Socioeconomic Differences in Bereavement across the Life Course: A Cohort Study

Abstract

The death of a family and kin-member is a near-ubiquitous human experience with detrimental and potentially lasting effects on one's social and psychological wellbeing. Mortality decline in rich countries has made this experience more predictable throughout the life course, but there is considerable variation in the patterns of bereavement across socioeconomic strata. In this study we propose a new framework to conceptualize the burden of bereavement with respect to intensity and predictability. Drawing on prior literature on mortality inequalities and the demography of kinship, we further examine how the burden of bereavement is shaped by differences in exposure to mortality among kin and differences in kin network (size and age structure). We apply our approach to the Swedish population. Using register data, we reconstruct a genealogy of four generations for the 1973 birth cohort and measure age-specific cumulated counts and risk ratios of kin bereavement across income quartiles of this index cohort. We decompose income differences in bereavement into a mortality rate component and a kinship age-and size component. We find that there is a marked negative income gradient in the number of kin members who had died, and that low-income individuals are more likely to experience the death of parents, siblings, cousins, and children early in life. This study contributes to the understanding of social inequalities in bereavement over the life course, and points to the intricate ways in which interrelated demographic processes shape those inequalities.

KEYWORDS: Bereavement, kinship, inequality, mortality, socioeconomic status, grandparents

Introduction

Life expectancy at birth in post-Napoleonic France was approximately 40 years. Over 30% of newborns did not survive the age of ten, and only 3% would live to celebrate their 85th birthday (Human Mortality Database 2018). These grim odds of survival were in fact better than most other countries at the time, and quite possibly most of human history. Today, more than half of French newborns are expected to live past the age of 85, and this pattern is hardly unique to France. Similarly in the United States, the most likely (modal) age at death for women is now 87 (Brown et al., 2012). What once was the exception is now the rule.

The historical rise in human longevity set in motion a socio-psychological transition in our attitudes toward life and death. It facilitated long-term planning among individuals and social institutions alike, generating greater confidence in the future (Dyson 2013). Indeed, this very change in attitude has prompted, among other social changes, a global fertility decline (Lloyd & Ivanov, 1988; Montgomery, 2000), the introduction of the modern pension system (Dyson, 2013), and (in combination with fertility decline) a shift in public spending from children to the elderly (Preston, 1984). Furthermore, as a result of the rapid mortality decline since the industrial revolution, death is now seen as both predictable and orderly (Bayatrizi, 2008). We expect death to occur in old age and children to outlive their parents. We can also expect to know our grandchildren. If at the turn of the 20th century the average American, for example, could expect to spend five years of their lives concurrently with grandchildren, a mere century later they can expect to live 35 years alongside their grandchildren (Song & Mare, 2019).

Yet, the prospects of growing old and confidence regarding the future are not equally shared by all groups. Although life expectancy at birth more than doubled in high-income countries during the mortality transition, significant disparities in length of life persist across subpopulations within nations. Studies have consistently found that disadvantaged groups have both shorter and more variable lifespans (Brown et al. 2012; Firebaugh et al. 2014; Sasson 2016a; van Raalte et al. 2011). In other words, individuals belonging to lower socioeconomic strata or disadvantaged minority groups have lower life expectancies, as well as greater lifetime uncertainty (i.e., they are less able to accurately predict their length of life). To the extent that kinship and other social ties run along ethnic and class divisions (McPherson et al., 2001), they may also be more likely to experience the death of family members and friends throughout the life course.

Social epidemiologist Richard Wilkinson provides a useful illustration linking aggregate demographic phenomena and how they are experienced by individuals (Wilkinson, 2002, p. 57):

> "Perhaps the easiest way of seeing intuitively what the socioeconomic differences in death rates mean, is to imagine two people, each with a similar-sized circle of friends and relations […] but living in separate rich and poor areas. For every death that occurs among the circle of friends of the person in the rich area, the person in the poor area will know of two, three or even four times as many deaths among his or her circle of friends."

Mortality rates that are two, three, or four times higher in one social group compared to another are not unheard-of in contemporary high-income countries. Numerous demographic studies have focused on differential survival across race, ethnicity, gender, and other social factors. Often neglected, however, is how mortality inequalities may result in unequal burden of bereavement. For example, black Americans are three times more likely than their white counterparts to experience maternal loss by the age of ten (Umberson et al., 2017); they are also more likely to experience the death of family members through mid-life (Donnelly et al., 2020). In much the same way, socioeconomic strata are effectively exposed to different mortality regimes (Marmot, 2003), though few studies to date have attempted to estimate the magnitude of socioeconomic disparities in bereavement.

In order to address this lacuna, the present study provides a detailed empirical account of the burden of bereavement in extended family networks by socioeconomic status. Importantly, the burden of bereavement is shaped not only by mortality regimes, but also by kinship structure, which itself is the product of demographic behavior and outcomes (e.g., family size and generational length) and varies across social groups. For example, educational attainment is associated with lower risk of mortality, but also later childbearing. From the child's perspective, he or she is less likely to lose a parent who is highly educated compared with a parent of the same age who is less educated; however, highly educated parents are often older and therefore have a greater risk of mortality. Thus, our conceptual framework, detailed below, is rooted in two distinct demographic traditions: the demography of kinship and social inequalities in mortality.

Drawing on those two bodies of literature, we pose the following research questions: How do mortality regimes and kinship structure shape the experience of bereavement in

extended family networks over the life course? To what extent does this experience vary by socioeconomic status of the bereaved? Answering these questions requires unique data on both mortality and kindship structure at the population level. Thus, our analysis is based on Sweden, one of few countries with sufficient data on the entire population. Using the Swedish population register, beginning with the 1973 birth cohort, we reconstruct kinship structures and enumerate the number of deaths in extended family networks through 2020. We include the death of grandparents, parents, aunts/uncles, in-laws, spouses, siblings (including half-siblings), children, and nieces/nephews. For each type of family tie, we estimate the average annual and cumulative number of deaths to which individuals are exposed, by income and education. We further decompose socioeconomic disparities in bereavement over the life course to differences in kin age-structure and differences in kin mortality.

The paper is structured as follows. First, we review the literature on both social inequalities in mortality and the demography of kinship. Second, drawing on both, we develop a conceptual framework for understanding the burden of bereavement in extended family networks. In doing so, we first define how to conceptualize the burden of bereavement with respect to intensity, which refers to the cumulative number of deaths an individual has been exposed to by age, and predictability, which refers to the timing of those deaths throughout the life course and whether they follow the expected generational sequence. Third, we discuss the Swedish case with respect to both mortality inequalities and characteristics of kinship structure. Fourth, we present our methodology and empirical results. The paper concludes by discussing the theoretical implications of inequalities in bereavement and the potential for demographic research at the intersection of kinship and mortality inequalities.

Theoretical background

Social inequalities in bereavement

The loss of a family member constitutes a stressful life event which causes psychological distress, often for prolonged periods of time (e.g., Sasson & Umberson, 2014; Umberson & Donnelly, 2022). Sociological perspectives on bereavement have emphasized the wider social context in which it occurs and how the experience of bereavement intersects with class, gender, and race/ethnicity (Thompson et al., 2016). The death of family members in particular may mark the transition into new social roles, or out of old ones (e.g., caregiving) (Aneshensel et al., 2004). Critical to coping with bereavement, as well as its long-term

impact, is whether the death was anticipated and the timing in which it is experienced during the life course. For example, experiencing the death of a child is associated with increased psychological distress in mid- to late-life (Umberson & Donnelly, 2022), and losing a spouse before the age of 50 appears to have longer-lasting effects on psychological wellbeing, compared with becoming widowed later in life (Sasson & Umberson, 2014). In order to understand social inequalities in bereavement, we therefore must account for differences in the number of deaths, their timing during the life course, and whether they follow the expected generational sequence.

