"Such a Rash Act"
Wartime Experiences and Veteran Suicides after the Great War

Abstract

World War I exposed sixty million soldiers worldwide to armed conflict and significant psychological trauma. Despite popular assumptions of significant long-term effects of the conflict on veterans, suicide among returned soldiers has received little attention. To address this lacuna we carried out the first retrospective cohort study of suicide risk in World War I veterans, following a cohort of New Zealand soldiers until death. Causes of death were ascertained by doctors and coroners. 32 of 1865 men (1.7%) committed suicide over 83,118 years of follow-up (Crude rate: 39/100,000 person years). Suicides were more likely to occur at early ages, accounting for 8% of deaths before 1939, and 11% of potential years of life lost before age 50. Suicide rates in this cohort were 1.5-2 times higher than among veterans of recent conflicts, and remained high throughout their lifetime, showing the significant long-term cost of the conflict on human health. Explanations of suicide by family and acquaintances revealed three key narrative themes: suicide as a "rash act" that family members did not accept; suicide as the culmination of a life course whose trajectory was altered by war; and finally suicide explained without reference to war at all. The majority of informants in the first 20 years after the war identified wartime experience as a contributing factor to suicide.

Keywords: New Zealand; Suicide; Cohort Studies, Historical; World War I; Veterans.

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Introduction

As the first global mass war, World War I exposed sixty million male soldiers to armed conflict for substantial periods of time. In many countries a high proportion of military age men participated in the conflict. For example, in Britain 46% of men aged 15-49 served, and among men in their 20s around two-thirds of men served (Winter, 2004). Conscription was introduced in many countries to bring sufficient numbers of men into military service, so that many men served only reluctantly. The power of weaponry increased substantially compared to earlier conflicts, and debilitating gas was used as a weapon in many battles (Haber, 1986). The long-term effects of the conflict on men who had served were particularly apparent in the 1920s, with many diagnosed as suffering from "shell shock" (Reid, 2013). Thus, it is reasonable to hypothesise that World War I had a significant long-term impact on the health of men who served. Because a high proportion of cohorts eligible for military service experienced the war, the impact on population health is likely to have been significant and long-lasting. However, there are few contemporary or historical studies of World War I's long-term impact on returned soldiers.

In contrast, since World War II and particularly since American involvement in the Vietnam war, researchers have studied the health and mortality of returned soldiers by following cohorts of soldiers for several years, in some cases 20-35 years after return (Kang and Bullman, 1996, Boehmer et al., 2004). Compared to their

peers in the general population, returned soldiers do not have significantly elevated overall mortality. Most studies find either that veterans have lower all-cause mortality, or mortality rates only slightly elevated above rates in the general population (Kang et al., 2002, O'Toole et al., 1996). This likely reflects a selection effect in recent military service, where fitter members of a cohort volunteer for military service. Most studies of modern wars find that soldiers who were wounded or held prisoner do tend to have higher all-cause mortality (Keehn et al., 1974), a result also found in a study of young American Civil War prisoners of war (Costa, 2012).

The most consistent finding across studies of returned soldiers mortality is they that have elevated risks from external causes, including accidents, drug overdoses, and suicide (Rozanov and Carli, 2012). Studies of World War II veterans have shown that the psychological trauma of combat exposure can take decades to manifest and affect behavior (Clipp and Elder, 1996). A long-run perspective on the health of returned soldiers is therefore important to give a full accounting of the war's effects.

Previous research

The individual and social correlates of suicidal behaviour have long interested social scientists. War and its aftermath bring many of the issues in understanding suicide into sharp relief. World War I, as the first global mass war, has been an especially interesting event for studying the impact of conflict on suicidal behaviour. Until recently most studies of war and suicide—including

studies of World War I—have been at the population level, where the behaviour of active and veteran soldiers, and civilians cannot be distinguished.

At a population level, it has long been found that war often reduces suicide rates for the duration of the conflict. As with many findings in the sociology of suicide, this insight can be traced to Emile Durkheim (Durkheim, 1897 (1951)). Durkheim explained this perhaps paradoxical finding by arguing that war promoted social integration. Many subsequent analyses of different countries in the mass wars of the twentieth century appeared to confirm Durkheim's insight, and added further explanations for why suicides may decrease during war, including lower unemployment and financial strain, temporal displacement of suicides, and inconsistent recording (Wray et al., 2011). However, in the last thirty years more scholarship has contradicted Durkheim than supported him. War may be correlated with a reduction in suicide, but the causal factors appear to be lower unemployment and lower alcohol consumption, not war per se (Stack, 2000).

