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The European Journal of Public Health, Vol. 29, No. 3, 582–587
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doi:10.1093/eurpub/cky189 Advance Access published on 10 September 2018

Mortality after the death of a parent in adulthood: a register-based comparison of two ethno-linguistic groups

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Background: Most research on parental bereavement and health have analysed health consequences of parental loss in childhood, while collateral health in adulthood has been less studied. **Methods:** Using register-based population data from Finland, we analyse adult offspring aged 18–50 years with discrete-time hazard models that adjust for offspring and parental socioeconomic and demographic characteristics. In focus are adult children whose parents were alive and lived together at the beginning of the observation period. We compare two culturally distinct but otherwise similar ethno-linguistic groups, Finnish speakers and Swedish speakers. **Results:** The results suggest that bereaved men have an approximately 30% higher death risk than non-bereaved men, while there is practically no difference in women. Associations between parental and child deaths are, as expected, stronger for concordant causes of death than for discordant causes of death. However, some associations for discordant causes of death remain, which may indicate causality. Among Swedish speakers, who have notably higher family stability than Finnish speakers, the death of one or both parents shows a stronger association with own mortality. **Conclusions:** The estimated associations found are generally larger than in the neighbouring country Sweden, which may be due to a stronger obedience to traditional family values and patriarchal family roles in Finland. These findings suggest that the association between parental death and mortality in adult offspring may depend on the societal context as well as on cultural practices. These factors should be increasingly acknowledged in future studies on collateral health.

Introduction

When a person dies, he or she leaves family members behind who have to deal with the grief and stress of losing an intimate and important relationship in their life. There is extensive evidence showing that the death of a family member negatively influences the health of bereaved family members.[1–3] There may also be social and economic consequences for the individual, as well as unintended economic and social costs for the society.[4] Most research in the field of parental bereavement and offspring health have studied the consequences of parental loss in childhood, while collateral health in adulthood has been less analysed. This is somewhat surprising, considering that, due to the continuing increase in life expectancy, most people in economically developed societies experience parental death in adulthood. Parental death may nevertheless not only be associated with negative outcomes for the bereaved offspring, and positive and negative effects may even cancel each other out.[5] Given the emotional strain that precedes the death of an aging and ill parent, it may even bring relief from worries and release the adult offspring from other burdens, such as the provision of informal care.[6]

Research on collateral health generally require large-scale data with a considerable follow-up period, and in the case when offspring and their parents are studied, also multigenerational linkage. Data from population registers are particularly useful, since they are virtually free of sample attrition and have no self-reporting bias. Evidence based on data of this kind, from Sweden[7] and the USA,[8] suggests that there is an association between parental death and the adult offspring mortality risk, although fairly modest and primarily related to sudden deaths in offspring, such as suicides and accidents. The US evidence is based on data from the Utah Population Database, and considers a quite different societal context than Sweden. In this paper, we use Finnish data that are highly similar to those used in the Swedish study. Thus, we are able to replicate the previous evidence from Sweden, but for a neighbouring country. Overall mortality and birth rates in both countries are low and comparable, and the Finnish and Swedish societies are much alike with regard to economic institutions, social conditions and political environment.

An important threat to causal inference in studies of this kind is that the death of two persons in the same family may share a common prior cause, foremost because of genetic similarities, shared environmental exposures and shared risk behaviours within the family. Different approaches have been suggested to attempt accommodate the problem of confounding. One has been to examine deaths due to specific causes of death.[9,10] Another approach has been to utilize some exogenous event that is independent of social and biological factors. An example is so-called anniversary reactions, which refer to a phenomenon where temporal triggers precipitate acute reactions, such as grief, anger depression and despair associated with the traumatic event on the date of a close person's death.[11] Both approaches have found support for the argument that the experience of a close person's death may have a causal influence on own mortality.[12–14] This paper approaches the issue from yet another perspective, which builds on the intuition that social phenomena do not have uniform effects across a population. Across subgroups, cultural norms and values that are important for family stability and views on the role and importance of the nuclear family may vary, and this is likely to influence also health effects related to bereavement.

