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## Loss of partner and suicide risks among oldest old: a population-based register study

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### Abstract

**Background:** while mortality among the oldest old has improved over recent decades, these improvements are not reflected in the suicide mortality of this age group. We do not know the reasons why the suicide mortality is still very high among the oldest old.

**Objective:** the aim is to analyse the impact that loss of a partner has on the suicide risks of the oldest old (80+) compared to younger age groups.

**Subjects:** the entire Danish population aged 50 during 1994–1998 ( $n = 1,978,527$ ).

**Methods:** we applied survival analysis to calculate the changes in relative risk of suicide after a loss by using individual-level data.

**Results:** the majority of older persons who commit suicide are widowed, although only a relatively small proportion of the oldest old who commit suicide have experienced a recent loss of partner (men: 18%, women: 6%). In absolute terms, the oldest old men experience the highest increase in suicide risk immediately after the loss (15-fold; 95% CI 10.2–23.6) compared to middle-aged men who are still married. Oldest old men seem to suffer more from the loss and need longer time to recover than women.

**Conclusions:** although a small proportion of oldest old who commit suicide have experienced a recent bereavement, there is a significant increase in the suicide risk during the first year after a bereavement, especially for men. However, the increased risk of suicide in the oldest old men may only in part be explained by the loss of a partner.

**Keywords:** *suicide, aged, aged 80 and over, bereavement, stressful events, Denmark, elderly*

## Introduction

Over recent decades the mortality decline in the oldest old aged 80 years or above has been accompanied by decreasing disability levels [1–5]. These improvements have not been reflected in the suicide trends of the oldest old; the highest suicide rates are still found among the oldest old [6]. The reasons for the differences in suicide risk between the old and oldest old need to be assessed.

Certain life events are associated with increased suicide risks in older people [7–11]. The loss of a partner is found to have a significant impact on the suicide risks of the surviving partner [12–15]. In addition, the death of a partner seems to have a stronger impact on men than on women in terms of suicide risk [12]. While previous studies mainly focused on older persons in general, it has not been examined if there are differences in risks of suicide with advancing age and how many of the older persons who commit suicide have been affected by a recent loss of a partner.

Miller [16] suggests that the higher suicide rate in old age is due to the increased number of various losses experienced at this stage in life. An older person has a higher probability of being exposed to several losses within a limited time span and thus left less time for emotional recovery. Following this thesis we formulate the hypothesis that the death of a partner will have a greater impact on the suicide risks of the oldest old than on younger age groups. Taking into account that elderly men generally are more prone to suicide than women [17], we would furthermore expect that the loss of a partner will have a strong impact on the suicide risk of oldest old men compared to women.

The aim of this study is to analyse the impact that the loss of a partner has on the suicide risk of the oldest old (80+) and to examine whether there are differences with regard to gender.

Danish register data offer unique research opportunities for studying relatively rare events such as suicide [18]. In Denmark, each person has a personal identification (ID) number, which can be used to link various registers. The present study is the first of its kind to use longitudinal individual-level data covering an entire nation to study the loss of a partner among older people.

## Data and methods

Prospective data on all persons aged 50 years or above and who were living in Denmark during 1994–1998 are included in the study. People reaching 50 years during the study period enter the study in the following calendar year. Through the personal ID number, individual-level data from the Register of Population Statistics are linked with data from the Register for Preventive Medicine [19], and from the Danish Psychiatric

Central Register. The first two registers are kept and maintained at Statistics Denmark; the Danish Psychiatric Central Register is compiled by the Department of Psychiatric Demography at Aarhus University Hospital, Denmark [20].

The event of interest is completed suicide and is defined as the following causes of death: X60–X84, Y87, registered according to the 10th revision of the International Classification of Diseases [21]. Persons dying of other causes during the study are censored at the date of death and we also censor for in- and out-migration. As psychiatric disorders have been found to be an important predictor for suicide [24, 25], we control for any previous (since 1972) and current admission to psychiatric hospitals that occurred before a loss of a partner during the observation period. We do not control for psychiatric hospitalisation after a loss, because psychiatric hospitalisation could act as an intermediate factor between the loss and suicide.