At an individual level, understanding how war affects the propensity for suicide has been limited by the relative rarity of suicide, and the significant amount of effort required to track returned soldiers after their homecoming. Indeed, at the conclusion of World War I longitudinal studies of any social and medical conditions were in their infancy. Thus, there are just a handful of contemporary studies of suicides in veterans of World War I. Comprehensive searches of the United States' National Library of Medicine's Index Catalogue which indexes global medical literature before 1961 uncovered only two systematic studies of suicides among returned soldiers from World War I.

Reflecting the practical difficulties of studying rare behaviour in a large population, both contemporary studies had an institutional perspective. S.J. Minogue, the Medical Superintendent of Rydalmere Mental Hospital in New South Wales, published an article in the *Medical Journal of Australia* in 1945 about suicides of World War I returned soldiers in New South Wales (Minogue, 1945). Drawing on coronial reports, death registration and census records, Minogue calculated a crude suicide rate of 39/100,000 among returned soldiers compared to 31 per 100,000 in the general male population of the same age (30-69). Lacking comparative figures from other countries, Minogue was unable to contextualize his results, and concentrated on describing the social and psychiatric causes of suicide that his position at Rydalmere gave him unique insight into, providing access to case records of some decedents. Minogue concluded with an appeal for more specialist training for psychiatric care that "general hospital experience" and "traditional military procedure" did not currently provide.

The only other contemporary data published on the risk of suicide for World War I veterans can be found in an early 1930s report in the *Medical Bulletin* of the Veterans Administration (VA) which compiled mortality figures for 284,318 patients seen in VA hospitals between 1926 and 1930 (Anonymous, 1932). Despite the late entry of the United States into the war, around 4.5 million Americans served in the American Expeditionary Forces. On their return to the United States, some veterans were able to take advantage of medical services offered by the Veterans Bureau (later Veterans Administration). Mortality information was available for the year after discharge, and show an overall suicide rate of 22.5 per 100,000 in the late

1920s. Suicide rates were significantly higher in veterans with a neuropsychiatric diagnosis, compared to tubercular or general medical patients.

Recent monographic studies by Canadian historian, John Weaver, of suicide in twentieth century New Zealand, complement the contemporary accounts of Minogue and the VA (Weaver, 2014, Weaver, 2009). Weaver read all New Zealand coronial reports on suicides for even-numbered years in the twentieth century, including approximately 300 suicides by returned soldiers from World War I. Weaver found a high rate of suicide by returned soldiers in the initial post-war years (40.0/100,000 in 1920), that was much higher than the rate (8.7) among comparable men who had not served. Like Minogue in New South Wales, Weaver found the divergence between veterans and their peers who had not served diminished with time.

Despite there being only two systematic contemporary studies of suicide rates among World War I veterans, both contemporary and historical accounts have assumed that the psychological trauma was unusually great, compared to previous conflicts and then to World War II. Discussions of suicide in scholarly and professional journals between the World Wars show a widespread assumption that World War I had contributed to an increase in suicide (Geffen, 1932). There are sound reasons why this may have been so: World War I *did* involve unprecedented numbers of men in long-term armed conflict, often far from routine sources of support. The application of industrial technology to warfare dramatically increased the damage that could be done to men's bodies and minds, even if they survived the war and returned home. Thus, in many combatant countries there was repeated

media coverage in the 1920s and 1930s of mental disturbance and suicide in returned soldiers (Stagner, 2014).

Historians of World War I's legacy in the Allied countries have shown how the military, medicine, and governments were, at best, unsure of how to treat soldiers with chronic psychological problems immediately after the war. At worst, the official response was hostile and ineffective. In several Allied countries historians have discerned widespread public sympathy for "troubled" returned soldiers during the 1920s, turning to impatience in the Great Depression when the economic downturn was a greater national priority than a war concluded more than a decade ago (Reid, Stagner, 2014, Thomas, 2009, Kang and Bullman, 2008, Parsons, 2013, Winter, 2000). Although many historians have dwelled on the ineffective response to psychological casualties of World War I, it was clear to health professionals at the end of World War II that lessons had been learned. Fewer men suffered from psychological trauma, and for less time, after World War II, and their experiences were studied more systematically (Jones and Wessely, 2007, Jones and Wessely, 2001).

Since World War II there has been increasing attention by epidemiologists, particularly in the United States, to the effect of military service and exposure to armed conflict on health and mortality. Nevertheless, there is only one cohort study of suicide risk among returned soldiers of World War II, finding that American soldiers imprisoned in the Pacific war had a significantly increased risk of suicide over thirty years of follow-up. But small sample sizes made it impossible to tell if suicide rates in a "regular" group of soldiers were higher than in the general

population (Keehn, 1980). Similar to the aftermath of World War I, there has been extensive American media coverage in the past two decades of suicides by veterans, accompanied by speculation that veterans are at greater risk of suicide (Bruce, 2010). Yet most recent studies of American and British veterans have concluded that suicide rates are only slightly elevated in veterans compared to men of the same age (Kang and Bullman, 2008, Miller et al., 2009, Miller et al., 2012, Kapur et al., 2009).