In spite of the ubiquity of bereavement as a human experience, we know little about the demographic factors which shape exposure to bereavement in extended family networks. Even less is known about how this exposure varies across social groups and over the life course. While there is a long tradition of demographic research on mortality inequalities, few studies have considered their impact from the perspective of the bereaved, rather than the individual being exposed to the risk of mortality. Only in recent years have studies focused on bereavement patterns according to the individual characteristics of the bereaved, including the age at which one experiences death in the family, the relationship to the bereaved, and the cumulative exposure to kin mortality (Kim et al., 2021; Umberson et al., 2017; Verdery & Margolis, 2017). Studies based in the US, for example, have found that black Americans are three times more likely than white Americans to experience the death of a parent by the age of 10 (Umberson et al., 2017), and that they are also more likely to experience the death of other family members by mid-life (Donnelly et al., 2020). Other research has found that the death of a sibling during childhood is more common among families with lower household income (Fletcher et al., 2013).

And yet, these studies too have considered the risk of bereavement from an individual standpoint (e.g., how likely it is to have lost a parent at a given age). It is illustrative to consider the impact of death from a kinship network. For example, it is estimated that every death caused by the Covid-19 pandemic in the US bereaved nine extended-family members (Verdery et al., 2020); this average, however, masked a disproportionately higher burden of bereavement among black, Latino, and less educated communities (Andrasfay & Goldman, 2021; Clouston et al., 2021). These communities differ not only with respect to mortality, but also with respect to kin structure. Thus, in order to understand the full impact of differential mortality from the standpoint of the bereaved, we must consider how kin structure intersects with mortality inequalities to produce social disparities in bereavement.

Demography of kinship

Importantly, the burden of bereavement depends not only on mortality levels, but also on a host of additional demographic characteristics which shape exposure to kin of varying ages (e.g., age, fertility, family size and complexity) (Coresh & Goldman, 1988; Goodman et al., 1974). Over the course of the demographic transition, families have become smaller as lives have been extended and fertility declined. The kinship network structure itself has changed. In the past structures were horizontally-dominated by siblings, cousins, and aunts and uncles. Today, kinship structures are vertically-dominated 'beanpole' networks of parents, children, and grandparents (Bengtson, 2001; Murphy, 2011; Verdery, 2015).

These major demographic shifts have not taken place uniformly across social groups. While there have always been social gradients in childbearing–including ages at childbearing, family size, and multi-partner fertility–many of these gradients have reversed over the course of the twentieth century (Esping-Andersen & Billari, 2015; Kravdal & Rindfuss, 2008). This has led to enormous variation in family size and generational length across families. Within European countries, the age at entry into grandparenthood has an interquartile range of around 10 to 15 years (Leopold & Skopek, 2015), and inter-household variation in generational length has increased over time (Margolis & Verdery, 2019). As a result, the majority of Europeans are now part of three-generation families, less than a fifth belong to two- or four-generation families, and only 8% have no vertical kin (Puur et al., 2011). Evidence from the US further suggests that the size of kin networks varies substantially across race/ethnicity and socioeconomic status (Schafer & Vargas, 2016).

In sum, social gradients in family dynamics shape exposure to family members of different ages; social gradients in mortality shape the probability that these family members will die at any given age. Both factors, which our study aims to disentangle, contribute to the burden of bereavement within family networks (i.e., how often and when during the life course individuals experience the death of family members).

Conceptualizing the burden of bereavement

Drawing on the theoretical background, we propose a comprehensive framework for understanding the burden of bereavement over the life course as a demographic phenomenon. First, we conceptualize the burden of bereavement as resulting from both its intensity and predictability. By intensity of bereavement we refer to the number of deaths of family members experienced by an individual, by age, such as losing a parent before adulthood. By

predictability of bereavement we mean either deaths of family members which do not follow the expected generational ordering, such as loss of a child by a parent, or deaths following the expected generational ordering but occur early in the life course, such as loss of a parent during childhood. This conceptualization is rooted in the sociology of bereavement, which emphasizes the multifaceted nature of bereavement and how it is experienced by individuals in relation to their social roles and expectations throughout the life course.

Second, our framework clarifies the relationship between the demographic factors shaping the burden of bereavement. Both the intensity and predictability of bereavement are strongly associated with mortality levels within the social groups in which individuals and their kin are embedded (e.g., group differences in life expectancy and lifespan variability). However, they are also shaped by group differences in kin networks (size and age structure). A comprehensive analysis of social inequalities in bereavement must therefore address both factors, because differences in bereavement between individuals may be attributed to (1) differences in the size and age structure of their respective family networks (i.e., assuming no difference in age-cohort-specific mortality rates of each kin member); and (2) kin members being subjected to different mortality regimes, assuming similarly sized and age-structured family networks.

Our study builds upon the extant literature and innovates it in several ways. Prior research in this area can be broadly divided into two groups. One consists of survey-based, empirical studies comparing the risk of losing a family member across social groups (e.g., Umberson et al., 2017). However, studies in this tradition have tended to look at differential mortality alone while neglecting other demographic variables such as family structure and complexity. The second group consists of studies employing either formal demographic models of kinship or micro-simulation, thus offering a comprehensive breakdown of how demographic factors shape the experience of death within family networks (e.g., Caswell & Song, 2021b; Verdery & Margolis, 2017). However, with few exceptions (e.g., Kolk et al., 2021), this literature has relied on aggregate demographic parameters rather than individual microdata. Thus, these studies have assumed assuming that different subpopulations follow a historical or projected set of central demographic rates. In real populations, extended-family networks often consist of individuals belonging to multiple social groups (social class, ethnicity, religiosity, etc.), each exhibiting different demographic behavior. Our study is intended to bridge the two approaches by evaluating how bereavement patterns are shaped in a real population using complete register data.

We apply the above framework to the case of socioeconomic inequalities in bereavement in Sweden. The next section provides a brief review of recent trends in mortality inequalities and kinship structure in Swedish society.

The case of Sweden

Swedish society is famously egalitarian, boasting one of the lowest levels of income inequality among OECD countries. Its welfare regime is characterized by generous (though eroding) universal welfare provision and strong redistributive policies (Bambra, 2007). Nevertheless, Sweden too has seen persistent and even growing social inequalities in mortality in recent decades. Mortality inequalities are observed across multiple social factors, including socioeconomic status (Katikireddi et al., 2020), gender (Sundberg et al., 2018), migration background (Wallace, 2022), and geographic regions (Wilson et al., 2020). Class-based inequalities in particular have been on the rise in Sweden since the 1950s (Bengtsson et al., 2020). Although prior research has focused primarily on mortality differentials from the perspective of the individual, the same factors likely shape the experience of bereavement in kin networks.

With respect to kinship, Sweden is characterized by low fertility (though high in comparison with the rest of Europe) and diverse family structures. Considered a forerunner of the Second Demographic Transition (Ohlsson-Wijk et al., 2020), Sweden's total fertility rate is below replacement level (1.6 births per woman) and cohabitation has long replaced marriage as the modal union form (though marriage is regaining popularity in recent years—see Ohlsson-Wijk, 2011). Intermarriage between native and foreign-born Swedes varies considerably across immigrant groups, though as in most Western countries it tends to increase with educational attainment and human capital (Dribe & Lundh, 2011). Divorce and separation rates increased almost steadily through the early 1970s, before leveling off, and a commensurate uptake in re-partnering meant an increase in family complexity (Ohlsson-Wijk et al., 2020). Trends in union instability, coupled with increasing multi-partner fertility, have meant a rising share of half-siblings in kin networks (Kolk, Martin et al., 2021).

Increasing socioeconomic inequality in Sweden has also contributed to the changing social gradients in childbearing (Dribe & Smith, 2021). High socioeconomic status in Sweden is now associated with higher fertility whereas childlessness is most common among the least educated women (Jalovaara et al., 2019). These complex trends in marriage, fertility, and mortality have led to considerable variation in kinship size in Sweden, even among the same

birth cohorts (Kolk, Martin et al., 2021). Thus, rather than adopt a model-based analytical approach, we trace the genealogies of the Swedish 1973 birth cohort using administrative data to estimate the actual burden of bereavement, by income and education, over the life course.

