the second). Typical life charts created for each group are presented in Figures 1-7.

Diagnosis of mental illness following life events or stressors

Group 1: (n=12, mean age 38.6 years, 58% female). This was the largest of all groups and consisted of people who were diagnosed with mental illness following experience of violence, abuse and/or bullying as shown in Figure 1. Almost all (n=11) of these cases had diagnosed depression, sometimes with co-morbid anxiety and/or post-traumatic stress disorder. Five of these individuals had been sexually abused as children (most commonly at approximately 11-12 years of age), three had been bullied in their teenage years and four were exposed to other violence or abuse (e.g., emotional or physical abuse, intimate partner violence). Among cases where time frames were specified (n=8), the experience of violence/abuse/bullying occurred between 7 and 37 years prior to suicide (average 19 years). The life course of most of these individuals was characterised by multiple inpatient admissions (n=9) and 58% had made at least one suicide attempt in the year prior to their death (n=7). All

experienced at least one significant stressor in the weeks prior to suicide, most commonly work-related issues (n=6) and/or relationship separation (n=5).

Group 2: (n=4, mean age 47.5 years, 75% male). As shown in Figure 2, these individuals all had a significant experience of loss such as the death or absence of a parent or the death of a child. A diagnosis of mental illness (most commonly depression, n=3) was made in the years following the experience of this loss. All of these individuals then experienced another loss as one of the final recorded stressors prior to suicide, either a relationship separation or the death of a family member or close friend. Prior suicide attempts were a feature in the life course of most individuals in this group.

Group 3: (n=4, mean age 62.5 years, 75% male). These individuals were all diagnosed with depression after a significant physical injury or illness (Figure 3). Chronic pain as a result of injury or illness was mentioned for three of these individuals. All experienced further stressors prior to suicide. Stressors related to substance use (often prescription medications) and financial issues (as a result of being unable to work) were present in the years preceding suicide for some of these individuals. For three individuals with this life trajectory, the most proximal event to suicide was the loss of a partner (either through death or separation).

Diagnosis of mental illness preceding life events or stressors

Group 4: (n=7, mean age 63.9 years, 71% male). This group consisted of people with (usually) long-standing depression that was typically fairly stable until the person experienced a significant issue that affected their physical health, either illness or injury (Figure 4). Following this physical health issue, there were often other stressors, and exacerbation of the mental illness and related symptoms prior to the suicide. In all cases in this life trajectory, the individuals had been diagnosed with depression and some also had a co-morbid diagnosis of anxiety.

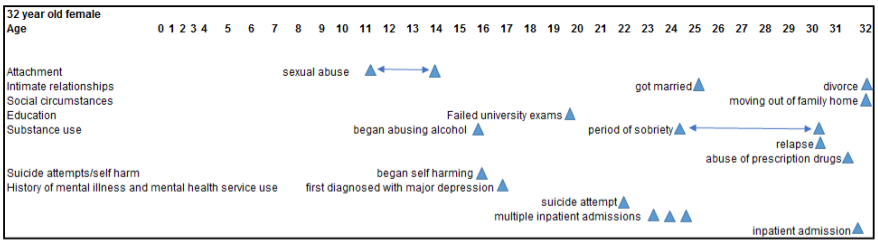

Figure 1 Typical life chart of Group 1

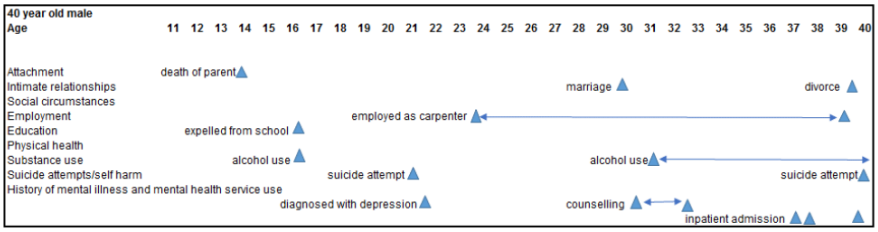

Figure 2 Typical life chart of Group 2

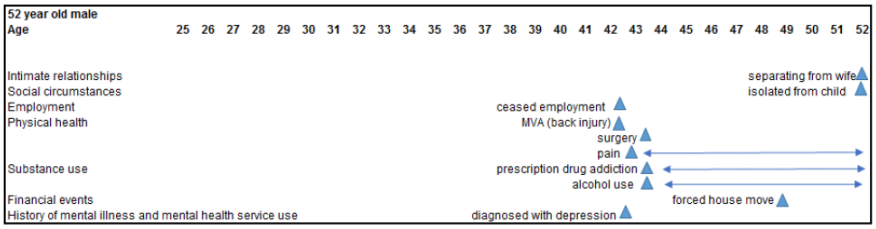

Figure 3 Typical life chart of Group 3

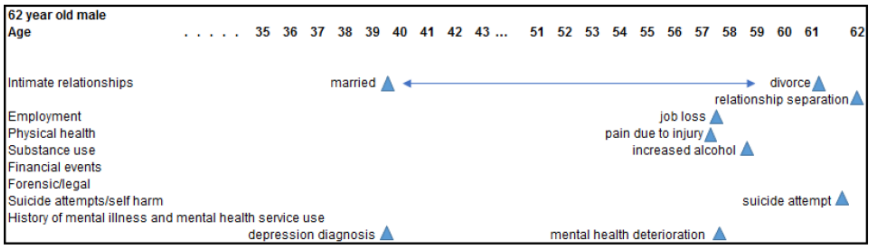

Figure 4 Typical life chart of Group 4

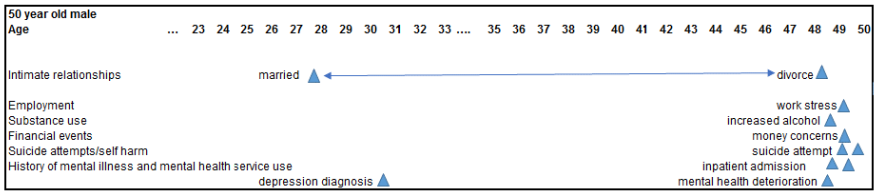

Figure 5 Typical life chart of Group 5

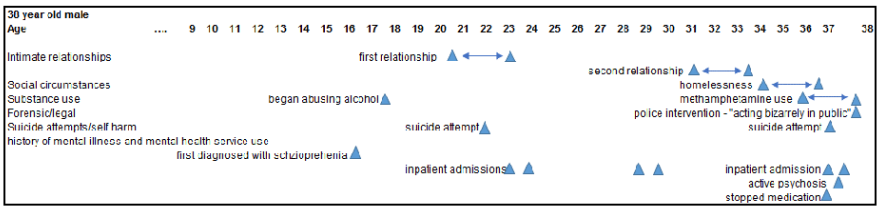

Figure 6 Typical life chart of Group 6

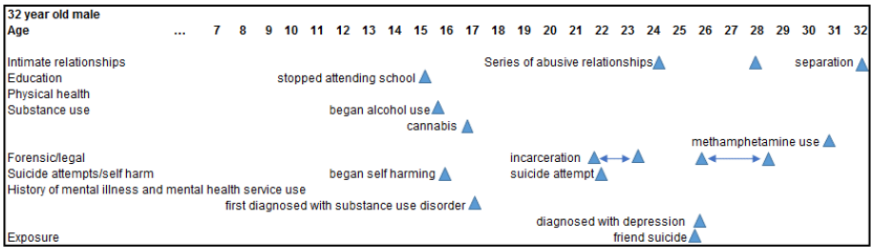

Figure 7 Typical life chart of Group 7

Group 5: (n=8, mean age 52.8 years, 88% male). The typical life chart for this group closely resembled that for the previous group. In this case, people with (usually) long-standing mental illness seemed fairly stable with regards to their mental health until a significant stressor (other than a physical injury or illness) seemed to precipitate the exacerbation of their mental illness and related symptoms prior to the suicide (Figure 5). The most common stressors that seemed to precipitate worsening mental health were relationship separation (63%) and work-related issues (50%). Seven of the eight cases had been diagnosed with depression (88%), sometimes with co-morbid anxiety.

Group 6: (n=7, mean age=48.9 years, 57% male). This group consisted of people diagnosed with long-term schizotypal, schizophrenia and delusional disorders, often with psychosis, who appeared to be experiencing active psychosis at the time of their death (Figure 6). In most cases, the period prior to suicide was characterised by exposure to multiple stressors such as relationship separation, isolation, homelessness, and police issues. Previous suicide attempts and recent episodes of non-concordance with treatment were present in five out of the seven cases.

Group 7: (n=8, mean age 34.0 years, 75% male). This group consisted of people who all had long-term substance use throughout the course of their life (Figure 7). Half had a diagnosis of psychoactive substance use disorder often with depression and or personality disorders. The remaining cases all had a diagnosis of depression and suspected psychoactive substance use disorder. This group was distinct from the previous group as no cases had a diagnosed schizotypal, schizophrenia and delusional disorder. The other defining feature of this life trajectory was that all individuals experienced forensic and/or legal stressors post diagnosis of mental illness. This ranged from people with extensive criminal histories and periods of incarceration to violence against police officers or family members in the context of an actual or threatened suicide attempt. Upcoming legal proceedings were mentioned in 50%

of cases. Alcohol (n=7), cannabis (n=4) and methamphetamines (n=3) were the most commonly recorded substances used by individuals with this life trajectory.

Discussion

This study examined the pathways to suicide in a sample of Victorians who had a diagnosed mental illness prior to their suicide. Analysis of life charts revealed two distinct pathways with regards to the chronology of factors and stressors reported for the deceased - one was characterised by life trajectories where diagnoses of mental illness appeared to follow life events or stressors and the other by trajectories where diagnoses of mental illness appeared to precede exposure to events or stressors.

The presence of experiences of child abuse among people who died by suicide in this study (Group 1) was not unexpected given childhood trauma has been found to be associated with mental illness (Afifi, Boman, Fleisher, & Sareen, 2009; Draper et al., 2008) and with suicide and/or suicide attempts (Afifi et al., 2009; Devries et al., 2011; Ng, Yong, Ho, Lim, & Yeo, 2018). Similarly, exposure to other types of violence, such as intimate partner violence, non-partner physical violence and family violence have been found to be independent risk factors for suicidal thoughts and attempts (Devries et al., 2011; Ellsberg, Jansen, Heise, Watts, & Garcia-Moreno, 2008) and for mental illness (Campbell, 2002; Golding, 1999). Additionally, an association has been found between suicidal behaviours and an experience of bullying (Luukkonen, Rasanen, Hakko, & Riala, 2009; McMahon, Reulbach, Keeley, Perry, & Arensman, 2010) and between an experience of bullying and mental illness (Luukkonen et al., 2009; McMahon et al., 2010). In addition to prevention of childhood abuse, treatment strategies that promote resilience following childhood trauma are clearly essential (Ng et al., 2018). In addition, it is important for health professionals treating clients with diagnosed mental illness

to be aware of the potential link between childhood sexual abuse, or exposure to other forms of violence or bullying, and subsequent suicide.

An experience of loss (as was apparent in Group 2), such as the loss of a parental figure or the death of a child or sibling, has been linked with an increase in risk for attempted suicide and/or suicide (Qin & Mortensen, 2003; Rostila, Saarela, & Kawachi, 2013) and for mental illness (Kreicbergs, Valdimarsdóttir, Onelöv, Henter, & Steineck, 2004). In addition to early losses being present in this group, the factors most proximal to suicide were all related to another loss such as relationship separation or a death of a loved one. This finding could point to a link between repeated loss experiences over the course of a person's life and potential for suicide – at least in this population of people with diagnosed mental illness.

Physical illness or injury was a significant stressor in two groups (Groups 3 and 4) and people in these groups tended to be older than those in all other groups. The link between physical illness, mental illness and suicide is not new. A review by Whitlock (1986) demonstrated that more than one-third of people who die by suicide had a medical illness at the time of their death and more recent research has found physical illness was mentioned as the main reason for suicide in almost 20% of cases (Fegg, Kraus, Graw, & Bausewein, 2016). Certain conditions have been shown to increase the risk of suicidal behaviour including HIV/AIDS (Harris & Barraclough, 1997), some cancers (Bjorkenstam, Edberg, Ayoubi, & Rosen, 2005), multiple sclerosis (Harris & Barraclough, 1997), and Huntington's disease (Schoenfeld et al., 1984). In addition, depression and anxiety disorders have also been found to be independently related to a wide range of chronic medical conditions (Scott et al., 2007). Findings from the current study show that in addition to there being cases of suicide where physical illness or injury appears to be a proximal risk factor for suicide in people already experiencing mental illness, physical issues also act as the precipitating factor that precedes mental illness diagnosis and subsequent suicide in others. All individuals with these life

trajectories had depression which is consistent with prospective cohort and retrospective case-control studies that indicate affective disorder is a powerful independent risk factor for suicide in older people (Conwell, Duberstein, & Caine, 2002). Older people who die by suicide often have contact with general practitioners proximal to their death (Van Orden & Conwell, 2011) but the focus of visits in the year prior to death is often physical issues which can lead to mental distress, and potentially suicidal ideation, being left unaddressed (Waern, Beskow, Runeson, & Skoog, 1999). The current study indicates that it may be beneficial for suicidal ideation to be enquired about and addressed in this population, particularly in individuals with long standing mental health issues even if any mental illness has appeared to be stable.

Situational and contextual stressors were a significant feature of many of the life trajectories but were particularly prominent in Group 5. People in this group typically had long-standing mental illness and fairly stable mental health until some kind of significant issue (which was not related to physical health) precipitated the exacerbation of their mental illness and related symptoms. Work-related (including unemployment and stress at work) and relationship separation stressors were common events proximal to suicide. Unemployment has been linked to suicide (Yoshimasu, Kiyohara, & Miyashita, 2008), as have adverse conditions in the workplace (Baumert et al., 2014) and relationship separation has been shown to contribute to higher rates of suicide, particularly in males (Ide et al., 2010; Stack & Scourfield, 2015). Good employment programs that preferentially employ people with mental illness and flexible employment arrangements that cater for the episodic nature of mental illness might be examples of approaches that could prove beneficial for this population. Other approaches could include increased access to counselling and/or mediation (for relationship or work-related issues) at times of increased stress in an attempt to mitigate any potential related negative consequences.