Thus, historical evidence on the circumstances faced by soldiers in World War I, and the limited systematic evidence available suggest that suicide rates were likely to have been higher in veterans of World War I compared to veterans of later conflicts. In many countries—including Australia, Great Britain, New Zealand, and the United States—source materials for studying veterans of World War I have become more widely available in recent years through digitisation of military personnel records by government agencies and genealogical companies such as Findmypast.co.uk and Ancestry.com. These newly available sources make it possible to study the post-combat experience of World War I veterans using modern research methods.

Research context

Institutional and demographic factors make New Zealand a good place to conduct longitudinal studies. Out-migration from New Zealand was limited, and a unitary and effective civil registration system, allows us to successfully link 80% of European-descended men to their death records, markedly higher than linkage rates

in federal systems with dispersed death registration (Ferrie and Rolf, 2011), and only slightly lower than linkage rates in countries such as Scandinavia that maintain population registers (Palme and Sandgren, 2008).

Although New Zealand was geographically the most distant country from the actual site of World War I of any combatant nation, it was fully involved in the conflict throughout the war. New Zealand entered World War I on the side of the Allied Powers at the beginning of the conflict in August 1914 and participated until the Armistice in November 1918. Men in what was known as the New Zealand Expeditionary Force served largely in the Middle East and France, though a small force was sent to occupy the former German colony of Samoa (Crawford and McGibbon, 2007). While several thousand New Zealand born men living in Australia and Britain served in the forces of those countries, our records pertain only to men in the New Zealand Expeditionary Force.

Over the course of the conflict, just under 100,000 men served overseas, from 134,632 men called up for service, of whom 121,519 were medically examined (Defence Forces of New Zealand, 1919). Conscription under the Military Service Act was imposed in 1916, after being debated since mid-1915 when recruiting slowed after reports of losses in the Gallipoli campaign. Forty percent of men in the eligible age range eventually served overseas, one of the highest proportions of any Allied country. The casualty rate among the New Zealand forces was high, with 18,166 men dying in action or from war-related illness and injury, and another 41,317 suffering non-fatal wounds (Crawford and McGibbon, 2007, Pugsley, 2004).

Either through service with a high chance of injury, or knowing men who had served, a high proportion of New Zealand's population was exposed to the trauma of World War I. While New Zealand was small and remote from the major sites of conflict its participation in the war was intense and prolonged just as it was for larger countries closer to the conflict. Thus, evidence from New Zealand on the long-term impact of the war on returned soldiers' well-being can inform a broader international understanding of the legacy of World War I on human health.

Methods

Data: As part of a project on long-term change in health and well-being in New Zealand from the nineteenth century to the present, we collected large samples of soldiers' attestation records from both World Wars (Reference omitted to preserve author anonymity). Military attestation records provided information on name, place and date of birth, enlistment date, occupation at enlistment, marital status, educational achievement and religion, military identification number, and height and weight. These variables provide measures of health and socio-economic status at enlistment, and identifying information, that allow the subject to be found in other record sources, in particular death registers maintained by the New Zealand Registrar of Births, Deaths and Marriages.

In order to assess the long-run effects of early-adult health on mortality in 2011 we drew a sample of 2,540 New Zealand-born men, aged 21 or older at enlistment, who we knew had survived the war and influenza pandemic of 1919. The sample was stratified to ensure adequate numbers in the sample of Māori (the

indigenous population of New Zealand) and to ensure adequate numbers of men in agricultural and non-agricultural occupations. We provided personally identifying information about the men from their attestation records to the Registrar of Births, Deaths and Marriages to undertake searches of death registers for the men. The Registrar provided copies of death certificates for men who were successfully located. Overall, we linked 73.8% of the men to their death certificates (Table 1). . Information from death certificates was transcribed into a database. Causes of death were assigned ICD-10 codes, with all cases coded by two research assistants, and reviewed by the authors.