Research objectives and hypotheses

While research on social inequalities in mortality abounds, few studies have examined the impact of mortality inequalities on the surviving kin across social groups. This study aims to fill the gap by linking population-level trends in mortality to the individual experience of death in one's extended-family network. Furthermore, there is reason to believe that this experience differs widely across groups because kin networks, even if not entirely homogeneous, run along ethnic and class divisions (McPherson et al., 2001). We therefore hypothesize that both the intensity and predictability of bereavement will vary across socioeconomic strata in many high-income countries. All else being equal, we expect individuals from lower socioeconomic strata to suffer a higher burden of bereavement within family networks. This gap will be reflected in (H1a) greater number of deaths of family members, on average, at each age; and (H1b) greater number of deaths that are out of the expected generational sequence (e.g., parents before grandparents, nieces and nephews before aunts and uncles).

Intuitively, one might expect that macro-level trends in mortality inequalities are reflected in individuals' experience of mortality in their kin networks. However, we also expect the characteristics of kinship networks to vary by socioeconomic status in complex ways, the net effect of which on the burden of bereavement is difficult to predict. Socioeconomic groups vary in fertility, marriage, divorce, and remarriage rates, which in combination impact the number of familial ties (both consanguineal and affinal), as well as generational length. For example… Thus, we hypothesize the (H2) kin structure will vary across socioeconomic groups and contribute to differences in bereavement, though we cannot anticipate the direction of such effect (i.e., whether it will exacerbate or offset disparities in bereavement due to mortality inequalities). We test these hypotheses by following one Swedish birth cohort while reconstructing their genealogies.

Data and Methods

Geneologies

We used administrative registers of Sweden's entire population including monthly information on births and deaths, and identified biological and in-law relations via unique personal identification numbers, and through marital and residential records. Our index cohort is the 1973 birth cohort, born in Sweden to Swedish-born parents (N = 82,709). In order to study complete geneologies we conditioned the population on having identifiable grandmothers on both the maternal and paternal side (N=80,308, about 91 % of Swedish-born to Swedish-born parents) and finally excluded about 3.5 % of this population who either died before 2020 or emigrated without returning before 2020.

We constructed kinship networks of the index cohort, including all kin ever alive and ever resided in Sweden from an index individual's birth to age 47 (e.g. from the calendar years 1973 to 2020). Grandparents, parents, aunts and uncles, cousins, full- and half siblings, nieces and nephews were identified using parent-child linkages. Spouses, Parents-in-law and brothers and sisters in-laws (both of spouse and siblings) were identified via partnership linkage. Partnership links consisted of either marriage or co-residence with a childbearing partner. In-law kin were no longer enumerated followingunion dissolutions.

Socioeconomic status

Socioeconomic status (SES) wasoperationalized as annual income earnings from taxation registers. We measured earnings at ages 39, 40, and 41 of the 1973 birth cohort. We then used the highest income achieved during those three years and grouped the cohort into sex-specific income rank quartiles. A full set of grandmothers were identified for 89.5 % of the lowest-earning income group (first income quartile), and 90 %, 90.5 % and 91 % of the second to fourth income quartiles, respectively. We also measured SES using educational level, obtaining the highest level of education achieved by age 47, gategorized into four groups:ISCED levels 0–2 (basic education, lower-secondary or short/interrupted upper-secondary education), 3 (upper-secondary education), 4–5 (post-secondary or short-cycle tertiary education), and 6–8 (bachelor's degree or equivalent, and above) (UNESCO 2012).

Kin bereavement and analytical approach

We emunerate the death of every individual kin-member beginning from ego's birth in 1973. Thus, bereavements of kin prior to the birth of ego are not enumerated. If kin members out-migrate without returning before 2020, they are cencored at the year after last observed residence (folkbokföring) in Sweden.

We counted bereavements in total and for each kin group, at each chronological age of ego from 0 to 47, separately for each income quartile. We then calculatedthe number of bereavements, in total and within each kin group (e.g. grandparent, cousin, etc), at each chronological age of ego from 0 to 47. We then calculated, for each income quartile, the average number of bereavements per kins group, from ages 0 to 47. Second, we estimated the average cumulated number of bereavements, in total and within each kin group, from age 0 to 47, separately for each income quartile. Third, we estimated the relative income quantile gradient in bereavement. Bereavement wasmeasured as at least one death among: kin members of egos contemporaneous generation (full,half,inlaw-sibling, cousin) by age 18 and by age 47; among egos parental generation (parents, aunts, uncles and parents-in-law) by age 18 and by age 47; among egos grandparents by age 18 and by age 47; among ego descendant generation (own children, nieces and nephews) by age 47. We predict each of these binary dependent variables by income quartiles in a logistic regression, holding the highest income quartile as reference category. We present the risk ratios with 95% confidence intervals.

Finally, we decompose (Das Gupta, 1993; Kitagawa, 1955) the income-group differences in yearly rate of bereavement between the first and the fourth income quartile into the contribution of two components: differences in kin age-specific death rates (ASKDR) and differences in kin age-specific prevalence (w), using five-year kin-age-groups (a), for each age of the index cohort (i) (Equation 1). A positive difference delta ($\Delta > 0$) indicates a higher KDR for the low-income group, $\Delta < 0$ indicates a higher KDR for the high-income group.

$$\Delta\mathrm{KDR} = \sum_{\mathrm{ai}} \left[\left(\mathrm{w}_{\mathrm{ai}} \frac{\mathrm{ASKDR}_{\mathrm{IQ1}} + \mathrm{ASKDR}_{\mathrm{IQ4}}}{2}\right) + \left(\Delta\mathrm{ASKDR}_{\mathrm{ai}} \frac{\mathrm{w}_{\mathrm{aIQ1}} + \mathrm{w}_{\mathrm{aIQ4}}}{2}\right)\right]$$

Results

Yearly and cumulated socioeconomic disparities in bereavements

We first analyze the yearly incidence of kin bereavement. The left-hand plot of Figure 1 shows the average number of kin deaths for each kin relation at a given age of the index population. In total, ego experiences an average of 0.04 bereavements during her first year of life, and these are almost exclusively the death of her grandparents. From around the early 20s, the bereavement of the parental generation, including aunts and uncles, as well as parents-in-law become more prominent. By age 47, bereavement of this group account for a roughly half of the average number of bereavements (~0.4), with the other half dominated by grandparents. Through the ages, bereavement of generational contemporaries (Cousins and

full, half, and in-laws siblings) are confined to less than 0.01 deaths on average, and bereavement of descendant kin (own children and the children of one's siblings) is even rarer.

The right-hand plot of Figure 1 shows the difference between the age-specific average number of kin deaths of the lowest earning quartile (the first income quartile) and the highest earning quartile (the fourth income quartile). Negative values indicate more bereavement in the fourth income quartile, and positive values indicate more bereavement in the first income quartile. The differences are small, with at most a total difference (indicated by the red line) of about 0.003 kin deaths. The lowest income group experiences more bereavements on average across the life course, and this is driven by the death of the parental and contemporaneous generation, while the highest income quartile experience more grandparental deaths from around age 15 and onwards.

