

Seeking sliding door moments

Assessing patterns in the timing of youth suicides

Chris Styler



Centre for Social
Justice and Inclusion



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Foreword

The Stay Kind movement in Australia evolved from two tragic circumstances. The death of Thomas Kelly, aged 18, from an unprovoked attack on the streets of Sydney, followed by the death by suicide of his younger brother, Stuart Kelly, four years later, also aged 18. Stay Kind's vision is to make Australia a kinder country so that we can prevent unnecessary deaths of young people to suicide whilst making the world a better place for all of us to live in. We understand that social change takes time, most likely around 10-12 years. However, we are committed to driving a movement that promotes awareness and encourages more kindness in everyday life and when it matters most.

At Stay Kind (formerly the Thomas Kelly Youth Foundation, founded in 2013), we have spent significant time reviewing global research on the underlying causes of violence, hazing, bullying and suicide in young people and identified that society and the community at large who engaged in these behaviours had a moral disconnect as well as a clear deficit of kindness. If we look around our society as a whole, we do not see enough momentum driving core values of kindness such as generosity, caring and empathy. These core values have been found to be in decline, yet they are so important for the greater good, for maintaining relationships, creating a connection with others and the personal wellbeing of individuals, in particular young people who are vulnerable.

It became clear to us that to prevent harm to other young people, such as Thomas and Stuart, our work needed to focus on harm prevention at very much a grass roots level. In addition to our ambition of driving social change in relation to kindness, we asked how else can we significantly impact harm prevention to young people? Anecdotally we noticed a trend of youth suicide occurring on a Sunday night/Monday morning. While many people might consider that the weekend is when our loved ones would be the most relaxed and least at risk, our loved ones may in fact be at a much higher risk due to anxieties and dread of the coming week as they reflect on what is causing them pain. We asked, are there days of the week trends for youth suicide? If our loved ones are more vulnerable when we least expect, what strategies do we use to activate community awareness of these potentially time-based vulnerabilities; when kindness matters most?

We are thrilled to have had this opportunity to work with UTS on this literature review to help answer our questions, as there appears to be very limited information on timing of youth suicide in Australia. UTS is a world class university that clearly supports and links academic learnings to practical and meaningful application that clearly translates into exceptional graduates. We have had the opportunity to work on a number of cause-based projects with UTS and each project has consistently had the exceptional dedication and commitment of all involved. On this occasion we need to especially thank Christopher Styler who took on the challenging questions we posed. Christopher is to be commended for his professionalism in seeking answers to difficult questions which was enhanced further by his wanting to make a difference to other young people in Australia.

As well as answering our question, this literature review should usefully inform others operating in the suicide prevention space on current understanding of timings in terms of vulnerability of youth to suicidality and suicide ideation, and also the need for further research to unpack these questions.

The learnings for Stay Kind from this literature review are that our anecdotal understanding of timing has been validated by this review. Youth between aged 15 to 25 years appear to be at a higher risk of suicide at the start of a week. We were aware of Christmas Eve and New Year's Eve being significant days of risk, however we were unaware that spring and summer appeared to be seasonally higher risk periods, although this may be influenced by the dominance of Northern Hemisphere research.

We plan to use this knowledge to strategically inform our work on activating kindness in communities, families and schools. The literature review has also highlighted the importance of Stay Kind continuing to advocate for further research to support suicide prevention.

Much has been invested into suicide prevention yet each day we continue lose a young person to an unnecessary death. Stay Kind remains committed to values of kindness being a key changing agent in the rate of youth suicide. This literature review provides some useful insights to underpin and support our ongoing mission to reduce violence, bullying, and suicide among young Australians and the wider community.

Natalie Zelinsky

Chief Operating Officer

Stay Kind

Introduction

This report seeks to identify patterns in the timings of youth suicides by reviewing relevant academic literature to outline key time periods and contributing risk factors affecting youth suicide rates.

To achieve these aims the present literature review was guided by two core research questions:

1. What are the observable seasonal and time-based patterns of youth suicide?
2. What are the suggested triggers surrounding these patterns of suicide?

In addition, a number of secondary areas of focus underpin the literature review in order to ensure that findings are contextually relevant. Firstly, to preferentially consider research undertaken within the last ten years, due to the shifting cultural dynamics of the last decade. Secondly, research conducted in Australia and New Zealand was prioritised, followed by culturally similar sources such as the United Kingdom and the USA. This objective aimed to increase the cultural relevance of the findings, while also granting wider access to available literature.

The literature review was commissioned by Stay Kind, formerly known as the Thomas Kelly Youth Foundation. Stay Kind is a Family Foundation focussed on the prevention of harmful behaviours amongst young people, including those associated with violence, bullying, substance abuse and suicide.

In 2016 the Foundation undertook a review of harm prevention strategies based on global evidence, which led Stay Kind to focus on becoming a national movement of kindness (Stay Kind 2019). With an overarching goal of grass roots youth harm prevention, Stay Kind approached UTS Shopfront to seek further insight into temporal patterns of youth suicides. As evidence-based strategy forms a central principle of Stay Kind's operations, one of the early steps in the project involved the collation and analysis of existing research. The insights gained from this analysis may aid Stay Kind to explore future avenues for harm prevention strategies, as well as adding new dimensions to its approach towards becoming a national movement of kindness.