Analysis: In order to compare our results to modern studies of suicide risk in veteran populations, we calculated the life-years lived by our cohort after return from the war, and calculated the rate of suicides per 100,000 life years lived. We calculated potential years of life lost before age 50 and before cohort life expectancy by comparing the age at death of men in the sample to population figures on life expectancy calculated by Statistics New Zealand (Statistics New Zealand, 2006). Simple descriptive statistics were used to characterize the sample, and the characteristics of men committing suicide in comparison to the overall sample. We investigated which variables measured at enlistment affected suicide through survival analysis, using competing risks regression (Fine and Gray, 1999). We measured the length of exposure to war service, based on the date of enlistment, as both a categorical and continuous variable. We assessed the effect of under-reporting of suicides by reviewing the death certificates of all men who died of

external causes for causes consistent with possible suicide. We repeated all analyses using the broader set of suicides and potential suicides. All analyses were conducted in Stata 13.1 (Stata Corporation, 2013).

Results

In total we linked 1,878 men from attestation records to their death records. Linkage rates were higher for New Zealanders of European descent, than for the indigenous Māori (Table 1). The overall characteristics of the sample that we linked compared well with the larger sample from whom this cohort was drawn (Table 2) (Reference omitted to preserve author anonymity). The 32 men who committed suicide were substantially similar to the larger sample, with no significant differences between the groups. Just one of the suicide decedents was Māori, but in such a small sample this difference in suicide rates between Māori and European-descended New Zealanders was not statistically significant.

Over 83,118 years of follow-up 32 men were definitely recorded as committing suicide (Table 3). Slightly more than half of the suicides occurred before age 50, in comparison to around ten per cent of deaths from all other causes. Accordingly, we calculated years of potential life lost (PYLL) as suggested by recent scholarship on the population health impact of suicide (Gunnell and Middleton, 2003, Pitman et al., 2012). Our measure of PYLL was conservative, calculating only years of life lost before age 70, as this was median life expectancy for the average man in the cohort on return from the war (Statistics New Zealand, 2006). If we

calculated PYLL using modern values of life expectancy (75) the impact of suicide would be even higher. The impact of suicide in this cohort of returned soldiers was significant (911 per 100,000 life years) when compared to other studies calculating PYLL on a standardized basis. For example, a study of suicide mortality in Queensland, Australia found a maximum PYLL for suicide of 600 per 100,000 in the twentieth century (Doessel et al., 2009).

We reviewed the death certificates for all men with causes of death from external injuries (47 deaths, 2.5%), and classified 17 of these deaths as potential suicides where the coronial record on the death certificate suggested the decedent's actions leading to death were inexplicable. For example, two of these deaths were single occupancy motor vehicle crashes without intoxication or bad road conditions, three involved drowning in mysterious circumstances, two involved misadventure with firearms, one man walked in front of a bus, and another was found dead in his own house which he had apparently set fire to. The statistical profile of these potential suicides was similar to the definite suicides. Including the potential suicides in calculations raises the crude suicide rate to 57 per 100,000 life years (Table 3). While we base our conclusions most firmly on deaths definitely recorded as suicide, it is well known that suicides may be concealed in other forms of accidental death, particularly motor vehicle crashes (Wyatt et al., 2009, Murray and de Leo, 2007). In the first half of the twentieth century drownings accounted for more than a fifth of all deaths by suicide in New Zealand, but declined rapidly as a method after 1960 (Weaver, 2014, Skegg and Cox, 1991). Thus, there are reasonable

grounds to consider unobserved deaths in motor vehicle crashes and drowning as potential suicides.

We modelled risk factors for suicide before age 70 using competing risks regression (Table 4) (Fine and Gray, 1999, Stata Corporation, 2013). Results were substantially similar when potential suicides were included, and we report only results for the definite suicides. We included all socio-economic and health variables measured at enlistment that might have influenced suicide. With such a small sample, none of these variables were associated with suicide in a statistically significant manner. Models included additional controls for place of birth (results not reported). There were no statistically significant differences in suicide risk between men born in rural areas, small towns, or New Zealand's four larger cities. Duration of exposure may have increased the risk of suicide, as men enlisting earlier in the war had elevated risk of suicide compared to men enlisting in 1918. However, the confidence intervals on the estimates do not allow us to establish this result as significant.

We observed 32 definite suicides in 83,118 years of follow-up, for a crude suicide rate of 39 per 100,000 life years. We calculate a 95% confidence interval for this estimate by assuming a Poisson process, which gives a 95% confidence interval for the suicide rate of (26,54) per 100,000. To contextualize our findings, we compare our suicide rate to a range of other studies of suicide in veteran populations from comparable countries—Australia, Great Britain, and the United States—in wars since World War I (Table 5). Notably, our suicide rate is nearly twice as high as American World War I soldiers treated in VA hospitals in the 1920s,

but identical to that observed by Minogue in his study of World War I veteran suicides in New South Wales. Given the short exposure of Americans to World War I, and the similarities of New Zealand and Australian exposure to the conflict this result is unsurprising. Compared to other more recent conflicts, the rate we observe is significantly higher, confirming the impression of contemporaries that World War I was associated with high rates of suicide by returned soldiers. Indeed, in recent American veteran cohorts, rates of 39 or higher are only observed in selective cohorts likely to be at much greater risk of suicide, such as veterans with recent presentations to hospital, or veterans with very long periods of service.

