Life weariness, suicidal thoughts and mortality: A seventeen-year longitudinal study among men and women older than 60 years

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Abstract

Background

Suicide in old age is a significant contributor to premature mortality. However, the extent to which life weariness and suicidal thoughts impact on mortality in a long-term perspective is still unknown. The aim of this study was to investigate the effect of life weariness and suicidal thoughts on long-term survival (17 years) in an older Swedish population (60 + years), controlling for demographic and social network factors and depression. A further aim was to investigate differences in sex and age interactions in relation to mortality among individuals with and without life weariness and suicidal thoughts.

Methods

A longitudinal cohort study on a national, representative sample of people 60 + years was conducted through the Swedish National Study of Aging and Care study and included $n = 7,213$ individuals, who provided information about life weariness and suicidal thoughts, through an item derived from the Montgomery-Åsberg Depression Rating Scale. Data were analysed with multivariate Cox proportional hazards models, adjusted for potential confounders.

Results

At baseline, 12.5% of the participants (14.6% of females and 9.5% of males) reported life weariness and suicidal thoughts. During the 17-year follow-up, survival time was 11.5 years, SD 5.6, and 3,804 individuals died (59.5% females and 40.5% males). Individuals with life weariness and suicidal thoughts had half the survival rate compared with those without such thoughts (24.5% vs. 50.6%), with a survival time of 8.4 years (Standard deviation, SD, 5.7) versus 12.0 years (SD 5.4). The multi-adjusted hazard ratio of mortality for reporting life weariness and suicidal thoughts was 1.44 (95% confidence interval, 1.30–1.59), the population attributable risk was 11.1%. In the models, being male or female 80 + years (ref. female 60–69 years) showed the highest multi-adjusted hazard ratio of long-term mortality.

Conclusions

Findings suggest that life weariness and suicidal thoughts are risk factors for long-term mortality, when controlling for sex and age interactions that were found to strongly predict long-term mortality. The findings have practical implications in prevention of premature mortality, emphasising preventive actions of screening, identifying, and intercepting older men and women with signs of life weariness and suicidal thoughts.

Background

Suicide rates in late life are high in most countries, increasing in salience with aging, making suicide a major public health concern globally (1–3). Globally, the all-ages suicide rate is 11.1 deaths per 100,000 (4). From a Swedish perspective, the rate is even higher (15 deaths per 100,000), and in the oldest age group (65–84 years) the suicide rates vary between sexes (24.4 deaths per 100,000 in men and 7.3 per 100,000 in women) (5). Furthermore, early signs of suicidality, such as suicidal thoughts, have been suggested as being among the most prevalent predictors for completed suicide (6, 7), but little is known regarding the long-term effect on mortality of suicidal thoughts in late life.

The spectrum of suicidality ranges from life weariness and suicidal thoughts to suicide attempts and completion of suicide (8, 9). Several concepts are used in the literature to describe initial or early signs of suicidality, such as suicidal feelings, suicidal ideation, and suicidal thoughts (see for example (10–12)). In the present study, we are using the term “life weariness and suicidal thoughts”, comprising suicidal aspects such as life weariness, death wishes, suicide preparation, and planning (13).

To our knowledge, there are few long-term longitudinal studies with national, representative samples of older adults that have investigated the impact of life weariness and suicidal thoughts on mortality. Further to this study, one 5-year mortality study from 2010 found that the “wish to die” was associated with mortality in usual care of elderly (60+ years) primary healthcare patients ($n = 1,202$) (14). Another study from 2013 presented data from 861 community-based older persons (70+ years), followed during 17 years, and found that suicidal ideation increased the risk of mortality from natural causes by 23% (15). For several reasons, it is important to emphasise the potential impact of life weariness and suicidal thoughts on mortality. With life weariness and suicidal thoughts, older adults could risk a decline in both physical and mental health through, for example, reduction of disease management, treatment adherence, health care visits, physical activities, or food intake. It is reasonable to assume that detection of life weariness and suicidal thoughts, resulting in appropriate actions, referrals, and follow-ups, could help prevent premature mortality in older adults.

In this study, we considered several factors that might be relevant in explaining the risk of mortality in older adults with suicidal thoughts: demographic factors, social network factors, and depression. Much of the previous research regarding these factors in older adults is cross-sectional and provides a limitative snapshot of life weariness and suicidal thoughts in late life. Regarding demographic and social network factors, longitudinal research suggests that age, sex, marital status, education, financial situation, living situation, and country of origin are significantly associated with suicidal thoughts (see for example (6, 7, 10, 16, 17)). Depression has also been found to be associated with suicidal thoughts in late life (see for example (11, 18)). A comprehensive model in which several of these variables are simultaneously accounted for can reveal whether specific characteristic variables exacerbate vulnerability among older adults with life weariness and suicidal thoughts. Furthermore, focusing specifically on sex and age and accounting for their interactions could provide valuable information important to consider when developing preventive interventions targeting the older population.

The current study is intended to address several gaps in the extant literature, namely the limited research in national, representative samples of older adults with long-term longitudinal data investigating the impact of life weariness and suicidal thoughts on mortality. Thus, the aim of the current study was to investigate the effect of life weariness and suicidal thoughts on long-term survival (17 years) in an older Swedish population (60 + years), controlling for demographic and social network factors and depression. A further aim was to investigate differences in sex and age interactions in relation to among individuals with and without life weariness and suicidal thoughts.

Methods

Sample

Individuals included in this longitudinal study are involved in the Swedish National Study on Aging and Care (SNAC), which launched in 2001 at centres in different parts of Sweden. The SNAC is a prospective multicentre study and includes randomly selected individuals age 60 years and up, drawn from the national population register, in 10 clusters (60, 66, 72, 78, 81, 84, 87, 90, 93, 96 + years). All individuals in the oldest age groups were invited, with an oversampling process used to manage the decreasing numbers of people in these groups. More information about the SNAC study can be read elsewhere (19).

At baseline, during the period 2001–2004, participants ($n = 7,418$) were recruited from geographical areas covering a medium-sized town, small towns, rural areas (five municipalities in the Skåne region and one municipality in Blekinge, all located in southern Sweden), and one urban district in the capital city Stockholm. The participants were invited to the project by post and reasons for non-participation were registered. For the present study, those participants who gave information about life weariness/suicidal thoughts at baseline were included ($n = 7,213$) and followed for up to 17 years.