Previous research has suggested that the period of greatest risk for suicide in schizophrenia is early in the course of the disorder (McGirr & Turecki, 2011). However, many in the Group 6—which was characterised by long-term schizotypal, schizophrenia and delusional disorders—had diagnoses that were originally made twenty or more years prior to suicide and in only one case was the diagnosis made within five years of death. Non-concordance with treatment is a known suicide risk factor in people who have schizotypal, schizophrenia and delusional disorders (Hawton, Sutton, Haw, Sinclair, & Deeks, 2005) and was evident in the majority of life trajectories in this group, as were previous suicide attempts. Efforts to prevent suicide in this population should focus upon those with long-term illness (as well as newly diagnosed), particularly those experiencing a change in medication or ceasing medication altogether, and those experiencing an escalation in symptoms.

Group 7 was the youngest group and life trajectories were characterised by substance use (commonly in the context of a diagnosis of psychoactive substance use disorder) and forensic/legal issues. Extensive research has demonstrated the association between substance use and suicide/suicidal behaviour (Foster, 2011; Moscicki, 1995; Mościcki, 1997) and substance use and mental disorders (Jane-Llopis & Matytsina, 2006). Consistent with previous research, the life charts of this group also demonstrate episodes of violence (Botsis, Soldatos, Liossi, Kokkevi, & Stefanis, 1994), contact with police (Linsley, Johnson, & Martin, 2007) and legal issues (Stack & Wasserman, 2007) are often proximal events to suicide. The significance of police and legal events in this study suggests there is an obvious need for suicide awareness within the justice system. Support needs to be made available to people not only once they leave prison/jail but also in the lead up to court appearances, as these seem to be times of risk for suicide, at least in this population with a history of mental illness.

There is an obvious interplay between life events and/or stressors and mental illness in the different trajectories to suicide identified among this sample. In addition, there were

interesting findings with regards to distal and proximal factors present in the life trajectories of these individuals. Some factors seemed to act as distal factors (e.g. sexual abuse), and in some instances these events happened almost 40 years prior to suicide. Other factors were more common as proximal factors (e.g. relationship separation), with some of these events occurring in the days leading up to, or even on the day of, suicide. Yet others acted as both distal and proximal factors (e.g. mental illness, physical illness, injury, substance use, death of a family member).

Limitations

The intention of this study was not to establish casual relationships between mental illness and suicide as that is not possible in a retrospective study such as this. Rather, the intention was to examine the probable chronology of factors in a sample of suicides occurring among persons with mental illness. However, due to the lack of a control group who did not die, this study cannot determine whether these trajectories or chronologies are significantly more common in those who die by suicide than in those who do not. In addition, a review of coronial information might be biased due to the potential for incomplete information (Sutherland et al., 2018), or alternatively the importance of some factors in a person's life may have been overstated by virtue of that information having being supplied after the suicide by someone other than the person themselves. The paper concentrated on the chronology of various stressors and events leading up to the death because this was most relevant to the research question. While including information regarding other factors such as communication of suicidal intent and suicide method might have given a fuller picture of the death it was not considered of immediate relevance to the question at hand.

Conclusion

This study revealed two distinct pathways to suicide in this sample of Victorians who had diagnosed mental illness. One pathway was characterised by life trajectories where diagnoses of mental illness appeared to follow life events or stressors such as abuse, violence, interpersonal loss and physical illness. The other trajectory identified was where diagnoses of mental illness appeared to precede exposure to events or stressors. Importantly exposure to some events seemed to act as distal factors related to suicide, other events were more common as proximal factors and yet others appeared to act as both distal and proximal factors. Consequently, strategies to reduce suicide clearly need to be different depending on whether distal or proximal factors are the target of the intervention and need to consider the chronology of stressors that occur in people's lives.

References

Afifi, T. O., Boman, J., Fleisher, W., & Sareen, J. (2009). The relationship between child abuse, parental divorce, and lifetime mental disorders and suicidality in a nationally representative adult sample. *Child Abuse and Neglect, 33*(3), 139-147. doi: 10.1016/j.chiabu.2008.12.009

Agerbo, E., Nordentoft, M., & Mortensen, P. B. (2002). Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case-control study. *BMJ (Clinical research ed.), 325*(74), 1-5. doi: 10.1136/bmj.325.7355.74

Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychiatry, 4(*37), 1-11. doi: 10.1186/1471-244x-4-37

Baumert, J., Schneider, B., Lukaschek, K., Emeny, R. T., Meisinger, C., Erazo, N., . . . Ladwig, K. H. (2014). Adverse conditions at the workplace are associated with increased suicide risk. *Journal of Psychiatric Research, 57*, 90-95. doi: 10.1016/j.jpsychires.2014.06.007

Beautrais, A. L. (2002). A case control study of suicide and attempted suicide in older adults. *Suicide and Life-Threatening Behavior, 32*(1), 1-9. doi: 10.1521/suli.32.1.1.22184

Bertolote, J. M., & Fleischmann, A. (2002). Suicide and psychiatric diagnosis: a worldwide perspective. *World Psychiatry, 1*(3), 181-185.

Bjorkenstam, C., Edberg, A., Ayoubi, S., & Rosen, M. (2005). Are cancer patients at higher suicide risk than the general population? *Scandinavian Journal of Public Health, 33*(3), 208-214. doi: 10.1080/14034940410019226

Botsis, A. J., Soldatos, C. R., Liossi, A., Kokkevi, A., & Stefanis, C. N. (1994). Suicide and violence risk: relationship to coping styles. *Acta Psychiatrica Scandinavica, 89*, 92-96.

Campbell, J. C. (2002). Health consequences of intimate partner violence. *The Lancet, 359*(9314), 1331-1336. doi: 10.1016/s0140-6736(02)08336-8

Chesney, E., Goodwin, G. M., & Fazel, S. (2014). Risks of all-cause and suicide mortality in mental disorders: a meta-review. *World Psychiatry, 13*, 153-160. doi: 10.1002/wps.20128.

Clapperton, A., Newstead, S., Bugeja, & Pirkis, J. (in press). Relative risk of suicide following exposure to recent stressors, Victoria, Australia. *Australian & New Zealand Journal of Public Health.* doi: 10.1111/1753-6405.12886

Conwell, Y., Duberstein, P. R., & Caine, E. D. (2002). Risk factors for suicide in later life. *Biological Psychiatry, 52*, 193-204. doi: 10.1016/S0006-3223(02)01347-1

Devries, K., Watts, C., Yoshihama, M., Kiss, L., Schraiber, L. B., Deyessa, N., . . . Team, W. H. O. M.-C. S. (2011). Violence against women is strongly associated with suicide attempts: evidence from the WHO multi-country study on women's health and domestic violence against women. *Social Science and Medicine, 73*(1), 79-86. doi: 10.1016/j.socscimed.2011.05.006

Draper, B., Pfaff, J. J., Pirkis, J., Snowdon, J., Lautenschlager, N. T., Wilson, I., . . . Early Prevention of Suicide in General Practice Study, G. (2008). Long-term effects of childhood abuse on the quality of life and health of older people: Results from the Depression and Early Prevention of Suicide in General Practice Project. *Journal of the American Geriatrics Society, 56*(2), 262-271. doi: 10.1111/j.1532-5415.2007.01537.x

Ellsberg, M., Jansen, H. A. F. M., Heise, L., Watts, C. H., & Garcia-Moreno, C. (2008). Intimate partner violence and women's physical and mental health in the WHO multi-country study on women's health and domestic violence: an observational study. *The Lancet, 371*(9619), 1165-1172. doi: 10.1016/s0140-6736(08)60522-x

Fegg, M., Kraus, S., Graw, M., & Bausewein, C. (2016). Physical compared to mental diseases as reasons for committing suicide: a retrospective study. *BMC Palliative Care, 15*(1), 14. doi: 10.1186/s12904-016-0088-5

Fortune, S., Stewart, A., Yadav, V., & Hawton, K. (2007). Suicide in adolescents: using life charts to understand the suicidal process. *Journal of Affective Disorders, 100*(1-3), 199-210. doi: 10.1016/j.jad.2006.10.022

Foster, T. (2011). Adverse life events proximal to adult suicide: a synthesis of findings from psychological autopsy studies. *Archives of Suicide Research, 15*(1), 1-15. doi: 10.1080/13811118.2011.540213

Golding, J. (1999). Intimate partner violence as a risk factor for mental disorders: a meta-analysis. *Journal of Family Violence, 14*, 99-132. doi: 10.1023/A:1022079418229

Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders: A meta-analysis. *British Journal of Psychiatry, 170*, 205-228. doi: 10.1192/bjp.170.3.205

Haw, C., Bergen, H., Casey, D., & Hawton, K. (2007). Repetition of deliberate self-harm: A study of the characteristics and subsequent deaths in patients presenting to a general hospital according to extent of repetition. *Suicide and Life-Threatening Behavior, 37*(4), 379-396. doi: 10.1521/suli.2007.37.4.379

Hawton, K., Sutton, L., Haw, C., Sinclair, J., & Deeks, J. J. (2005). Schizophrenia and suicide: Systematic review of risk factors. *British Journal of Psychiatry, 187*, 9-20. doi: 10.1192/bjp.187.1.9

Hjelmeland, H., & Knizek, B. L. (2017). Suicide and mental disorders: A discourse of politics, power, and vested interests. *Death Studies, 41*(8), 481-492. doi: 10.1080/07481187.2017.1332905

Ide, N., Wyder, M., Kolves, K., & De Leo, D. (2010). Separation as an important risk factor for suicide: A systematic review. *Journal of Family Issues, 31*(12), 1689-1716. doi: 10.1177/0192513x10365317

Isometsä, E. T. (2001). Psychological autopsy studies - a review. *European Psychiatry, 16*(7), 379-385. doi: 10.1016/S0924-9338(01)00594-6

Jane-Llopis, E., & Matytsina, I. (2006). Mental health and alcohol, drugs and tobacco: a review of the comorbidity between mental disorders and the use of alcohol, tobacco and illicit drugs. *Drug and Alcohol Review, 25*(6), 515-536. doi: 10.1080/09595230600944461

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

Kolves, K., Potts, B., & De Leo, D. (2015). Ten years of suicide mortality in Australia: Socio-economic and psychiatric factors in Queensland. *Journal of Forensic and Legal Medicine, 36*, 136-143. doi: 10.1016/j.jflm.2015.09.012

Kreicbergs, U., Valdimarsdóttir, U., Onelöv, E., Henter, J.-I., & Steineck, G. (2004). Anxiety and depression in parents 4–9 years after the loss of a child owing to a malignancy: a population-based follow-up. *Psychological Medicine, 34*(8), 1431-1441. doi: 10.1017/s0033291704002740

Kunde, L., Kolves, K., Kelly, B., Reddy, P., & De Leo, D. (2017). Pathways to suicide in australian farmers: A life chart analysis. *International Journal of Environmental Research and Public Health, 14*(4), 352. doi: 10.3390/ijerph14040352

Linsley, K., Johnson, N., & Martin, J. (2007). Police contact within 3 months of suicide and associated health service contact. *British Journal of Psychiatry, 190*, 170-171. doi: 10.1192/bjp.bp.106.021857

Luukkonen, A. H., Rasanen, P., Hakko, H., & Riala, K. (2009). STUDY-70 Workgroup. Bullying behavior is related to suicide attempts but not to self-mutilation among psychiatric inpatient adolescents. *Psychopathology, 42*, 131-138. doi: 10.1159/000204764

Maris, R. (1981). Pathways to suicide: A survey of self-destructive behaviors. Baltimore, MD: Johns Hopkins University Press.

McGirr, A., & Turecki, G. (2011). Schizophrenia, other psychotic disorders, and suicidal behaviour. In R. C. O'Connor, S. Platt & J. Gordon (Eds.), *International handbook of suicide prevention : research, policy and practice* (pp. 75-94).

McMahon, E. M., Reulbach, U., Keeley, H., Perry, I. J., & Arensman, E. (2010). Bullying victimisation, self harm and associated factors in Irish adolescent boys. *Social Science and Medicine, 71*(7), 1300-1307. doi: 10.1016/j.socscimed.2010.06.034

Moscicki, E. K. (1995). Epidemiology of suicidal behavior. *Suicide and Life-Threatening Behavior, 25*(1), 22-35. doi: 10.1111/j.1943-278X.1995.tb00390.x

Mościcki, E. K. (1997). Identification of suicide risk factors using epidemiologic studies. *Psychiatric Clinics of North America, 20*(3), 499-517. doi: 10.1016/S0193-953X(05)70327-0

Ng, Q. X., Yong, B. Z. J., Ho, C. Y. X., Lim, D. Y., & Yeo, W. S. (2018). Early life sexual abuse is associated with increased suicide attempts: An update meta-analysis. *Journal of Psychiatric Research, 99*, 129-141. doi: 10.1016/j.jpsychires.2018.02.001

Pompili, M. (2018). The increase of suicide rates: the need for a paradigm shift. *The Lancet, 392*(10146), 474-475. doi: 10.1016/s0140-6736(18)31498-3

Poorolajal, J., Haghtalab, T., Farhadi, M., & Darvishi, N. (2016). Substance use disorder and risk of suicidal ideation, suicide attempt and suicide death: a meta-analysis. *Journal of Public Health (Oxford, England), 38*(3), e282-e291. doi: 10.1093/pubmed/fdv148

Qin, P., & Mortensen, P. B. (2003). The impact of parental status on the risk of completed suicide. *Archives of General Psychiatry, 60*(8), 797-802. doi: 10.1001/archpsyc.60.8.797

Rostila, M., Saarela, J., & Kawachi, I. (2013). Suicide following the death of a sibling: A nationwide follow-up study from Sweden. *BMJ Open, 3*(4), e002618. doi: 10.1136/bmjopen-2013-002618

Schoenfeld, M., Myers, R. H., Cupples, A., Berkman, B., Sax, D. S., & Clark, E. (1984). Increased rate of suicide among patients with Huntington's disease. *Journal of Neurology, Neurosurgery, and Psychiatry, 47*, 1283-1287. doi: 10.1136/jnnp.47.12.1283

Scott, K. M., Bruffaerts, R., Tsang, A., Ormel, J., Alonso, J., Angermeyer, M. C., . . . Von Korff, M. (2007). Depression-anxiety relationships with chronic physical conditions: Results from the World Mental Health Surveys. *Journal of Affective Disorders, 103*(1-3), 113-120. doi: 10.1016/j.jad.2007.01.015

Skerrett, D. M., Kolves, K., & De Leo, D. (2016). Pathways to suicide in lesbian and gay populations in Australia: A life chart analysis. *Archives of Sexual Behavior,* 46(5):1481-1489. doi: 10.1007/s10508-016-0827-y

Stack, S., & Scourfield, J. (2015). Recency of divorce, depression, and suicide risk. *Journal of Family Issues, 36*(6), 695-715. doi: 10.1177/0192513x13494824

Stack, S., & Wasserman, I. (2007). Economic strain and suicide risk: A qualitative analysis. *Suicide and Life-Threatening Behavior, 37*(1), 103-112. doi: 10.1521/suli.2007.37.1.103

Sutherland, G., Milner, A., Dwyer, J., Bugeja, L., Woodward, A., Robinson, J., & Pirkis, J. (2018). Implementation and evaluation of the Victorian Suicide Register. *Australian and New Zealand Journal of Public Health, 42*(3), 296-302. doi: 10.1111/1753-6405.12725

Van Orden, K., & Conwell, Y. (2011). Suicides in late life. *Current Psychiatry Reports, 13*(3), 234-241. doi: 10.1007/s11920-011-0193-3

Waern, M., Beskow, J., Runeson, B., & Skoog, I. (1999). Suicidal feelings in the last year of life in elderly people who commit suicide. *The Lancet, 354*(9182), 917-918. doi: 10.1016/s0140-6736(99)93099-4

Whitlock, F. (1986). Suicide and physical illness. In A. Roy (Ed.), *Suicide* (pp. 151–170). Baltimore: Williams and Wilkins.