Explaining suicide

Demographic rates cannot capture *why* men committed suicide. To address this, we turn to coronial records, archived in their entirety for all suicides in New Zealand. These reports, informed by surviving family members, witnesses, and acquaintances provide somewhat greater insight into the state of mind of veterans who took their own life.

Attempts by the living to understand suicide likely have a history as long as suicide and humanity itself. Yet our understanding of suicide continues to contain powerful and unresolved, and thus likely inherent, paradoxes. One paradox involves the individuals and groups. Suicide is a profoundly individual act. Indeed some argue suicide is an incredibly selfish action. But in order to understand suicide and its

antecedents we have to consider suicides as a group, trying to figure out the distinguishing circumstances that may lead an individual to take their life.

A second paradox—at least for the living—is that suicides are both over-determined and under-determined. In many cases an apparent cause can be seen. Commonly adduced reasons include financial and employment concerns, the failure of romantic relationships, ill health, or trauma. When the living can identify these factors, sometimes layered on each other in close succession, suicide is over-determined. But these factors are rarely wholly sufficient to explain suicide to the living. Even conditional on experiencing these objective ill fortunes the majority of people do not take their own life. Suicide in that respect is under-determined—no reasons appear enough to fully explain it to the grieving survivors.

A final paradox is that remains to the living to fully make sense of the act, as the one person who could explain it, by definition, cannot. While suicide notes are a staple of dramatic representations of suicide, they are less frequently left in real life. Recognizing these paradoxes, it may be presumptuous to think we can explain individual acts of suicide. What we can do with more confidence is understand how the living purported to explain suicide. Modern scholars and contemporary populations in the immediate aftermath have taken as common knowledge that the Great War or World War I was particularly hard on returned soldiers. But psychiatric epidemiology was not a distinguishable academic field until after World War II, and constructing retrospective estimates of the psychological impact of

World War I is a difficult task to say the least. Thus one frequently encounters newspaper reports and official documents from the 1920s and 1930s that acknowledge the burden on returned soldiers, without ever really quantifying it. Everyone just knew that the war had been hard.

We identify three basic narratives are identified in the explanations of family and friends who testified in investigations of these suicides. We focus particularly on how the experience of war functions as an explanation of suicide

1. "A rash act" — motivating circumstances were identified but the living see these as clearly insufficient to explain suicide. As early as 1922 we see family members acknowledge the war, but then argue it was long enough ago that it should have no bearing. Other, more proximate, experiences the family feel should have determined the choice of life.
2. "Altered trajectories": Wartime experience had a direct impact on the man's life, and likely led to his suicide. For example, men were referred to as "A returned soldier and an alcoholic," and this concise summary of their life was taken as sufficient explanation of their state of mind in a coronial inquiry.
3. War of no consequence or not mentioned.

<u>"Rash Acts":</u> The phrase "rash act" is repeated in a significant minority of coronial inquiries, suggesting both understood causes, but also that those causes were not truly sufficient in the eyes and mind of the surviving informants. Agnes Coster, whose husband Herbert took his life in 1925 described how her husband had

meningitis and infections in the war that prevented him going into combat, that caused persistent migraines on his return. But the three months prior to the suicide, were split between 8 weeks of migraines and "for the last six weeks he has been splendid. I cannot account for his rash act."[1] Thus, even when people related circumstances that appear to the outsider to describe persistent and profound suffering they could still describe it as a "rash act." Rash is in the eyes of the informant, not the deceased (or the historian).

"Rash acts" also described men whose behaviour and health seemed to indicate no risks even in retrospect. William McMullan was described by the local constable and friend as a "sober good living man" and the rash act "due to war service."[2] Later informants echoed the phrase, though adding that McMullan had seen 4.5 years in the forces. In some cases informants created the trajectory of a rash act, even when evidence of acute mental issues were clear. Alfred Holmes Harding had a four month spell in the Porirua (near Wellington) Mental Hospital, yet his brother-in-law described him as being unaffected by "war service in any way."[3] The policeman testifying similarly presented Harding's injuries as being minimal: a gunshot wound in the right arm. Together, the two informants indicated their surprise even as they related events that may seem sufficient to precipitate a trajectory of depression and suicide.

