



Zooming into the first year after parental death: Loss and recovery in adult mental health

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ABSTRACT

The initial year after parental death is a critical period for grief and coping. Despite its significance for declines in and recovery of adult mental health, this initial period is not sufficiently captured in existing research following changes across annual or even broader intervals. This paper assesses the impact of the first and second parent's death on adult mental health on more fine-grained monthly timescales. Using data from up to 12 waves of the German Socio-Economic Panel Study (GSOEP) and fixed-effects models with yearly and monthly impact functions, the analysis yielded two main findings. First, mental health declines were much deeper when measured on a monthly scale. The magnitude of drops recorded within the first two months following parental death approximately doubled those measured at an annual scale. Second, recovery occurred much faster when recorded on a monthly timescale and was evident already a few months after the loss of a parent. Overall, this study suggests that reaction and adaptation to parental death are stronger and faster than previously documented. The study additionally identified variations in mental health responses. Those who lost their first parent had worse mental health a year after the event compared to those who lost their second parent. The most significant decline in mental health, around 10 points, occurred among daughters one to two months after their mother's death. When the mother died first, the impact was more severe on mental health, especially among younger daughters and sons.

1. Introduction

Today, the vast majority of people experience the death of their parents as adults, and for many, this is the first major experience of loss and grief (Umberson, 2003). It is a stressor and emotional turmoil, even for well-functioning and healthy adults. It is widely recognized in the literature that parental death can have severe implications for mental health (Bowlby, 1980; Leopold and Lechner, 2015; Umberson, 2003).

According to theories of grief and coping, many of the emotional responses to parental death occur over a relatively short period of time (Bonanno et al., 2002). This initial period is particularly critical for assessing the magnitude of its impact on mental health as well as the speed of subsequent recovery and adaptation throughout the mourning phase.

In research on parental bereavement, however, this initial period has remained a black box. Previous studies have examined the impact of parental loss on, for example, life satisfaction, depressive symptoms, and cognitive impairment, usually suggesting drops of moderate size followed by a relatively swift recovery (Kamis et al., 2022; Leopold and

Lechner, 2015; Liu et al., 2022). However, timescales employed in prior research were not sensitive to the initial period following parental loss, as death events and changes in the outcomes of interest were recorded across consecutive panel waves spaced at annual or even larger intervals (for a related discussion, focusing on childbirth and partner bereavement, see Hudde and Jacob, 2023).

The present study aims to illuminate this black box. Exploiting up to 12 waves of the German Socio-Economic Panel Study (SOEP-Core v37, 2022) collected biannually from 2002 to 2016 and annually from 2016 through 2020, we estimate fixed-effects (FE) models to assess short-term losses and recovery in adult children's mental health following their first and second parent's death. Data on the month of parental death and on the month of the interview allowed us to assess the magnitude of its impact as well as subsequent recovery on a monthly timescale and hence provide an exceptionally fine-grained picture of the dynamics that occur during this critical period.

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2. Background

2.1. Parental death and mental health responses

Parental death might negatively influence an adult’s mental well-being, at least temporarily (Bowlby, 1980; Marks et al., 2007; Umberson, 2003). Parents are no longer expected to pass away until they reach old age, except the rare cases of unexpected mortality (Umberson, 2003). The death of a parent in adulthood is a life-altering event, introducing upheaval into various facets of an adult’s existence, including emotional well-being, personal life, and social involvement (Umberson, 2003). An adult’s emotional well-being can be affected even before parent’s death, especially if the parent has been dealing with a long-term illness that makes death inevitable (Marshall, 2004; Moss and Moss, 1985). Anticipatory grief, which can begin months or even years before an actual loss, can assist adults in building coping mechanisms for the upcoming loss. However, no preparation can be comparable to the reality of the death experience (Marshall, 2004; Moss and Moss, 1985). Once the death comes, bereaved adult children first experience grief and then initiate a process of reassessment of their life’s purpose, mental health, interpersonal relationships, and identity (Bowlby, 1980; Leopold and Lechner, 2015; Petersen and Rafuls, 1998; Umberson, 2003). The complexity of these transformations places a significant psychological burden on adults, leading to negative effects on their mental health (Bowlby, 1980; Umberson, 2003).