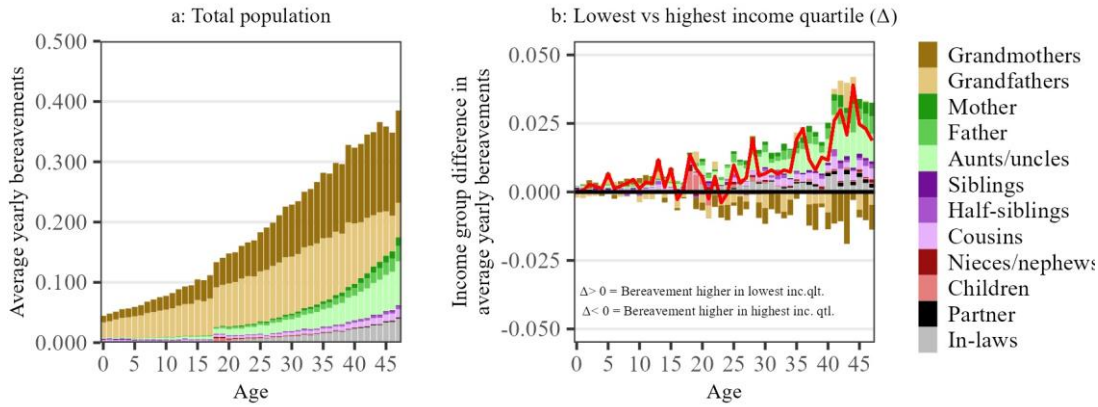

Figure 1. Left: Yearly average number of bereavements by kin type in the total population. Right: The difference between the first and fourth income earnings quartiles in yearly average bereavements by kin type. 1973 birth cohort, ages 0 to 47. The red line indicates the income quantile difference in all kin-types combined.

Next, we turn from yearly incidence of kin death to consider instead the deaths of kin accumulating across the life course. The left-hand plot of Figure 2 shows the average cumulated number of kin deaths for each kin-relation of the index population. In total, individuals have experienced around six kin deaths by the year they turn 47. Of these, the four grandparents account for two-thirds. Second in order of magnitude are aunts and uncles, the most numerous kin group in the age span where deaths are not extremely rare – by age 47, our index cohort has seen an average of slightly more than one of her aunts or uncles pass away.

The right-hand plot of Figure 2 shows the difference between the cumulated average number of kin deaths of the lowest earning quartile (the first income quartile) and the highest earning quartile (the fourth income quartile). As rather few individuals have surviving grandparents at age 47 regardless of their income, the differences in cumulated bereavement are driven by the parental and contemporaneous generation, and total at about 0.03 more bereavements among the lowest income quartile. Again, as uncles and aunts are the most numerous kin group, socioeconomic disparities in bereavement are primarily driven by the death of aunts and uncles by age 47. At earlier stages of life, however, the gradient, albeit very small, is driven by deaths of grandparental and contemporaneous kin.

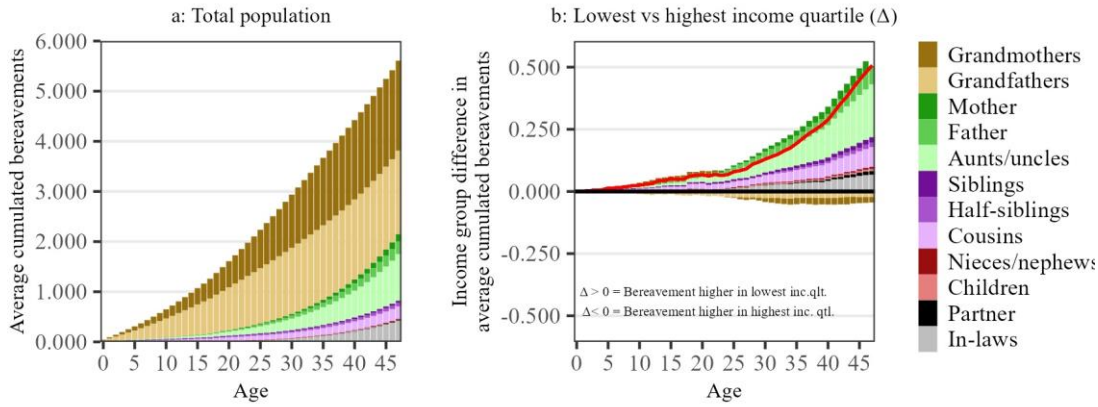

Figure 2. Left: cumulated number of bereavements by kin type in the total population. Right: The difference between the first and fourth income earnings quartiles in cumulated number of bereavements by kin type. 1973 birth cohort, ages 0 to 47. The red line indicates the cumulated income quantile difference in all kin-types combined.

Relative socioeconomic disparities in bereavement

Figures 1 and 2 focused on the differences in intensity of bereavement between income groups by describing the average number of bereavements of different kin members. Here, we focus on socioeconomic disparaties in the predictability of bereavement by analysingthe relative difference between income groups in ever having experienced bereavement of various characters. We focus on the experience- by age 18 and by age 47 respectively - of at least one death of a kin member of the contemporaneous generation, parental, grandparental, and descendant generation. In Figure 3, these outcomes are expressed as the odds ratio of experiencing the given bereavement among the lowest, second, and third income quartiles relative to the highest income quartile group. There is no substantive difference across income

groups in ever experiencing the death of at least one grandparent by age 18. All income groups have a lower risk than the highest income group of experiencing at least one grandparental death by age 47. All income groups have a higher risk of a parental and contemporary generation bereavement by age 18, as well as of experiencing bereavement of parental, contemporary, and descendant generation by age 47. This income gradient is mostly linear, with the higher risk at lower income quartiles, save for the exception of the risk of bereavement in the parental generation by age 18, where the second income group has a higher risk than the first income group. Death of descendant generation by age 18 was not possible to calculate as the vast majority in all income groups had no descendants by age 18 and almost no bereavements occurred among those who had (by age 18). The lowest income group have the highest likelihood - and the highest income grou have the lowest likelihood - of having had kin from the parental (aunts and uncles and, in rare cases, fathers) die before ego was born.

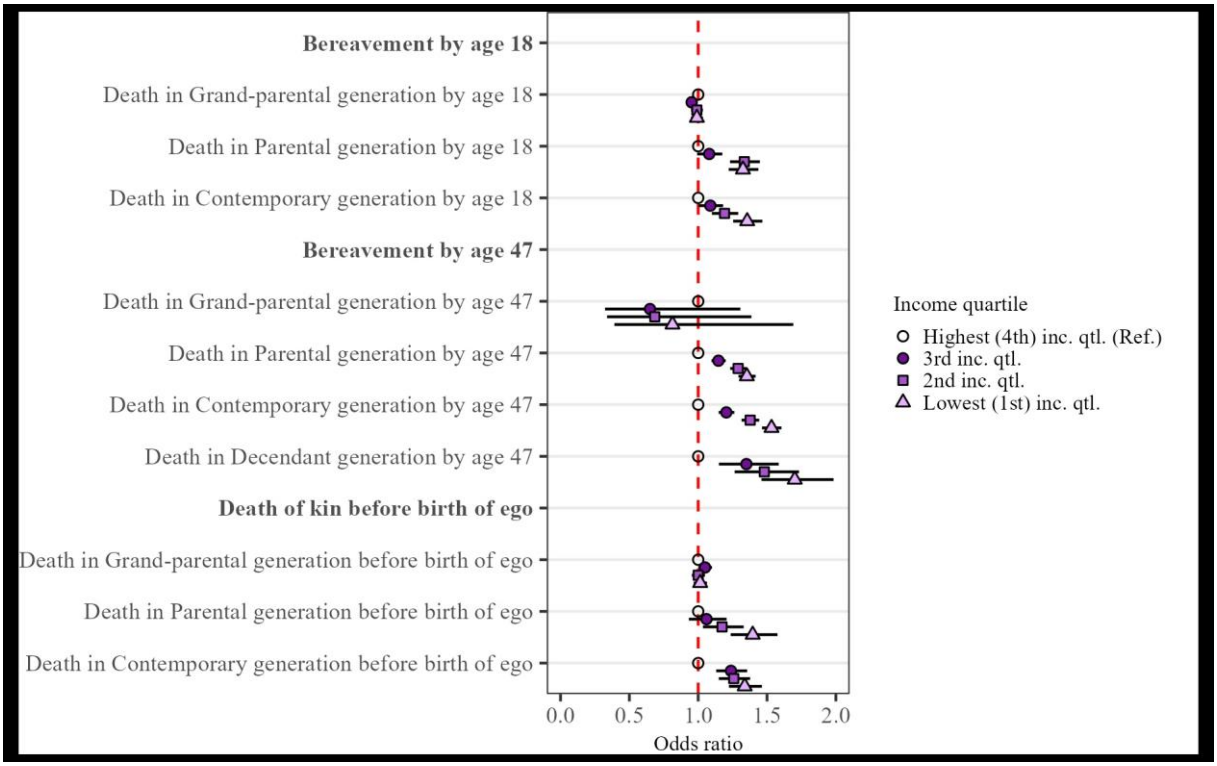

Figure 3. Risk ratio by income earnings quartile of ever experiencing various types of bereavement by age 18, age 47, and before ego was born. Reference group: highest income quartile. Logistic regression. 1973 birth cohort.