Methodology

The literature review underpinning this report applies a methodology akin to that outlined by Templier and Paré (2015, p. 116). In order to guide the project, a proposal document was first drafted outlining the scope of the project and formulating the key research objectives. A search of the existing literature was then undertaken between August and October 2019, during this process informed decisions about the material to be included in the review were made. In light of time restraints and the well-defined bounds of the project scope, a thematic approach was undertaken for this stage. Therefore, the aim of the search was not one of full comprehension, but rather to identify and extract the key elements of research. Moreover, this approach served to ensure that only the most relevant studies were included in the review, meaning resultant conclusions address the research questions as concisely as possible.

After preliminary explorative searches, four databases were identified and used (Google Scholar, UTS Article Search, MEDLINE, and PsycARTICLES). Key search terms were initially developed from the research questions and evolved as identified articles returned further key terms.

Some of the most effective search terms included:

- Suicide
- Youth
- Adolescent
- Seasonality
- Seasonal Variation
- Suicides
- Variation
- Diurnal
- Circadian

A lack of uniformity in the definitions of the terms ‘youth’ and ‘adolescent’ led to difficulties in literature searching and screening. Varying age ranges across studies and literature resulted in a wider range of papers (those that investigated ages between 0-25) being included, with extracted findings adjusted for applicability. Furthermore, literature was also searched within the bounds of the last ten years, in order to best identify current trends and patterns. Three exceptions were made to this standard: one due to a lack of literature on the topic within the last 10 years (in time-of-day suicide patterning), and two due to the particularly relevant content of the studies (as Australian suicide studies). In each of these cases, this timeliness was considered during the screening process. Searches were also initially cross-referenced with specific geographical terms such as ‘Australia’. This process ensured that a preferential consideration could be given to research most relevant to the project aims. While the original focus was on literature from Australia and New Zealand, or culturally similar countries, this quickly became untenable as insufficient relevant literature was found from these sources. As such the scope of the review was expanded to include European and Asian studies as well as international literature reviews. In addition to database searches, articles were also identified from the reference lists of reviewed materials. A total of 54 articles were logged using these methods, with preliminary scans of the research

abstracts, introductions, and conclusions used to judge the applicability of a paper for further reading.

A critical evaluation of the material gathered during the search in addressing the core research objectives was then undertaken. Key factors for consideration of applicability included whether the paper reviewed addressed the issues of risk factors and time-based patterns in youth suicide directly, as well as the quality and reputation of the source. Thus, included articles came from peer-reviewed journals only, favouring those with higher citations.

At the end of the searching and screening process, 27 articles were selected for inclusion in the review. Of these, all 27 are peer reviewed journal articles, with 8 of these articles originating from the United States, 6 from Australia, 3 from Turkey, 2 from across-country European studies, and 2 from countries in Asia. The remaining 6 papers were international literature reviews of English language literature.

Key Findings

Trends in Youth Suicide

This review identified a number of patterns in the timing of suicides and youth suicides present in the literature, with varying degrees of confidence and strength. For school-aged youth, below the age of 18, promising evidence was found for higher suicide rates during periods in which school is in session when compared to periods during school holidays. No such trend was found for populations over the age of 18. Additionally, strong evidence of higher rates of suicide during the beginning of the week, predominantly on Monday and Tuesday was found for all ages. However, this pattern is strongest amongst youth populations in their teens and twenties. Evenings, particularly from 5pm – 11pm were also found to correlate with higher rates of suicide amongst youth, though evidence for this lacks contemporary research and should be taken with some caution.

Where contemporary research on youth populations is non-existent, insights from studies on all ages provides some indication of further potential patterns. These include New Year's Day and the Christmas Period (particularly Christmas Eve), both of which present an increase in the overall frequency of suicides.

Adverse Life Events as Key Triggers

Young people present an increased vulnerability to a culmination of adverse life events in the triggering of suicide. It is suggested in the literature that young people's greater tendency towards behavioural impulsivity and poor emotional regulation strategies leave them particularly vulnerable to an accumulation of stressful life events exceeding the coping strategies of at-risk individuals. Such factors most notably include family conflict, peer conflict (such as bullying) and, academic stressors.

Limited Existing Research

This literature review reveals a large gap in research looking at patterns in the timings of youth suicide in Australia, and the wider world. Due to this clear lack of contemporary literature on the topic, the findings of this paper come from analysis of a range of sources looking both internationally, and across age groups. As such, conclusions on the key research questions of this paper can only be answered in part, and the resultant analysis is left stressing the need for further research.

Recommendations

The following recommendations are suggestions based on the findings from this literature review:

- A number of periods should be targeted by suicide prevention strategies as periods of 'high risk' for youth suicide. These include:
 - Evenings, particularly from 5pm – 11pm
 - The beginning of the week, predominantly Monday and Tuesday
 - New Year's Day
 - The Christmas period (specifically Christmas Eve)
 - Periods in which school is in session (for those aged under 18 years).
- Due to increased vulnerability to adverse life events, youth-specific risk factors should be considered when designing and implementing suicide prevention strategies for this population. These include:
 - Family conflict,
 - Peer conflict (such as bullying) and,
 - Academic stressors.
- Further research is needed to better understand patterns in the timing of youth suicide. The highly contextual nature of the suicide combined with large changes to society in the past decade suggests that older research needs to be updated, and contemporary studies are certainly lacking in this area.
 - In particular, the relationship between academic calendars and suicide rates for youth aged under 18 should be the topic of future research. Existing findings in this space are promising and suggest that this is an area that may be of use in an Australian context.
- Suicide seasonality should be considered as a collection of heterogeneous phenomenon.
 - An accurate and reliable account of suicide seasonality among youth in Australia cannot be extracted from the current literature, as existing research is outdated.
 - Further research to investigate the specific trends of suicide seasonality must consider such patterns as heterogeneous and dependant on age, locality, and cultural context. As such, future research methodologies should be structured to account for demographic diversity and other known risk factors.
 - Where the literature indicates seasonal patterns of suicide rates, it is noted that these trends are led by incidences of violent suicide predominantly carried out by males and may not be applied to the general population. As such, future research should take this statistical distortion into account.