Wyder, M., Ward, P., & De Leo, D. (2009). Separation as a suicide risk factor. *Journal of Affective Disorders, 116*(3), 208-213. doi: 10.1016/j.jad.2008.11.007

Yoshimasu, K., Kiyohara, C., & Miyashita, K. (2008). Suicidal risk factors and completed suicide: meta-analyses based on psychological autopsy studies. *Environmental Health and Preventive Medicine, 13*(5), 243-256. doi: 10.1007/s12199-008-0037-x

10.2 Supplementary material for Study 4

Study 4 explored the pathways to suicide among Victorians with a diagnosed mental illness by using the generation and analysis of life charts. 'Typical' trajectories to suicide by people with mental illness were identified.

A further component of this study that was not included in the submitted manuscript, aimed to examine these trajectories in the light of explanatory models for the association between mental illness and suicide that were outlined in Chapter 4.

10.2.1 Additional results not presented in manuscript

Two specific results were not included in the manuscript as they were relevant to the second part of the study only (i.e., the examination of life trajectories in the light of explanatory models for the association between mental illness and suicide).

Group 1: Consisted of people who were diagnosed with mental illness following experience of violence, abuse and/or bullying

- Changes to medication in the days/weeks prior to suicide were noted for three cases in Group 1 and there were also references made to the quality of health care received by some people in this group (n=2).

Group 6: Consisted of people diagnosed with long-term schizotypal, schizophrenia and delusional disorders, often with psychosis, who appeared to be experiencing active psychosis at the time of their death

- Changes to medication in the days/weeks prior to suicide were noted for three cases in group 6. Mention of command hallucinations were also recorded for three of the deceased and there were references made in suicide notes to the quality of care received by two individuals.

10.2.2 Assessment of the proposed models of the association between mental illness and suicide

Aspects of all the models proposed for the association between mental illness and suicide [22, 190] were apparent in the cases in this sample. None of the life trajectory groups identified in this study fitted neatly into one of the models proposed, rather, aspects of each of the models could be found in different life charts of the individuals included in this sample.

The first model, which suggests no direct causal link between mental illness and suicide, and instead posits that suicide and mental illness have the same common determinants was

consistent with Groups 1 and 2 which comprised people who had been exposed to abuse/violence/bullying or a significant loss prior to their diagnosis of mental illness and eventual suicide. Due to the design of the study, it is not possible to establish definitively whether exposure to violence/abuse/bullying occurred before or after the onset of symptoms for mental illness, but the life charts suggest that the diagnosis of mental illness at least was not made until after these experiences. Similarly, a descriptive study such as this cannot determine definitively whether mental illness was a causal factor in the suicides among these people or whether the suicide was independent of the mental illness.

The second model posits that mental illness can be an alternative to suicide (i.e., mental illness develops as a means of controlling the impulse for self-destruction in some people [22]). While there is no definitive way to identify whether the substance use recorded in this sample was a response to suicidal ideation, of the seven cases (mostly from groups 1 and 7) for whom mention was made of both a psychoactive substance use disorder and suicide attempts, three cases had evidence that a suicide attempt/s occurred prior to the substance use issue. This could be indicative that at least some people were using alcohol and other drugs as a means of controlling their suicidal thoughts/impulses.

Some support for the third proposed model, that suggests suicide can be the direct result of the symptoms of mental illness, was evident. References to command hallucinations were made in some suicide notes and/or in records of mental health service use prior to suicide. This mostly occurred in group 6, which consisted of individuals diagnosed with schizotypal, schizophrenia and delusional disorders.

Some preliminary evidence was apparent in Group 7 for both the models which emphasise the consequences of living with a mental illness as causative of suicide (one with the addition of crisis situations). For example, there were cases in this sample where the development of the mental illness appeared to precipitate all the other stressors and the eventual suicide. An example is psychoactive substance use disorders contributing to relationship issues, employment issues and then a crisis such as contact with the police prior to suicide.

The final model relates to suicide being an iatrogenic consequence of mental health care. There were ten cases (18% of all cases) in this sample that made mention of changes to medication in the days/weeks prior to suicide, most commonly in Groups 1 and 6. There were also references made to the quality of care received by six people in this study – either made by themselves in suicide notes, or made by others in statements to the police/Coroner (again, most commonly among people in Groups 1 and 6).

10.3 Conclusion

This final study aimed to explore the pathways to suicide among a sample of Victorians with a diagnosed mental illness at the time of their death. With regards to pathways to suicide, this study showed cases tended to group, in the first instance, into individuals whose diagnosis of mental illness appeared to follow life events/stressors and individuals whose diagnosis appeared to precede exposure to stressors and life events. A number of quite distinct life trajectories were then identified within these original two groups (three in the first group and four in the second). Further to this, all aspects of all the models proposed for the association between mental illness and suicide [22, 190] presented in Chapter 4 were apparent in the cases included in this sample.

Chapter 11: Discussion

This chapter synthesises the findings of the four studies presented in Chapters 7 to 10. Implications of these findings and suggestions for future research are also presented.

11.1 Rationale for research

Research has consistently shown that 90% or more of people who die by suicide (at least in the Western world) have a mental illness at the time of their death [6, 7, 73, 74, 191]. This is not the case for other parts of the world such as Japan [192] and China [98, 193] where the figure reported is closer to 60%. Most of the evidence that the vast majority of people who die by suicide have a mental illness comes from psychological autopsy (PA) studies which some suggest have inherent problems. Consequently, the claim that almost all people who die by suicide have a mental illness has since come under criticism from a number of researchers [10, 12, 13, 57]. Perceived problems related to PA studies were outlined in Chapter 3.

Other Australian and international research which has used purpose-built suicide registers or other coronial-based data sources has consistently shown that the proportion of people who die by suicide that have a mental illness might be much lower than the 90% often quoted [23, 111-113] suggesting the importance of other stressors or factors, for example relationship breakdown, substance use (in the absence of diagnosed mental illness), social isolation, exposure to violence, financial and legal issues, may be playing a more major role in individuals' decisions to die by suicide than previously thought. These two types of research overlap in some ways. For example, they both use much of the information generated during the coronial investigation process. However, a major difference is that purpose-built registers do not usually include provision to diagnose people with a mental illness following their death.

If the proportion of people who have a mental illness at the time of their suicide is actually much lower than previously proposed, or even if the figure is close to 90%, then it logically follows that there are a significant number of people who die by suicide that do not have a mental illness. This has many implications, the main one being that a major current strategy for the prevention of suicide – i.e., increasing access to psychiatric treatment – is unlikely to work for at least a proportion of people who are at risk of dying by suicide. However, other interventions such as reducing access to lethal means, responsible reporting by the media, school-based peer support and gatekeeper training could be beneficial for individuals regardless of whether they have a diagnosed mental illness.

Although mental illness may not be universally present among people who die by suicide – it has been shown to be a risk factor and as such there have been explanatory models proposed

to aid in understanding why this association between mental illness and suicide exists and to attempt to explain how mental illness may interact with other stressors and other risk factors in someone's decision to die by suicide. These models were explained in detail in Chapter 4.

The aim of this research was to first examine the presence of mental illness among Victorians who died by suicide. As part of this, a major component was to examine the other stressors and factors that were associated with suicide in the Victorian population. The research included examining the differences between Victorians who died by suicide who did have a diagnosed mental illness and those who did not. A further step was to examine suicide cases to see if they form meaningful groups based on the presence or absence of stressors and factors and whether mental illness cuts across any identified groups. In addition, the presence of a mental illness and exposure to other stressors in the 12 months prior to death by suicide were examined with regard to the commonality of these factors in the general population. The final stage involved creating and examining life charts among a sample of people who died by suicide and had a diagnosed mental illness to attempt to examine patterns in the trajectories to suicide among this population. In addition, this final stage aimed to see if models proposed to explain the association of suicide and mental illness are supported by the Victorian data.

11.2 Summary of Findings

The findings from the four studies are perhaps best summarised by reference to the research questions posed in Chapter 6.

11.2.1 What proportion of people who died by suicide in Victoria had a diagnosed mental illness and what types of mental illnesses were represented?

Using data from the Victorian Suicide Register (VSR), Study 1 showed that 2839 Victorians died by suicide over the five-year study period 2009-2013 and 52% of these individuals (n=1482) had a documented diagnosed mental illness recorded in the VSR. The most common mental illnesses represented were mood [affective] disorders (42.0%), neurotic, stress-related and somatoform disorders (14.9%), mental and behavioural disorders due to psychoactive substance use (8.7%), schizophrenia, schizotypal and delusional disorders (7.0%) and disorders of adult personality and behaviour (6.1%).

11.2.2 What were the differences and similarities between people who died by suicide and had a diagnosed mental illness compared to those who died by suicide but did not have a diagnosed mental illness?

Study 1 found that there were differences between suicide cases that had a diagnosed mental illness reported in coronial data and those that did not. Compared with those aged 40-54 years, those in the youngest and oldest age groups (10-24, 70-84 and 85+) were significantly less likely to have a diagnosed mental illness at the time of their death by suicide. Females and metropolitan residents had increased odds of having a diagnosed mental illness compared to males and residents of rural and regional areas, respectively. Individuals who had made a previous suicide attempt had 2.4 times the odds of having a diagnosed mental illness compared to those with no documented history of suicide attempts. Conversely, employed persons had decreased odds of having a diagnosed mental illness compared to unemployed persons.

The ten most common specific stressors recorded for both groups were the same although the ranking differed slightly. A substance-related stressor was the most common specific stressor documented for both groups and overall - recorded for 44.0% of cases (49.5% of cases among persons with a diagnosed mental illness and 38.1% of cases among persons with no documented diagnosed mental illness). Separation from and/or conflict with a partner were also very commonly recorded stressors, as were family conflict, current treatment for a physical condition (injury and/or illness), and stressors related to work, finances and legal issues.

Interestingly, cases with a diagnosed mental illness had a higher number of additional stressors recorded (M = 6.39, SD = 3.56) than the non-mental illness cases (M = 5.00, SD = 2.98; $t(2837) = -11.221$, $p<0.001$). In addition, six stressors reached statistical significance as independently associated with mental illness status. Persons exposed to isolation, family-related, work, educational, and substance-related stressors and those receiving current treatment for a physical condition, were more likely to have a diagnosed mental illness compared to people who had not been exposed to these potential stressors.

11.2.3 Could meaningful clusters/groups of people (based on identifiable factors and exposure to stressors) be identified in the Victorian suicide data?

The total sample for Study 2 comprised the same 2839 individuals as Study 1 and therefore, evidence of a diagnosis of mental illness was present in 52% of cases. Study 2 determined

that there were distinct clusters or groups of cases that could be identified in the Victorian suicide population and that these fitted neatly into one major group of cases that did have evidence of a diagnosed mental illness and another major group that did not. Further, each of these initial groups then further broke down into subgroups, four groups composed of individuals who had diagnosed mental illness and two groups composed of individuals who did not. The final six groups all had different characteristics.

Among the mental illness subgroups, almost all cases in two of the subgroups had a diagnosed mood disorder (98% in the first and 96% in the second). The first of these subgroups had a median age of 43 years, was 82% male and had 69% of cases who were employed. In contrast, the second subgroup had a median age of 65 years and was 65% male, and almost 90% were either retired or unable to work, and had at least one physical stressor coded. The remaining two mental illness subgroups were characterised by complex mental health needs as well as a high number of stressors. One of these subgroups contained a high proportion of individuals who had been diagnosed with schizophrenia, schizotypal and delusional disorders (56%). The final mental illness subgroup was characterised by a high proportion of females and although mood disorder was still the most commonly recorded diagnosis, almost half of cases had a diagnosed neurotic, stress-related or somatoform disorder and around a third had a diagnosed disorder of adult personality and behaviour.

The non-mental illness subgroups were quite distinct although males comprised a similar proportion of cases in each group (80% and 85% of cases respectively). One group was older than the other (median age 57 years compared to 38 years), and comprised people less likely to be employed (34% vs 64%) and more likely to have at least one physical stressor coded (55% vs 35%). Persons in the second of these subgroups were almost universally experiencing multiple stressors as evidenced by interpersonal stressors being recorded in 98% of cases and situational stressors recorded for all cases.

11.2.4 Were people with a diagnosed mental illness significantly overrepresented in the population of people who died by suicide in Victoria, Australia?

Neither of the first two studies considered exposure and therefore risk of suicide relative to the different stressors included in the VSR could not be established. For this reason, the third study aimed to identify stressors overrepresented in the 12-months prior to death among 553 Victorian adults who died by suicide in 2013. Age- and sex-specific suicide rates and relative risks of suicide were calculated using numerator data on suicides 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.