2.2. The role of grief theory and time in mental health responses to parental death

Grief is identified as a key explanatory mechanism of the negative mental health responses around parental death event (Anderson, 2010; Shuchter and Zisook, 1993). However, there is a number of unresolved questions with respect to the nature of loss, coping, and grief process in the existing data. Grief develops fast on a fine-grained timescale, varies between normal and complicated processes, with immediate reactions playing a crucial role in long-term coping mechanisms (Bowlby, 1980).

Typically, grief starts shortly after the loss, with individuals taking hours to several months to acknowledge and grieve the event (Bowlby, 1980; DeVaul et al., 1979; Shuchter and Zisook, 1993). Using the shortest usually available, that is, annual timescale, previous research has indicated the rapid adaptation line from parental death one year after the event (Leopold and Lechner, 2015). However, it is during the initial year after the loss that the most challenging stages of adaptation unfold, which require closer examination: 1) shock, denial, 2) mourning, and 3) steady recognition of death (Bowlby, 1980; DeVaul et al., 1979). The first stage of shock and denial lasts from hours to weeks. The second phase extends over several months and involves the cognitive and emotional acknowledgment of death. The final restitution stage entails the recognition of the loss and a gradual recovery that can last up to several years (Shuchter and Zisook, 1993). In simpler terms, the grief outcome, not the process itself, was declared earlier using an annual approach.

Prior studies have also shown that parental death in adulthood predicts heightened depressive symptoms (Kamis et al., 2022), a decrease in overall life satisfaction (Leopold and Lechner, 2015), and an increased risk of cognitive impairment in later life, as stress can accelerate cognitive decline (Liu et al., 2022). A recent Nordic study on the mental health consequences of parental death for children revealed that the effects were most severe in same-sex constellations of parents and children (Böckerman et al., 2023).

These findings successfully established the effects of parental death on different mental outcomes for bereaved children along the lines of the child’s age, gender of a parent and child. Table 1 additionally summarizes the key details of the prior research. To the best of our knowledge, no quantitative study to date has examined mental health responses to parental death with a detailed monthly timeline, specifically focusing on

Table 1
Parental death and outcomes: main prior research.

Authors	Data	Design	Dependent variable	Waves covered
Böckerman et al. (2023)	Nordic register data	Family fixed effects, event study analysis	Hospitalization spell due to mental health	1970–2016
Kamis et al., 2022	National Longitudinal Study of Adolescent to Adult Health, USA	OLS	Depressive symptoms: Center for Epidemiological Studies-Depression scale (CES-D; Radloff 1977)	4 waves (1996, 2001–2002, 2008–2009, 2016–2018)
Liu et al. (2022)	Health and Retirement Study, USA	Discrete-time hazard regression models	Cognitive status: cognitive impairment (0–11), no cognitive impairment (12–27)	2000–2016
Leopold and Lechner (2015)	German Socio-economic Panel (GSOEP)	FE models	Life satisfaction (0–10)	1984–2012

Note: OLS = Ordinary Least Squares, FE = fixed effects.

the initial year after the loss as the period of most adaptation. Moreover, the most pronounced negative mental health responses tend to occur already in the month of loss (Bonanno et al., 2002). It means that the yearly data is not granular enough to capture the mental health response phases within the first year. The current study aims to address this gap and zoom into the first year after parental death by utilizing the same annual data structure.

Thus, the following responses are expected within the first post-loss year.

Hypothesis 1. The mental health decline after parental death is deeper when assessed on a monthly compared to a yearly timescale.

Hypothesis 2. The speed of adaptation in mental health is faster when assessed on a monthly compared to a yearly timescale.

In another scenario, if the initial phases of adjustment do not progress naturally, and those who are grieving fail to fully address their grief in the early months, there is a chance of grief complications arising, which might potentially result in significant mental health challenges (Granek, 2010). Scholars introduced the concept of ‘complicated’ or ‘prolonged grief’ to articulate extended mourning periods that last longer than expected (Bonanno et al., 2002; Shear, 2015; Shuchter and Zisook, 1993). Furthermore, prolonged grief disorder has recently gained recognition in both the International Classification of Diseases (ICD-11) and the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), each outlining specific criteria (Bonanno and Malgaroli, 2020; Eisma et al., 2020). For instance, according to ICD-11, individuals must endure persistent preoccupation with the deceased along with emotional distress for a minimum of six months following the loss (Eisma et al., 2020). Simply put, every additional month of grieving beyond the initial phases adds to the risk of future mental health complications.