General Risk Factors

Suicide

Globally, suicide is one of the major causes of death across the entire human lifespan. Estimates show that over 800,000 people die from suicide annually (Carballo et al. 2019, p. 1; Kinchin & Doran 2018, p. 672). Moreover, in spite of the frequency of suicide as a cause of death, assessing suicide risk is a task of particular difficulty. Researchers have long pointed out that due to its multifactorial nature and links to the complexities of human behaviour, suicide is a highly dynamic phenomenon and thus presents a significant challenge for researching, understanding, and responding (Chaudhari et al. 2018, p. 20; Christodoulou et al. 2012, p. 73). This issue is of even more prominence in Australia, where the suicide rates are at the higher statistical end compared to other developed countries, totaling almost twice that of transport-related fatalities (Beautrais 2000, p. 420; Kinchin & Doran 2018, p. 672).

Youth Suicide

In the field of suicide studies, youth suicide is of particular concern. While there is some irregularity in the literature when defining the age range that constitutes youth, the most consistent formulation is that it encompasses people between 15 and 24 years of age. Among this group, suicide is the second-highest cause of death globally. In Australia however, it is the single leading cause of death for young people, and measurably higher than in countries with comparable levels of prosperity such as Canada, Hong Kong, The Netherlands, Singapore and Sweden (Kinchin & Doran 2018, p. 672). Youth suicide rates are also seen to be increasing, causing growing concern over the causes of this trend.

It is important to note that the suicide rate of this group is not only particularly high but that the features of youth suicidality also differ from adults (Carballo et al. 2019, p. 1). Young people have been found to act more impulsively than their older counterparts and are more likely to be influenced by media and social networks (Kinchin & Doran 2018, p. 673). In addition to this, previous studies have pointed to the particular centrality of interpersonal conflicts to the triggering of suicidal behaviour among adolescents (Klomek, Sourander & Gould 2010, p. 283). As such, the need for a more targeted understanding of youth suicidality is clearly apparent.

Particular Risk Factors for Youth Suicide

Major Risk Factors for Suicide Among Adolescents

- A previous suicide attempt
- A psychiatric disorder, especially major depressive disorder, bipolar disorder, conduct disorder, and substance (alcohol and drug) use disorders
- Psychiatric comorbidity, especially the combination of mood, disruptive, and substance abuse disorders
- Personality disorders (especially cluster B disorders: antisocial, borderline, histrionic, narcissistic)
- Impulsive aggression (the tendency to react to frustration or provocation with hostility or aggression)
- Availability of lethal means

-
- Feelings of hopelessness and worthlessness that often accompany depression
 - A family history of depression or suicide
 - Loss of a parent to death or divorce
 - Family discord
 - Physical and/or sexual abuse
 - Lack of a support network, poor relationships with parents or peers and feelings of social isolation
 - Dealing with homosexuality in an unsupportive family or community or hostile school environment

Table 1: (Cash & Bridge 2009)

Internationally, literature on the risk factors for youth suicide yields generally consistent findings. A 2009 epidemiology study of youth suicide outlines the major risk factors as listed in Table 1.

Most notably, psychiatric disorders are found to be present in up to 80-90% of young people that attempt or succeed in suiciding (Cash & Bridge 2009, p. 615). The most common psychiatric afflictions include mood, anxiety, conduct and substance abuse disorders. Importantly, the comorbidity of these psychiatric disorders (the presence of more than one disorder in the same person) significantly increases the risk of an individual committing suicide (Beautrais 2000, p. 426; Carballo et al. 2019, pp. 2-3; Cash & Bridge 2009, p. 615).

Perhaps unsurprisingly, depression is found to be a particularly influential factor across studies in youth suicidality. One epidemiology review found evidence that major depressive disorders are associated with a fivefold increase in the risk of suicide, even when adjusted for the presence of other disorders, as well as demographic and socioeconomic factors (Carballo et al. 2019, p. 2). Another epidemiology review outlines that 40-80% of adolescent suicide attempters meet diagnostic requirements for depression at the time of attempt, while psychological autopsy studies have shown that up to 60% of youth who have suicided have a depressive disorder at the time of death (Cash & Bridge 2009, p. 615). Thus, it is critical to acknowledge the substantial and consistent links between psychopathology and suicide, and in particular the strong links between the comorbidity of psychiatric disorders and suicide (Beautrais 2000, p. 429; Carballo et al. 2019, p. 14; Cash & Bridge 2009, p. 615; Chaudhari et al. 2018, p. 24).