The analysis showed mental illness was associated with increased suicide risk among males and females of all analysed age groups. Among all adults combined, the calculated relative risks associated with mental illness ranged from a low of 4.71 (95% confidence intervals (CI), 3.55, 6.25) among people aged 25-44 years to 15.31 (95% CI 10.10, 23.20) among those aged 65 years and older. For males, again the lowest relative risk associated with mental illness was calculated for those aged 25-44 years (RR: 3.98, 95% CI 2.87, 5.52) and the highest for those aged 65 years and older (RR: 10.91, 95% CI 6.59, 18.07). The pattern was a little different for females, although the highest relative risk associated with mental illness occurred in women aged 65 years and older (RR: 36.43, 95% CI 15.84, 83.79), the lowest occurred in females aged 15-24 years (RR: 4.96, 95% CI 1.80,13.68).

11.2.5 What other factors and stressors (e.g., relationship separation, unemployment, exposure to violence, physical illness, injury etc.) associated with suicide were present and overrepresented in the Victorian suicide data?

In addition to the results presented above for risk conferred by mental illness, Study 3 examined relative risk of suicide associated with a further 13 stressors.

Of the additional 13 stressors examined in the study, six were associated with significantly increased suicide risk in the whole adult population: relationship separation, alcohol and other drug problems; involuntary loss of employment, exposure to violence/abuse; trouble with the police and removal of children. Overall, including mental illness, the three stressors with the highest relative risk 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). Importantly, mental illness was the only stressor associated with significantly increased suicide risk for men and women across all age groups.

The majority of those who died by suicide were recorded to have been exposed to two or more of the stressors (57.1%). An additional component of Study 3 was to examine suicide risk among people experiencing different combinations of stressors. Mental illness, alcohol or other drug problems, physical illness, divorce/relationship separation and trouble with the police were the most commonly reported stresses overall, and in combination. Therefore, the various combinations of these stressors were analysed and relative risks associated with each combination were calculated. Results showed 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.

11.2.6 What were some of the pathways to suicide among those who had a mental illness in Victoria, Australia?

Due to the recognition of mental illness as a risk factor for suicide and in light of results from Study 3 showing it to be the only stressor associated with significantly increased suicide risk across males and females of all age groups, the final study aimed to explore the pathways to suicide among a sample of Victorians with a diagnosed mental illness at the time of their death.

With regards to pathways to suicide, this study showed cases tended to group, in the first instance, into those whose diagnosis of mental illness appeared to follow life events/stressors and into those whose diagnosis appeared to precede exposure to stressors and life events. A number of quite distinct life trajectories were then identified within these original two groups (three in the first group and four in the second).

Some of the specific pathways identified where mental illness appeared to follow life events/stressors included people diagnosed with mental illness following:

- an experience of violence, abuse and/or bullying;
- a significant experience of loss such as the death or absence of a parent or the death of a child; or
- a significant physical injury or illness.

Some of the specific pathways identified where diagnosis of mental illness preceded other life events or stressor included people:

- with (usually) long-standing depression that was typically fairly stable until the person experienced a significant issue that affected their physical health (either illness or injury);
- with (usually) long-standing mental illness seemed fairly stable with regards to their mental health until a significant stressor (other than a physical injury or illness) seemed to precipitate the exacerbation of their mental illness and related symptoms prior to the suicide;
- diagnosed with long-term schizotypal, schizophrenia and delusional disorders, often with psychosis, who appeared to be experiencing active psychosis at the time of their death; or
- who all had long-term substance use throughout the course of their life.

Detailed characteristics of this trajectories were presented in Chapter 10.

Further to this, all aspects of all the models proposed for the association between mental illness and suicide [22, 190] presented in Chapter 4 were apparent in the cases in this sample. None of the life trajectory groups identified in this study fitted neatly into one of the models proposed, rather, aspects of each of the models could be found in different life charts of the individuals included in this sample. A more detailed consideration of the findings with respect to the models proposed by Mishara and Chagnon [22] was presented at the end of Chapter 10. The first model, which suggests no direct causal link between mental illness and suicide, and instead posits that suicide and mental illness have the same common determinants was consistent with Groups 1 and 2 which comprised people who had been exposed to abuse/violence/bullying or a significant loss prior to their diagnosis of mental illness and eventual suicide. The second model posits that mental illness can be an alternative to suicide. Using the life charts method, there is no definitive way to identify whether the substance use recorded in the sample was a response to suicidal ideation, but, of the seven cases (mostly from groups 1 and 7) for whom mention was made of both a psychoactive substance use disorder and suicide attempts, three cases had evidence that a suicide attempt/s occurred prior to the substance use issue. This could be indicative that at least some people were using alcohol and other drugs as a means of controlling their suicidal thoughts/impulses. Some support for the third proposed model, that suggests suicide can be the direct result of the symptoms of mental illness, was evident. References to command hallucinations were made in some suicide notes and/or in records of mental health service use prior to suicide. Some preliminary evidence was apparent in Group 7 for both the models which emphasise the consequences of living with a mental illness as causative of suicide (one with the addition of crisis situations). For example, there were cases in this sample where the development of the mental illness appeared to precipitate all the other stressors and the eventual suicide. The final model relates to suicide being an iatrogenic consequence of mental health care. Ten cases in this sample made mention of changes to medication in the days/weeks prior to suicide and there were references made to the quality of care received by six people in this study – either made by themselves in suicide notes, or made by others in statements to the police/Coroner.

11.3 Limitations

In Victoria, all deaths where suicide is suspected are legally required to be investigated by the coroner, and therefore the information generated for these investigations comprises the most comprehensive and reliable data source available on suicide in Victoria. However, there are

problems inherent in studies of this nature. Some limitations were consistent for all four studies that constitute this thesis. These include retrospectivity of data collection and the validity and reliability of some of the data may be questionable as it is subject to recall bias and potential subjective views of the individuals providing information. In addition, the absence of information in the coronial file does not guarantee that the factor of interest was not present and the presence of a factor does not necessarily imply contribution of that factor. Further to this, the volume of information varies between coronial investigations depending on a number of factors including who was asked to provide information, what questions were asked and the willingness of informants to disclose some or all of the information they had [24].

Similarly, a further limitation relevant to all four studies related to the coding of diagnosed mental illness. Clearly, it is possible and quite likely, that some individuals without diagnosed mental illness recorded in the Victorian Suicide Register may have had a mental illness that was yet to be diagnosed prior to the death. In fact, over the 5-year study period used for studies one and two, around one-third of cases without a diagnosed mental illness had some kind of treatment in the 12 months prior to their death that was coded as being for a mental health-related issue. Although, importantly, having treatment designated as mental health-related does not necessarily infer mental illness. Nevertheless, this potential for under-diagnosis of mental illness should be considered when examining the implications of the studies that constitute this thesis. However, this same potential for underreporting of factors could equally apply to other factors investigated throughout the studies incorporated into this thesis.

There were also limitations specific to some but not all of the studies. For example, three studies (one, two and four) did not consider exposure. These studies lacked a population-based control group and although this did not mean that the research question/s could not be answered, it did limit the broader interpretation for the results to risk beyond prevalence. For example, in Study 2 which identified typologies of people who died by suicide, it may be that certain variables cluster together in the population and this is why they clustered in that analysis. With regards to Study 1 which examined differences between those and without diagnosed mental illness, detailed information regarding psychosocial and precipitating events is available for both categories of suicides and therefore there is no reason potential biases should differ between the categories – consequently, the comparisons should represent real differences. Nevertheless, the associations found in Study 1 may not be specific for suicides but could be related to the differences between those with and without mental illness in the general population. Similarly, the intention of Study 4, which examined pathways to suicide among people with a mental illness, was not to establish casual relationships between mental

illness and suicide as that is not possible in a retrospective study. Rather, the intention was to examine the probable chronology of factors in a sample of suicides occurring among individuals with mental illness as a means of commenting on the relative worth of the models postulated by Mishara and Chagnon [22]. However, consistent with the other studies, Study 4 could not determine whether these trajectories or chronologies of events were significantly more common in those who died by suicide than in those who did not.

Some other limitations were specific to Study 3 which used the ABS General Social Survey (GSS) as a source of exposure data. Firstly, the study could only examine the stressors that are included in both the VSR and the GSS. This meant that some stressors that could reasonably be expected to increase suicide risk, as identified in previous literature such as social isolation, educational stressors, exposure to suicide, previous self-harm, or military exposure could not be examined in this study. Further, data was not available in the GSS for specific mental illnesses so the relative risk of suicide associated with different mental illnesses could not be examined. In addition, the specific question regarding exposure to 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 may 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 overrepresented 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 calculated for each factor could not be adjusted for the influence of other factors and as such all estimates were unadjusted.

11.4 Contributions to knowledge

11.4.1 A consideration of findings with respect to previous research

Some of the key findings from the studies that constitute this thesis are relatively unsurprising, and confirm the results of previous international and national studies. However, by utilising data collected in a purpose-built suicide register, this research has allowed various factors involved in suicide in Victoria to be quantified. Furthermore, the reproduction of results in another population provides evidence of the ability to generalise these associations across populations.

A 2017 report regarding research priorities in suicide prevention in Australia [194] advocated most strongly for intervention studies and studies that might help to develop effective interventions. However, it was also acknowledged that there was a need for more information regarding priority setting relating to target groups and that additional information was required

to guide decisions in these areas. It was suggested that decisions about the attention that should be afforded to particular target groups might be influenced by objective measures of the significance of the problem for different groups [194]. The studies that constitute this thesis contribute to knowledge by doing just this - by identifying target groups through quantifying which stressors are prevalent, and overrepresented in the Victorian population.

Studies 1 and 2 showed that the overall prevalence of diagnosed mental illness among Victorians who died by suicide over the period 2009-2013 was 52%. This is much lower than the prevalence reported in PA studies (i.e., 90% or more) but it is fairly consistent with three recent Australian studies which used data from suicide registers or the National Coronial Information System (NCIS). These studies found 43.9% [23], 49.2% [111] and 55.0% [24] of cases had a diagnosed mental illness at the time of death. A recent US study using the National Vital Statistics System determined 46% percent of cases in 2015 had a known mental health condition at the time of their death by suicide [112]. Although results of Study 1 were not unexpected given previous research that used similar data sources, utilising the systematically collected VSR data allowed quantification of the presence of diagnosed mental illness among the population of Victorians who died by suicide.

It must be acknowledged that utilising coronial data most likely provides an underestimate of the mental illness involvement in suicide due to only including cases where there is evidence of diagnosis of mental illness. Therefore, mental illness involvement could be underestimated by virtue of lack of existing information regarding presence of mental illness diagnosis being present in the coronial brief and also due to the fact that not everyone who has a mental illness has been diagnosed. However, the PA methodology is also likely biased due to the potential for people to look for a reason for the suicide after the event, particularly people who had close relationships with deceased who are generally the ones interviewed in such studies.

Consolidating this evidence, suggests that the real prevalence of mental illness involvement in suicide is probably somewhere in between the estimates produced by researchers using the coronial and PA methods, but where exactly the true prevalence lies, is hard to determine. A large cohort study followed up over a long period of time and involving regular assessments of mental illness could be used to determine this accurately but this type of research has not been conducted in Victoria – and even if it were to be conducted the study would presumably still suffer from the potential for under-diagnosis of mental illness.

With regards to identified differences between people who died by suicide who did and did not have a diagnosed mental illness, it was established that people who had a diagnosed mental illness at the time of their suicide were more likely to have been exposed to isolation, family-

related, work, educational, and substance-related stressors when compared to people who did not have a diagnosed mental illness. Interestingly, no stressors were identified that were significantly more common in people without diagnosed mental illness when compared to people with diagnosed mental illness. A 2018 US study included a similar analysis comparing suicide decedents who did and did not have a known mental health condition. In contrast to the findings from Study 1, relationship problems/loss, life stressors, and recent/impending crises, were significantly less likely among those with known mental health conditions than among those without mental health conditions [112]. This could reflect actual differences, which is perhaps not that surprising given that suicide and associated factors are known to differ across cultures, but it could also reflect differences in the data collection and quality of data used for the two studies.

Cluster analysis for Study 2 identified typologies among Victorians who died by suicide. Importantly, the groups identified appear consistent with existing knowledge in suicide research and also make clinical sense, e.g., older persons with physical problems with or without an accompanying mental illness diagnosis, younger persons with complex mental health needs often in combination with significant and multiple life stressors, younger males experiencing significant stressors without a diagnosed mental illness. A previous Australian study [23] used a similar data source and method to examine subtypes of suicide in Victoria and Australia and although the current study used a more detailed data source it was expected that groups found in the current study would be broadly similar. Although it was difficult to directly compare the identified subgroups due to inconsistency in both the number of groups identified and the variables included across the two studies, the largest groups identified were similar – both had a mean age of 38 years, were approximately 85% male, and contained either no or a very small number of cases with diagnosed mental illness. Similarly, both studies identified a group characterised by older age, mostly male with very low incidence of mental illness. The previous study identified two mental illness subgroups whereas the current study identified four, which in addition to making it difficult to directly compare groups, suggests there is more variation among persons who have a diagnosed mental illness who die by suicide than could be determined in the previous study.

Previous international studies in England [195], Scotland [196], Ireland [197], Hong Kong [198], the USA [199] and Canada [200] all identified subgroups among cases of suicide in those specific locations. While, again, it is not feasible to directly compare the groups found in this study with those identified in previous international studies due to differences in methodology, variables included and the number of groups identified, there are some important similarities and differences between the identified groups. Consistent with findings from this study,

international studies have found that subtypes or groups of persons who died by suicide differ with regards to proportions of cases with mental illness [195-200] and in addition to the previous Victorian study, two international studies also found that the largest groups identified had the lowest rates of identified mental illness [196, 200]. Suicide in the context of physical illness is a recognised issue [23, 195] and was a feature in the current study. A group characterised by a high proportion of females, with diagnosed mental illness and high numbers of previous suicide attempts as identified in this study was also identified in a Canadian study [200]. Finally, many studies found that in cases with and without diagnosed mental illness, individuals were usually exposed to at least one, if not multiple, other stressors prior to the suicide [195-197, 199, 200]. The high prevalence of stressors documented in almost all cases in this study emphasises the complex interplay between factors associated with suicide.