The study was conducted in accordance with the ethical principles of the Helsinki Declaration and both verbal and written informed consent were obtained. The SNAC study was approved by the review boards in Stockholm (KI Dnr 01-114) and Lund (LU Dnr 128-00, LU 604-00, LU 744-00).

Data collection

The data collection team included trained nurses, physicians, and test leaders. Participants who could not come to the research centres were offered home visits in order to avoid selection bias. Data on participant age, sex, education, living arrangements, marital status, geographical residence, financial situation (two items), country of birth, self-reported depression (one item), social support (three items), and religious beliefs were obtained through single-item self-administrated questionnaires (see Table 1).

Table 1

Descriptive characteristics of population at baseline (n = 7,213) and 17-year follow-up, by mortality group.

Variables	Baseline (n = 7213)	Survivors (n = 3409)	Deceased (n = 3804)	p value
Age group (%)	3147 (43.6)	2540 (74.5)	607 (16.0)	< 0.001 ³
60–69 years				
70–79 years	1754 (24.3)	709 (20.8)	1045 (27.5)	
> 80 years	2312 (32.1)	160 (4.7)	2152 (56.6)	
Mean age (SD)	73.11 (10.72)	65.74 (6.75)	79.72 (9.21)	
Sex	4291 (59.5)	2029 (59.8)	2262 (52.7)	< 0.001 ¹
Female (%)				
Sex-age interaction (%)	1474 (20.4)	1128 (33.1)	346 (9.1)	< 0.001 ¹
Male 60–69 y			494	
Male 70–79 y	707 (9.8)	213 (6.2)	(13.0)	
Male 80 + y	741 (10.3)	39 (1.1)	702 (18.5)	
Female 60–69 y	1673 (23.2)	1412 (41.4)	261 (6.9)	
Female 70–79 y		496 (14.5)	551 (14.5)	
Female 80 + y	1047 (14.5)	121 (3.5)	1450 (38.1)	
	1571 (21.8)			
Marital status (%)	3520 (49.8)	2117 (62.5)	1403 (38.1)	< 0.001 ¹
Married				
Widow/-er	1890 (26.7)	385 (11.4)	1505 (40.8)	
Unmarried	708 (10.0)	320 (9.5)	388 (10.5)	
Divorced	788 (11.1)	105 (3.1)	330 (9.0)	
Living apart	169 (2.2)		60 (1.6)	

Variables	Baseline (n = 7213)	Survivors (n = 3409)	Deceased (n = 3804)	p value
Country of birth (%)	6503 (91.3)	3045 (89.5)	3458 (92.9)	0.001 ¹
Sweden				
Nordic countries	222 (3.1)	112 (3.3)	110 (3.0)	
Europe	335 (4.7)	211 (6.2)	124 (3.3)	
Outside Europe	62 (0.9)	33 (1.0)	29 (0.8)	
Geographical area (%)	4958 (68.7)	2569 (75.4)	2389 (62.8)	< 0.001 ¹
Urban				
Medium-sized town	2158 (29.9)	800 (23.5)	1358 (35.7)	
Rural	97 (1.3)	40 (1.2)	57 (1.5)	
Highest level of education (%)	2268 (32.7)	763 (23.0)	1505 (41.6)	< 0.001 ²
Primary school, left at age < 13 yrs		379 (11.4)		
Secondary school, left at age 14–16 yrs	831 (12.0)	1123 (33.8)	452 (12.5)	
Upper secondary or vocational school, left at age 18–19 yrs	2252 (32.4)	1053 (31.7)	1129 (31.2)	
College or above	1589 (22.9)		536 (14.8)	
Housing (%)	6816 (96.2)	3362 (99.2)	3454 (93.5)	< 0.001 ¹
Community dwelling				
Residential care facility and other	267 (3.8)	26 (0.8)	241 (6.5)	
Financial difficulties in the last year	373 (5.3)	1173 (5.1)	200 (5.5)	0.453 ¹
Yes				
Able to access EUR 1,400 within a week (%)	6043 (87.6)	3042 (90.6)	3001 (84.8)	< 0.001 ¹
Yes				
Depression (%)	1060 (14.8)	539 (15.9)	521 (13.8)	0.006 ¹
Yes		2822		
No	6048 (84.5)	(83.2)	3226 (85.7)	
Don't know	47 (0.7)	29 (0.9)	18 (0.5)	

Variables	Baseline (n = 7213)	Survivors (n = 3409)	Deceased (n = 3804)	p value
Do you have someone who can help you when you are ill? (%)	4468 (67.7)	2317 (71.1)	2151 (64.4)	< 0.001 ²
Yes, no problem	1766 (26.8)	836 (25.7)	930 (27.8)	
Yes, probably	244 (3.7)	79 (2.4)	165 (4.9)	
No, probably not	121 (1.8)	27 (0.8)	94 (2.8)	
No, I do not				
Number of individuals you know well enough that you can talk to them about everything (%)	149 (2.3)	51 (1.6)	98 (2.9)	< 0.001 ²
None	2369 (35.8)	1034 (31.6)	1335 (39.9)	
1–3	2134 (32.2)	1090 (33.3)	1044 (31.2)	
4–6	805 (12.2)	449 (13.7)	356 (10.6)	
7–9	707 (10.7)	386 (11.8)	321 (9.6)	
10–15	282 (4.3)	168 (5.1)	114 (3.4)	
16–30	176 (2.7)	95 (2.9)	81 (2.4)	
> 30				
Religious beliefs (%)	2868 (49.0)	1245 (44.0)	1623 (53.7)	< 0.001 ¹
Yes	2984 (51.0)	1584 (56.0)	1400 (46.3)	
No				
Feeling lonely (%)	449 (6.4)	118 (3.5)	331 (9.1)	< 0.001 ²
Yes, often	1863 (26.6)	740 (22.0)	1123 (30.9)	
Yes, sometimes	1957 (28.0)	1071 (31.8)	886 (24.4)	
No, seldom	2729 (39.0)	1438 (42.7)	1291 (25.6)	
No, never				

