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## Research report

## The association between suicidal ideation and increased mortality from natural causes

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## ABSTRACT

**Background:** Despite strong evidence for increased suicide mortality among individuals experiencing thoughts of suicide, the effect of suicidal ideation on increased natural mortality has not been evaluated. The present study aimed to assess whether there is excess mortality from all natural causes or from specific natural causes that is attributable to suicidal ideation. Adjustments were made for a range of demographic, mental health and physical health measures to examine evidence for specific mechanisms of the relationship.

**Method:** A community-based Australian cohort of 861 older adults was followed for up to 17 years. Vital status and cause of death were ascertained from a national death registry.

**Results:** After adjusting for demographics, physical health and mental health, presence of suicidal ideation was associated with a 23% increase in the risk of mortality from natural causes ( $p=0.034$ ). The increased mortality was largely attributable to heart disease deaths (hazard ratio=1.43,  $p=0.041$ ).

**Limitations:** There was a limited number of deaths from respiratory disease or stroke, and modest rates of suicidal ideation in the cohort. Assessment of suicidal ideation was brief, while adjustment for mental health symptoms relied on non-diagnostic measures.

**Conclusions:** Although the relationship between suicidal ideation and mortality from natural causes was partly explained by physical and mental health status, thoughts of suicide independently accounted for an increased risk of mortality. Further research should examine whether this relationship is mediated by poorer health behaviours among individuals experiencing thoughts of suicide.

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## 0. Introduction

Suicidal ideation is a strong risk factor for suicide attempts and completions (Harris and Barraclough, 1997; Kessler et al., 1999). Suicidal ideation is also known to reduce quality of life, with the disability of suicidal ideation found to be comparable to that of alcohol dependence or severe asthma (Kerkhof, 2012; van Spijker et al., 2011). Suicide attempts are a strong risk factor for subsequent suicide and non-suicide mortality (Bergen et al., 2012; Hawton and Fagg, 1988; Karasouli et al., 2011; Ostamo and Lonnqvist, 2001), and have previously been shown to be associated with higher rates of mortality from most natural causes, particularly deaths from respiratory, circulatory and digestive diseases (Bergen et al., 2012). However, suicide attempts are rare while suicidal ideation is quite common. Yet, to date, there has been little research on possible associations between suicidal

thoughts and non-suicide mortality, possibly due to the length of follow-up required to test the relationship. Late life cohorts provide one of the few opportunities to investigate mortality outcomes in unselected, epidemiologically representative samples. Moreover, older adults account for a considerable proportion of deaths from suicide (Arias et al., 2003; Australian Bureau of Statistics, 2012; Bruce et al., 2004). Although levels of ideation in older adults tend to be lower than levels in younger adults (Kessler et al., 1999; Weissman et al., 1999), there may be scope for suicide prevention interventions to reduce non-suicide mortality by targeting ideation.

Establishing the impact of suicidal ideation on mortality from specific causes may also provide a clearer picture of the disease states that tend to lead to death in people with suicidal ideation. Mental health problems may contribute to mortality through a number of biological and psychological mechanisms. These include the effects of ideation on poorer physical health status (increased disease and disability) and poorer health behaviours (e.g., reduced doctor's visits, poorer health literacy and less treatment adherence), which may lead to higher mortality

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(Schulz et al., 2002). The effect of mental health on mortality may also reflect confounding by socioeconomic status or by initial physical health. Studies that prospectively measure a range of physical health, health behaviour and sociodemographic factors enable examination of potential confounders and testing of possible mechanisms (e.g., Batterham et al., 2012).

The aim of the present study was to prospectively examine whether suicidal ideation was associated with increased mortality from natural causes over 17 years in an elderly community-dwelling cohort. Data indicating underlying cause of death were used to assess the contribution of suicidal thoughts to mortality from specific causes, with the aim of identifying the disease states that are more likely to lead to death in people with suicidal ideation. Possible mechanisms by which suicidal ideation may contribute to mortality were further evaluated by taking into account the effects of individual characteristics including physical health status and health behaviours.