The relative suicide risks for various combinations of the above mentioned levels of the covariates are estimated using survival analysis. This is done by fitting proportional-hazard models of the following type:

$$\frac{\mu_i(t)}{\mu_1} = e^{\alpha_j(t)} e^{\beta I} \quad (A)$$

where  $\mu_i(t)$  denotes the probability that individual  $i$  will commit suicide at time  $t$ . The relative suicide risk,  $\frac{\mu_i(t)}{\mu_1}$ , is calculated for each of the examined factor combinations and we obtain a value for the coefficient  $\alpha_j$ . The effect of admission to a psychiatric hospital is represented by  $\beta$ , where  $I$  is an indicator function equal to zero when a person has not been admitted to psychiatric hospital prior to bereavement and equal to one when a person has. Details on the applied methodology can be found in Appendix 1 (available as supplementary data at <http://www.ageing.oupjournals.org>).

Survival analysis incorporates the detailed individual-level information available and allows us at the same time to control for compositional changes over the various covariates [24]. The SAS system package [25] is used for the data management and the survival analysis is carried out using aML Multilevel Multiprocess Statistical Software, Version 1.01 [26].

## Results

The study population comprises a total of 1,978,527 persons aged 50+ (918,452 men and 1,060,075 women). As shown in Table 1, the population is observed for approximately 8.3 million person-years. During the 5-year period, 2,323 persons (1,494 men and 829 women) committed suicide.

The percentage of widowed persons in the study population is increasing with age, particularly for women. This is also the case for the percentage of suicides committed by

**Table 1.** Study population and suicides, 1994–1998

	Population				Suicide			
	All (person-years)	(%)	Widowed (person-years)	(% of all)	All	(%)	Among widowed	(% of all suicides)
<b>Men</b>								
50–64	2,199,611	(58.1)	66,014	3.0	720	(48.2)	51	7.1
65–79	1,276,106	(33.7)	178,063	14.0	525	(35.1)	140	26.7
80+	311,512	(8.2)	115,255	37.0	249	(16.7)	136	54.6
All (50+)	3,787,228	(100.0)	359,331	9.5	1494	(100.0)	327	21.9
<b>Women</b>								
50–64	2,227,422	(49.5)	225,839	10.1	361	(43.5)	46	12.7
65–79	1,621,604	(36.1)	666,515	41.1	318	(38.4)	159	50.0
80+	647,241	(14.4)	464,770	71.8	150	(18.1)	107	71.3
All (50+)	4,496,266	(100.0)	1,357,124	30.2	829	(100.0)	312	37.6

the widowed. However, for the oldest old men, the proportion of suicides among the widowed is markedly higher than the proportion of widowed in the study population.

During the 5 years of observation, 33,683 males and 71,894 women experienced the death of a partner (Table 2). The rate ratio for suicide among oldest old men who are widowed is about twice as high as in the younger age groups. This is not the case for women.

Table 3 shows the risk patterns of suicide with regard to the loss of a partner, current age, and its interaction with time since the loss of the partner. The suicide risk is measured relative to the middle-aged who are married and have not experienced a loss. For instance, married men aged 65–79

years have a suicide risk that is 1.2 times higher than our reference group of married middle-aged men. By comparing the first and the third row, we find that losing a partner among men leads to a significantly higher suicide risk during the first year after the loss. Middle-aged men whose partner dies experience a 6-fold increase in their suicide risk. For the old and the oldest old, the increase is 8-fold (10.1/1.2 and 15.5/1.9, respectively). Among women, there is about a 9- and 5-fold increase in the risk for the old and the oldest old women, respectively.