Within the wider analysis of risk factors, an array of both demographic, behavioural, and clinical factors are included. What is critical in the present review, however, is an approach aiming to identify key moments for service delivery. Thus, temporal events in which existing risk factors may be compounded provide specific points in which intervention may be best targeted. For example, while individuals who report same-sex sexual orientation illustrate a consistently heightened risk to suicide attempt, personal factors such as sexual orientation may not always be easily detected by outside observers and do not always present a clear temporal guide for intervention (Cash & Bridge 2009, p. 617). This is contrasted with related findings that negative family reactions to “coming out” processes is associated with an eight-fold increase in the likelihood of suicide attempt when compared to individuals that encounter minimal or no family rejection (Cash & Bridge 2009, p. 617). Here, a period in which existing risk factors may be compounded is more readily identifiable. Therefore, for the purposes of identifying optimum moments of intervention, this paper will place greater emphasis on an exploration of social rather than clinical risk factors

contributing to youth suicide. These social factors become even more significant when considering adolescent's greater vulnerability to interpersonal conflict in the triggering of suicide. With this in mind, the presence of such events may act as a signpost for harm prevention services, where a compounding of less visible risk factors is more likely, and service delivery can be more effectively targeted towards individuals in need.

Adverse Life Events

When considering the wider environment of risk factors in youth suicide, the research points to an increase in rates of suicidality being brought on by a culmination of adverse life events (Beautrais 2000, p. 429). A 2019 review of the psychosocial risk factors for child and adolescent suicide defines stressful life events for this age group as predominantly consisting of family conflicts, peer conflict (such as bullying), academic stressors, and other traumas such as physical and sexual abuse (Carballo et al. 2019, pp. 3-8). Here, it is important to note that the occurrence of stressful life events does not inevitably cause suicidality among all individuals, nor does the incidence of one isolated stressful event inevitably lead to an increased risk of suicide. Instead, it is likely that young people's greater tendency towards behavioural impulsivity and poor emotional regulation strategies leave them particularly vulnerable to an accumulation of stressful life events (Carballo et al. 2019, p. 14). As such, it appears that adverse life circumstances (such as family problems or peer conflicts) may more accurately represent the precipitating factor that exceeds the coping strategies of vulnerable individuals. Such factors are inherently temporal, and as such an understanding of these adverse life circumstances presents services with tangible markers of increased risk.

Family Factors

Across the literature a number of family factors are found to be associated with suicidality among adolescents, such as; family separation or loss of parent(s), parental discord, a family history of psychopathology or suicidal behaviour, poor parent-child relationships, sexual or physical abuse, and frequent changing of residence (Beautrais 2000, pp. 421-3; Carballo et al. 2019, pp. 3-8; Cash & Bridge 2009, pp. 616-7).

Academic Stress

Academic stressors are included as one of the key forms of stressful life events for children and adolescents. While this category incorporates instances of school-based bullying in some research, it also includes other school-related factors such as exam stress. For example, it is noted in the literature that students who perceive their academic performance as failing are more likely to report suicidal behaviours such as ideation, plans, and attempts (Carballo et al. 2019, p. 8).

Bullying

The relationship between bullying and youth suicide is one of the most well researched risk factors among the literature, perhaps due to high awareness of school-age bullying in the Western world (Klomek, Sourander & Gould 2010, p. 282). Indeed, multiple studies highlight the association of bullying with the presence of other psychosocial problems in both the victim and perpetrator (Borowsky, Taliaferro & McMorris 2013, p. 5; Kim & Leventhal 2008, pp. 133-4; Klomek, Sourander & Gould 2010, p. 283). A 2008 paper reviewed 37 studies internationally and identified a consistent increase in the risk of suicide for both the victim and perpetrator of bullying, but noted serious

methodological concerns throughout the literature that call into question the validity of these findings (Kim & Leventhal 2008, p. 150). The most troubling of these was the failure of most studies to adequately control for other well-known risk factors of suicide. However, a more recent review that included longitudinal studies and incorporated understandings of cyberbullying provided more robust and reliable findings. This paper found strong and clear evidence of associations between bullying and suicide, with the authors suggesting that factors of peer victimization may be more than just correlates with suicide (Klomek, Sourander & Gould 2010, p. 286). Again, and unsurprisingly, there is evidence that the comorbidity of psychopathology and bullying increases a particularly strong increase in the risk of suicide in young people. Most significantly, the authors point to a coinciding of risk factors between suicide and interpersonal violence in general, and indicate that an integrated understanding of these will increase the effectiveness of prevention strategies.

Patterns in Time of Year

Seasonality

The seasonality of suicide has historically been a widely accepted phenomenon. Previous studies of relevant literature have found consistent evidence among older research that global suicide deaths increase and peak in spring and early summer (Chaudhari et al. 2018, p. 20; Christodoulou et al. 2012, p. 73; Doganay et al. 2003, p. 274). In fact, one study looking at Australian data spanning 1970-1999 found an increasing seasonality of suicide, with consistent spring peaks and winter troughs (Rock, Greenberg & Hallmayer 2003, p. 47). Despite this, more recent studies show a decline in this trend, especially across Western industrialised countries, and indicate a more complex and heterogeneous set of patterns occurring throughout the seasons (Ajdacic-Gross et al. 2010, p. 663; Chaudhari et al. 2018, p. 20). Critically, it is also noted that research into the general seasonality of suicide does not provide an adequate analysis of patterns across age groups, and thus specific insights must be inferred from more general data.