A major contribution of the work that constitutes this thesis, is that exposure to various stressors was taken into account for Study 3. Although there were some limitations with the approach taken, this research constitutes a step forward with regards to understanding suicide in the Victorian context. Preventing suicide relies on prediction of suicide to identify appropriate individuals for targeting countermeasures. It has recently been argued that prediction of suicide will be better achieved by understanding proximal rather than distal risk factors [201]. Proximal risk factors for suicide were examined in a number of the studies included in this thesis but were the specific focus of Study 3 which examined suicide risk associated with 12-month exposure to 14 stressors. This study underscored the importance of mental illness as a risk factor for suicide but also identified exposure to many other stressors as increasing suicide risk in the Victorian population. In some populations the risk conferred by other stressors was significantly higher than that conferred by mental illness.

The life charts method has only recently begun to be used to examine suicide in Australia [185, 186] and Study 4 is the first Victorian study to be published that has used the method. While there were some noted limitations associated with this study, the analysis allowed for more detailed conceptualisation of the pathways to suicide among Victorians with diagnosed mental illness and provided an example that these kinds of studies can be conducted using data from purpose-built suicide registers.

Taken as a whole, the findings from the current thesis confirm some things that were expected, but importantly, the research quantified some of this in a tangible way. The research quantified the presence and nature of mental illness in Victorian suicides, but importantly, this was established in the context of other factors and stressors that also occur in people's lives. While previous research [23, 24] has made reference to the fact that not all who die by suicide in Victoria have a mental illness, it has not been quantified in such a way, with such a detailed

data source and in the context of the other stressors that people are experiencing. The data contained in the VSR made this possible and consequently the studies in this thesis provide more reliable results than those which have used other data sources. The research was able to demonstrate that while mental illness is indeed a risk factor for suicide in Victoria, the picture is much more complex than mental illness alone. Even within the population with mental illness who die by suicide, people and their experiences are clearly not homogenous, there is much variation regarding factors that individuals are exposed to prior to suicide. Without research such as the studies that constitute this thesis, the oft-cited statistic that 90% of people who die by suicide have a mental illness will continue to be largely unchallenged which therefore has the potential to have negative flow-on effects. Those that are at risk may be missing vital warning signs and messages as they do not have a mental illness and therefore may think suicide is not a concern for them. There is even a risk that continuing to overstate the role of mental illness could lead to decreased help seeking, i.e., suicide helplines, access to healthcare professionals may not be utilised by individuals when they do not have a mental illness.

The findings from this research show that the medical model, and the mental illness explanation are not the only explanation for suicide and that continuing to focus on only the mental illness and the role it plays in suicide will be detrimental to suicide prevention efforts in Victoria.

11.4.2 A consideration of findings with respect to contemporary theories of suicide

Chapter 5 provided an overview of some influential theories of suicide. Advantages of theories of suicide are that they enhance our understanding of the mechanisms of suicidal behaviour [167] and can lead to conceptualisation of how suicide may be prevented by highlighting potential intervention strategies. Some theorists have emphasised the importance of constructs that are considered modifiable risk factors, for example feelings of hopelessness [156] or thwarted belongingness [28], while others have highlighted personality characteristics such as impulsivity and aggression, as they are also amenable targets for intervention [165].

Contemporary theories of suicide acknowledge the importance of mental illness as a risk factor for suicide, however it is argued that suicide is an outcome of a complex process which involves many factors and stressors and is not always, or simply, a result of mental illness [29, 147]. Others more strongly argue for a clear distinction to be made between mental illness and suicide emphasising that people do not die as a result of mental illness, they die from suicide [158].

Findings from the studies that constitute this thesis clearly support these arguments. Some Victorians are dying by suicide not in the context of mental illness and even among those who do have diagnosed mental illness there are clear and distinct differences between exposures to stressors among different groups of Victorians who die by suicide. Further, analysis identified complex and varied trajectories to suicide among Victorians who had a diagnosed mental illness, supporting the theories that emphasise the importance of other constructs and not simply mental illness.

11.4.3 Implications for suicide prevention

Outcomes from the research presented in this thesis have implications for suicide prevention. The first two studies in particular, have shown that there are a significant number of people who die by suicide in Victoria who do not have a diagnosed mental illness at the time of their death, lending support to the argument that suicidal behaviour should be examined as a behaviour that is related to, but also distinct from, mental illness. Notwithstanding the limitation that the lack of evidence of a diagnosed mental illness is not necessarily evidence of the absence of mental illness, these studies show that it is highly likely that at least some people are dying by suicide in the absence of mental illness. This statement will likely be considered as equivocal by some researchers. In fact, some have argued that efforts to promote suicide prevention via access to high-quality mental health care may be undermined if researchers suggest that not all those who died by suicide experienced a mental illness in the days and weeks before their deaths [191]. However, a potential counterargument is that pathologising those with suicidal ideation through consistently stating that 90% of those who die by suicide have a mental illness could conceivably lead to decreased help seeking for suicidality whether it occurs in the context of mental illness or not if a person does not think they have a mental illness or does not want to accept that they do. In this way, placing all emphasis on mental illness could actually be discouraging help seeking by alienating people who are struggling with particularly stressful life events and who may be experiencing very strong negative emotions in the absence of mental illness. It could also lead to others not looking for suicide warning signs in instances where someone is struggling with particular events/stressors but is known or considered not to have a diagnosed mental illness. In addition, there is currently no evidence that increasing awareness or access to treatment is working to reduce suicide rates given that rates in Victoria and the rest of Australia are either stable or increasing [2] despite awareness raising efforts, increases in treatments such as antidepressant medications [202] and no identifiable increase in the prevalence of common mental illness in Australia [203]. Clearly, any suicide prevention plan or strategy needs to be multifaceted and cannot only be about increasing access to, and effectiveness of, psychiatric treatment for mental illness.

Study 1 also showed that the ten most common specific stressors recorded for both the group comprised of people with diagnosed mental illness, and the group comprised of people without diagnosed mental illness, were the same albeit with a slightly different ranking. A substance-related stressor was the most common specific stressor documented for both groups and overall, separation from and/or conflict with a partner were also very commonly recorded stressors, as were family conflict, current treatment for a physical condition and stressors related to work, finances and legal issues. While it is not possible to realistically eliminate these kinds of stressors from people's lives, strengthening an individual's personal resources, such as self-esteem, self-efficacy and locus of control, to help cope with difficulties associated with these stressors may present an important component of suicide prevention programs [(103)]. In addition, effective social support within communities could help protect vulnerable people from suicide by building and improving social connectedness and skills to cope with difficulties when they occur [(1)].

Study 2 showed that to view those who die by suicide as a single population without recognising apparent subpopulations (identified in that study) would be to ignore useful information that may be pertinent to success in decreasing the frequency of suicide in Victoria. People who die by suicide cannot be considered a homogenous group. Specific recommendations related to each of the typologies identified were outlined in Chapter 8. Recommendations when treating people with a mental illness included that professionals should be mindful that even in the absence of prior suicidal behaviour and in individuals with seemingly stable mental illness, exposure to stressors—particularly multiple stressors—in this population can leave individuals vulnerable to suicide. Further, results point to the need for health professionals to ensure that among older people, in addition to treating physical aspects of an individual's health, focus is also placed on their mental health. Among the population without a diagnosed mental illness, stressors recorded were mostly related to substance use, work and finances suggesting it may be likely that many in this population could be in contact with other services, such as drug and alcohol, human resources, workplace counselling services or welfare services. Therefore, there is a likely benefit in these kinds of services being aware of an individual's potential vulnerability to suicide even in the absence of diagnosed mental illness. It is crucial that these support services focus on suicide prevention within the context of their service, whether it be services relating to relationship breakdown, financial hardship, legal or work-related issues. It is essential to ensure that regardless of their mental illness status, people reaching out to all relevant services are able to access support for potential suicidality. In addition, it is important to imbed support services in processes that occur around these events in individuals' lives for example in work places and family law

services. These supports would then target people at their potential point of need and would not rely on the person actively seeking help.

Study 3 showed that the presence of exposure to some other stressors was at least as overrepresented in the suicide cases as mental illness. Some of these included the presence of substance use and removal of children in certain populations. However, mental illness was the only stressor associated with significantly increased suicide risk across all age groups and in men and women – other stressors appeared to increase suicide risk only in certain populations. This study showed that 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. Clearly, 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 as do certain populations of people experiencing specific combinations of co-occurring stressors.

In contrast to the first three studies which examined only the presence of factors and stressors prior to suicide, Study 4 additionally examined the chronology of the factors and stressors. This analysis revealed two distinct pathways to suicide in this sample of Victorians who had diagnosed mental illness. One pathway was characterised by life trajectories where diagnoses of mental illness appeared to follow life events or stressors such as abuse, violence, interpersonal loss and physical illness. The other trajectory identified was where diagnoses of mental illness appeared to precede exposure to events or stressors. Importantly exposure to some events seemed to act as distal factors related to suicide, other events were more common as proximal factors and yet others appeared to act as both distal and proximal factors. These findings have important implications for suicide prevention as strategies to reduce suicide clearly need to be different depending on the category of factor being targeted (i.e., distal versus proximal) and need to consider the chronology of stressors that occur in people's lives.

Overall, the findings of this research suggest that interventions at the universal, selective and indicated levels are all needed to prevent suicide and also support previous researchers that have argued for public health responses, interventions and upstream prevention to decrease suicide [1, 38, 204-208] . The most common suicide prevention approach used to date has been indicated interventions which aim to identify and treat individuals already in crisis or with symptoms and disorders linked to suicide [204]. However, universal interventions such as those that may reduce risk by removing barriers to care, increasing access to help, and

strengthening family and community protective factors would benefit those at risk for suicide regardless of whether they have been diagnosed with a mental illness. Clearly, good supports need to be available when people are going through stressful times and while these supports need to be available to people with diagnosed mental illness (as they often experience these stressors more often than people without mental illness), support also has to be available for the entire population. Further, the supports cannot only be available for those who seek them out, support has to be available and made known to those that do not seek help. Reducing access to means has been shown to be effective for preventing suicide [35] and is going to continue to be an important component of suicide prevention initiatives. If increased support is available for people having difficulty with stressful life circumstances and the potential avenues to suicide are made more difficult by reducing access to means, then one could be reasonably confident of saving at least some people from suicide.

11.4.3.1 A consideration of current suicide prevention initiatives in Victoria, Australia

The Victorian government has a suicide prevention framework that supports a strong effort to reduce suicide with a goal of halving Victoria's suicide rate by 2025. The two key initiatives being implemented are *Place-based trials* and *Assertive outreach trials (HOPE Initiative)*.

For the *place-based trials* the Victorian government is partnering with 12 Primary Health Networks to support local communities to develop and implement coordinated place-based approaches to suicide prevention. The trials bring together different parts of the community, including people with lived experience of suicide, schools, businesses, local council, police, health services, community agencies and others to identify what is needed to prevent suicide and what types of initiatives will best support people locally. This may include initiatives like raising awareness of mental health issues and support services, general practitioner training, school-based programmes, frontline staff training, reducing access to lethal means and training people with lived experience to talk about suicide in the community.

Under the *Assertive Outreach trials - HOPE initiative* - six health services were originally funded to design and implement flexible and person-centred care for people that present to the emergency department for intentional self-harm. The HOPE initiative has recently been rolled out at a further six health services. The initiative involves tailored, person-centered support that is responsive to the unique needs and circumstances of the individual. Individuals are provided with practical, psychosocial support in addition to direct mental health or other medical treatment for up to three months after their discharge from hospital. In addition, assertive outreach workers work with, and provide support to, families, friends and carers so that they can better support their loved one.

Importantly neither of these initiatives preclude people without a diagnosed mental illness from benefiting from the interventions. Place-based trials, should in theory, benefit the entire community in which the trial is occurring through imbedding support services in broad community-based interventions. For example, interventions such as reducing access to means in areas known for frequent suicides in certain communities should benefit people regardless of mental illness status. In addition, there is no requirement that people engaged in the HOPE trials have a diagnosed mental illness meaning all people who present to the relevant health services will be able to be included in the trials.

11.4.4 Implications for future research

By relying on the VSR which is a population-based dataset, the four studies in the current thesis had the advantage of being comprehensive and large in scale. However, the main disadvantage of relying on this dataset is that all research that constitutes this thesis was limited by what information is available in the VSR.

Future research could address this limitation by analysing a linked dataset. That is, by linking the VSR data to other data sources such as hospital administrative, community mental health, and alcohol and drugs related datasets, some of the gaps in data in the VSR could potentially be addressed. A linked data study using the whole population (or a sample such as all Victorians who have used hospitals) could also address the other major limitation of some of the studies – the lack of a population-based control group.

In relation to Study 4, which examined life trajectories in a sample of people with diagnosed mental illness who had died by suicide, future research could replicate the study among individuals who died by suicide without diagnosed mental illness in order to determine whether there are distinct life trajectories in the two populations. While it is possible that the life charts of people with a diagnosed mental illness were more informative by virtue of mental health and general practitioner reports being a major source of detailed information that contributes to the VSR, future research could assess the utility of using the life charts to examine the lives and trajectories to suicide in other groups in the Victorian context.

While the life chart study and the pathways identified, showed aspects of all the explanatory models for the association between mental illness and suicide were apparent in the sample, it was essentially very difficult to clearly and confidently assign a case to one of the models. Interviews with suicide attempt survivors may make this more achievable as the complex interaction between mental illness and suicidal behaviour may be better understood by the individuals themselves rather than health professionals or people close to someone who has died by suicide.

All studies showed that most people who died by suicide were undergoing multiple stressors preceding, or at the time of, their death. Although the life charts study was able to give insight into the chronology of factors and exposures to stressors in people's lives, it is not possible in studies such as these to determine the actual causal mechanisms related to suicide and the exact motivations that led someone to die by suicide. Large scale cohort studies would be the best option but there are ethical and practical implications around these. Perhaps qualitative studies conducted with a representative sample of people who have survived a suicide attempt might be the best way to address some of the limitations of the studies included in this thesis, other register-based studies, and of psychological autopsy studies in general. Interviews with people who have survived an attempt would be beneficial in understanding the impact of various stressors and their contribution to suicide. In addition, detailed interviews with people who made a serious suicide attempt and had a diagnosed mental illness would further help to elucidate the association between mental illness and suicide and would make it possible to better assess the explanatory models for the association that were proposed by Mishara and Chagnon [22].