Kin age structure and mortality

Thus far, we have analyzed the socioeconomic disparities in exposure to death and the experience of bereavement. What remains unclear is the extent to which inequalities in kin death are exacerbated or offset by differences in the age-structure of family members, which result from differential fertility and generational lengths across income groups. We disaggregate the yearly bereavement rate disaggregating kin-members across five-year age groups. We then decompose the difference between income quartiles one and four into a component owing to income quartile group differences in the stock of kin of a given age-group, and a component owing to the income quartile group difference in the death rate of these kin age-groups. We focus on the yearly incidence rate, as seen in figure 1. Bars with negative values indicate a contribution to more bereavement in the highest income quartile; bars with positive values indicate a contribution to more bereavement in the lowest income quartile. In the left-hand figure we see that, overall, the age compositional effect begets higher bereavement of the high-income group: their grandparents, parents, aunts, uncles, and parents-in-law are on average older than those of the low-income group. In the right-hand figure, we see that the kin mortality effect, or the rate effect, leads to higher bereavement in the lowest, compared to the highest income group. In appendix figures A1 to A4 we analyse SES gradients in bereavement using educational level instead of income as try stratifying variable, and find the same patterns as showed in figure 1 to 4

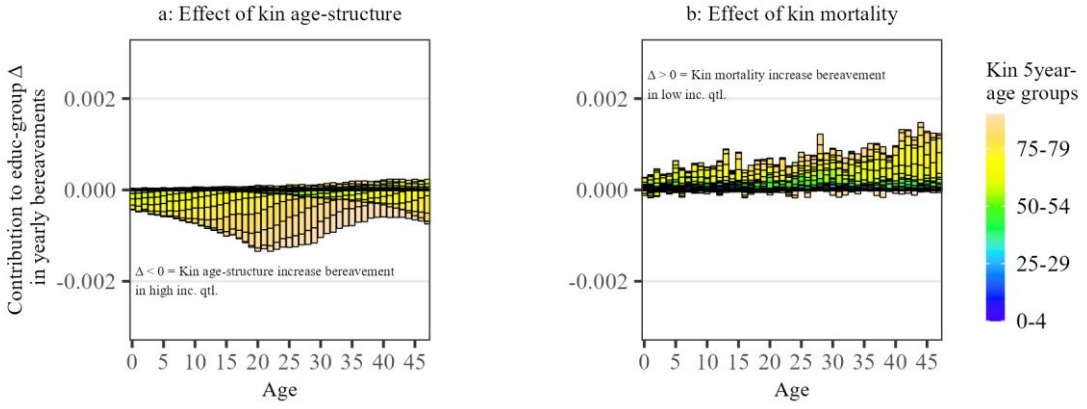

Figure 4. Decomposition of income difference in yearly bereavement rate. Left: compositional effect of kin size by age group. Right: rate effect of kin age group death rate. 1973 birth cohort, ages 0 to 47.

Discussion

The experience of death among kin networks is a fundamental question for demography, as well as other disciplines across the social sciences (Montgomery, 2000). At the individual level, the loss of family members has direct implications for the physical and psychological wellbeing of the bereaved (Fletcher et al., 2013; Rogers et al., 2008; Sasson & Umberson, 2014). It also affects how individuals evaluate their own survival expectations (Donnelly et al., 2020), which may in turn impact life-cycle economic behavior (e.g., retirement, saving and spending) (Hurd et al., 2004). From a population perspective, classic demographic theory has long assumed that individuals and families change their demographic behavior in response to perceived mortality change (Davis, 1945; Kirk, 1996), thus linking individual exposure to bereavement to aggregate demographic phenomena such as fertility decline (Mathews & Sear, 2008). Yet, the demographic factors shaping exposure to bereavement remain understudied.

Whereas previous research has focused primarily on the role of mortality inequalities in shaping exposure to bereavement, in this study we develop a comprehensive framework which also considers the role of kin structure. Moreover, we conceptualize the burden of bereavement in relation to both its intensity (how many deaths in the family have been experienced at a given age) and predictability (how many of those deaths occur out of the expected generational sequence). Inequalities in bereavement may be important drivers of social and economic behavior and outcomes. However, inequalities in bereavement are difficult to predict because of the potentially countervailing effects of mortality differentials and differences in kin structure across social groups.

Applying this framework to the Swedish population, we find that the burden of bereavement experienced by age 47 is higher among lower SES groups. Moreover, this excess burden of bereavement is driven primarily by the death of parents and kin of the same generation (siblings, cousins), and it tends to occur earlier in life. By contrast, deaths experienced by high SES individuals by age 47 are largely attributed to the loss of grandparents, and they are less likely to experience the death of parents, siblings, and children by that age. Overall, we find support for our hypotheses that lower SES groups experience greater burden of bereavement, and that this burden is expressed both in terms of number of deaths experienced and when they are experienced during the life course. It may be tempting to attribute inequalities in bereavement to mortality inequalities. However, the burden of bereavement is also shaped by group differences in kin structure. Our decomposition analysis revealed that whereas lower socioeconomic groups were disadvantaged with respect to

mortality rates, their kin were younger on average, which tended to offset the inequality in bereavement.

Understanding inequalities in bereavement bears theoretical and practical implications. First, it is a first step toward understanding the full impact of mortality inequalities on society, which extends beyond the individual who may be at greater risk of dying. This impact is dependent upon kin networks, because the death of each individual is experienced by multiple family members. Second, we must consider the psychological, social, and economic implications of bereavement. Much of the literature has focused on direct effects such as psychological distress and wellbeing. There may be other, more subtle effects, relating to how individuals evaluate their own survival expectation. These expectations are both shaped by the death of family members and impact social and economic decision-making (Dormont et al., 2018; Hurd & McGarry, 2002; Liu et al., 2007). Indeed, if mortality regimes operate as Durkheimian "social facts," that is, internalized by individuals and exerting a causal influence on their behavior, then inequalities in bereavement, in addition inequalities in mortality, may constitute a fundamental and overlooked form of disadvantage (Bernstein & Sasson, 2023).

This study is not without limitations. Relying on administrative data means that we can only identify nominal kin relations, but have no insight as to how important they really are in the lives of affected individuals. Prior research has shown that the quality of relationships matters and poor relationships may be detrimental, rather than beneficial to one's wellbeing. This study was also limited to kin relations because other types of meaningful social ties are not identifiable through population registers. Nevertheless, this study goes beyond prior research to cover extensive familial relations, including cousins, in-laws, and half-siblings, among others.

In conclusion, this study highlights the importance of multiple demographic processes in shaping the experience of bereavement, as well as how it differs across social groups. It proposes a comprehensive framework for understanding how mortality regimes are experienced by individuals embedded in their extended-family networks, with respect to both the intensity and predictability of bereavement. It is a first step toward linking group differences in mortality inequalities, from a population perspective, to how those differences impact individuals and their families. In doing so, we hope to motivate new research at the intersection of social stratification, mortality, and the demography of kinship.

Data accessibility

The code and aggregate data to produce all output in this study are provided in the [outlet here]. The raw data use national registers, which we are prohibited by law to use or share outside secure servers provided by Statistics Finland. Contact the corresponding author for further information.