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[1] Coronial Report 1925/860
[2] Coronial Report 1926/25
[3] Coronial Report 1924/1209

"Altered Trajectories": Two basic forms of altered trajectories can be seen in the coronial reports, those in the first few years after the war when the direct burdens of war were clear, and another group where informants described a person whose mental well-being had been chronically worse since the war. For example, in 1922 neighbors of Robert Robertson explained his actions as come from the deceased having "been to the front & was very excitable".[4] Later that same year the father of William Percival Owen said his son "went with the Expeditionary Forces to Egypt and was there for a year & 91 days. He had not been in France. He was on active service in Palestine."[5] Alcohol was sometimes mentioned as a cause and prelude of suicidal actions. The landlady of Arthur Backhouse explained his state as being that of a "heavy drinker and a returned soldier".[6]

Altered trajectories could be hinted at without mentioning the war. Alan Wilson was described in 1924 by his brother as "not actually strong, but quite fit to do light work."[7] His wife related that his "health had improved all the time" since they were married. But hidden from the coroner in the statements from his wife and brother was that Wilson had been discharged from the forces in August 1918 with neurasthenia—a general term used in World War I to describe ill-defined mental conditions. Another informant hinted at conditions by saying that the day before Wilson had described "things as going better". Moreover, while Wilson had been

[4] Coronial Report 1922/20
[5] Coronial Report 1922/482
[6] Coronial Report 1923/430
[7] Coronial Report 1925/184.

found sitting over a rifle in a position able to pull the trigger, the official cause of death was recorded as "misconduct leading to accidental discharge of a rifle."

While altered trajectories were often described as related to the deceased's mental health, physical health was also part of the sequence of causes indicated for people taking their lives. The brother of Thomas Costello that he "saw service in both the South African and the Great War. He suffered from malaria fever. He had an attack of this fever just before Christmas. He never at any time gave any indication that he would take his life. At intervals of a month deceased would get violent headaches and violently depressed as a result of the malaria fever, and would have to knock off work." John Hannon was described by his wife in 1945 as struggling to hold down heavy work at the railways as a porter and shunter as war injuries took a toll.[8] War, it appeared, accelerated the process of aging for some men making it harder to carry on physically demanding jobs to the age they expected. Coronial inquiries were concerned to establish intent and what provoked a decision to commit suicide. Thus, statements of chronic ill-health without a direct indication of suicidal intentions were more common in the 1920s through 1940s, suggesting men who had struggled with persistent health problems since the war.

Chronic ill health could contribute to other sources of suicidal motivation, such as unemployment. John Tucker Ford was described in 1935 as having "been unable to

[8] Coronial Report 1945/1327

secure a permanent position since the war, owing to injuries".[9] Similarly, James Matchett who had been "gassed in 1916" was described in 1942 as having "not worked for the past seven or eight years, to any great extent." As his wife described it, the consequences of gas had taken their toll over time.[10]

We have identified, tentatively, two key narratives of suicide in returned soldiers: rash acts and altered trajectories. Rash acts describe the suicide from the perspective of the informant emphasizing that while contributing causes can be identified, they are not regarded as sufficient or powerful. They are, in a sense, an attempt to dismiss the suicide and reason with the deceased. Altered trajectories can overlap with rash acts, since rash acts came at the end of a sequence of events triggered by wartime service. Altered trajectory narratives were fundamentally more empathetic to the deceased, trying to articulate how it had come to that.

Discussion

We have conducted the first ever retrospective cohort study of suicide risk across the lifetime in returned soldiers from World War I, beginning to fill in a significant gap in the literature on the long-term effects of the conflict. While it was common knowledge to contemporaries that World War I led to significant psychological trauma for some returned soldiers, there has been little quantitative evidence of how significant the problem was. We show that lifetime suicide rates of New Zealand World War I veterans (39 per 100,000 life years) were significantly

[9] Coronial Report 1935/165
[10] Coronial Report 1942/1262.

higher than among veterans of more recent conflicts, including New Zealand veterans of World War II. A limitation of our study is the relatively small sample size, and small number of suicides. Thus we are unable to discern statistically what social, health or wartime service factors were associated with suicide.

Comparing the results of this study to cohort studies of soldiers returning from more recent conflicts suggests that New Zealand World War I soldiers had 1.5 to 2 times the risk of dying of suicide across their lifetime of soldiers in more recent conflicts. For example, despite considerable media attention in the United States to the problem of suicides by veterans of Afghanistan and Iraq wars, the rate of suicide in the whole cohort of veterans is nearly half (21.9 per 100,000) that of New Zealand veterans of World War I (Kang and Bullman, 2008). Among a broader age range of veterans from more conflicts that may be more comparable with our lifetime estimates, Miller *et al* found a suicide rate of 26.2 per 100,000 (Miller et al., 2009). The lifetime suicide rates of New Zealand World War I soldiers are closer to suicide rates among American veterans presenting to Veterans Administration Hospitals, and followed up for a short time, who would presumably be most at risk of suicide (McCarthy et al., 2009, Ilgen et al., 2010).