In an Australian context, one multicity study conducted in Australia found inconsistent patterns of seasonal suicides across capital cities, even while applying consistent methodology (see Figure 1) (Qi et al. 2015, pp. 115-9). A breakdown of these findings showed a marked difference in the suicide frequency trends across different cities, and the resulting flattening of these patterns once data was collated for national analysis. Additionally, this cross-city approach concluded that not only did seasonal patterns differ across Australian capital cities, but that rural and non-capital urban areas were expressively overlooked (Qi et al. 2015, p. 125). Without consideration of age group, results like these demonstrate clearly how current studies of suicidality lack the clarity from which robust insights can be extracted. Such research suggests that an investigation of temporal patterns of suicide among Australian youth and the general population, using more specific and contextually relevant approaches, is sorely required.

In short, despite the commonly held view that suicidality generally peaks in spring and summer, recurrent inconsistencies among recent studies stress the heterogeneity in the seasonal patterns of suicide. Such contemporary research points to the need for more nuanced, standardized, and methodologically sound research to better understand the specific mechanisms of seasonal patterns (Ajdacic-Gross et al. 2010, p. 664; Chaudhari et al. 2018, p. 25). In addition to this ambiguity, it is suggested that these historically accepted patterns imply more uniformity than truly exists. This is a point of critical importance when seeking to gain insight into seasonal patterns of specific populations, such as Australian youth. One 2018 review even proposes that true effects of seasonality may be essentially irrelevant once other risk factors are properly adjusted for (Chaudhari et al. 2018, p. 25). This paper points to a lack of research on seasonality that adequately considers other risk factors, and indicates the need for improved methodologies to further understand seasonal patterns in suicide rates. Another 2010 review, citing frequent inconsistencies in findings and the diminishing and heterogeneous nature of seasonal patterns of suicide rates, stated that the “era of highly replicated major seasonal effects is definitely over”, to be replaced by arrangements of more specific and nuanced phenomena (Ajdacic-Gross et al. 2010, p. 663). Together, this contemporary research indicates that seasonal patterns of suicidality and their underlying determinants are, for the moment, poorly understood. As such, while some indication of spring/summer seasonal suicide patterns can be inferred, strong conclusions about Australian patterns of suicide seasonality, especially among youth, are certainly lacking.

Gender and Seasonality

While the aforementioned Australian multicity study did not differentiate for specific age groups, the findings do provide a breakdown of both general population and gender (as shown in Figure 1) (Qi et al. 2015, pp. 115-9). Evidence from this paper reinforces a key feature of seasonality found in the literature; that when present, such patterns are largely led by seasonality in male suicide. This is a topic of some agreement in the literature. That is, that observations of seasonality across total populations are often determined by an increase in the number of violent suicides (ie. hanging, shooting, drowning, jumping) predominantly carried out by men (Chaudhari et al. 2018, p. 24; Christodoulou et al. 2012, pp. 75-6; Rock, Greenberg & Hallmayer 2003, p. 47). This conclusion supports the call for a heterogenous approach to seasonality, suggesting that findings establishing overall trends of increased suicidality in spring and summer may be more representative of trends in specific populations (in this case subsets of suicide method and gender) than they are of patterns within general populations.

Findings that determine violent male suicide as the primary driver of seasonal patterns have also been replicated in studies looking at correlations between meteorological variables and suicide, an often theorised mechanism for patterns of seasonality. One such study on the effect of meteorological variables on youth suicide attempts in Turkey found positive correlations between temperature increase and suicide attempts by young males (Akkaya-Kalayci, Vyssoki, et al. 2017, p. 367). These findings are further supported by a 2019 systematic review on the effect of climatic factors on suicide across 14 studies that determined strong correlations between temperature increase and completed suicides, particularly in men (Gao et al. 2019, p. 1028).

When considering patterns of seasonal suicide, it is therefore important to identify the key drivers of these trends. Amongst the literature, violent male suicide as one such driver appears to have some consensus. Therefore, suicide prevention strategies hoping to target seasonal patterns should embed a directed approach towards male suicide and risk factors around violent methods of suicide.

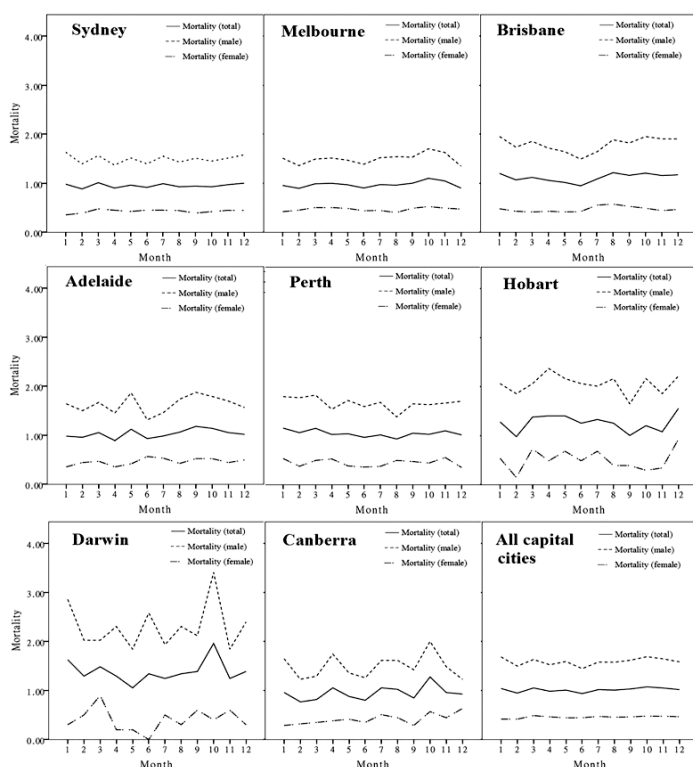


Figure 1: Monthly suicide rate by city (Qi et al. 2015, p. 119)