## 1. Method

### 1.1. Participants

The Canberra Longitudinal Study is a large epidemiological survey of mental health and cognitive functioning. Eight hundred and ninety-six participants (456 men and 440 women) aged 70 or older were recruited for the baseline assessment in 1990. All participants were initially living in the community in the cities of Canberra or Queanbeyan, Australia. Participants were sampled from the compulsory electoral roll, with 69% responding. Participants were interviewed on up to four occasions over 12 years, with similar interviews conducted every four years. The study included this longitudinal component to investigate changes in mental health, physical health and cognition during late life, although the present investigation only examined suicidal ideation at the first assessment. Of the original sample of 896 participants, 185 (20.6%) were deceased by four years, 363 (40.5%) were deceased by eight years, and 544 (60.7%) were deceased by 12 years. At the end of vital status collection in June 2007, 687 (76.7%) of the participants were deceased. Of the participants who remained in the study, 14.1% (100/711) refused or were unable to complete the second interview, 21.1% (100/474) for the third interview and 21.1% (57/270) for the fourth interview. Approval for the research was obtained from the Ethics in Human Experimentation Committee of The Australian National University. Further details of the study design are provided by Christensen et al. (2004).

In the present study, 35 participants (3.9%) were excluded from analyses on the basis of missing baseline data. The analysis sample included 861 participants, including 656 decedents and 205 survivors. Excluded participants were significantly more likely to meet criteria for possible dementia ( $\chi^2_1=9.28, p=0.002$ ), were significantly older ( $F_{1,894}=9.45, p=0.002$ ) and had significantly greater functional disability ( $F_{1,875}=14.59, p<0.001$ ). However there were no significant differences between excluded and included participants in terms of suicidal ideation, gender, education, marital status, smoking status, depression, anxiety or disease count.

### 1.2. Procedure

Interviews were sought from both the participant and an informant, although the present study only examines participant data. Baseline interviews lasted approximately 2 h, incorporating a survey measuring a wide range of risk factors including socio-demographics, physical health and disease status, mental health status, cognitive performance and social support. Interviews also included physical assessments of blood pressure, lung function,

grip strength, vision and reaction time. The interviews were conducted by trained professional interviewers.

### 1.3. Assessment of mortality

Mortality status and date of death were established by searching the National Death Index, by contacting relatives, and from searching death notices in the local newspaper. The Australian National Death Index, a register of all deaths in Australia, was searched by name and date of birth. Mortality status was followed for up to 17 years, from the start of the study in September 1990 until the end of June 2007. Missing death identifications from the National Death Index are a rare occurrence, as the index provides nationwide coverage. The supplementary methods used for death reporting (contacting relatives, newspaper searches) were conducted to provide further confidence in the mortality status data. Survival was calculated as the time from the baseline interview to death for deceased participants, or from baseline until June 30, 2007 for surviving (right-censored) participants. For six participants with unknown day of death, the day was set to the 15th of the month. For one participant with an unknown month of death, the month was set to June. The mean follow-up time was 9.7 years: 16.4 years for surviving participants and 7.6 years for deceased participants.

Cause of death was based on the primary cause of death provided by the National Death Index, which was identified using an ICD-9 or ICD-10 code, depending on the date of death. Although up to 10 causes of death were assessed for participants who died after 1996, only the underlying cause of death codes were available for all deaths, so only the underlying cause was examined in the present analyses. The ICD codes were categorized into five binary categories: cardiovascular, cancer (all malignant neoplasms), respiratory, ischaemic heart disease, and stroke (cerebrovascular). No cause of death was provided for 60 deceased participants (9.1%), with these participants counted as having other causes of death. One participant had intentional self-harm as the cause of death and was excluded from analyses.

### 1.4. Measures

Suicidal ideation was assessed using two items from the Canberra Interview for the Elderly, a standardized psychiatric interview for use by lay interviewers developed on the basis of ICD and DSM diagnostic classifications (Social Psychiatry Research Unit, 1992). The items were: "In the last two weeks, have you felt as if you wanted to die?" (no/depends on the situation/yes) and "In the last two weeks, have you had any thoughts about doing away with yourself?" (never/sometimes/often/all the time). Participants who responded "depends" or "yes" to the first item, or "sometimes"/"often"/"all the time" to the second item were classified as having experienced suicidal ideation. Participants who did not report feelings of wanting to die in the first item were not asked the second item. Gender, age and marital status (married, single, widowed, divorced/separated) were assessed by self-report at the first interview. Years of education were estimated using the combined responses to two items regarding the number of years in school and the highest qualification attained.

Cognitive impairment was assessed based on Mini-Mental State Examination scores (MMSE, range 0–30: Folstein et al., 1975), with participants having MMSE scores < 24 at any assessment classified as meeting criteria for possible dementia (Holsinger et al., 2007). Norms for the MMSE indicate sensitivity of 95% and specificity of 82% for detecting Alzheimer's disease at this cut point in community-based individuals who are 80 years or older (Tombaugh et al., 1996). Depression and anxiety symptoms were measured using the Goldberg Depression and Anxiety Scales, which each consist of nine yes/no items (Goldberg et al., 1988). Scores on these tests reflect a symptom count ranging from 0 to 9.

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