Our study complements significant monographic studies of suicide in New Zealand by Weaver, who estimated suicide rates for New Zealand soldiers in the immediate aftermath of World War I and World War II using coronial reports (Weaver, 2014, Weaver, 2009). Like Weaver we find that many suicides of World War I soldiers occurred at relatively young ages and in the first two decades after the war. Relying on coronial reports Weaver was unable to trace the impact of

wartime service across men's lifetimes. When returned World War I soldiers committed suicide later in life, their veteran status may not have been known or thought worthy of comment.

Our study breaks new ground by using a prospective cohort design to study suicide in returned soldiers from World War I across their adult lifetimes, extending our knowledge of the impact of World War I on human health. We show the risk of suicide in World War I veterans remained elevated across their lifetime, confirming with modern epidemiological methods a belief held by many in the decades after World War I that the war left significant psychological scars on many of those who fought. Comparable source materials to those used in this study exist for many other combatant countries, and with their increasing availability scholars may now begin to re-assess the lasting effects of World War I on the health of soldiers who survived the war itself.

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Table 1. Construction of linked sample

Strata	Not in linked sample		Linked		Failed link		Strata linkage rate
	No.	%	No.	%	No.	%	
Pakeha farm	5,086	26.3	860	45.9	232	34.9	78.8
Pakeha non-farm	13,912	71.8	859	45.8	275	41.4	75.7
Maori farm	153	0.8	70	3.7	66	9.9	51.5
Maori non-farm	215	1.1	86	4.6	91	13.7	48.6
Total	19,366	100.0	1,875	100.0	664	100.0	73.8

Table 2. Characteristics of linked sample and suicide victims

Variable	Mean (overall)	Mean (suicides)	Variable	Mean (overall)	Mean (suicides)
Height			*Birthplace*		
height < 1.65m	0.10	0.09	Auckland	0.07	0.09
1.65m ⩽ height < 1.70m	0.21	0.25	Wellington	0.05	0.03
1.70m ⩽ height < 1.75m	0.30	0.25	Christchurch	0.07	0.00
1.75m ⩽ height < 1.80m	0.24	0.28	Dunedin	0.06	0.06
height ⩽ 1.80m	0.11	0.06	Provincial city	0.14	0.19
BMI			Rural area or small town	0.58	0.50
BMI < 18	0.01	0.03	Unknown	0.03	0.13
18 ⩽ BMI < 20	0.06	0.09	*Place of death*		
20 ⩽ BMI < 22	0.27	0.25	Auckland	0.15	0.15
22 ⩽ BMI < 25	0.44	0.45	Wellington	0.08	0.06
25 ⩽ BMI	0.15	0.09	Christchurch	0.09	0.03
Birth cohort			Dunedin	0.05	0.06
1870-74	0.02	0.03	Provincial city	0.25	0.22
1875-79	0.06	0.06	Rural area or small town	0.39	0.44
1880-84	0.10	0.06	Unknown	0.00	0.03
1885-89	0.20	0.22			
1890-95	0.33	0.31	*Maori*	0.08	0.03
1895-99	0.28	0.31			
Enlisted					
1914	0.12	0.06			
1915	0.24	0.25			
1916	0.27	0.38			
1917	0.29	0.28			
1918	0.06	0.03			

Table 3. Potential years of life lost from suicide

	All other causes			Suicides		
Endpoint	**Number**	**Mortality rate (per 100,000)**	**PYLL (per 100,000)**	**Number**	**Mortality rate (per 100,000)**	**PYLL (per 100,000)**
Death before age 50	181	346	3564	18	34	442
Death before age 70*	778	956	12208	31	38	911
Including potential suicides						
Death before age 50	171	326	3303	28	53	703
Death before age 70*	762	936	11693	47	57	1425

* The average man in the sample was born in 1891 and was 29 at the beginning of follow-up in 1920. Life expectancy for this average cohort member was 70.