For men, we find a tendency towards a surplus or interaction effect between age and death of partner. The oldest old married men have a 1.9-fold higher risk than the middle-aged

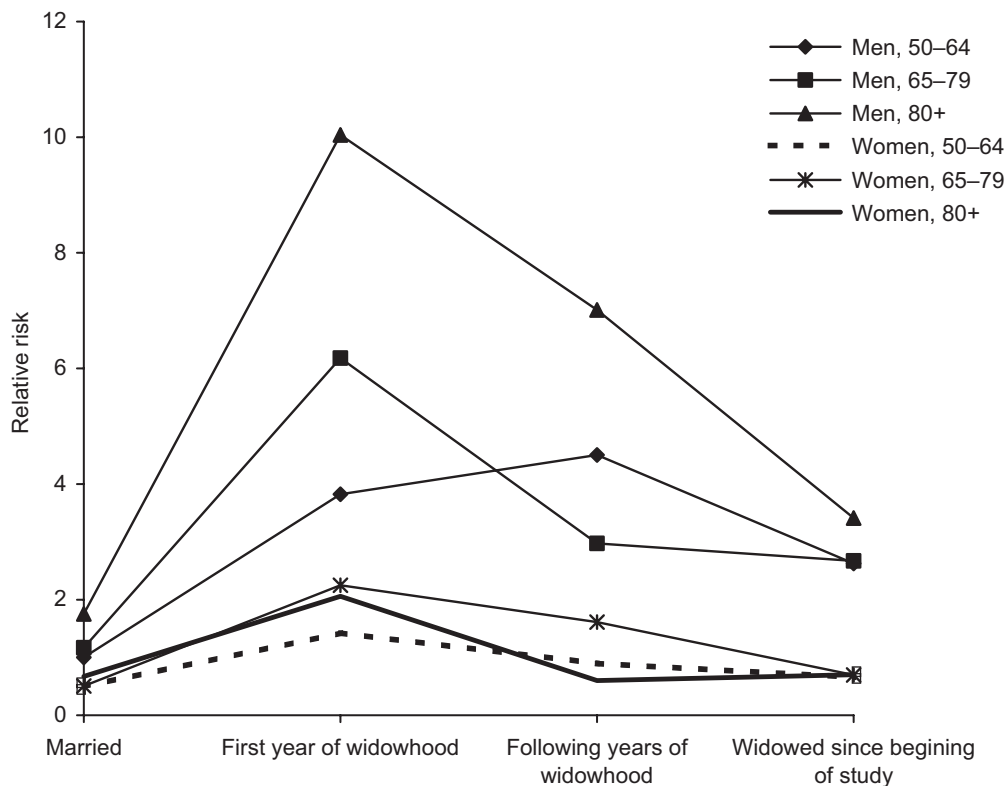
**Table 2.** Number of persons experiencing a loss of partner during the study period 1994–1998 and number of suicides in this group

	Widowed during study (person-years)	<i>n</i>	Suicides among widowed during study	(% of all suicides)	Suicide rate per 100,000	95% CI of suicide rate	Rate ratio
<b>Men</b>							
50–64	16,179	6,631	17	2.4	105.1	[61.1–168.6]	1.0
65–79	37,147	16,298	44	8.4	118.4	[86.0–159.1]	1.1
80+	19,958	10,754	44	17.7	220.5	[160.1–296.2]	2.1
50+	73,284	33,683	105	7.0	143.3	[117.2–173.5]	
<b>Women</b>							
50–64	44,275	17,095	13	3.6	29.4	[15.6–50.4]	1.0
65–79	94,346	39,207	45	14.2	47.7	[34.8–63.9]	1.6
80+	32,032	15,592	9	6.0	28.1	[12.7–53.6]	1.0
50+	170,652	71,894	67	8.1	39.3	[30.4–49.9]	