11.5 Conclusion

The four studies in the current thesis have advanced knowledge regarding suicide among the Victorian population which in turn informs the global context. These studies have demonstrated people exposed to stressors other than mental illness are dying by suicide and this is, at least sometimes, in the absence of any diagnosed mental illness. In addition, the studies constituting this thesis showed that even within the population who have a diagnosed mental illness, these individuals are not a homogenous group and the pathways or life trajectories to suicide are complex and varied.

Given that mental illness is a risk factor for suicide, then ignoring the psychiatric reasons that one might choose to die by suicide and consequently, ignoring psychiatric interventions would be negligent. However, the same can be said for ignoring the psychological and social stressors related to suicide, particularly when mental illness is not a factor. 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.

References

1. WHO. Preventing suicide: a global imperative. Geneva: World Health Organization. Retrieved from http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/; 2014.

2. ABS. Causes of Death. Catalogue No. 3303.0. Canberra, Australia: Australian Bureau of Statistics; 2017.

3. Van Orden KA, Witte TK, Cukrowicz KC, Braithwaite SR, Selby EA, Joiner TE. The interpersonal theory of suicide. Psychol Rev. 2010;117(2):575-600.

4. Moscicki EK. Epidemiology of suicidal behavior. Suicide Life Threat Behav. 1995;25(1):22-35.

5. Fegg M, Kraus S, Graw M, Bausewein C. Physical compared to mental diseases as reasons for committing suicide: a retrospective study. BMC Palliat Care. 2016;15(1):14.

6. Isometsä ET. Psychological autopsy studies - a review. Eur Psychiatry. 2001;16(7):379-85.

7. Bertolote JM, Fleischmann A. Suicide and psychiatric diagnosis: a worldwide perspective. World Psychiatry. 2002;1(3):181-85.

8. Cavanagh JTO, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. Psychol Med. 2003;33(3):395-405.

9. Haw C, Hawton K. Suicide is a complex behaviour in which mental disorder usually plays a central role. Aust N Z J Psychiatry. 2015;49(1):13-5.

10. Hjelmeland H, Dieserud G, Dyregrov K, Knizek BL, Leenaars AA. Psychological autopsy studies as diagnostic tools: are they methodologically flawed? Death Stud. 2012;36(7):605-26.

11. Hawton K, Appleby L, Platt S, Foster T, Cooper J, Malmberg A, et al. The psychological autopsy approach to studying suicide: a review of methodological issues. J Affect Disord. 1998;50(2-3):269-76.

12. Shahtahmasebi S. Examining the claim that 80-90% of suicide cases had depression. Front Public Health. 2013;1:62.

13. Pridmore S. Mental disorder and suicide: a faulty connection. Aust N Z J Psychiatry. 2015;49(1):18-20.

14. Selkin J, Loya F. Issues in the psychological autopsy of a controversial public figure. Prof Psychol. 1979;10(1):87-93.

15. Qin P, Agerbo E, Mortensen PB. Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: A national register–based study of all suicides in Denmark, 1981–1997. Am J Psychiatry. 2003;160:765-72.

16. Mortensen PB, Agerbo E, Erikson T, Qin P, Westergaard-Nielsen N. Psychiatric illness and risk factors for suicide in Denmark. Lancet. 2000;355:9-12.

17. Harris EC, Barraclough B. Suicide as an outcome for mental disorders: A meta-analysis. Br J Psychiatry. 1997;170:205-28.

18. Bostwick JM, Pankratz VS. Affective disorders and suicide risk: a reexamination. Am J Psychiatry. 2000;157(12):1925-32.

19. Palmer BA, Pankratz VS, Bostwick JM. The lifetime risk of suicide in schizophrenia: A reexamination. Arch Gen Psychiatry. 2005;62:247-53.

20. Allebeck P, Allgulander C. Suicide among young men: Psychiatric illness, deviant behavior and substance abuse. Acta Psychiatr Scand. 1990;81:565-70.

21. Cheng AT, Chen TH, Chen CC, Jenkins R. Psychosocial and psychiatric risk factors for suicide. Case-control psychological autopsy study. Br J Psychiatry. 2000;177:360-5.

22. Mishara BL, Chagnon F. Understanding the relationship between mental illness and suicide and the implications for suicide prevention. In: O'Connor RC, Platt S, Gordon J, editors. International handbook of suicide prevention : research, policy and practice. West Sussex, UK: John Wiley & Sons; 2011. p. 609-23.

23. Judd F, Jackson H, Komiti A, Bell R, Fraser C. The profile of suicide: changing or changeable? Soc Psychiatry Psychiatr Epidemiol. 2012;47(1):1-9.

24. Bugeja L, Milner A, Pirkis J. Identification and analysis of health service use and pathways to health service contact amongst persons who died from suicide in Victoria, 2009-2010. Melbourne: Coroners Court of Victoria, 2015.

25. Chan KPM, Hung SF, Yip PSF. Suicide in response to changing societies. Child Adolesc Psychiatr Clin N Am. 2001;10(4):777-95.

26. Fleischmann A, Bertolote JM, Belfer M, Beautrais A. Completed suicide and psychiatric diagnoses in young people: a critical examination of the evidence. Am J Orthopsychiatry. 2005;75(4):676-83.

27. Durkheim E. Suicide: A Study in Sociology. New York: Routledge Classics; 1951 [1897].

28. Joiner TE. Why people die by suicide. Cambridge, MA: Harvard University Press; 2005.

29. O'Connor RC. The integrated motivational-volitional model of suicidal behavior. Crisis. 2011;32(6):295-8.

30. Vijayakumar L, John S, Pirkis J, Whiteford H. Suicide in developing countries (2): risk factors. Crisis. 2005;26(3):112-9.

31. O'Neill S, Corry C, McFeeters D, Murphy S, Bunting B. Suicide in Northern Ireland: An analysis of gender differences in demographic, psychological, and contextual factors. Crisis. 2016;37(1):13-20.

32. O'Neill S, Ennis E, Corry C, Bunting B. Factors associated with suicide in four age groups: A population based study. Arch Suicide Res. 2018;22(1):128-38.

33. Seiden RH. Where are they now? A follow-up study of suicide attempters from the Golden Gate Bridge. Suicide Life Threat Behav. 1978;8(4):203-16.

34. Suominen K, Isometsä E, Suokas J, Haukka J, Achte K, Lönnqvist J. Completed suicide after a suicide attempt: A 37-year follow-up study. Am J Psychiatry. 2004;161:563-4.

35. Pirkis J, Too LS, Spittal MJ, Krysinska K, Robinson J, Cheung YTD. Interventions to reduce suicides at suicide hotspots: a systematic review and meta-analysis. Lancet Psychiatry 2015;2(11):994-1001.

36. Cox GR, Owens C, Robinson J, Nicholas A, Lockley A, Williamson M, et al. Interventions to reduce suicides at suicide hotspots: a systematic review. BMC Public Health. 2013;13(1):1-12.

37. Pirkis J, Spittal MJ, Cox G, Robinson J, Cheung YTD, Studdert D. The effectiveness of structural interventions at suicide hotspots: a meta-analysis. Int J Epidemiol. 2013;42:541-48.

38. WHO. Public health action for the prevention of suicide: A framework. Geneva: World Health Organization; 2012.

39. WHO. World health statistics 2017: monitoring health for the SDGs, Sustainable Development Goals. Geneva: World Health Organization; 2017.

40. De Leo D, Milner A, Xiangdong W. Suicidal behavior in the Western Pacific region: characteristics and trends. Suicide Life Threat Behav. 2009;39:72-81.

41. De Leo D. Can we rely on suicide mortality data? Crisis. 2015;36(1):1-3.

42. De Leo D, Dudley MJ, Aebersold CJ, Mendoza JA, Barnes MA, Harrison JE, et al. Achieving standardised reporting of suicide in Australia: rationale and program for change. Med J Australia. 2010;192(8):452-6.

43. Elnour AA, Harrison J. Suicide decline in Australia: where did the cases go? Aust N Z J Public Health. 2009;33(1):67-9.

44. De Leo D. Suicide mortality data need revision. Med J Australia. 2007;186(3):157-8.

45. Cantor C, McTaggart P, De Leo D. Misclassification of suicide - The contribution of opiates. Psychopathology. 2001;34(3):140-6.

46. Williams RFG, Doessel DP, Sveticic J, De Leo D. Accuracy of official suicide mortality data in Queensland. Aust N Z J Psychiatry. 2010;44:815-22.

47. Byard RW. Issues with suicide databases in forensic research. Forensic Sci Med Pathol. 2017;13(4):401-2.

48. Austin AE, van den Heuvel C, Byard RW. Differences in local and national database recordings of deaths from suicide. Forensic Sci Med Pathol. 2017;13(4):403-8.

49. Harrison JE, Pointer S, Elnour AA. A review of suicide statistics in Australia. Adelaide: AIHW, 2009.

50. ABS. Causes of Death. Catalogue No. 3303.0. Canberra, Australia: Australian Bureau of Statistics; 2016.

51. Snowdon J. Should the recently reported increase in Australian suicide rates alarm us? Aust N Z J Psychiatry. 2017;51(8):766-9.

52. Paraschakis A, Michopoulos I, Douzenis A, Christodoulou C, Koutsaftis F, Lykouras L. Differences between suicide victims who leave notes and those who do not: a 2-year study in Greece. Crisis. 2012;33(6):344-9.

53. Shneidman ES. The psychological autopsy. Suicide Life Threat Behav. 1981;11(4):325-40.

54. Scott CL, Swartz E, Warburton K. The psychological autopsy: solving the mysteries of death. Psychiatr Clin North Am. 2006;29(3):805-22.

55. Pouliot L, De Leo D. Critical issues in psychological autopsy studies. Suicide Life Threat Behav. 2006;36(5):491-510.

56. Conner KR, Beautrais AL, Brent DA, Conwell Y, Phillips MR, Schneider B. The next generation of psychological autopsy studies. Part I. Interview content. Suicide Life Threat Behav. 2011;41(6):594-613.

57. Hjelmeland H, Knizek BL. Suicide and mental disorders: a discourse of politics, power, and vested interests. Death Stud. 2017;41(8):481-92.

58. Tasmanian Suicide Prevention Strategy (2016-2010). Hobart, Australia: State Government of Tasmania, 2016.

59. NT suicide prevention Strategic Action Plan (2015-2018). Darwin, Australia: Government of the Northern Territory, 2015.

60. Living Well: A strategic plan for mental health in NSW. Sydney, Australia: NSW Mental Health Commission, 2014.

61. MacIsaac MB, Bugeja L, Weiland T, Dwyer J, Selvakumar K, Jelinek GA. Prevalence and characteristics of interpersonal violence in people dying from suicide in Victoria, Australia. Asia Pac J Public Health. 2018;30(1):36-44.

62. Clapperton A, Newstead S, Bugeja L, Pirkis J. Differences in characteristics and exposure to stressors between persons with and without diagnosed mental illness who died by suicide in Victoria, Australia. Crisis. 2018;in press [Epub ahead of print].

63. Sutherland G, Milner A, Dwyer J, Bugeja L, Woodward A, Robinson J, et al. Implementation and evaluation of the Victorian Suicide Register. Aust N Z J Public Health. 2018;42(3):296-302.

64. De Leo D. Australia revises its mortality data on suicide. Crisis. 2010;31(4):169-73.

65. Milner A, Sveticic J, De Leo D. Suicide in the absence of mental disorder? A review of psychological autopsy studies across countries. Int J Soc Psychiatry. 2013;59(6):545-54.

66. De Leo D, Klieve H. Communication of suicide intent by schizophrenic subjects: data from the Queensland Suicide Register. Int J Ment Health Syst. 2007;1(1):6.

67. Leenaars AA. The quantitative and qualitative in suicidological science: an editorial. Arch Suicide Res. 2002;6(1):1-3.

68. Goldney RD. Qualitative and quantitative approaches in suicidology: commentary. Arch Suicide Res. 2002;6(1):69-73.

69. Lester D. Qualitative versus quantitative studies in psychiatry: two examples of cooperation from suicidology. Arch Suicide Res. 2002;6(1):15-8.

70. Hjelmeland H, Knizek BL. What kind of research do we need in suicidology today? In: O'Connor RC, Platt S, Gordon J, editors. International handbook of suicide prevention : research, policy and practice 2011. p. 591-608.

71. Hjelmeland H, Knizek BL. Why we need qualitative research in suicidology. Suicide Life Threat Behav. 2010;40(1):74-80.

72. Mościcki EK. Identification of suicide risk factors using epidemiologic studies. Psychiatr Clin North Am. 1997;20(3):499-517.

73. Bertolote JM, Fleischmann A, De Leo D, Wasserman D. Psychiatric diagnoses and suicide: revisiting the evidence. Crisis. 2004;25(4):147-55.

74. Barraclough B, Bunch J, Nelson B, Sainsbury P. A hundred cases of suicide: clinical aspects. Br J Psychiatry. 1974;125:355-73.

75. Henriksson MM, Aro HM, Marttunen MJ, Heikkinen ME, Isometsä ET, Kuoppasalmi KI, et al. Mental disorders and comorbidity in suicide. Am J Psychiatry. 1993;150(6):935-40.

76. Henriksson MM, Marttunen MJ, Isomets ET, Heikkinen ME, Aro HM, Kuoppasalmi KI, et al. Mental disorders in elderly suicide. Int Psychogeriatr. 1995;7(2):275-86.

77. Beautrais AL. A case control study of suicide and attempted suicide in older adults. Suicide Life Threat Behav. 2002;32(1):1-9.

78. Haw C, Bergen H, Casey D, Hawton K. Repetition of deliberate self-harm: A study of the characteristics and subsequent deaths in patients presenting to a general hospital according to extent of repetition. Suicide Life Threat Behav. 2007;37(4):379-96.

79. Devries K, Watts C, Yoshihama M, Kiss L, Schraiber LB, Deyessa N, et al. Violence against women is strongly associated with suicide attempts: evidence from the WHO multi-

country study on women's health and domestic violence against women. Soc Sci Med. 2011;73(1):79-86.