Variables	Baseline (n = 7213)	Survivors (n = 3409)	Deceased (n = 3804)	p value
Suicidal thoughts (%)	6310 (87.5)	3189 (93.5)	3121 (82.0)	< 0.001 ¹
No suicidal thoughts				
Life weariness	814 (11.3)	197 (5.8)	617 (16.2)	
Suicidal thoughts	89 (1.2)	23 (0.7)	66 (1.7)	
Note: Chi-squared test was performed for nominal data ⁽¹⁾ , the Mann-Whitney U-test for ordinal data ⁽²⁾ , and Student's t-test ⁽³⁾ for interval data. SD = standard deviation, EUR = Euros. The p value < 0.05 was used to test significance.				
Number of people grouped by risk (time in days) in the total sample (n = 7,213).				
Days	0	2000	4000	6000
Male 60–69 y	1474	1369	1228	1128
Male 70–79 y	707	548	360	215
Male 80 + y	741	373	109	39
Female 60–69 y	1673	1613	1523	1413
Female 70–79 y	1047	905	685	499
Female 80 + y	1571	880	330	121
Number of people by risk group (time in days) in those with no life weariness and suicidal thoughts (n = 6,310).				
Days	0	2000	4000	6000
Male 60–69 y	1402	1306	1174	1080
Male 70–79 y	634	506	342	207
Male 80 + y	608	326	104	39
Female 60–69 y	1537	1487	1402	1307
Female 70–79 y	919	806	623	456
Female 80 + y	1210	708	283	105

Information about life weariness and suicidal thoughts was collected in the questionnaire and were measured through one (item 9) of the nine items derived from the Montgomery-Åsberg Depression Rating Scale (MADRS) (13). More information about the MADRS scale and in what manner the item has been used in the older population can be read elsewhere (12). In the present study, suicidal expressions, including life weariness and suicidal thoughts, were classified into the following categories: (0) no life

weariness or suicidal thoughts, (1–2) life weariness, and (3–6) suicidal thoughts. The outcome variable of survival, i.e., date of death, was collected from the Swedish National Death Register for 2019.

Data analysis

Descriptive statistics were used for variables in demographic data, such as social support, depression, and life weariness and suicidal thoughts, and given as absolute values and percentages (%). Chi-squared tests, the Mann-Whitney U-test, and the Student's t-test were used to test the differences in the proportions at a nominal, ordinal, and interval data level, respectively. Age was divided into three groups (60–69, 70–79, and 80 + years) and was combined with sex in an interaction variable. Survival time was calculated from the date of the baseline survey to the date of death during the 17-year follow-up. To estimate the impact of the interaction of age and sex on survival, a Kaplan-Meier survival analysis was performed (for age groups, 60–69, 70–79, and 80 + years, and sex in combination) in the whole sample, and in those with and without life weariness and suicidal thoughts separately.

The differences between groups regarding mortality, sex-age interactions, and presence or absence of life weariness and suicidal thoughts, were tested and assessed using the log-rank test. To explore life weariness and suicidal thoughts together with the independent risk factors of mortality, the variables sex-age interaction, marital status, education, housing, geographic area, financial resources, country of birth, feeling lonely, support from others, social contacts, suicidal thoughts, and depression were entered simultaneously into a multivariate Cox regression model. To verify the proportional hazard assumption, the cumulative hazard function was inspected visually. Models including adjusted variables were also performed separately for individuals with and without life weariness and suicidal thoughts. Before entering the variables sex-age interaction, marital status, geographic area, country of birth, and social contacts, dummy variables were used to distinguish between different groups. The likelihood ratio (LR) significance test was used for goodness-of-fit on the models that were set up. Cox proportional hazard models were used to calculate the multi-adjusted hazard ratio (HR) with 95% confidence interval (95% CI) of long-term mortality with a particular focus on life weariness and suicidal thoughts at the baseline examination. The population attributable risk (PAR) of life weariness and suicidal thoughts was calculated with HR (20). SPSS 25.0 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp., USA) was used in all analyses, and the level of significance was set to $p < 0.05$.

Results

At baseline, the study sample included 7,213 participants (59.5% females), with a mean age of 73.11 years (SD 10.72). The follow-up period began at the time of the individual's baseline examination and ended after 17 years or at time of death. A total of 3,804 (52.7%) individuals died during the observation period. The 80 + females had the highest proportion of deaths (38.1%), twice as high as the 80 + males (18.5%). Compared with the individuals in the deceased group, the survivors differed significantly in all variables included, excepting the variable of financial difficulties during the last year.

In the total sample, 12.5% of the individuals reported life weariness and suicidal thoughts at baseline. Fewer individuals in the survival group reported life weariness and suicidal thoughts (6.5% vs. 17.9%) compared with those in the deceased group. At baseline, more females and males in the oldest age group (80 + years) had life weariness and suicidal thoughts (23.0% and 17.9%, respectively) than females and males in the youngest age group (60–69 years) (8.1% and 4.9%, respectively) ($P < 0.001$). Demographic characteristics of the survivors and the deceased are shown in Table 1.

—————Insert Table 1 here—————

Individuals with life weariness and suicidal thoughts had half the survival rate (24.5% vs. 50.6%) compared with those without such thoughts, with a survival time of 8.4 years (SD 5.7) versus 12.0 years (SD 5.4) (data not shown). The sex-age interactions differed significantly in total survival rate and in individuals with and without life weariness and suicidal thoughts (log-rank test $P < 0.001$). In the group of individuals with no life weariness and suicidal thoughts, males in the age group 80 + years showed the lowest survival rate (6.4%) and survival time (mean 6.6 years, SD 4.5) in comparison with any of the combinations female 80 + years (8.7%, mean 7.4 years, SD 4.7), male 70–79 years (32.6%, mean 10.9 years, SD 5.2), female 70–79 years (49.6%, mean 12.6 years, SD 4.8), male 60–69 years (77.0%, mean 14.6 years, SD 4.0), or female 60–69 years (85.0%, mean 15.4 years, SD 3.1). Meanwhile, in the group of individuals with life weariness and suicidal thoughts, males 80 + years showed the lowest survival rate and survival time (0%, mean 4.5 years SD 3.2) compared with being female 80 + years (4.4%, mean 6.0 years, SD 4.2), male 70–79 years (11.0%, mean 7.3 years, SD 5.0), female 70–79 years (33.6%, mean 10.4 years, SD 5.5), male 60–69 years (66.7%, mean 13.4 years, SD 5.2), or female 60–69 years (77.6%, mean 14.9 years, SD 3.7). Separate lines of survival rates for sex-age interactions in individuals, in total, as well as with or without life weariness and suicidal thoughts at baseline, and number of risk exposures, are presented in Figs. 1a-c.