Public Holidays and Seasonality

Taking the heterogeneity of seasonal phenomena into account, the link between suicide rates and public holidays is another area of research that increases understandings of temporal patterns in suicide throughout the year. A 2014 Australian study compared Queensland suicide cases over a ten year period at Easter, New Year's, Christmas, Anzac Day and Valentine's Day to the average rates of suicide in the time periods around these days (Barker, O'Gorman & De Leo 2014, p. 122). The results showed significant increases on Christmas Eve and New Year's Day and no effects for any other holiday period (Barker, O'Gorman & De Leo 2014, pp. 123-6). Such findings are in part consistent with two other studies from the Netherlands and the United States that also found an increase in suicides and suicide attempts on New Year's Day (Beauchamp, Ho & Yin 2014, p. 778; Hofstra et al. 2018, p. 8). These studies, however, both found lower incidences of suicide throughout the Christmas period, contrary to the findings published in the Australian paper.

Much like general patterns of seasonality, the literature suggests that correlations between holidays and suicide incidence is likely to be heterogeneous and representative of local cultural and environmental factors. Thus with relative consistency, findings from these papers share considerable limitations in drawing direct connections between holiday temporality and suicide (Barker, O'Gorman & De Leo 2014, p. 126; Beauchamp, Ho & Yin 2014, p. 779; Hofstra et al. 2018, p. 8).

Despite weaknesses in this area of research, consensus throughout the research on higher suicidality on New Year's Day suggests that prevention strategies should take the heightened risk of this into account. Additionally, the lack of focused research on youth suicide in this area is a gap that needs to be addressed. This is especially pertinent as young people are highly vulnerable to the interpersonal conflicts that more frequently take place during holiday periods.

Age and Seasonality

In the case of seasonal patterns of youth suicides, one study on suicide attempts among Turkish 15 - 24 year olds found spring and summer peaks consistent with older literature (Doganay et al. 2003, p. 273). However, a 2018 systematic review found conflicting evidence of seasonality across populations. Analysing a sample of four studies that used data from Belgium, Finland and the United States, this review found completely inconsistent patterns of seasonality (Chaudhari et al. 2018, p. 24). The authors of this paper, however, point to the possibility of methodological or environmental differences across studies and so draw no conclusions from this area of their research. One study from the Netherlands that echoed typical spring peaks in suicidality also found no difference in seasonality between the 20 - 29 age group and older subjects, indicating that research conducted without age considerations may be generalisable to the 20-25 group of adolescents (Hofstra et al. 2018, p. 6). Together, these studies demonstrate a definite uncertainty across the existing literature in the overall seasonal patterns of youth suicide. Thus, much like patterns of seasonality for suicide across all populations, future research conducted on Australian youth is needed for further insight to be gained.

One area of research that may possibly shed more light on annual patterns of youth suicide is the link between suicide rates and the academic calendar. While the literature is thin, several studies in the past decade have identified correlations between the school calendar and suicidality of high school age adolescents in the United States and Japan (Carbone, Holzer & Vaughn 2019; Hansen & Lang 2011; Matsubayashi, Ueda & Yoshikawa 2016; Plemmons et al. 2018). All of these studies indicate a significant increase in suicides or suicide attempts during the months when school is in

session as opposed to school break periods (Carbone, Holzer & Vaughn 2019, pp. 228-9; Hansen & Lang 2011, pp. 854-5; Matsubayashi, Ueda & Yoshikawa 2016, p. 1126; Plemmons et al. 2018, pp. 6-7).

This claim is further supported by the absence of such patterns in youth above high school age, as three of the aforementioned studies also examined the correlation between suicide rates and academic sessions in individuals above 18 years of age. The findings indicated that this correlation disappeared altogether (Carbone, Holzer & Vaughn 2019, p. 228; Hansen & Lang 2011, p. 855; Matsubayashi, Ueda & Yoshikawa 2016, p. 1126).

Possible explanations for the phenomenon of higher suicide rates during school terms may be related to increased stress levels and exposure to interpersonal conflicts such as bullying (Carbone, Holzer & Vaughn 2019, pp. 228-9; Hansen & Lang 2011, p. 860). However, there is an agreement across the literature that such explanations are speculative and causal links between suicide and school-related factors are yet to be established.

While as of yet, there is a dearth of adequate research in this area, the results listed here are promising. As such, for youth in the school-age range (15-18) such correlations should be further researched in Australian contexts, using appropriate methodologies to evaluate links between school-related stressors and youth suicide. Findings from such studies may provide evidence to support the implementation of school-based interventions, particularly to gate suicide risk for 15 to 18 year olds during key times of the academic year.