We are therefore interested also in whether the association between parental and child deaths differs across two culturally distinct groups. Due to low levels of immigration of foreign-born individuals until the very recent years, Finland has a homogenous population. However, there are two ethno-linguistic groups in the country, which both are native, equal and guaranteed similar rights. Most remarkable is that they differ largely in terms of union stability. Finnish speakers, who constitute approximately 90% of the country's population, have almost twice higher the risks of divorce and separation from cohabiting unions, as compared with Swedish speakers, who constitute about 5.5% of the total population. This ethno-linguistic gradient in separation risks is not dependent on socioeconomic and demographic factors.[15] It is therefore believed to reflect a difference in cultural practices related to family life and the importance of the nuclear family, presumably associated with a higher degree of social cohesion in the Swedish-speaking group than in the Finnish-speaking one.[16] Considering that Swedish speakers seem to attach stronger values and norms to the role of the family as an institution, one might expect that the loss of a parent is stronger associated with subsequent own mortality. We will investigate whether this may be the case by performing parallel analyses for these two groups.

The primary aim with this paper is therefore to study associations between parental death and subsequent mortality in adult offspring, since many studies have investigated bereavement only in childhood. Furthermore, we aim also to compare with previous evidence for Sweden,[7] and to explore potential differences in these associations between two ethno-linguistic groups.

Methods

Data sources

The data, used with permission TK-53-768-12, came from the Finnish population register and had linkage to Statistics Finland's employment statistics file, death registries and records of the Social Insurance Institute (KELA). The data sources were merged by Statistics Finland using personal identification numbers. In the Finnish population register, people can be uniquely identified according to ethno-linguistic affiliation, which means that Finnish speakers and Swedish speakers could be distinguished.

Study population

The data we had consisted of a 5% random sample of all Finnish speakers living in Finland in 1988–2011. For Swedish speakers, there was a similar 20% random sample. Swedish speakers were oversampled since they constitute only about 5.5% of the total population.

Each of these index persons could be observed longitudinally on an annual basis between 1 January 1988 and 31 December 2011. For each of them, there was linkage to the biological children and to the potential partner, who could be observed during the same period. The partner identification was based on a standard procedure performed by Statistics Finland, referring to a person who lived in the same dwelling as the index person, was of opposite sex, was not a close relative, and whose age did not differ more than 20 years from that of the index person.

We had no information about whether the partner was the other biological parent of the child. Some of them were consequently stepparents. However, based on divorce and remarriage propensities, we approximated that stepparents accounted for less than 5% of all parents in the data.

All analyses concerned adult offspring aged 18–50 years. Our approach for studying how offspring mortality related to parental mortality was highly similar to that of Rostila and Saarela.[6] We observed the offspring from the beginning of 1988, or later if they lived abroad in 1988. The data were restricted to persons whose both parents were alive and lived together at the beginning of the observation period.

In these data, there were 117 489 Finnish-speaking men, 24 021 Swedish-speaking men, 110 363 Finnish-speaking women, and 21 852 Swedish-speaking women (table 1). The total number of deaths in each group was 3284, 411, 1173 and 179.

Variables

For each index person (parent), adult child and partner (the other parent), there was information about the year of potential death,