80. Ellsberg M, Jansen HAFM, Heise L, Watts CH, Garcia-Moreno C. Intimate partner violence and women's physical and mental health in the WHO multi-country study on women's health and domestic violence: an observational study. Lancet. 2008;371(9619):1165-72.

81. Afifi TO, Boman J, Fleisher W, Sareen J. The relationship between child abuse, parental divorce, and lifetime mental disorders and suicidality in a nationally representative adult sample. Child Abuse Negl. 2009;33(3):139-47.

82. Ng QX, Yong BZJ, Ho CYX, Lim DY, Yeo WS. Early life sexual abuse is associated with increased suicide attempts: An update meta-analysis. J Psychiatr Res. 2018;99:129-41.

83. Agerbo E, Nordentoft M, Mortensen PB. Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case-control study. BMJ. 2002;325(7355):74-9.

84. Ide N, Wyder M, Kolves K, De Leo D. Separation as an important risk factor for suicide: a systematic review. J Fam Issues. 2010;31(12):1689-716.

85. Stack S, Scourfield J. Recency of divorce, depression, and suicide risk. J Fam Issues. 2015;36(6):695-715.

86. Wyder M, Ward P, De Leo D. Separation as a suicide risk factor. J Affect Disord. 2009;116(3):208-13.

87. Australian Health Ministers. Fourth national mental health plan: an agenda for collaborative government action in mental health 2009-2014 [Internet]: Commonwealth of Australia; 2009.

88. ABS. National Survey of Mental Health and Wellbeing: Summary of results. Catalogue No. 4326.0. Canberra, ACT: Australian Bureau of Statistics; 2007.

89. Robins E, Gassner S, Kayes J, Wilkinson R, Murphy G. Some clinical considerations in the prevention of suicide based on a study of 134 successful suicides Am J Public Health. 1959;49:888-9.

90. Dorpat TL, Ripley HS. A study of suicide in the Seattle area. Compr Psychiatry. 1960;1(6):349-59.

91. Draper B, Snowdon J, Wyder M. A pilot study of the suicide victim's last contact with a health professional. Crisis. 2008;29(2):96-101.

92. Draper B, Kolves K, De Leo D, Snowdon J. The impact of patient suicide and sudden death on health care professionals. Gen Hosp Psychiatry. 2014;36(6):721-5.

93. De Leo D, Draper BM, Snowdon J, Kolves K. Suicides in older adults: a case-control psychological autopsy study in Australia. J Psychiatr Res. 2013;47(7):980-8.

94. Draper B, Kolves K, De Leo D, Snowdon J. A controlled study of suicide in middle-aged and older people: personality traits, age, and psychiatric disorders. Suicide Life Threat Behav. 2014;44(2):130-8.

95. Snowdon J, Draper B, Wyder M. Age variation in the prevalence of DSM-IV disorders in cases of suicide of middle-aged and older persons in Sydney. Suicide Life Threat Behav. 2011;41(4):465-70.

96. Skerrett DM, Kõlves K, De Leo D. Suicidal behaviours in LGBT populations. Australian Institute for Suicide Research and Prevention, 2015.

97. Thacore VR, Varma SL. A Study of suicides in Ballarat, Victoria, Australia. Crisis. 2000;21(1):26-30.

98. Phillips MR, Yang G, Zhang Y, Wang L, Ji H, Zhou M. Risk factors for suicide in China: a national case-control psychological autopsy study. Lancet. 2002;360(9347):1728-36.

99. Zhang J, Xiao S, Zhou L. Mental disorders and suicide among young rural Chinese: A case-control psychological autopsy study. Am J Psychiatry. 2010;167:773-81.

100. Cho SE, Na KS, Cho SJ, Im JS, Kang SG. Geographical and temporal variations in the prevalence of mental disorders in suicide: Systematic review and meta-analysis. J Affect Disord. 2016;190:704-13.

101. Bertolote JM. Suicide and mental disorders: do we know enough? Br J Psychiatry. 2003;183(5):382-3.

102. Conner KR, Beautrais AL, Brent DA, Conwell Y, Phillips MR, Schneider B. The next generation of psychological autopsy studies. Part 2. Interview procedures. Suicide Life Threat Behav. 2012;42(1):86-103.

103. Arnautovska U, McPhedran S, De Leo D. Differences in characteristics between suicide cases of farm managers compared to those of farm labourers in Queensland, Australia. Rural Remote Health. 2015;15(3250):online.

104. Arnautovska U, McPhedran S, De Leo D. A regional approach to understanding farmer suicide rates in Queensland. Soc Psychiatry Psychiatr Epidemiol. 2014;49(4):593-9.

105. Kolves K, De Leo D. Suicide in medical doctors and nurses: an analysis of the Queensland Suicide Register. J Nerv Ment Dis. 2013;201(11):987-90.

106. Heller TS, Hawgood JL, Leo DD. Correlates of suicide in building industry workers. Arch Suicide Res. 2007;11(1):105-17.

107. De Leo D, Milner A, Sveticic J. Mental disorders and communication of intent to die in indigenous suicide cases, Queensland, Australia. Suicide Life Threat Behav. 2012;42(2):136-46.

108. De Leo D, Sveticic J, Milner A. Suicide in Indigenous people in Queensland, Australia: trends and methods, 1994-2007. Aust N Z J Psychiatry. 2011;45(7):532-8.

109. Soole R, Kolves K, De Leo D. Factors related to childhood suicides: analysis of the Queensland Child Death Register. Crisis. 2014;35(5):292-300.

110. De Leo D, Krysinska K. Suicidal behaviour by train collision in Queensland, 1990–2004. Aust N Z J Psychiatry. 2010;42(9):772-9.

111. Kolves K, Potts B, De Leo D. Ten years of suicide mortality in Australia: socio-economic and psychiatric factors in Queensland. J Forensic Leg Med. 2015;36:136-43.

112. Stone DM, Simon TR, Fowler KA, Kegler SR, Yuan K, Holland KM, et al. Vital Signs: Trends in state suicide rates — United States, 1999–2016 and circumstances contributing to suicide — 27 States, 2015. MMWR Morb Mortal Wkly Rep. 2018;67(22):617–24.

113. Ali NH, Zainun KA, Bahar N, Haniff J, Hamid AM, Bujang MA, et al. Pattern of suicides in 2009: data from the National Suicide Registry Malaysia. Asia Pac Psychiatr. 2014;6(2):217-25.

114. Chesney E, Goodwin GM, Fazel S. Risks of all-cause and suicide mortality in mental disorders: a meta-review. World Psychiatry. 2014;13:153-60.

115. Bradvik L, Mattisson C, Bogren M, Nettelbladt P. Longterm suicide risk of depression in the Lundby cohort 1947–1997 – severity and gender. Acta Psychiatr Scand. 2008;117:185-91.

116. Mattisson C, Bogren M, Ojehagen A, Nordstrom G, Horstmann V. Mortality in alcohol use disorder in the Lundby Community Cohort--a 50 year follow-up. Drug Alcohol Depend. 2011;118(2-3):141-7.

117. Anderberg J, Bogren M, Mattisson C, Bradvik L. Long-term suicide risk in anxiety-The Lundby Study 1947-2011. Arch Suicide Res. 2016;20(3):463-75.

118. Holmstrand C, Bogren M, Mattisson C, Bradvik L. Long-term suicide risk in no, one or more mental disorders: the Lundby Study 1947-1997. Acta Psychiatr Scand. 2015;132 (6):459–69.

119. Hawton K, Fagg J. Suicide, and other causes of death, following attempted suicide. Br J Psychiatry. 1988;152:359-66.

120. Cooper J, Kapur N, Webb R, Lawlor M, Guthrie E, Mackway-Jones K, et al. Suicide after deliberate self-harm: a 4-year cohort study. Am J Psychiatry. 2005;162:297-303.

121. Morgan C, Webb RT, Carr MJ, Kontopantelis E, Green J, Chew-Graham CA, et al. Incidence, clinical management, and mortality risk following self harm among children and adolescents: cohort study in primary care. BMJ. 2017;359:j4351.

122. Appleby L, Cooper J, Amos T, Faragher B. Psychological autopsy study of suicides by people aged under 35. Br J Psychiatry. 1999;175:148-74.

123. Duberstein PR, Conwell Y, Conner KR, Eberly S, Caine ED. Suicide at 50 years of age and older: perceived physical illness, family discord and financial strain. Psychol Med. 2004;34(1):137-46.

124. Plunkett A, O'Toole B, Swanston H, Oates RK, Shrimpton S, Parkinson P. Suicide risk following child sexual abuse. Ambul Pediatr. 2001;1(5):262–6.

125. Beautrais AL. Suicides and serious suicide attempts: two populations or one? Psychol Med. 2001;31:837-45.

126. Luukkonen AH, Rasanen P, Hakko H, Riala K. STUDY-70 Workgroup. Bullying behavior is related to suicide attempts but not to self-mutilation among psychiatric inpatient adolescents. Psychopathology. 2009;42:131-8.

127. McMahon EM, Reulbach U, Keeley H, Perry IJ, Arensman E. Bullying victimisation, self harm and associated factors in Irish adolescent boys. Soc Sci Med. 2010;71(7):1300-7.

128. Bjorkenstam C, Edberg A, Ayoubi S, Rosen M. Are cancer patients at higher suicide risk than the general population? Scand J Public Health. 2005;33(3):208-14.

129. Schoenfeld M, Myers RH, Cupples A, Berkman B, Sax DS, Clark E. Increased rate of suicide among patients with Huntington's disease. J Neurol Neurosurg Psychiatry. 1984;47:1283-7.

130. Whitlock F. Suicide and physical illness. In: Roy A, editor. Suicide. Baltimore: Williams and Wilkins; 1986. p. 151–70.

131. Yoshimasu K, Kiyohara C, Miyashita K. Suicidal risk factors and completed suicide: meta-analyses based on psychological autopsy studies. Environ Health Prev Med. 2008;13(5):243-56.

132. Schneider B, Grebner K, Schnabel A, Hampel H, Georgi K, Seidler A. Impact of employment status and work-related factors on risk of completed suicide. A case-control psychological autopsy study. Psychiatry Res. 2011;190(2-3):265-70.

133. Baumert J, Schneider B, Lukaschek K, Emeny RT, Meisinger C, Erazo N, et al. Adverse conditions at the workplace are associated with increased suicide risk. J Psychiatr Res. 2014;57:90-5.

134. Linsley K, Johnson N, Martin J. Police contact within 3 months of suicide and associated health service contact. Br J Psychiatry. 2007;190:170-1.

135. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. Suicide Life Threat Behav. 2007;37(1):103-12.

136. Guldin MB, Ina Siegismund Kjaersgaard M, Fenger-Grøn M, Thorlund Parner E, Li J, Prior A, et al. Risk of suicide, deliberate self-harm and psychiatric illness after the loss of a close relative: A nationwide cohort study. World psychiatry. 2017;16(2):193-9.

137. Latham AE, Prigerson HG. Suicidality and Bereavement: Complicated Grief as Psychiatric Disorder Presenting Greatest Risk for Suicidality. Suicide Life Threat Behav. 2004;34(4).

138. Stroebe M, Stroebe W, Abakoumkin G. The Broken Heart: Suicidal Ideation in Bereavement. Am J Psychiatry. 2005;162:2178–80.

139. Pitman AL, Osborn DP, Rantell K, King MB. Bereavement by suicide as a risk factor for suicide attempt: a cross-sectional national UK-wide study of 3432 young bereaved adults. BMJ open. 2016;6(1):e009948.

140. Draper B, Pfaff JJ, Pirkis J, Snowdon J, Lautenschlager NT, Wilson I, et al. Long-term effects of childhood abuse on the quality of life and health of older people: results from the Depression and Early Prevention of Suicide in General Practice Project. J Am Geriatr Soc. 2008;56(2):262-71.

141. McIntyre RS, Soczynska JK, Mancini D, Lam C, Woldeyohannes HO, Moon S, et al. The relationship between childhood abuse and suicidality in adult bipolar disorder. Violence Vict. 2008;23(3):361-72.

142. Mann JJ, Arango VA, Avenevoli S, Brent DA, Champagne FA, Clayton P, et al. Candidate endophenotypes for genetic studies of suicidal behavior. Biol Psychiatry. 2009;65(7):556-63.

143. Afifi TO, Cox BJ, Enns MW. Mental health profiles among married, never-married, and separated/divorced mothers in a nationally representative sample. Soc Psychiatry Psychiatr Epidemiol. 2006;41(2):122-9.

144. Agerbo E, Qin P, Mortensen PB. Psychiatric illness, socioeconomic status, and marital status in people committing suicide: a matched case-sibling-control study. J Epidemiol Community Health. 2006;60(9):776-81.

145. Morgan C, Burns T, Fitzpatrick R, Pinfold V, Priebe S. Social exclusion and mental health: Conceptual and methodological review. Br J Psychiatry. 2007;191:477-83.

146. Mishara BL, Tousignant M. Comprendre le suicide. Montréal: Presses de l'Université de Montréal; 2004.

147. O'Connor RC, Nock MK. The psychology of suicidal behaviour. Lancet Psychiatry. 2014;1(1):73-85.

148. Buchanan DM. Suicide: a conceptual model for an avoidable death. Arch Psychiatr Nurs. 1991;V(6):341-49.

149. Barzilay S, Apter A. Psychological models of suicide. Arch Suicide Res. 2014;18(4):295-312.

150. Brent DA. Preventing youth suicide: time to ask how. J Am Acad Child Adolesc Psychiatry. 2011;50(8):738-40.

151. Nock MK. Suicidal behavior among adolescents: correlates, confounds, and (the search for) causal mechanisms. J Am Acad Child Adolesc Psychiatry. 2009;48(3):237-9.

152. Freud S. Beyond the pleasure principle. Leiozig, Vienna: International Psychoanalytic Publisher; 1920.

153. Menninger KA. Man against himself. Oxford, England: Harcourt, Brace; 1938.

154. Baumeister RF. Suicide as escape from self. Psychol Rev. 1990;97(1):90-113.

155. Beck AT, Kovacs M, Weissman MA. Hopelessness and suicidal behavior an overview. JAMA psychiatry. 1975;234(11):1146-9.