**Table 3.** Relative suicide risk after loss of partner during the period 1994–1998

	50–64	CI 95%	<i>n</i>	65–79	CI 95%	<i>n</i>	80+	CI 95%	<i>n</i>
<b>Men</b>									
Married	1.0 <sup>a</sup>		365	1.2	[1.0–1.4]	253	1.9	[1.5–2.5]	78
Widowed since beginning of study	2.4	[1.7–3.5]	34	2.7	[2.1–3.3]	96	3.8	[3.0–4.8]	92
First year of widowhood	6.1	[3.1–12.3]	8	10.1	[6.9–14.7]	29	15.5	[10.2–23.6]	23
Following years of widowhood	4.7	[2.4–9.4]	9	3.4	[2.0–5.7]	15	8.5	[5.4–13.3]	21
<b>Women</b>									
Married	1.0 <sup>a</sup>		188	1.1	[0.9–1.4]	94	1.6	[1.0–2.6]	17
Widowed since beginning of study	1.3	[0.9–1.9]	33	1.5	[1.2–1.9]	114	1.7	[1.4–2.2]	98
First year of widowhood	6.2	[3.0–12.5]	8	9.6	[6.3–14.7]	24	7.9	[3.5–17.8]	6
Following years of widowhood	2.7	[1.1–6.5]	5	4.9	[3.1–7.8]	21	2.0	[0.6–6.1]	3

<sup>a</sup>Reference group. The models are controlled for current and previous psychiatric admission taking place prior to the loss of a partner.



**Figure 1.** Change in relative suicide risk after loss of partner in a combined model for men and women during the period 1994–1998. The reference group is married men in the age group 50–64. The model is controlled for current and previous psychiatric admission taking place prior to the loss of a partner.

married men. Persons aged 50–64, who have lost a partner during recent years, have a relative suicide risk of 6.1. The relative risk experienced by the recently bereaved oldest old, 15.5, is higher than the product of the two mentioned above, although the interaction is not significant.

Among all the examined groups, the suicide risk levels off during the years after a loss.

The relative risk patterns in a combined model for both men and women are shown in Figure 1. Irrespective of age, an increased suicide risk is found among all persons who experienced a loss, but the highest absolute increase took place among the oldest old men. When comparing the genders, it appears that men are more affected by a loss than women in the same age groups. During the first year after the death of a partner, the suicide risk of people aged 80+ years increases almost 6-fold, from 1.8 (95% CI 1.4–2.2) to 10.0 (95% CI 6.6–15.3) for married men during the first year of widowhood. For women, the increase is about 3-fold, from 0.7 (95% CI 0.4–1.1) to 2.1 (95% CI 0.9–4.6). Furthermore, the process of recovery takes a longer time for the oldest old men than for their female counterparts. During the years following the loss, the risk of suicide among the oldest old men is barely reduced from what it was during the first year after the loss (from 10.0 to 7.0). For women, the suicide risk is reduced to about a quarter of the suicide risk of first-year widows (from 2.1 to 0.6). This difference is less pronounced in younger age groups.

## Discussion

Our study has shown several new findings. Although the majority of older persons who commit suicide are widowed, only a small proportion has experienced the bereavement recently. However, the first year after a bereavement is clearly associated with a significant increase in the risk of suicide. In absolute terms, the oldest old men experience the highest increase in their suicide risk after the loss of a partner, and the oldest old men are more prone to commit suicide after the loss than the women. In addition, it takes a longer time for men in this age group to recover from the death of the spouse.

According to our hypothesis, we would expect that the loss of a partner would have a stronger impact on the suicide risk of the oldest old than on the old. However, we only find a tendency towards a surplus effect on the risk among the bereaved oldest old men. Rather, it seems that the increase in risk is following the expected increase due to the age effect, which means that the loss of a partner cannot as such explain the higher suicide rates among persons aged 80+ years. This is supported by the limited explanatory power of the loss of a partner. Although we do find a significant impact on the suicide risk of older people after a loss of partner, almost half of the oldest old men have not been affected by a loss of partner when committing suicide (cf. Table 1). The loss of a partner, then, only provides a partial explanation of why the oldest old commit suicide more frequently than other age groups. It seems probable that other types of losses among

the very old, such as somatic disorders or disabilities, could account for some of the differences in risk.