—————Insert Figs. 1a-c here—————

The results from the multivariable Cox proportional hazard model show significant associations between life weariness and suicidal thoughts and survival time, when adjusting for the control factors included. The multi-adjusted hazard ratio of mortality, HR, for reporting life weariness and suicidal thoughts was 1.44, 95% confidence interval (CI) 1.30–1.59 ($P < 0.001$) (Table 2), PAR 11.1%, where those with life weariness and suicidal thoughts had a lower survival rate and shorter survival time (log-rank test, $P < 0.001$). Being a male or a female 80 + years (ref. female 60–69 years) had the highest multi-adjusted hazard ratio of mortality: 17.79 and 11.21, respectively (95% CI 15.13–20.90, CI 9.60–13.08). The HRs of the sex-age interactions (male and female 80 + years) in relation to mortality were still high in the stratified hazard models for life weariness and suicidal thoughts, especially in individuals with life weariness and suicidal thoughts at baseline, HR 22.39, CI 13.85–36.18, HR 12.49, CI 7.93–19.66) (Table 3). Figure 2 presents the survival curve for individuals with and without life weariness and suicidal thoughts adjusted for the control factors included (demographic variables, social network factors, and depression).

Table 2

Hazard ratios for life weariness/suicidal thoughts in relation to mortality, adjusted for control factors included.

Number of people grouped by risk (time in days) in people with life weariness and suicidal thoughts (n = 903).				
Days	0	2000	4000	6000
Male 60–69 y	72	63	54	48
Male 70–79 y	73	42	18	8
Male 80 + y	133	47	5	0
Female 60–69 y	136	126	121	106
Female 70–79 y	128	99	62	43
Female 80 + y	361	172	47	16
	HR	CI	p value	
Life weariness and suicidal thoughts	Ref	-	-	
No	1.44	1.30–1.59	< 0.001	
Yes				
Sex-age interaction	Ref	-	-	
Female 60–69 y	3.86	3.29–4.54	< 0.001	
Female 70–79 y	11.21	9.60–	< 0.001	
Female 80 + y	1.77	13.08	< 0.001	
Male 60–69 y	7.42	1.49–2.10	< 0.001	
Male 70–79 y	17.79	6.30–8.74	< 0.001	
Male 80 + y		15.13–20.90	< 0.001	
Education	Ref	-	0.002	
Primary school	1.13	1.05–1.23		
Secondary school or higher education				

Number of people grouped by risk (time in days) in people with life weariness and suicidal thoughts (n = 903).

Marital status	Ref	-	-
Married	1.34	1.21– 1.48	< 0.001
Widow/-er	1.34	1.18– 1.54	< 0.001
Unmarried	1.22	1.07– 1.40	0.003
Divorced	0.97	0.74– 1.28	0.828
Living apart			
Housing	Ref	-	-
Community dwelling	1.68	1.41– 2.00	< 0.001
Residential care facility or other			
Geographic area	Ref	-	-
Urban	1.07	0.99– 1.16	0.100
Semi-urban	1.15	0.87– 1.52	0.319
Rural			
Financial difficulties in the past year	Ref	-	-
No	1.06	0.99– 1.25	0.502
Yes			
Able to access EUR 1,400 within a week	Ref	-	-
Yes	1.23	1.11– 1.36	< 0.001
No			
Feeling lonely	Ref	-	-
No	1.09	1.00– 1.18	0.051
Yes			
Country of birth	Ref	-	-
Sweden	1.34	1.10– 1.63	0.003
Other Nordic country	0.82	0.68– 0.99	0.043
Non-Nordic Europe	1.02	0.78– 1.35	0.882
Outside Europe			

Number of people grouped by risk (time in days) in people with life weariness and suicidal thoughts (n = 903).

Depression	Ref	-	-
No	1.01	0.91– 1.12	0.893
Yes			
Do you have someone who can help you when you are ill?	Ref	-	-
Yes	1.12	0.98– 1.29	0.100
No			
Number of individuals you know well enough that you can talk to them about everything	Ref	-	-
≥ 10	1.10	0.99– 1.22	0.087
4–9	1.12	1.01– 1.25	0.040
0–3			
Note: Log likelihood p value < 0.001. Cox analyses with enter model. Significant factors in bold. HR = Hazard ratio, CI = confidence interval, EUR = Euros			

Table 3

Hazard ratios for control factors on mortality: without and with life weariness/ suicidal thoughts.

	Without life weariness and suicidal thoughts			With life weariness and suicidal thoughts		
	HR	CI	p value	HR	CI	p value
Sex-age interaction	Ref	-	-	Ref	-	-
Female 60–69 y	3.83	3.22–4.55	< 0.001	4.65	2.87–7.54	< 0.001
Female 70–79 y	11.27	9.54–13.31	< 0.001	12.49	7.93–19.66	< 0.001
Female 80 + y	1.77	1.47–2.12	< 0.001	1.87	1.04–3.36	< 0.001
Male 60–69 y	7.25	6.09–8.63	< 0.001	9.77	5.93–16.08	< 0.001
Male 70–79 y	17.20	14.47–20.45	< 0.001	22.39	13.85–36.18	< 0.001
Male 80 + y						
Education	Ref	-	-	Ref	-	-
Primary school	1.12	1.02–1.22	0.013	1.22	1.00–1.48	0.047
Secondary school or higher education						
Marital status	Ref	-	-	Ref	-	-
Married	1.38	1.24–1.54	< 0.001	1.10	0.86–1.39	0.452
Widow/-er	1.41	1.22–1.63	< 0.001	0.91	0.64–1.31	0.613
Unmarried	1.21	1.04–1.41	0.013	1.34	0.80–1.62	0.485
Divorced	0.96	0.72–1.28	0.783	1.03	0.37–2.83	0.960
Living apart						
Housing	Ref	-	-	Ref	-	-
Community dwelling	1.53	1.25–1.87	< 0.001	2.23	1.57–3.18	< 0.001
Residential care facility or other						
Geographic area	Ref	-	-	Ref	-	-
Urban	1.13	1.04–1.24	0.005	0.78	0.64–0.95	0.015
Semi-urban	1.17	0.88–1.56	0.284	1.45	0.45–4.65	0.532
Rural						