Authors' contributions

IS: Research design (%), Data curation (%), Programming (%), Research conceptualization (%), Writing (%)
LA: Research design (100%), Data curation (100%), Programming (100%), Research conceptualization (10%), Writing (5%)
AR: Research design (%), Data curation (%), Programming (%), Research conceptualization (%), Writing (%)
DA: Research design (%), Data curation (%), Programming (%), Research conceptualization (%), Writing (%)

Conflict of interest declaration

We declare we have no competing interests.

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References

Aneshensel, C. S., Botticello, A. L., & Yamamoto-Mitani, N. (2004). When Caregiving Ends: The Course of Depressive Symptoms After Bereavement. Journal of Health and Social Behavior, 45(4), 422–440. https://doi.org/10.1177/002214650404500405

Bambra, C. (2007). Going beyond The three worlds of welfare capitalism: Regime theory and public health research. Journal of Epidemiology & Community Health, 61(12), 1098–1102. https://doi.org/10.1136/jech.2007.064295

Bayatrizi, Z. (2008). Life sentences: The modern ordering of mortality. University of Toronto Press.

Bengtsson, T., Dribe, M., & Helgertz, J. (2020). When Did the Health Gradient Emerge? Social Class and Adult Mortality in Southern Sweden, 1813–2015. Demography, 57(3), 953–977. https://doi.org/10.1007/s13524-020-00877-5

Bernstein, S. F., & Sasson, I. (2023). Black and white differences in subjective survival expectations: An evaluation of competing mechanisms. SSM - Population Health, 21, 101339. https://doi.org/10.1016/j.ssmph.2023.101339

Brown, D. C., Hayward, M. D., Montez, J. K., Hummer, R. A., Chiu, C.-T., & Hidajat, M. M. (2012). The Significance of Education for Mortality Compression in the United States. Demography, 49(3), 819–840. https://doi.org/10.1007/s13524-012-0104-1

Das Gupta, P. (1993). Standardization and decomposition of rates: A user's manual. (United States Census Bureau.). https://www.census.gov/library/publications/1993/ demo/p23-186.html.

Donnelly, R., Umberson, D., & Pudrovska, T. (2020). Family Member Death and Subjective Life Expectancy Among Black and White Older Adults. Journal of Aging and Health, 32(3–4), 143–153. https://doi.org/10.1177/0898264318809798

Dormont, B., Samson, A.-L., Fleurbaey, M., Luchini, S., & Schokkaert, E. (2018). Individual Uncertainty About Longevity. Demography, 55(5), 1829–1854. https://doi.org/10.1007/s13524-018-0713-4

Dribe, M., & Lundh, C. (2011). Cultural Dissimilarity and Intermarriage. A Longitudinal Study of Immigrants in Sweden 1990–2005. International Migration Review, 45(2), 297–324. https://doi.org/10.1111/j.1747-7379.2011.00849.x

Dribe, M., & Smith, C. D. (2021). Social class and fertility: A long-run analysis of Southern Sweden, 1922–2015. Population Studies, 75(3), 305–323. https://doi.org/10.1080/00324728.2020.1810746

Dyson, T. (2013). Population and Development: The Demographic Transition. Zed Books.

Firebaugh, G., Acciai, F., Noah, A. J., Prather, C., & Nau, C. (2014). Why Lifespans Are More Variable Among Blacks Than Among Whites in the United States. Demography, 51(6), 2025–2045. https://doi.org/10.1007/s13524-014-0345-2

Hurd, M. D., & McGarry, K. (2002). The Predictive Validity of Subjective Probabilities of Survival. The Economic Journal, 112(482), 966–985. https://doi.org/10.1111/1468-0297.00065

Jalovaara, M., Neyer, G., Andersson, G., Dahlberg, J., Dommermuth, L., Fallesen, P., & Lappegård, T. (2019). Education, Gender, and Cohort Fertility in the Nordic Countries. European Journal of Population, 35(3), 563–586. https://doi.org/10.1007/s10680-018-9492-2

Katikireddi, S. V., Niedzwiedz, C. L., Dundas, R., Kondo, N., Leyland, A. H., & Rostila, M. (2020). Inequalities in all-cause and cause-specific mortality across the life course by wealth and income in Sweden: A register-based cohort study. International Journal of Epidemiology, 49(3), 917–925. https://doi.org/10.1093/ije/dyaa053

Kitagawa, E. M. (1955). Components of a Difference Between Two Rates. Journal of the American Statistical Association, 50(272), 1168–1194. https://doi.org/10.2307/2281213

Kolk, Martin, Andersson, Linus, Pettersson, Emma, & Drefahl, Sven. (2021). The Swedish Kinship Universe – A demographic account of the number of children, parents, siblings, grandchildren, grandparents, aunts/uncles, nieces/nephews, and cousins using national population registers. 1215821 Bytes. https://doi.org/10.17045/STHLMUNI.17704988.V1

Liu, J., Tsou, M., & Hammitt, J. K. (2007). Health Information and Subjective Survival Probability: Evidence from Taiwan. Journal of Risk Research, 10(2), 149–175. https://doi.org/10.1080/13669870701191802

Lloyd, C. B., & Ivanov, S. (1988). The Effects of Improved Child Survival on Family Planning Practice and Fertility. Studies in Family Planning, 19(3), 141–161. https://doi.org/10.2307/1966750

Marmot, M. G. (2003). Understanding Social Inequalities in Health. Perspectives in Biology and Medicine, 46(3x), S9–S23. https://doi.org/10.1353/pbm.2003.0070

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a Feather: Homophily in Social Networks. Annual Review of Sociology, 27(1), 415–444. https://doi.org/10.1146/annurev.soc.27.1.415

Montgomery, M. R. (2000). Perceiving Mortality Decline. Population and Development Review, 26(4), 795–819. https://doi.org/10.1111/j.1728-4457.2000.00795.x

Ohlsson-Wijk, S. (2011). Sweden's marriage revival: An analysis of the new-millennium switch from long-term decline to increasing popularity. Population Studies, 65(2), 183–200. https://doi.org/10.1080/00324728.2011.574724

Ohlsson-Wijk, S., Turunen, J., & Andersson, G. (2020). Family Forerunners? An Overview of Family Demographic Change in Sweden. In D. N. Farris & A. J. J. Bourque (Eds.), International Handbook on the Demography of Marriage and the Family (Vol. 7, pp. 65–77). Springer International Publishing. https://doi.org/10.1007/978-3-030-35079-6_5

Preston, S. H. (1984). Children and the Elderly: Divergent Paths for America's Dependents. Demography, 21(4), 435. https://doi.org/10.2307/2060909

Sasson, I. (2016). Trends in Life Expectancy and Lifespan Variation by Educational Attainment: United States, 1990–2010. Demography, 53(2), 269–293. https://doi.org/10.1007/s13524-015-0453-7

Sasson, I., & Umberson, D. J. (2014). Widowhood and Depression: New Light on Gender Differences, Selection, and Psychological Adjustment. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 69B(1), 135–145. https://doi.org/10.1093/geronb/gbt058

Song, X., & Mare, R. D. (2019). Shared Lifetimes, Multigenerational Exposure, and Educational Mobility. Demography, 56(3), 891–916. https://doi.org/10.1007/s13524-019-00772-8

Sundberg, L., Agahi, N., Fritzell, J., & Fors, S. (2018). Why is the gender gap in life expectancy decreasing? The impact of age- and cause-specific mortality in Sweden 1997–2014. International Journal of Public Health, 63(6), 673–681. https://doi.org/10.1007/s00038-018-1097-3

Thompson, N., Allan, J., Carverhill, P. A., Cox, G. R., Davies, B., Doka, K., Granek, L., Harris, D., Ho, A., Klass, D., Small, N., & Wittkowski, J. (2016). The case for a sociology of dying, death, and bereavement. Death Studies, 40(3), 172–181. https://doi.org/10.1080/07481187.2015.1109377

Umberson, D., & Donnelly, R. (2022). The Death of a Child and Parents' Psychological Distress in Mid to Later Life: Racial/Ethnic Differences in Exposure and Vulnerability. The Journals of Gerontology: Series B, 77(8), 1561–1570. https://doi.org/10.1093/geronb/gbab206