Table 1 Descriptive statistics of the analytic data, offspring aged 18–50 years

	Finnish-speaking men	Swedish-speaking men	Finnish-speaking women	Swedish-speaking women
Number of offspring	117 489	24 021	110 363	21 852
Number of person-years in offspring	1 801 263	357 602	1 706 823	324 070
Number of sibling groups	52 964	11 504	49 465	10 356
Number of offspring deaths	3284	411	1173	179
Number of paternal deaths	26 617	4991	25 142	4536
Number of maternal deaths	12 074	2442	11 422	2109
Experience of parental death (%)				
No parental death	83.3	84.6	83.0	84.6
Father died	11.4	10.2	11.6	10.3
Mother died	3.3	3.4	3.2	3.3
Both parents died	2.1	1.9	2.1	1.8
Offspring deaths by main cause (%)				
Cardiovascular disease	13.7	14.6	11.2	9.5
Cancer	10.3	17.0	31.1	47.5
Other disease	10.9	13.9	17.4	16.2
Alcohol related	14.7	8.0	8.6	4.5
Suicide	23.8	18.5	13.9	9.5
Other external	26.6	28.0	17.8	12.8
Paternal deaths by main cause (%)				
Cardiovascular disease	45.3	43.1	45.2	42.7
Cancer	26.3	32.4	26.5	32.9
Other disease	14.2	15.4	13.9	15.0
Alcohol related	4.5	2.0	4.4	2.5
Suicide	3.5	2.1	3.6	2.1
Other external	6.2	4.9	6.3	4.8
Maternal deaths by main cause (%)				
Cardiovascular disease	36.5	29.4	35.9	30.0
Cancer	36.9	46.0	36.5	46.7
Other disease	16.4	17.4	17.0	16.2
Alcohol related	2.9	1.6	3.3	1.2
Suicide	2.4	2.1	2.6	1.8
Other external	4.9	3.5	4.7	4.1
Offspring's age in years				
18–24	25.2	24.6	25.2	24.8
25–30	21.0	20.1	21.0	20.2
31–40	31.6	31.4	31.7	31.7
41–50	22.3	23.9	22.1	23.3
Father's age in years				
≤50	16.7	14.1	16.7	14.4
51–60	32.1	30.5	32.1	30.9
61–70	28.5	28.9	28.6	28.8
71+	22.7	26.5	22.6	25.8
Mother's age in years				
≤50	22.9	20.3	23.0	20.5
51–60	33.3	32.5	33.3	32.8
61–70	27.3	28.2	27.4	28.2
71+	16.4	19.0	16.3	18.5

Experience of parental death, age of offspring and age of each parent are time-varying variables and the description here refers to their distribution according to time under risk.

mortality from six main causes of death, and whether the person lived abroad during any of the study years. There was a number of demographic and socioeconomic background variables. We included control variables for offspring and parental characteristics, and a variable for period. Variables for offspring characteristics were age, level of education, income, household type and region of residence. Variables for parental characteristics were father's age, mother's age, father's level of education, mother's level of education, father's income, mother's income, parental homeownership and parental region of residence. We operated mainly with three sets of control variables (see the following section). Descriptive statistics are found in Supplementary table S1.

Statistical analyses

The data were split by calendar year. For each year, we categorized an adult child according to whether he or she experienced the death of the father, the mother or both parents during the calendar year, and if so, the number of calendar years since the event. In almost three quarters of all cases of parental death, the father died before the mother, whereas in only 1.5% of all cases the father and the mother died during the same calendar year.

Discrete-time hazard models were used to estimate the offspring mortality risk, where the focus was on assessing effects related to parental death. The individuals were censored at the time of death, at the time of migration abroad and at the end of the study period. Separate analyses were undertaken by sex and ethno-linguistic group. We accounted for dependence between siblings, based on the index person (the known biological parent), using a random-effects specification.[17]

Results

For Finland, we found that parental death had a notable association with the adult offspring mortality risk (table 2, upper panel). When having controlled for both offspring and parental characteristics, Finnish-speaking men who experienced the death of a parent had a mortality risk that was 1.33 (95% CI: 1.22–1.45) that of men who did not experience the death of a parent. For Swedish-speaking men,

Table 2 Effect of parental death on the offspring mortality risk in models with different sets of control variables, by sex and ethno-linguistic group