	Without life weariness and suicidal thoughts			With life weariness and suicidal thoughts		
Financial difficulties in the past year	Ref	-	-	Ref	-	-
No	1.04	0.86– 1.24	0.714	1.30	0.88– 1.92	0.189
Yes						
Able to access EUR 1,400 within a week	Ref	-	-	Ref	-	-
Yes	1.22	1.08– 1.38	0.001	1.22	0.97– 1.53	0.089
No						
Feeling lonely	Ref	-	-	Ref	-	-
No	1.12	1.03– 1.23	0.012	0.97	0.79– 1.18	0.738
Yes						
Country of birth	Ref	-	-	Ref	-	-
Sweden	1.35	1.09– 1.67	0.007	1.24	0.75– 2.05	0.403
Other Nordic country	0.83		0.079	0.90		0.644
Non-Nordic Europe	0.99	0.67– 1.02	0.925	4.13	0.57– 1.42	0.006
Outside Europe		0.73– 1.33			1.51– 11.34	
Depression	Ref	-	-	Ref	-	-
No	0.92	0.82– 1.04	0.192	1.26	1.02– 1.57	0.034
Yes						
Do you have someone who can help you when you are ill?	Ref	-	-	Ref	-	-
Yes	1.15	0.98– 1.35	0.079	1.04	0.78– 1.37	0.799
No						
Number of individuals you know well enough that you can talk to them about everything	Ref	-	-	Ref	-	-
	1.11	0.99– 1.24	0.67	0.89	0.63– 1.26	0.738
≥ 10	1.12		0.50	0.98		0.508
4–9		1.00– 1.26			0.70– 1.39	
0–3						
Note: Log likelihood p value < 0.001. Cox regression analyses with enter model. Significant factors in bold. HR = Hazard ratio, CI = confidence interval, EUR = Euros						

- —————Insert Tables 2 and 3 here—————
- —————Insert Fig. 2 here—————

Discussion

This study, based on a large, geographically diverse, national sample of an older population (60 + years), investigated the importance of life weariness and suicidal thoughts for mortality when controlling for expected age-related factors. A total of 12.5% of participants reported life weariness and suicidal thoughts at baseline. About half of the individuals died and the interactions of higher age and sex increased the risk of mortality. Our analysis has added value concerning our understanding of the effect of life weariness and suicidal thoughts on mortality in older adults. For example, being an individual with life weariness and suicidal thoughts was independently associated with a 1.44 times higher risk (hazard ratio) for mortality at follow-up after 17 years, in comparison with those without such thoughts. Individuals with life weariness and suicidal thoughts had a shorter survival time (2.7 years) and their survival rate was half that of those of other individuals (24.5% vs. 50.6%).

People of advanced age have previously been found to be particularly vulnerable to health problems due to reduced internal and external resources (21), factors also included in the present study. Such conditions increase the complexity of meeting, identifying, treating, and studying older individuals regarding their suicidality; the high mortality rate found in this study underscores the importance of delaying the onset of life weariness and suicidal thoughts in the older population. Furthermore, the findings indicate that subtle and early signs of suicidality, such as life weariness and suicidal thoughts, need to be assessed more structurally and thoroughly in old age, especially within community and primary care settings. By detecting life weariness and suicidal thoughts through screening, identifying causes, and developing solutions, we could improve preventive strategies and treatment, and thereby reduce the risk of premature mortality.

With the expected increase of life weariness and suicidal thoughts in the population due to increased demographic aging, it is vital to understand early signs and risk factors for premature death. The present study contributes to the understanding of the possible long-term importance of demographic and social characteristics on mortality in old age. Our study is supported by earlier evidence about the elevated risk of mortality in older individuals with suicidal thoughts (14, 15). A recent Korean literature review points out the importance of considering multi-level factors, including individual, family, and social aspects, that interact over a lifetime in the protection against suicidal thoughts in old age (22). This highlights the importance of including several factors over time in research. However, there are still few robust studies from other countries and under other conditions, making it difficult to validate results.

Regarding the demographic factors, the present study confirms a number of factors established by previous research, most of which was cross-sectional, regarding the sex and age interaction with suicidality. In this study, more females (8%) than males (3.7%) had life weariness and suicidal thoughts at baseline ($P < 0.001$). The highest proportion of life weariness and suicidal thoughts was found in the

group of females 80 + years (23.0%), followed by the oldest males (17.9%). The results are supported by Barnow et al. (23) and Barnow and Linden (1), but not by Alaneida et al. (24) and Ko et al (25), who found a higher proportion among men. Interestingly, when investigating the predictive value of the sex-age interaction on mortality, we found that males 80 + years with life weariness and suicidal thoughts, not females, had the highest multi-adjusted hazard ratio of mortality (22.4, CI 13.85–36.18). In previous literature, there is no clear consensus on if the sex of older adults has a potential relationship with suicidality. For instance, it has been found that older men are at higher risk of suicide than women (3, 24, 26–29), but also that there are no sex differences as regards suicidal thoughts (12, 30, 31). Here, the varying results may be due to the use of different spectrums of the concept, the contexts, and the measurements of suicidality in the studies of the older population, as well as the age populations included. This complexity justifies the assumption of moderation through several factors, and confirms the relevance of including socio-demographic factors to verify factors contributing to mortality.

Another important finding of the present study was that life weariness and suicidal thoughts increased with higher age. This finding is in agreement with prior research showing that suicidal thoughts increase with advanced age (10), although no previous study used a combined variable encompassing both sex and age. In addition, the highest difference in survival rate was found in males 70–79 years, where those without life weariness and suicidal thoughts had 3.6 years longer survival time (10.9 years vs. 7.3 years, P value < 0.001) than males with life weariness and suicidal thoughts. We did not specifically investigate the risk of death by completed suicide, which is higher in older males, but our study indicates that being a man, especially of high age, with suicidal thoughts, poses a risk for mortality. It should be noted that our study, like previous research, only asked about legal sex (i.e., male or female) and we lack an understanding of how gender identification potentially affects the results presented here.