156. Beck AT, Brown G, Berchick RJ, Stewart BL, Steer RA. Relationship between hopelessness and ultimate suicide: A replication with psychiatric outpatients. Am J Psychiatry. 1990;147:190-5.

157. Beck AT, Steer RA, Kovacs M, Garrison B. Hopelessness and eventual suicide: a 10-year prospective study of patients hospitalized with suicidal ideation. Am J Psychiatry. 1985;142(5):559-63.

158. Shneidman ES. Suicide as Psychache. J Nerv Ment Dis. 1993;181(3):145-7.

159. Troister T, Holden RR. A two-year prospective study of psychache and its relationship to suicidality among high-risk undergraduates. J Clin Psychol. 2012;68:1019-27.

160. Van Heeringen K. Stress-diathesis model of suicidal behavior. In: Dwivedi Y, editor. The neurobiological basis of suicide. Boca Raton: CRC Press; 2012. p. 113-25.

161. Schotte DE, Clum GA. Suicide ideation in a college population: A test of a model. J Consult Clin Psychol. 1982;50(5):690-6.

162. Wenzel A, Beck AT. A cognitive model of suicidal behavior: Theory and treatment. Appl Prev Psychol. 2008;12(4):189-201.

163. Mann JJ, Waternaux C, Haas GL, Malone KM. Toward a clinical model of suicidal behavior in psychiatric patients. Am J Psychiatry. 1999;156(2):181-9.

164. Mann JJ. The neurobiology of suicide. Nat Med. 1998;4(1):25-30.

165. McGirr A, Turecki G. The relationship of impulsive aggressiveness to suicidality and other depression-linked behaviors. Curr Psychiatry Rep. 2007;9(6):460-6.

166. Nock MK, Borges G, Bromet EJ, Alonso J, Angermeyer M, Beautrais AL, et al. Cross-national prevalence and risk factors for suicidal ideation, plans, and attempts. Br J Psychiatry. 2008;192:98-105.

167. Hagan CR, Ribeiro JD, Joiner J, T. E. Present status and future prospects of the Interpersonal-Psychological Theory of suicidal behavior. In: O'Connor RC, J P, editors. International handbook of suicide prevention : second edition. West Sussex: Wiley Blackwell; 2016. p. 119-31.

168. van Heeringen K, Mann JJ. The neurobiology of suicide. Lancet Psychiatry. 2014;1(1):63-72.

169. Vijayakumar L, Rajkumar S. Are risk factors for suicide universal? A case-control study in India. Acta Psychiatr Scand. 1999;99:407-11.

170. Shahtahmasebi S. De-politicizing youth suicide prevention. Front Pediatr. 2013;1:8.

171. Braithwaite R. Suicide prevention and mental illness. BMJ. 2012;345:e8201.

172. Walter G, Pridmore S. Suicide is preventable, sometimes. Australas Psychiatry. 2012;20(4):271-3.

173. Beautrais AL, Collings SCD, Ehrhardt P, Henare K. Suicide prevention: A review of evidence of risk and protective factors, and points of effective intervention. Wellington: Ministry of Health, 2005.

174. Bugeja L, Ibrahim JE, Ferrah N, Murphy B, Willoughby M, Ranson D. The utility of medico-legal databases for public health research: a systematic review of peer-reviewed publications using the National Coronial Information System. Health Res Policy Syst. 2016;14:28.

175. Owens L, Lightfoot J. The National Coroners Information System: a new death and injury surveillance tool. Australas epidemiol. 2000;7(1):24-30.

176. Milner AJ, Maheen H, Bismark MM, Spittal MJ. Suicide by health professionals: a retrospective mortality study in Australia, 2001-2012. Med J Australia. 2016;205(6):260-5.

177. Milner A, Niven H, LaMontagne A. Suicide by occupational skill level in the Australian construction industry: data from 2001 to 2010. Aust N Z J Public Health. 2014;38(3):281-5.

178. Murphy B, Kennedy B, Martin C, Bugeja L, Willoughby M, Ibrahim JE. Health and care related risk factors for suicide among nursing home residents: A data linkage study. Suicide Life Threat Behav. 2018.

179. Murphy BJ, Bugeja LC, Pilgrim JL, Ibrahim JE. Suicide among nursing home residents in Australia: A national population-based retrospective analysis of medico-legal death investigation information. Int J Geriatr Psychiatry. 2018;33(5):786-96.

180. Roxburgh A, Hall WD, Burns L, Pilgrim J, Saar E, Nielsen S, et al. Trends and characteristics of accidental and intentional codeine overdose deaths in Australia. Med J Australia. 2015;203(7):299.

181. O'Connor RC, Sheehy NP, O'Connor DB. A thematic analysis of suicide notes. Crisis. 1999;20(3):106-14.

182. ABS. General Social Survey Summary Results, Australia, Catalogue No. 4159.0: Explanatory notes Canberra, ACT: Australian Bureau of Statistics; 2014.

183. Mooi E, Sarstedt M. A concise guide to market research : The process, data, and methods using IBM SPSS statistics. Berlin: Springer; 2011.

184. Fortune S, Stewart A, Yadav V, Hawton K. Suicide in adolescents: using life charts to understand the suicidal process. J Affect Disord. 2007;100(1-3):199-210.

185. Skerrett DM, Kolves K, De Leo D. Pathways to suicide in lesbian and gay populations in Australia: A life chart analysis. Arch Sex Behav. 2016;46(5):1481-9.

186. Kunde L, Kolves K, Kelly B, Reddy P, De Leo D. Pathways to suicide in australian farmers: a life chart analysis. Int J Environ Res Public Health. 2017;14(4):352.

187. Paykel ES. The interview for recent life events. Psychol Med. 1997;27(2):301-10.

188. Clapperton A, Bugeja L, Newstead S, Pirkis J. Identifying typologies of persons who died by suicide: characterising suicide in Victoria, Australia. Arch Suicide Res. 2018;in press [Epub ahead of print].

189. Clapperton A, Newstead S, Bugeja L, Pirkis J. Relative risk of suicide following exposure to recent stressors, Victoria, Australia. Aust N Z J Public Health. 2019;in press [Epub ahead of print].

190. Mishara BL, Chagnon F. Why mental illness is a risk factor for suicide. In: O 'Connor RC, J P, editors. The international handbook of suicide prevention. 2nd ed. West Sussex, UK: John Wiley & Sons; 2016. p. 594-608.

191. Joiner TE, Jr., Buchman-Schmitt JM, Chu C. Do undiagnosed suicide decedents have symptoms of a mental disorder? J Clin Psychol. 2017;73(12):1744-52.

192. Hirokawa S, Kawakami N, Matsumoto T, Inagaki A, Eguchi N, Tsuchiya M, et al. Mental disorders and suicide in Japan: a nation-wide psychological autopsy case-control study. J Affect Disord. 2012;140(2):168-75.

193. Li XY, Phillips MR, Zhang YP, Xu D, Yang GH. Risk factors for suicide in China's youth: a case-control study. Psychol Med. 2008;38(3):397-406.

194. Reifels L, Ftanou M, KKrysinska K, Machlin A, Robinson J, Pirkis J. Research priorities in suicide prevention. 2017.

195. Bagley C, Jacobson S, Rehina A. Completed suicide: a taxonomic analysis of clinical and social data. Psychol Med. 1976;6(3):429-38.

196. Ovenstone IMK, Kreitman N. Two Syndromes of Suicide. Br J Psychiatry. 1974;124(581):336-45.

197. O'Connor RC, Sheehy NP, O'Connor DB. The classification of completed suicide into subtypes. J Ment Health. 1999;8(6):629-37.

198. Chen EYH, Chan WSC, Chan SSM, Liu KY, Chan CLW, Wong PWC, et al. A cluster analysis of the circumstances of death in suicides in Hong Kong. Suicide Life Threat Behav. 2007;37(5):576-84.

199. Logan J, Hall J, Karch D. Suicide categories by patterns of known risk factors: a latent class analysis. Arch Gen Psychiatry. 2011;68(9):935-41.

200. Sinyor M, Schaffer A, Streiner DL. Characterizing suicide in Toronto: An observational study and cluster analysis. Can J Psychiatry. 2014;59(1):26-33.

201. Christensen H, Cuijpers P, Reynolds CF, 3rd. Changing the direction of suicide prevention sesearch: a necessity for true population impact. JAMA psychiatry. 2016;73(5):435-6.

202. Davey CG, Chanen AM. The unfulfilled promise of the antidepressant medications. Med J Australia. 2016;204(9):348-50.

203. Harvey SB, Deady M, Wang M-J, Mykletun A, Butterworth P, Christensen H, et al. Is the prevalence of mental illness increasing in Australia? Evidence from national health surveys and administrative data, 2001-2014. Med J Australia. 2017;206(11):490-3.

204. Wilcox HC, Wyman PA. Suicide prevention strategies for improving population health. Child Adolesc Psychiatr Clin N Am. 2016;25(2):219-33.

205. Wyman PA. Developmental approach to prevent adolescent suicides: research pathways to effective upstream preventive interventions. Am J Prev Med. 2014;47(3 Suppl 2):S251-6.

206. Knox KL, Conwell Y, Caine ED. If suicide is a public health problem, what are we doing to prevent it? Am J Public Health. 2004;94(1):37-46.

207. Gunnell D. A population health perspective on suicide research and prevention. Crisis. 2015;36(3):155-60.

208. Cornette MM, Schlotthauer AE, Berlin JS, Clark DC, French LM, Miller ML, et al. The public health approach to reducing suicide: opportunities for curriculum development in psychiatry residency training programs. Acad Psychiatry. 2014;38(5):575-84.

Appendices

12.1 Ethics approval for all studies

Department of
Justice & Regulation

Justice Human Research Ethics Committee

Information Integrity & Access
Melbourne Victoria 3000
GPO Box 123A
Melbourne Victoria 3001
Telephone: (03) 8684 1514
DX210077

11 November 2015

Reference: CD/15/520368

Stuart Newstead
Monash University
21 Alliance Lane
Monash University VIC 3800

Re: Using the Victorian Suicide Register to inform suicide prevention efforts in Victoria: investigating the presence, nature and contribution of mental illness among Victorian suicides over the period 2008-2012

Dear Mr Newstead

The Department of Justice & Regulation Human Research Ethics Committee (JHREC) considered your response to the provisional approval for the project *Using the Victorian Suicide Register to inform suicide prevention efforts in Victoria: investigating the presence, nature and contribution of mental illness among Victorian suicides over the period 2008-2012* and has now granted **full approval** for the duration of the investigation. The Department of Justice & Regulation reference number for this project is CF/15/16421. Please note the following requirements:

- To confirm JHREC approval sign the Undertaking form attached and provide both an electronic and hardcopy version within ten business days.
- The JHREC is to be notified immediately of any matter that arises that may affect the conduct or continuation of the approved project.
- You are required to provide an Annual Report every 12 months (if applicable) and to provide a completion report at the end of the project (see the Department of Justice & Regulation Website for the forms).
- Note that for long term/ongoing projects approval is only granted for three years, after which time a completion report is to be submitted. The project must be renewed with a new application before the initial three year period has expired.
- The Department of Justice & Regulation would also appreciate receiving copies of any relevant publications, papers, theses, conferences presentations or audiovisual materials that result from this research.
- All future correspondence regarding this project must be sent electronically to ethics@justice.vic.gov.au and include the reference number and the project title. Hard copies of signed documents or original correspondence are to be sent to The Secretary, Justice Human Research Ethics Committee, Level 24, 121 Exhibition Street, Melbourne, VIC 3000.

If you have any queries regarding this application you are welcome to contact the Secretary on (03) 8684 1514 or email: ethics@justice.vic.gov.au.

Yours sincerely

Department of Justice & Regulation Human Research Ethics Committee

UNDERTAKING

Project Title: Re: Using the Victorian Suicide Register to inform suicide prevention efforts in Victoria: investigating the presence, nature and contribution of mental illness among Victorian suicides over the period 2008-2012
Reference No. CF/15/16421

I acknowledge that I have read the conditions outlined in the current guidelines of the Department of Justice & Regulation Human Research Ethics Committee (JHREC), and undertake to abide by them.

Reporting requirements:

- *RE: Amendments: I will ensure that an Amendment Request Form is submitted to the JHREC if amendments to the project are required (e.g. staff changes, extension of completion date and adjustments to aims/methodology) and I will await approval before proceeding with the proposed change.*
- *RE: Amendments: If my JHREC application included a Department of Justice & Regulation (DJR) letter of support, I will advise the DJR contact officer of proposed amendments before an amendment request is submitted to the JHREC.*
- *RE: Annual Reports: I will ensure that annual reports are provided if my project extends 12 months in duration.*
- *RE: Completion Reports: I will ensure that a completion report is provided at the conclusion of the research.*
- *RE: Long term/ Ongoing Projects: I acknowledge that if my project is an ongoing/ long-term project I need to provide a completion report at the end of every three-year period and renew by submitting a new JHREC application before the end of the three-year period. I further acknowledge that if I fail to renew the project before the three-year period expires, the previous JHREC approval will cease to have effect on expiry of the three year period.*

Name of Principal Researcher: [redacted]

12.2 Confirmation of manuscript submission – Study 4

MONASH University

Angela Clapperton [redacted]

Crisis: Revision received of CRI-MS-2545R1
1 message

Ella Arensman [redacted] 19 February 2019 at 13:24
Reply-To: Ella Arensman [redacted]
To: Angela Clapperton [redacted]

CC: [redacted]

Ref. CRI-MS-2545R1
Pathways to suicide among people with a diagnosed mental illness, Victoria, Australia

Dear Dr. Clapperton,

Thank you very much for submitting the above revision to Crisis: The Journal of Crisis Intervention and Suicide Prevention. It will keep the same manuscript number.

As always, we shall be in touch once the reviews are in and an editorial decision has been made.

You may check the status of your manuscript by logging onto Editorial Manager at https://www.editorialmanager.com/cri/.

Best wishes,

Editorial Office
Crisis: The Journal of Crisis Intervention and Suicide Prevention

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In compliance with data protection regulations, you may request that we remove your personal registration details at any time. (Use the following URL: https://www.editorialmanager.com/cri/login.asp?a=r) Please contact the publication office if you have any questions.