	Finnish speakers			Swedish speakers		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Men						
No parental death	1	1	1	1	1	1
Parent died	1.54 (1.42–1.68)[a]	1.27 (1.17–1.38)[a]	1.33 (1.22–1.45)[a]	1.70 (1.33–2.17)[a]	1.44 (1.12–1.85)[a]	1.47 (1.13–1.91)[a]
Women						
No parental death	1	1	1	1	1	1
Parent died	1.26 (1.09–1.44)[a]	1.09 (0.95–1.26)	1.09 (0.94–1.27)	1.57 (1.08–2.26)[a]	1.42 (0.98–2.05)	1.39 (0.93–2.09)
Men						
No parental death	1	1	1	1	1	1
Father died	1.47 (1.34–1.62)[a]	1.27 (1.15–1.39)[a]	1.32 (1.19–1.45)[a]	1.64 (1.24–2.17)[a]	1.44 (1.08–1.92)[a]	1.49 (1.11–2.00)[a]
Mother died	1.55 (1.32–1.81)[a]	1.28 (1.10–1.50)[a]	1.33 (1.14–1.56)[a]	1.27 (0.78–2.06)	1.17 (0.72–1.91)	1.19 (0.72–1.96)
Both parents died	1.94 (1.65–2.28)[a]	1.26 (1.07–1.47)[a]	1.38 (1.17–1.64)[a]	2.83 (1.84–4.36)[a]	1.79 (1.16–2.75)[a]	1.87 (1.19–2.94)[a]
Women						
No parental death	1	1	1	1	1	1
Father died	1.15 (0.98–1.35)	1.02 (0.87–1.20)	1.03 (0.87–1.22)	1.56 (1.04–2.35)[a]	1.45 (0.96–2.19)	1.47 (0.94–2.30)
Mother died	1.14 (0.86–1.51)	1.02 (0.77–1.35)	1.02 (0.77–1.36)	1.10 (0.53–2.29)	1.00 (0.48–2.12)	0.96 (0.43–2.11)
Both parents died	1.93 (1.52–2.46)[a]	1.49 (1.17–1.90)[a]	1.52 (1.17–1.97)[a]	2.25 (1.19–4.26)[a]	1.78 (0.92–3.43)	1.74 (0.83–3.64)

Estimates are risk ratios with 95% confidence intervals within parentheses.
a: Indicates that the estimate is statistically significant at the 5% level.
Model 1 includes only age and period. Model 2 adds the variables for offspring characteristics. Model 3 adds the variables for parental characteristics.
In the upper panel, parental death refers to whether any or both parents died. In the lower panel, parental death distinguishes whether the father, the mother or both parents died.

Table 3 Effect of parental type of death on mortality risk by type of death in offspring, by sex and ethno-linguistic group

	Natural cause	**External cause**
Finnish-speaking men		
No parental death	1	1
Parent died of natural cause	1.22 (1.05–1.41)[a]	1.31 (1.16–1.48)[a]
Parent died of external cause	1.10 (0.76–1.61)	1.83 (1.48–2.25)[a]
Swedish-speaking men		
No parental death	1	1
Parent died of natural cause	1.62 (1.12–2.36)[a]	1.26 (0.84–1.90)
Parent died of external cause	1.73 (0.60–4.96)	1.37 (0.46–4.07)
Finnish-speaking women		
No parental death	1	1
Parent died of natural cause	1.12 (0.92–1.37)	0.91 (0.70–1.18)
Parent died of external cause	1.16 (0.72–1.86)	1.70 (1.11–2.62)[a]
Swedish-speaking women		
No parental death	1	1
Parent died of natural cause	1.26 (0.77–2.08)	1.78 (0.53–5.98)
Parent died of external cause	0.55 (0.06–4.82)	4.12 (0.81–21.03)

Estimates are risk ratios with 95% confidence intervals within parentheses.
a: Indicates that the estimate is statistically significant at the 5% level.
All control variables are included in each of these 8 models.
Parental death here refers to death of the father, the mother or both.
Natural cause refers to cardiovascular disease, cancer and other disease.
External cause refers to alcohol related, suicide and other external.

the estimated association was slightly higher, or 1.47 (95% CI: 1.13–1.91). The association was attenuated for women. For Finnish-speaking women, the mortality risk ratio was 1.09 (95% CI: 0.95–1.26), and for Swedish-speaking women 1.39 (95% CI: 0.93–2.09).

We studied also whether the association depended on age when parental death was experienced and time since the death (results not shown). We found an association also in older adulthood (ages 40–50 years), albeit the estimates were slightly larger in younger adulthood (ages 18–39 years). Furthermore, we could see that the elevated mortality risk associated with parental death was close to monotonous over time since parental death.

We further separated between father's death, mother's death and both parents' death (table 2, lower panel). Finnish-speaking men who experienced the death of the father had a mortality risk that was 1.32 (95% CI: 1.19–1.45) that of those with no such experience, those who experienced mother's death 1.33 (95% CI: 1.14–1.56), and those experienced both parents' death 1.38 (95% CI: 1.17–1.64). Corresponding point estimates for Swedish-speaking men were 1.49 (95% CI: 1.11–2.00), 1.19 (95% CI: 0.72–1.96) and 1.87 (95% CI: 1.19–2.94). For Finnish-speaking women, there was no association with father's death or mother's death, while those who experienced both parents' death had a mortality risk that was 1.52 (95% CI: 1.17–1.97) that of non-bereaved Finnish-speaking women. Estimates for Swedish-speaking women resembled those of Swedish-speaking men, although they were statistically not significant.