Several other independent predictors, aside from life weariness and suicidal thoughts and sex-age interactions, had varying yet significant importance for mortality in the models separated for individuals with and without life weariness and suicidal thoughts (cf. Table 3). Therefore, living in a residential care facility, being born in a country outside Europe, not being married, having insufficient financial resources, having low education, and having an insufficient social network should also be factors considered in the discussion of mortality and life weariness and suicidal thoughts in the older population. Although not investigated here, it may not be living in a residential care facility that increase the risk of mortality, but declined physical and mental health and functional ability and a lack of social relationships, which are more common in people living in residential care facilities than in ordinary homes. Holt-Lunstad et al. (32) and Yasuda et al. (33) found the importance of social network contacts for mortality, but also found that contacts decreased with age. Not only a lack of social interactions, but also the number of people that a person feels they can trust, have in previous literature been associated with mortality in old age (34, 35). In Sweden, about half of the older population (80+) are living alone (36). Furthermore, in the age group (80+), more women than men are living alone and about 80% of them are widows (37), often living with restricted financial resources and having low education, i.e., factors connected to mortality in old age (38). Such circumstances need to be considered in the understanding of differences in survival in old age,

as well as the varying importance of these factors in the groups with or without life weariness and suicidal thoughts.

In the literature, there are conflicting results regarding whether the effect of suicidal thoughts on mortality in older adults remains after controlling for factors such as depression (15). The findings in the present study suggest that life weariness and suicidal thoughts have an effect on mortality in old age, after controlling for depression. This is in line with two other longitudinal studies which found that suicidal thoughts had a significant association with mortality after controlling for various factors, including depression (14, 15). This finding has important implications for targeting preventive actions for old age mental health and premature mortality. A systematic literature review focusing on preventive interventions for suicidal thoughts in older individuals found that most studies have targeted depression as a risk predictor, for example through primary care depression screening and management (39). Such interventions are important, but may not be sufficient to prevent suicidal thoughts and premature death, in the long term. Furthermore, previous research has found depression to be a strong influential factor for suicidality in old age (see for example (24, 28, 40)). Death by suicide was not investigated in the present study, yet our results showed that depression had an effect on mortality in the case of individuals reporting life weariness and suicidal thoughts. Undoubtedly, the effect of life weariness, suicidal thoughts, and depression on mortality is complex, with difficulties determining the potential reverse effects regarding depression and suicidal thoughts on mortality. Still, considering the elevated risk of mortality in individuals with life weariness and suicidal thoughts and without depression in the present study, more research into preventive interventions is needed.

The strengths of this study include the prospective design, with the possibility to investigate the long-term effects on mortality in a large sample, and the nationally representative sample. The study also includes several demographic and social confounders which are relevant in advanced age and can be expected to influence the association between suicidal thoughts and mortality. Furthermore, the sample includes individuals living in urban and rural areas, in ordinary homes and in residential care facilities, meaning that the result can be discussed and generalised in the general old-age population. Limitations might include that we have no information about the individuals who participated at baseline, but were lost at the time of the follow-up. Also, the choice of using self-reported life weariness and suicidal thoughts may introduce a bias by underreporting, due to normalisation and unrecognition (3) of the symptoms in late life. This may lead to a misclassification of the risk group. Moreover, although the item taken from the MADRS scale comprises response alternatives ranging from life weariness to explicit plans and active preparation for suicide, the original item used is described only as suicidal thoughts by the authors (13), which could be misleading in the conceptualisation of the concept (cf. (12)).

Among the individuals randomly invited to participate in SNAC, the most common reason not to participate was poor health. It might be a limitation that only depression was included in the analysis as a well-known predictor for suicidal thoughts. There is reason to believe that diseases other than depression may also have a relationship to life weariness and suicidal thoughts and would be relevant to include, especially considering that the variable residential home facility was an independent risk factor

for mortality. However, the potential importance of health factors for mortality was outside the scope in the present study. Approximately 3% (n = 203) of the included individuals declined to share information about life weariness and suicidal thoughts, meaning that the rate of individuals with life weariness and suicidal thoughts could be underrepresented. However, the proportion found (12.5%) replicates previous findings of suicidal expressions, where about 13% experienced life weariness (41).

Conclusions

This study is, to our knowledge, the first to investigate the relationship between life weariness and suicidal thoughts and survival in older persons, using a large and nationally representative sample over a long time period. The findings underline life weariness and suicidal thoughts as risk factors for long-term mortality. Individuals with life weariness and suicidal thoughts had half the survival rate and a shorter survival time compared with those without such thoughts. This study also shows that the interaction between sex and age predicts long-term mortality among older people, especially in individuals with life weariness and suicidal thoughts. The findings suggest the importance of strategies of screening, identifying, and intercepting early signs in older men and women with life weariness and suicidal thought. Such strategies should be considered to improve the survival rate in the older population.

Abbreviations

CI

confidence interval

GÅS

Good Aging in Skåne

HR

hazard ratio

LR

likelihood ratio

MADRS

Montgomery-Åsberg Depression Rating Scale

SD

standard deviation

SNAC

Swedish National Study on Aging Care

Declarations

Trial registration Not applicable.

Ethics approval and consent to participate

The ethics committee of Lund University (LU 128-00, LU 604-00, LU 744-00) approved the SNAC Blekinge and GÅS studies and the committee of Karolinska Institutet, Stockholm (KI 01-114) approved the SNAC Kungsholmen.

Consent for publication

Not applicable.

Availability of data and material

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

CF designed the study, performed the statistical analyses, including data analysis, and drafted the manuscript together with HT. A-KW and SE contributed to the design of the study, the data collection and the intellectual content. All the authors read and approved the final manuscript.

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Tables

Figures

Table 1 Descriptive characteristics of population at baseline (n = 7,213) and 17-year follow-up, by mortality group.