Patterns in Time of Week and Time of Day

Time of Week

Unlike the varied evidence for annual patterns of youth suicide rates, research into weekly trends exhibits more consistent data. Two recent Korean and Turkish studies reviewed focused directly on weekly patterning of suicides in adolescents (Akkaya-Kalayci, Kapusta, et al. 2017; Kim et al. 2019). In both of these papers, the authors found strong evidence of increased suicidal behaviour at the start of the week, especially on Mondays (Akkaya-Kalayci, Kapusta, et al. 2017, pp. 2-3; Kim et al. 2019, pp. 396-7). While the Turkish study examined the hospital records of 2232 youth treated after attempting suicide, the Korean paper applied even larger sample size and a more rigorous methodology. Here, records of 377,204 deaths (suicides and accidental deaths) between 1997 and 2015 were analysed by age group and day of occurrence. The paper identified a marked increase in suicides at the start of the week for all age groups, with a corresponding decrease throughout the week until Saturday. Furthermore, the study indicated that this pattern was strongest among those in their teens and 20s (see Figure 2) (Kim et al. 2019, p. 397). Such findings indicating that this beginning of the week trend is stronger amongst youth is consistent with another paper from the United States that found a Monday and Tuesday trend for suicide attempt was most distinct among those aged <19 years (Beauchamp, Ho & Yin 2014, p. 778).

These results, focused predominantly on youth, are consistent in the literature across all age groups. Broadly, the start of the week has been found to correlate with increased cases of suicidality in all age groups across studies carried out in Korea, the United States and Australia (Beauchamp, Ho & Yin 2014, p. 778; Kim et al. 2019, pp. 395-6; Law & De Leo 2013, p. 2828). Only one recent study reviewed presented discrepant results. A 2010 paper from the United States analysing national death records for all adults over the age of 18 during the period of 2000 to 2004, indicated a significant Wednesday peak in deaths (Kposowa & D'Auria 2010, p. 438). Despite this trend, the robust nature of other research, especially for those in the youth demographic, indicates that a greater risk of suicide at the start of the week should be taken very seriously. Such patterns should therefore be reflected in future suicide prevention strategies that seek to target specific times of risk.

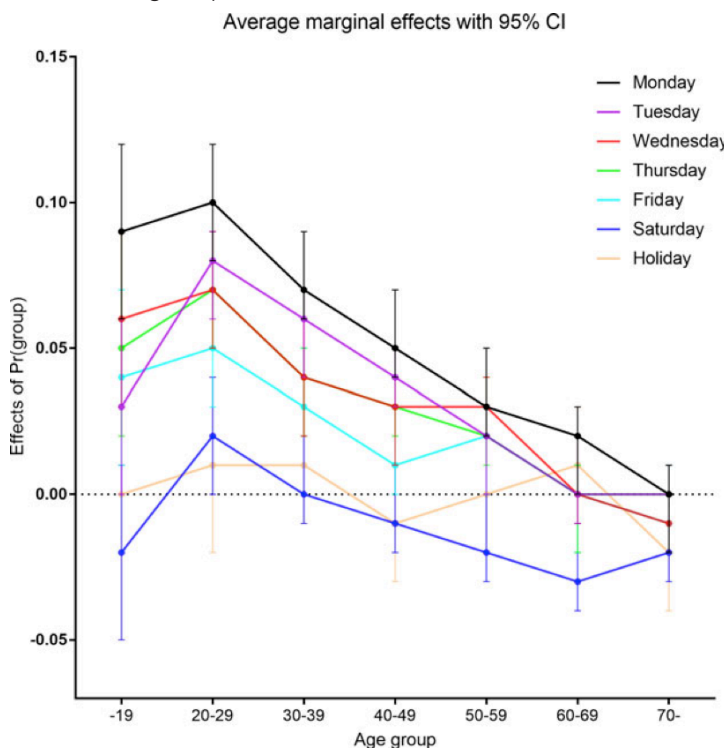


Figure 2: Marginal effects of day of the week by age group (Kim et al. 2019, p. 397)

Time of Day

Recent research into the time of day patterns of youth suicide rates is surprisingly sparse. Two studies were identified, both looking at incidences of suicide attempts in hospital records from Turkey (Akkaya-Kalayci, Kapusta, et al. 2017; Doganay et al. 2003). Accordingly, both of these studies found that suicide attempts among youth occur most frequently in the evening (see Figure 3) (Akkaya-Kalayci, Kapusta, et al. 2017, p. 3; Doganay et al. 2003, p. 274). While one of these studies also cites agreement among older literature (Akkaya-Kalayci, Kapusta, et al. 2017, p. 3), the absence of substantial research and recent data on this evening trend means that interpretation should be carried out with caution.

Another important point is that these studies look at suicide frequencies without consideration of the proportion of populations awake at a particular time interval. Thus, for those individuals awake during the later periods of the night (24:00-5:59), one study suggests that the risk of suicide could be up to 3.6 times higher than during the day (Perlis et al. 2016, pp. 103-4).