Analyses that distinguished natural and external causes of death in parents and the children revealed that associations were strongest for concordant causes, and particularly if they were external (table 3). In Finnish-speaking men, there nevertheless remained a notable influence of parental death by a natural cause on the risk of child mortality by an external cause. As compared with Finnish-speaking men who did not experience parental death, the risk ratio was 1.31 (95% CI: 1.16–1.48). For Swedish-speaking men, the association between parental and child mortality were largely driven by deaths from natural causes. If the parent died from a natural cause, the offspring risk of dying from a natural cause was 1.62 (95% CI: 1.12–2.36) that of adult children who did not experience any parental death. In women, and Swedish-speaking women in particular, most confidence intervals were wide due to few deaths. However, in Finnish-speaking women, there was a strong association between parental death from an external cause and offspring death from an external cause. The risk ratio as compared with those with no parental death experience was 1.70 (95% CI: 1.11–2.62).

Analyses using a more detailed classification of the cause of death, which had to focus on Finnish speakers because of the small size of the Swedish-speaking population, found that the association

Table 4 Effect of parental cause of death on cause-specific mortality risk in Finnish-speaking offspring, by sex

	Cardiovascular	Cancer	Other disease	Alcohol related	Suicide	Other external
Men						
No parental death	1	1	1	1	1	1
Parent died of concordant cause	1.35 (1.05–1.75)[a]	0.84 (0.53–1.33)	1.54 (1.00–2.39)	1.84 (0.96–3.53)	1.93 (1.04–3.57)[a]	1.85 (1.17–2.92)[a]
Parent died of discordant cause	1.10 (0.83–1.47)	1.32 (0.98–1.78)	1.12 (0.84–1.49)	1.15 (0.93–1.41)	1.40 (1.15–1.70)[a]	1.41 (1.17–1.70)[a]
Women						
No parental death	1	1	1	1	1	1
Parent died of concordant cause	0.81 (0.43–1.53)	1.35 (0.94–1.92)	1.60 (0.87–2.94)	3.19 (1.10–10.14)[a]	2.63 (0.72–9.58)	2.22 (0.92–5.35)
Parent died of discordant cause	0.76 (0.40–1.45)	1.07 (0.80–1.44)	1.27 (0.87–1.86)	0.90 (0.55–1.49)	0.81 (0.48–1.36)	1.00 (0.67–1.49)

Estimates are risk ratios with 95% confidence intervals within parentheses.
a: Indicates that the estimate is statistically significant at the 5% level.
All control variables are included in each of these 12 models.
Parental death here refers to death of the father, the mother or both.
ICD 10 codes for Cardiovascular are I00-I425 and I427-I99, for Cancer C00-D48, for Alcohol related F10, G312, G4051, G621, G721, I426, K292, K70, K860, P43 and X45, for Suicide X60-X84 and Y870, for Other external V01-X59, X85-Y98 (except Y870) and R96-R99 and for Other disease all other codes.

between parental and offspring mortality risks was largely driven by deaths from alcohol-related causes, suicide and other external causes (table 4). These associations were in both men and women strongest for concordant causes. However, in men there was a substantial effect on suicide and on mortality from other external causes also if the parent died from another cause. The suicide risk of men who experienced the death of a parent from a discordant cause was 1.40 (95% CI: 1.15–1.70) that of men who did not experience any parental death. Similarly, men who experienced parental death from a cause excluding other external had a risk of mortality from other external causes of 1.41 (95% CI: 1.17–1.70), as compared with men with no experience of parental death.

Discussion

Mortality consequences following bereavement conform to the broader role of social networks and social support in health.[18–21] This paper adds to this abundant documentation of collateral health, although we have focused on a less studied association, which is the interrelation between parental death experienced in adulthood and the offspring mortality risk. In line with previous evidence from Sweden,[7] we find that the death of a parent is associated with an increased mortality risk in men, while no clear association is found for women. In Finland, the death of both parents is found associated with an elevated mortality risk in both men and women.