Variables	Baseline (n = 7213)	Survivors (n = 3409)	Deceased (n = 3804)	p value
Age group (%)				<
60–69 years	3147	2540 (74.5)	607	0.001 ³
70–79 years	(43.6)	709 (20.8)	(16.0)	
> 80 years	1754	160 (4.7)	1045	
Mean age (SD)	(24.3)	65.74 (6.75)	(27.5)	
	2312		2152	
	(32.1)		(56.6)	
	73.11		79.72	
	(10.72)		(9.21)	
Sex				
Female (%)	4291	2029 (59.8)	2262	<
	(59.5)		(52.7)	0.001 ¹
Sex-age interaction (%)				<
Male 60–69 y	1474	1128 (33.1)	346 (9.1)	0.001 ¹
Male 70–79 y	(20.4)	213 (6.2)	494	
Male 80+ y	707	39 (1.1)	(13.0)	
Female 60–69 y	(9.8)	1412 (41.4)	702	
Female 70–79 y	741	496 (14.5)	(18.5)	
Female 80+ y	(10.3)	121 (3.5)	261 (6.9)	
	1673		551	
	(23.2)		(14.5)	
	1047		1450	
	(14.5)		(38.1)	
	1571			
	(21.8)			
Marital status (%)				<
Married	3520	2117 (62.5)	1403	0.001 ¹
Widow/-er	(49.8)	385 (11.4)	(38.1)	
Unmarried	1890	320 (9.5)	1505	
Divorced	(26.7)	458 (12.2)	(40.8)	
Living apart	708	105 (3.1)	388	
	(10.0)		(10.5)	
	788		330 (9.0)	
	(11.1)		60 (1.6)	
	169			
	(2.2)			
Country of birth (%)				
Sweden	6503	3045 (89.5)	3458	0.001 ¹
Nordic countries	(91.3)	112 (3.3)	(92.9)	
Europe	222	211 (6.2)	110 (3.0)	
Outside Europe	(3.1)	33 (1.0)	124 (3.3)	
	335		29 (0.8)	
	(4.7)			
	62 (0.9)			

Geographical area (%)				<
Urban	4958	2569 (75.4)	2389	0.001 ¹
Medium-sized town	(68.7)	800 (23.5)	(62.8)	
Rural	2158	40 (1.2)	1358	
	(29.9)		(35.7)	
	97 (1.3)		57 (1.5)	
Highest level of education (%)				<
Primary school, left at age < 13 yrs	2268	763 (23.0)	1505	0.001 ²
Secondary school, left at age 14–16 yrs	(32.7)	379 (11.4)	(41.6)	
Upper secondary or vocational school, left at age 18–19 yrs	831	1123 (33.8)	452	
	(12.0)		(12.5)	
College or above	2252	1053 (31.7)	1129	
	(32.4)		(31.2)	
	1589		536	
	(22.9)		(14.8)	
Housing (%)				<
Community dwelling	6816	3362 (99.2)	3454	0.001 ¹
Residential care facility and other	(96.2)	26 (0.8)	(93.5)	
	267		241 (6.5)	
	(3.8)			
Financial difficulties in the last year				
Yes	373	1173 (5.1)	200 (5.5)	0.453 ¹
	(5.3)			
Able to access EUR 1,400 within a week (%)				<
Yes	6043	3042 (90.6)	3001	0.001 ¹
	(87.6)		(84.8)	
Depression (%)				
Yes	1060	539 (15.9)	521	0.006 ¹
No	(14.8)	2822 (83.2)	(13.8)	
Don't know	6048	29 (0.9)	3226	
	(84.5)		(85.7)	
	47 (0.7)		18 (0.5)	
Do you have someone who can help you when you are ill? (%)				<
Yes, no problem	4468	2317 (71.1)	2151	0.001 ²
Yes, probably	(67.7)	836 (25.7)	(64.4)	
No, probably not	1766	79 (2.4)	930	
No, I do not	(26.8)	27 (0.8)	(27.8)	
	244		165 (4.9)	
	(3.7)		94 (2.8)	
	121			
	(1.8)			
Number of individuals you know well enough that you can talk to them about everything (%)				<
None				0.001 ²
1–3	149	51 (1.6)	98 (2.9)	
4–6	(2.3)	1034 (31.6)	1335	
7–9		1090 (33.3)	(39.9)	

10-15	2369	449 (13.7)	1044	
16-30	(35.8)	386 (11.8)	(31.2)	
> 30	2134	168 (5.1)	356	
	(32.2)	95 (2.9)	(10.6)	
	805		321 (9.6)	
	(12.2)		114 (3.4)	
	707		81 (2.4)	
	(10.7)			
	282			
	(4.3)			
	176			
	(2.7)			
<hr/>				
Religious beliefs (%)				<
Yes	2868	1245 (44.0)	1623	0.001 ¹
No	(49.0)	1584 (56.0)	(53.7)	
	2984		1400	
	(51.0)		(46.3)	
<hr/>				
Feeling lonely (%)				<
Yes, often	449	118 (3.5)	331 (9.1)	0.001 ²
Yes, sometimes	(6.4)	740 (22.0)	1123	
No, seldom	1863	1071 (31.8)	(30.9)	
No, never	(26.6)	1438 (42.7)	886	
	1957		(24.4)	
	(28.0)		1291	
	2729		(25.6)	
	(39.0)			
<hr/>				
Suicidal thoughts (%)				<
No suicidal thoughts	6310	3189 (93.5)	3121	0.001 ¹
Life weariness	(87.5)	197 (5.8)	(82.0)	
Suicidal thoughts	814	23 (0.7)	617	
	(11.3)		(16.2)	
	89 (1.2)		66 (1.7)	

Note: Chi-squared test was performed for nominal data⁽¹⁾, the Mann-Whitney U-test for ordinal data⁽²⁾, and Student's t-test⁽³⁾ for interval data. SD = standard deviation, EUR = Euros. The p value < 0.05 was used to test significance.

Table 2. Hazard ratios for life weariness/suicidal thoughts in relation to mortality, adjusted for control factors included.

	HR	CI	p value
Life weariness and suicidal thoughts			
No	Ref	-	-
Yes	1.44	1.30-1.59	< 0.001
Sex-age interaction			
Female 60-69 y	Ref	-	-
Female 70-79 y	3.86	3.29-	<
Female 80+ y	11.21	4.54	0.001
Male 60-69 y	1.77	9.60-	<
Male 70-79 y	7.42	13.08	0.001
Male 80+ y	17.79	1.49-2.10	< 0.001
		6.30-8.74	< 0.001
		15.13-20.90	< 0.001
Education			
Primary school	Ref	-	-
Secondary school or higher education	1.13	1.05-1.23	0.002
Marital status			
Married	Ref	-	-
Widow/-er	1.34	1.21-	<
Unmarried	1.34	1.48	0.001
Divorced	1.22	1.18-	<
Living apart	0.97	1.54	0.001
		1.07-1.40	0.003
		0.74-1.28	0.828
Housing			
Community dwelling	Ref	-	-
Residential care facility or other	1.68	1.41-2.00	< 0.001
Geographic area			
Urban	Ref	-	-
Semi-urban	1.07	0.99-	0.100
Rural	1.15	1.16	0.319
		0.87-1.52	
Financial difficulties in the past year			