Table 4. Risk factors for suicide before age 70 in a cohort of New Zealand World War I soldiers

Co-efficient	Hazard	Standard error	z	P > | z |	95% confidence interval	
BMI						
BMI < 18	4.11	4.74	1.23	0.22	0.43	39.43
18 ⩽ BMI < 20	1.95	1.33	0.97	0.33	0.51	7.46
20 ⩽ BMI < 22	Ref.					
22 ⩽ BMI < 25	1.05	0.44	0.12	0.90	0.47	2.37
25 ⩽ BMI < 28	0.54	0.48	-0.69	0.49	0.09	3.13
28 ⩽ BMI	1.55	1.73	0.39	0.70	0.17	13.80
Height						
height < 1.65m	0.86	0.60	-0.21	0.83	0.22	3.40
1.65m ⩽ height < 1.70m	1.05	0.51	0.09	0.93	0.40	2.71
1.70m ⩽ height < 1.75m	0.63	0.32	-0.91	0.36	.24	1.69
1.75m ⩽ height < 1.80m	Ref.					
height ⩽ 1.80m	0.37	0.29	-1.28	0.20	0.08	1.68
Birth cohort						
Born 1870-1874	2.10	2.57	0.60	0.55	0.19	23.28
Born 1875-1879	1.14	0.91	0.16	0.87	0.24	5.49
Born 1880-1884	0.70	0.56	-0.44	0.66	0.14	3.39
Born 1885-1889	Ref.					
Born 1890-1894	1.03	0.54	0.07	0.95	0.37	2.86
Born 1895-1899	1.15	0.60	0.27	0.79	0.42	3.19
Enlistment						
1914	1.34	1.78	0.22	0.82	0.10	18.01
1915	3.32	3.65	1.09	0.28	0.38	28.68
1916	4.12	4.42	1.32	0.19	0.50	33.82
1917	2.60	2.88	0.86	0.39	0.30	22.82
Occupation						

Co-efficient	Hazard	Standard error	z	P > | z |	95% confidence interval	
Farmer	1.60	1.06	0.71	0.48	0.44	5.85
Farm laborer	1.45	0.95	0.57	0.57	0.40	5.23
Manufacturing worker	1.24	0.84	0.31	0.76	0.32	4.71
White collar worker	Ref.					
Māori	0.35	0.36	-1.01	0.31	0.04	2.71

Table 5: Suicide rates in returned soldier populations since World War I

Conflict	Residence and other characteristics of veterans	Years followed	Suicide rate (per 100,000 life years) Returned soldiers	Comparable male population	Reference
World War I	New Zealand veterans	1918-2004	39.0		
World War I	New Zealand veterans	1920-1930	28.7	14.8	(Weaver, 2014)
World War I	New South Wales, Australia	1933-1937	39.0	31.0	(Minogue, 1945)
World War I	Patients in U.S. Veteran's Administration hospitals	1926-1930	22.5		(Anonymous, 1932)
World War II	New Zealand veterans	1946-1950	20.8	8.7	(Weaver, 2014)
World War II	Long-serving U.S. veterans	1946-1975	18.6		(Keehn, 1980)
World War II	Texas, United States	1960	21.7	25.5	(Pokorny, 1967)
World War II	U.S. veterans with psychoneurotic separation	1944-1968	32.7		(Keehn et al., 1974)
World War II	U.S. veterans without psychoneurosis		10.4		(Keehn et al., 1974)
Korea	U.S. veterans with long service	1954-1975	49.8		(Keehn, 1980)
Multiple conflicts	U.S. veterans in Cancer Prevention Study	1989-2004	18.9	21.7	(Miller et al., 2009)
Multiple conflicts	U.K. veterans leaving service, 1996-2005	1996-2007	20.9		(Kapur et al., 2009)
Vietnam	Wounded veterans	1969–1991	22.0 – 40.0		(Bullman and Kang, 1996)
Vietnam	Veterans	1965-2000	34.7 (0-5 years post-war) 23.7 (5+ years post-war)		(Boehmer et al., 2004)
Vietnam-era	U.S. veterans without Vietnam service	1965-2000	20.1 (0-5 years post-discharge) 25.7 (5+ years post-discharge)		(Boehmer et al., 2004)
Gulf War I	U.S. veterans	1991-1997	18.0		(Kang and Bullman, 1996)
Vietnam – Gulf War I	U.S. veterans treated in V.A. hospitals in 1999	1999 – 2006	40.9		(Ilgen et al., 2010)

Conflict	Residence and other characteristics of veterans	Years followed	Suicide rate (per 100,000 life years) Returned soldiers	Comparable male population	Reference
Afghanistan / Gulf War II	U.S. Veterans	2001 – 2008	21.9		(Kang and Bullman, 2008)
Multiple conflicts	U.S. veterans treated in V.A. hospitals in 2000 and 2001	2001 – 2006	43.1	23.2	(McCarthy et al., 2009)
Multiple conflicts	Veterans in U.S. National Health Interview Survey	1986 – 2000	26.2	18.8	(Miller et al., 2012)