For men, the risk of suicide and mortality from other external causes is approximately 40% higher for those who experienced parental death, as compared with those with no such experience, even if the parent died from another cause. Thus, parental death may be a critical life event for health also if experienced in adulthood, as suggested by research from the USA[8] and Sweden.[7]

Our study suggests that context and culture may matter. We find that parental death is associated with a higher adulthood mortality risk in Finland than previously documented for Sweden.[7] In addition, we find an association also in older adulthood (ages 40–50 years), and that the elevated mortality risk associated with parental death is close to monotonous over time since parental death. Both these findings can be contrasted to the situation in Sweden,[7] where no increased mortality was observed if parental death was experienced after age 30 years, and a slightly higher association was observed a few years after the death of a parent, as compared with in the more immediate term. The reasons behind these country-differences can only be speculated upon. Apart from the many similarities between the two countries, Finland has been categorized as abiding more to traditional family values and patriarchal family roles, presumably because the country industrialized later and faster, and experienced rapid urbanization not before the 1960s.[22,23] If elements of traditional thinking are more persistent in Finland than in Sweden, and thus remain stronger across generations, one might expect that also bereavement effects are stronger. Thus, in a society where the transmission of norms and resources are more prevalent, mortality associations related to emotional bonds and stressors of bereavement may be more emphasized. However, it needs to be stressed that inference of this kind may suffer from ecological fallacy, since we draw conclusions about macrorelated phenomena based on findings from micro data.

Furthermore, we have compared two ethno-linguistic groups, Swedish speakers and Finnish speakers. Both are native, equal and similar in most observable respects, but differ in cultural patterns and practices, as evidenced from a marked variation in family stability. Thus, Swedish speakers are believed to attach stronger values and norms to the role of the family as an institution than Finnish speakers do. In accordance, parental death, and the death of both parents in particular, tends to be stronger associated with the offspring mortality risk in Swedish speakers. Finnish-speaking men are known to live three years shorter than Swedish-speaking men do, while the difference in women is one year.[24] The ethno-linguistic mortality gradient is particularly marked in ages 18–50 years, in which the standardized death risk of Swedish speakers is only about 0.65 that of Finnish speakers, and it is largest for causes of death associated with behaviours and lifestyles, such as mortality related to alcohol consumption, suicides and other external causes.[25] Accordingly, we here find that, in Swedish speakers, associations with parental deaths tend to be more strongly driven by deaths from natural causes.

The study certainly has some limitations. We could not explicitly control for some potentially import confounders, such as familial disease history and lifestyles. We could not either separate stepparents, although they evidently accounted for a small share of all parents in the data. The data structure did not allow for detailed analyses of higher age groups, in which mortality is more common, but parent-offspring mortality associations presumably smaller.[7] Even though we used large-scale data from population registers with no sample attrition or self-reporting bias, the sample size did not allow for detailed analyses of cause-specific deaths or analyses around specific dates of death. It needs to be stressed as well that not all acts of intentional deaths are classified as suicides, but many fall into the category of other external deaths. Nevertheless, we believe that the results highlight two important things. First, that health workers and policymakers must acknowledge parental-offspring health relations also in adulthood, to more effectively explain and prevent poor health and postpone mortality. Second, that social and cultural identities are factors that should be increasingly acknowledged in studies of bereavement effects on health,

particularly when considering that they are known to influence the ways in which illness and health are perceived.[26] It would therefore be useful to attempt replicate these findings using data on other societies and other culturally distinct groups.

Supplementary data

Supplementary data are available at *EURPUB* online.

Funding

Financial support from Svenska Litteratursällskapet i Finland, Högskolestiftelsen i Österbotten and the Signe and Ane Gyllenberg Foundation is gratefully acknowledged.

Conflicts of interest: None declared.

Key points

- Health effects of parental bereavement in adulthood not extensively documented.
- Stronger associations in Finland than previously documented for Sweden.
- Stronger associations in the ethno-linguistic group with higher family stability.
- Collateral health effects dependent on the societal context and cultural practices.
- Parent-offspring health relations in adulthood should be increasingly acknowledged.

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