The largest gap in risk patterns between the two genders is found among the oldest old. The very old bereaved men have a significantly higher – 5 times higher – suicide risk than women of the same age and in the same situation. Not only are the oldest old men more affected by a loss than women, the impact of a loss also lasts for a longer period, as shown in Figure 1. It has previously been found that men have higher risks of suicide than women but not that this difference in risk increases with age [12]. Interestingly, the sex ratio (male suicides per female suicide) has been found to increase with age among older people in Denmark [6]. It is possible that the above mentioned difference between men and women might to some extent explain why the sex ratio of the suicide rate is increasing with age.

Apparently, to become widowed offers more obstacles for oldest old men than it does for women. Men in the cohorts we are studying may be less able to manage on their own after a long marriage. It has been found that after a loss men are more likely to become dependent on the help of others (e.g. for household work) than married men [27]. It seems that the oldest old men might be more vulnerable than their female counterparts as it has been shown that men with severe disability have a shorter life expectancy than women in the same situation [28]. These findings might in part provide an explanation for the higher suicide risks we find among men after the death of a partner when compared to women.

One limitation of the study is the relatively short follow-up period and that some findings have overlapping confidence intervals. A longer study period may compensate for this and obtain more significant differences between the old and oldest old. In addition, we only included those deaths of partners that occurred during the 5-year observation period. Persons who experience loss of a partner just prior to entering the study are included in the analyses on the same basis as those who lost their partner many years ago. This means that we miss some of the recently bereaved and thus our findings might underestimate the impact of the loss. However, we do not believe that this will alter our results significantly.

Our analyses are only controlled for psychiatric hospitalisation prior to the death of a partner. Thus, we do not correct for hospitalisation with psychiatric diagnoses that may occur after the loss but is not related to it. Also, we are not controlling for psychiatric disorders that were present prior to a loss but did not require hospitalisation until after the partner died. This means that there might be some influence from psychiatric disorders which are not adjusted for.

Another limitation is that only information on couples who are either married or living in a registered partnership was used. Cohabiting couples who are not living in a registered marriage or partnership are thus not included in the present study. During the period 1994–1998, more than 94% of all persons aged 65 years or above, who were living together, were married or living in a registered partnership [29].

A clear advantage of register-based data is the prospective data collection. All information is registered at the time of their occurrence and on equal terms for persons who later commit suicide and for persons who do not. Also, the

data are based on relatively reliable data sources. The registers have mostly been in operation for more than 25 years [19]. As an example of the reliability, the number of illogical changes of civil status, such as persons marrying twice consecutively or a divorced person becoming widowed, is quite small. Less than 0.02% of the study population experienced a change of civil status of illogical character. In addition, it is rather unusual and a clear strength of the study that we are able to analyse data covering the entire population of older individuals living in a nation.

In conclusion, our results show that the oldest old men have a higher risk in absolute terms of committing suicide after the loss of a partner than the younger age groups, and that the association is clearly stronger for men than for women. Men aged 80+ years are at risk for a longer period after the loss than both women and younger age groups. However, experiencing the loss of a partner does not provide sufficient explanation for the high suicide risks found among the oldest old. The present study is the first to examine the changes in risk of suicide after the loss of a partner among older people using nationwide data.

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### Key points

- The majority of persons aged 80 and above who commit suicide are widowed, but only a small proportion are recently widowed.
  - Oldest old men who recently lost a partner have the highest risk of suicide.
  - With increasing age, men are significantly more affected by a loss than women – and for a longer period of time.
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### Declaration of conflicts of interest

None.

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