No	Ref	-	-
Yes	1.06	0.99– 1.25	0.502
Able to access EUR 1,400 within a week			
Yes	Ref	-	-
No	1.23	1.11– 1.36	< 0.001
Feeling lonely			
No	Ref	-	-
Yes	1.09	1.00– 1.18	0.051
Country of birth			
Sweden	Ref	-	-
Other Nordic country	1.34	1.10–	0.003
Non-Nordic Europe	0.82	1.63	0.043
Outside Europe	1.02	0.68– 0.99 0.78– 1.35	0.882
Depression			
No	Ref	-	-
Yes	1.01	0.91– 1.12	0.893
Do you have someone who can help you when you are ill?			
Yes			
No	Ref	-	-
	1.12	0.98– 1.29	0.100
Number of individuals you know well enough that you can talk to them about everything			
≥ 10	Ref	-	-
4–9	1.10	0.99–	0.087
0–3	1.12	1.22 1.01– 1.25	0.040

Note: Log likelihood p value < 0.001. Cox analyses with enter model. Significant factors in bold. HR = Hazard ratio, CI = confidence interval, EUR = Euros

Table 3. Hazard ratios for control factors on mortality: without and with life weariness/suicidal thoughts.

	Without life weariness and suicidal thoughts			With life weariness and suicidal thoughts		
	HR	CI	p value	HR	CI	p value
Sex-age interaction						
Female 60–69 y	Ref	-	-	Ref	-	-
Female 70–79 y	3.83	3.22–4.55	<	4.65	2.87–	<
Female 80+ y	11.27	9.54–13.31	0.001	12.49	7.54	0.001
Male 60–69 y	1.77	1.47–2.12	<	1.87	7.93–	<
Male 70–79 y	7.25	6.09–8.63	0.001	9.77	19.66	0.001
Male 80+ y	17.20	14.47–20.45	<	22.39	1.04–	<
			0.001		3.36	0.001
			<		5.93–	<
			0.001		16.08	0.001
			<		13.85–	<
			0.001		36.18	0.001
Education						
Primary school	Ref	-	-	Ref	-	-
Secondary school or higher education	1.12	1.02–1.22	0.013	1.22	1.00–1.48	0.047
Marital status						
Married	Ref	-	-	Ref	-	-
Widow/-er	1.38	1.24–1.54	<	1.10	0.86–	0.452
Unmarried	1.41	1.22–1.63	0.001	0.91	1.39	0.613
Divorced	1.21	1.04–1.41	<	1.34	0.64–	0.485
Living apart	0.96	0.72–1.28	0.001	1.03	1.31	0.960
			0.013		0.80–	
			0.783		1.62	
					0.37–	
					2.83	
Housing						
Community dwelling	Ref	-	-	Ref	-	-
Residential care facility or other	1.53	1.25–1.87	<	2.23	1.57–	<
			0.001		3.18	0.001
Geographic area						
Urban	Ref	-	-	Ref	-	-
Semi-urban	1.13	1.04–1.24	0.005	0.78	0.64–	0.015
Rural	1.17	0.88–1.56	0.284	1.45	0.95	0.532
					0.45–	
					4.65	
Financial difficulties in the past year						

No	Ref	-	-	Ref	-	-
Yes	1.04	0.86–1.24	0.714	1.30	0.88–1.92	0.189
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Able to access EUR 1,400 within a week						
Yes	Ref	-	-	Ref	-	-
No	1.22	1.08–1.38	0.001	1.22	0.97–1.53	0.089
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Feeling lonely						
No	Ref	-	-	Ref	-	-
Yes	1.12	1.03–1.23	0.012	0.97	0.79–1.18	0.738
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Country of birth						
Sweden	Ref	-	-	Ref	-	-
Other Nordic country	1.35	1.09–1.67	0.007	1.24	0.75–	0.403
Non-Nordic Europe	0.83	0.67–1.02	0.079	0.90	2.05	0.644
Outside Europe	0.99	0.73–1.33	0.925	4.13	0.57– 1.42 1.51– 11.34	0.006
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Depression						
No	Ref	-	-	Ref	-	-
Yes	0.92	0.82–1.04	0.192	1.26	1.02–1.57	0.034
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Do you have someone who can help you when you are ill?						
Yes	Ref	-	-	Ref	-	-
No	1.15	0.98–1.35	0.079	1.04	0.78–1.37	0.799
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Number of individuals you know well enough that you can talk to them about everything						
≥ 10						
4–9	Ref	-	-	Ref	-	-
0–3	1.11	0.99–1.24	0.67	0.89	0.63–	0.738
	1.12	1.00–1.26	0.50	0.98	1.26 0.70– 1.39	0.508

Note: Log likelihood p value < 0.001. Cox regression analyses with enter model. Significant factors in bold.
HR = Hazard ratio, CI = confidence interval, EUR = Euros

Number of people grouped by risk (time in days) in the total sample (n = 7,213).

Days	0	2000	4000	6000
Male 60-69 y	1474	1369	1228	1128
Male 70-79 y	707	548	360	215
Male 80+ y	741	373	109	39
Female 60-69 y	1673	1613	1523	1413
Female 70-79 y	1047	905	685	499
Female 80+ y	1571	880	330	121

Number of people by risk group (time in days) in those with no life weariness and suicidal thoughts (n = 6,310).

Days	0	2000	4000	6000
Male 60-69 y	1402	1306	1174	1080
Male 70-79 y	634	506	342	207
Male 80+ y	608	326	104	39
Female 60-69 y	1537	1487	1402	1307
Female 70-79 y	919	806	623	456
Female 80+ y	1210	708	283	105

Number of people grouped by risk (time in days) in people with life weariness and suicidal thoughts (n = 903).

Days	0	2000	4000	6000
Male 60-69 y	72	63	54	48
Male 70-79 y	73	42	18	8
Male 80+ y	133	47	5	0
Female 60-69 y	136	126	121	106
Female 70-79 y	128	99	62	43
Female 80+ y	361	172	47	16

Figure 1

(Top) a. Survival curve and time table for the total sample (log rank test, p value <0.001). (Middle) b. Survival curve and time table for no life weariness and suicidal thoughts (log rank test, p value <0.001). (Bottom) c. Survival curve and time table for life weariness/suicidal thoughts (log rank test, p value <0.001).

Figure 2

Survival curve for life weariness and suicidal thoughts, adjusted for control factors