Umberson, D., Olson, J. S., Crosnoe, R., Liu, H., Pudrovska, T., & Donnelly, R. (2017). Death of family members as an overlooked source of racial disadvantage in the United States. Proceedings of the National Academy of Sciences, 114(5), 915–920. https://doi.org/10.1073/pnas.1605599114

van Raalte, A. A., Kunst, A. E., Deboosere, P., Leinsalu, M., Lundberg, O., Martikainen, P., Strand, B. H., Artnik, B., Wojtyniak, B., & Mackenbach, J. P. (2011). More variation in lifespan in lower educated groups: Evidence from 10 European countries. International Journal of Epidemiology, 40(6), 1703–1714. https://doi.org/10.1093/ije/dyr146

Wallace, M. (2022). Mortality Advantage Reversed: The Causes of Death Driving All-Cause Mortality Differentials Between Immigrants, the Descendants of Immigrants and Ancestral Natives in Sweden, 1997–2016. European Journal of Population, 38(5), 1213–1241. https://doi.org/10.1007/s10680-022-09637-0

Wilkinson, R. G. (2002). Unhealthy societies: The afflictions of inequality. Routledge.

Wilson, B., Drefahl, S., Sasson, I., Henery, P. M., & Uggla, C. (2020). Regional trajectories in life expectancy and lifespan variation: Persistent inequality in two Nordic welfare states. Population, Space and Place, 26(8). https://doi.org/10.1002/psp.2378

Appendix

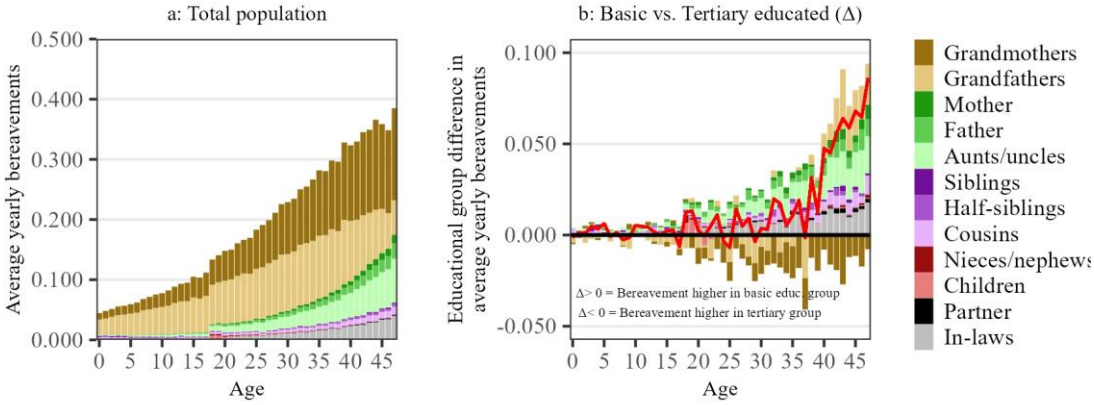

Figure A1. Left: Yearly average number of bereavements by kin type in the total population. Right: The difference between population with basic versus tertiary education in yearly average bereavements by kin type. 1973 birth cohort, ages 0 to 47. The red line indicates the income quantile difference in all kin-types combined.

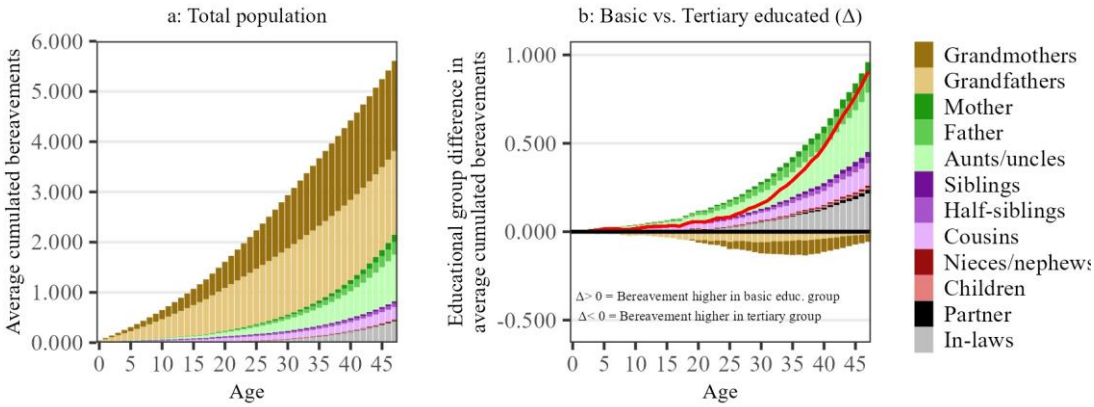

Figure A2. Left: cumulated number of bereavements by kin type in the total population. Right: The difference between the population with basic versus tertiary education in cumulated number of bereavements by kin type. 1973 birth cohort, ages 0 to 47. The red line indicates the cumulated income quantile difference in all kin-types combined.

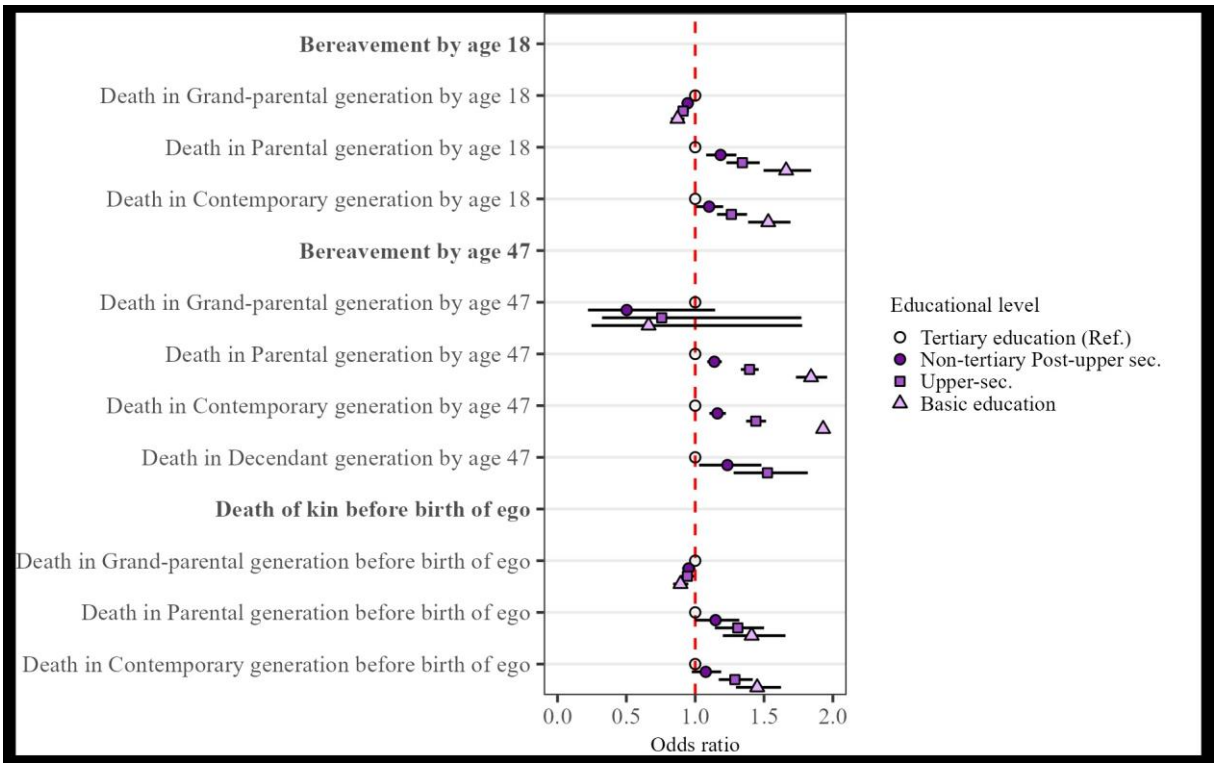

Figure A3. Risk ratio by educational group of ever experiencing various types of bereavement by age 18, age 47, and before ego was born. Reference group: highest income quartile. Logistic regression. 1973 birth cohort.