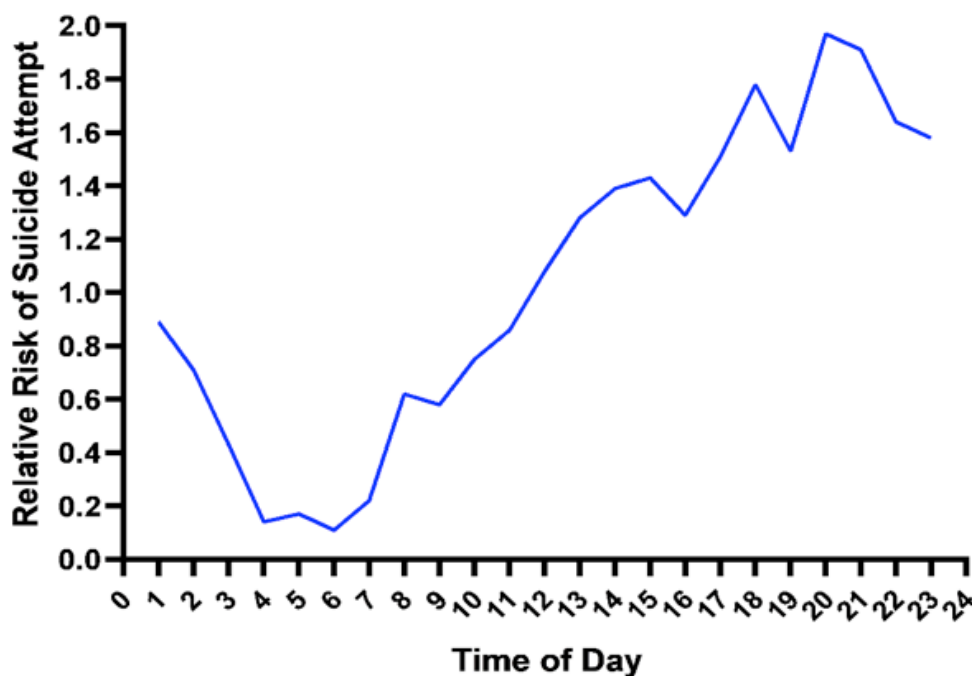


Figure 3: Relative risk of suicide attempt by time of day.
Data from (Akkaya-Kalayci, Kapusta, et al. 2017, p. 3)

Suggested Triggers for Weekly and Daily Patterns

Across the literature for temporal suicide trends in time of week and time of day, a number of recurring risk factors are suggested. The most prominent risk factors include increased stress and anxiety levels as individuals adjust to a return to school or work, as well as the possibility of bullying and a sense of dread of the week ahead (Akkaya-Kalayci, Kapusta, et al. 2017, p. 3; Kim et al. 2019, pp. 398-9). Previously explored findings on the relationship between youth suicide and interpersonal conflict, such as bullying, are consistent with such suggestions (Carballo et al. 2019, pp. 3-8; Klomek, Sourander & Gould 2010, p. 283). Similarly, spikes in suicide rates during

evening hours have been linked with increased incidences of family conflict at this time of the day (Akkaya-Kalayci, Kapusta, et al. 2017, p. 3).

While these suggestions are consistent and persuasive, it is unwise at this point to state that strong links between such distinct suicide trends and specific risk factors can be established, due to the lack of rigorous studies directly linking these factors. However, such relationships may suggest areas for further research or for consideration of youth suicide prevention strategies in the future.

Conclusion

According to this literature review, a number of temporal trends are clearly evident in youth suicide and links to specific risk factors can be identified throughout the selected research findings. Most notably, findings consistently indicate that the start of the week is a period of high suicide risk, especially for young people aged 15 – 24 years. In addition to this, a number of other periods are emphasized in the literature as possible times of increased risk. These include evenings, New Year's Day, Christmas Eve, and more generally the seasons of spring and summer. With specific relation to youth, promising connections between academic calendars and rates of youth suicide are also drawn, positing the need for further research in Australian contexts.

In addition to patterns in timing, a number of characteristic risk factors are repeated throughout the literature when seeking to understand these trends. In particular, the increased vulnerability of youth to a culmination of adverse life events and interpersonal conflicts triggering suicidal behaviour is consistently linked. As the occurrence of such conflicts, stressors, and events may peak at certain times of the year (during school terms for example), these factors are commonly suggested as possible mechanisms behind temporal patterning for young adults. The most notable of these include family conflict, peer conflict (such as bullying), and academic stressors.

However, the reviewed literature also highlights a number of under-researched avenues as well as areas in which the research is compromised by systematic methodological issues. As such, while vigilance and consideration of specific times of risk is encouraged, the complex nature of these patterns is problematic for wider applications. Above all, the literature points to variability in temporal patterns based on an array of determinants such as demographic, psychopathological, environmental, and cultural factors as well as the interaction between these determinants. Thus, gaining valid and accurate understandings of temporal trends in suicide for specific populations requires more targeted research of these population subsets.

Due to the shortage of relevant research focusing on Australian youth, this paper has reviewed the literature for patterns in the timing of youth suicide more generally. Therefore, further research using more nuanced parameters informed by these findings should be undertaken in order to better understand the applicability of these patterns to Australian youth. In turn, future studies should explore the patterns identified in this paper in populations of Australian youth using a rigorous methodological design that allows for the identification of strong correlates, reducing the systematic ambiguity that plagues the current literature.

Overall, the prevention of youth suicide is an extremely difficult task. Not only is the phenomenon of suicide incredibly complex and multifaceted, but also of a particularly sensitive nature in mainstream discourse. Those seeking to design and implement prevention strategies thus require all the guidance and insight available to them. Therefore, not only should future strategies in Australia consider the temporal patterns identified in this paper, but also seek to increase our understanding of such patterns by funding and conducting further research in this area.

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