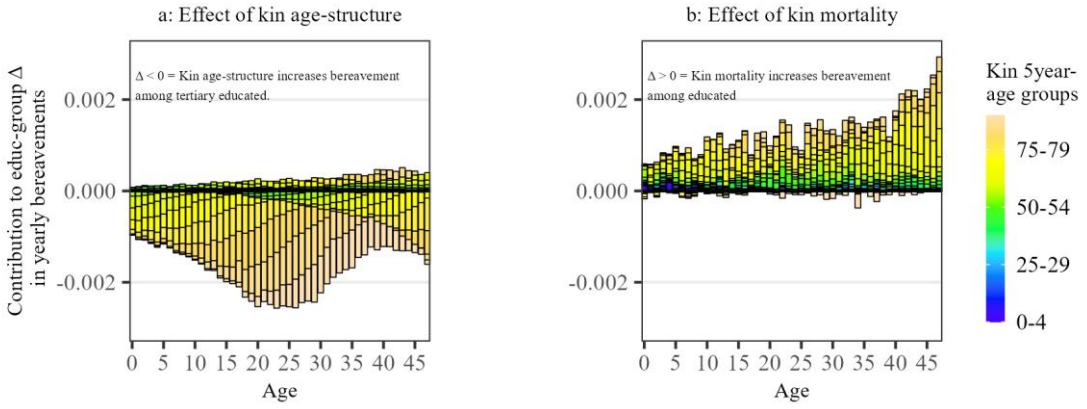

Figure A4. Decomposition of educational group difference (basic versus tertiary education) in yearly bereavement rate. Left: compositional effect of kin size by age group. Right: rate effect of kin age group death rate. 1973 birth cohort, ages 0 to 47.

Table 1A. Kin population by income quartile, potential range of overcoverage and unreported deaths.

			Not in death nor residence registers (NDR)				Not in death nor residence registers (NDR) (age above 90)		
Income quartile	N	YOB[1]	NDR (N)	NDR (%)	Age in 2020[2]	Last Yr. of obs[3]	NDR (N)	NDR (%)	Age in 2020[2]
Grandmothers									
1st	37128	1917	783	2,1	108	1982	769	2,1	108
2nd	37156	1917	742	2	108	1979	731	2	108
3rd	37062	1917	722	1,9	108	1979	714	1,9	108
4th	37245	1916	752	2	108	1980	742	2	108
All	148591	1917	2999	2	108	1980	2956	2	108
Grandfathers									
1st	33178	1914	1501	4,5	112	1983	1480	4,5	113
2nd	33450	1914	1401	4,2	113	1980	1392	4,2	113
3rd	33481	1914	1445	4,3	113	1978	1431	4,3	113
4th	33653	1913	1550	4,6	113	1977	1539	4,6	113
All	133762	1914	5897	4,4	113	1979	5842	4,4	113
Mothers									
1st	19375	1947	66	0,3	70	2002	0	0	0
2nd	19373	1947	39	0,2	70	2002	0	0	0
3rd	19353	1947	45	0,2	71	2004	0	0	0
4th	19357	1946	63	0,3	72	2002	0	0	0

	7745	194							
All	8	6	213	0,3	71	2003	0	0	0
Fathers									
	1937	194							
1st	1	4	179	0,9	73	2000	0	0	0
	1937	194							
2nd	1	4	97	0,5	74	1998	0	0	0
	1935	194							
3rd	2	4	129	0,7	73	2000	0	0	0
	1935	194							
4th	6	4	191	1	74	2000	0	0	0
	7745	194							
All	0	4	596	0,8	73	2000	0	0	0
Aunts/uncles									
	8335	194	122						
1st	3	7	9	1,5	72	1991	0	0	0
	8215	194	104						
2nd	5	7	8	1,3	71	1990	0	0	0
	7828	194	109						
3rd	3	7	7	1,4	72	1990	0	0	0
	7273	194	149						
4th	8	6	3	2,1	73	1989	0	0	0
	3165	194	486						
All	29	7	7	1,5	72	1990	0	0	0
Cousins									
	1717	197	495						
1st	64	5	3	2,9	44	2004	0	0	0
	1692	197	446						
2nd	71	5	2	2,6	45	2003	0	0	0
	1603	197	485						
3rd	64	5	8	3	44	2003	0	0	0
	1473	197	556						
4th	32	5	0	3,8	45	2003	0	0	0
	6487	197	198						
All	31	5	33	3,1	44	2003	0	0	0
Siblings									
	2579	197							
1st	1	3	639	2,5	46	2005	0	0	0
	2607	197							
2nd	6	3	586	2,2	46	2005	0	0	0
	2576	197							
3rd	0	3	668	2,6	45	2005	0	0	0
	2531	197	100						
4th	1	3	7	4	46	2005	0	0	0

	1029	197	290						
All	38	3	0	2,8	46	2005	0	0	0
Half-siblings									
	1356	197							
1st	5	7	398	2,9	43	2005	0	0	0
	1057	197							
2nd	9	7	271	2,6	42	2005	0	0	0
		197							
3rd	8929	7	300	3,4	42	2005	0	0	0
		197							
4th	7724	8	335	4,3	41	2005	0	0	0
	4079	197	130						
All	7	7	4	3,2	42	2005	0	0	0
Nieces/nephews									
	4494	200							
1st	1	3	449	1	20	2012	0	0	0
	4686	200							
2nd	6	3	450	1	20	2012	0	0	0
	4584	200							
3rd	7	4	459	1	18	2012	0	0	0
	4550	200							
4th	2	5	637	1,4	17	2012	0	0	0
	1831	200	199						
All	56	3	5	1,1	18	2012	0	0	0
Children									
	3225	200							
1st	9	4	157	0,5	16	2015	0	0	0
	3583	200							
2nd	3	4	78	0,2	21	2016	0	0	0
	3629	200							
3rd	4	4	62	0,2	21	2015	0	0	0
	3804	200							
4th	6	5	88	0,2	17	2017	0	0	0
	1424	200							
All	32	4	385	0,3	18	2016	0	0	0
Spouses									
	1822	197							
1st	9	2	198	1,1	47	2010	0	0	0
	1958	197							
2nd	3	2	103	0,5	49	2010	0	0	0
	1968	197							
3rd	3	2	112	0,6	47	2011	0	0	0

	1989	197							
4th	4	2	101	0,5	47	2011	0	0	0
	7738	197							
All	9	2	514	0,7	48	2011	0	0	0
In-laws									
	8803	196	159						
1st	5	2	1	1,8	55	2002	15	0	97
	9412	196	150						
2nd	3	1	6	1,6	54	2003	18	0	97
	9199	196	166						
3rd	3	1	5	1,8	54	2002	12	0	99
	8977	196	196						
4th	1	1	4	2,2	54	2003	13	0	95
	3639	196	672						
All	22	1	6	1,8	54	2003	58	0	97

Notes: [1]Mean year or birth, [2]Mean age in 2020 if assumed alive, [3]Mean year of last observation in RTB without a corresponding death-date. Individuals (Kin-members) who never have been registered in Sweden are not identifiable and thus not included in the study population and are not enumerated as kin or contribute to the bereavement numerator Individuals (kin-members) who are ever observed and at some point no longer observed from the residential registers (‘register över totalbefolkningen’, RTB) without returning by 2020 without a death date are treated as migrated. Dates of death of overseas populations are often reported to Statistics Sweden and updated in the death registers with some lag, but such reports and/or registry updates does not always take place. Migrated individuals (and individuals treated as such) without a death-date who are older than 90 in 2020 are treated as diseased at age 90.