Given that some population groups exhibit healthier coping strategies than others, a key task for scholars is to ensure that groups more prone to suppressing their grief do not experience long-term complications and ongoing psychological distress. The coping strategies can differ along the lines of first or second parent’s death, gender of the child and parent, and adult’s age at the parent’s death (Bowlby, 1980; Kamis et al.,

2022; Leopold and Lechner, 2015; Liu et al., 2022; Marshall, 2004). This heterogeneity is addressed in our analysis complementary to the main hypotheses.

2.3. Heterogeneity in the immediate mental health responses to parental death

2.3.1. First and second parental death

Quantitative studies offer limited understanding of the impacts of the first versus the second parental death. However, qualitative research propose that grief reactions can differ significantly between these events (Marshall, 2004). Grief associated with the loss of the first parent encompasses multiple dimensions, potentially involving a sense of responsibility for the surviving parent. The necessity to appear resilient, provide care, and comfort the surviving parent can suppress the immediate emotions of grief. Concurrently, witnessing the grief of a surviving parent involves sympathy and can intensify grief, particularly among adult daughters (Marshall, 2004).

Nevertheless, the death of the first parent is a shocking experience that involves a realization of parental mortality. The loss of the second parent might involve less shock but can resurface the grief for both parents, especially if it is suppressed for the first (Marshall, 2004). Both the first and second death facilitate a reevaluation of the adult's family role, acquisition of new responsibilities and awareness of self being the next generation that will pass away as a natural process of the life course (Neugarten, 1969).

2.3.2. Adult child's gender

Parental death is a gendered experience, with variations observed between the genders of children (Marshall, 2004; Moss and Moss, 1985). Following the loss, adult daughters tend to express more sadness and emotions towards the deceased parent, while sons are less inclined to openly share their deep thoughts and immediate reactions (Lundorff et al., 2020; Marshall, 2004; Stroebe et al., 2001). Daughters usually act as primary caregivers in case of long-term illness of a parent (Umberson, 2003). This way, they might feel a sense of relief by alleviating the responsibility strain. However, they simultaneously lose the much closer relationship built with a parent during the caregiving process (Umberson, 2003). It means that intensified grief from a parent's death can be a higher emotional price daughters pay for a closer relationship with a parent compared to sons.

Additionally, previous studies revealed that sons are more likely to express prolonged grief than daughters (Lundorff et al., 2020) and use avoidance strategies to cope with negative feelings, such as working more than usual, exercising a lot, and drinking alcohol (Umberson, 2003). Daughters also can use avoidance strategies but are more likely to choose the coping mechanisms that help to express their emotions (Umberson, 2003).

2.3.3. Other heterogeneity

The gender of a parent and the adult's age at the time of parental death are additional dominant moderators of interest in the parent death outcomes on mental health. Mother's loss might have greater negative impact due to closer attachment in childhood compared to fathers (Bowlby, 1980; Leopold and Lechner, 2015; Umberson, 2003). The immediate responses to parental loss can be more pronounced at younger ages when the loss happens 'off-time' the expectable schedule and natural order of timing in the social structure (Elder, 1977; Leopold and Lechner, 2015).

Further characteristics that have been shown to matter in parental death experiences include preceding relationship qualities with parents, the child's sociodemographic characteristics and social support (Neugarten, 1969). This differentiation makes a response to the loss both less

predictable and more complicated since hypothetical scenarios are diverse. For example, negative or silent relationships can serve as a relief for a bereaved adult and evolve less distress (Rossi and Rossi, 2018; Umberson, 1992; Umberson and Chen, 1994). At the same time, unresolved conflict with a deceased parent can increase the psychological distress of a child (Steffen et al., 2022).

3. Method

3.1. Data

We based the empirical analysis on data from German Socio-Economic Panel (GSOEP) 1984–2020, exploiting up to 12 measurements of mental health (from 2002 to 2016 biannually, from 2016 through 2020 annually). The GSOEP is one of the longest representative annual longitudinal studies of private households in Germany for social, behavioral, and economic research (SOEP-Core v37, 2022). Although the GSOEP is conducted annually, it includes additional information on the interview month and the month of a parent's death.

3.2. Sample selection

We defined two separate analytical samples for the first and the second parent's death. The inclusion criteria for the first parental death sample were: 1) both parents were alive at the initial observation (those whose parents died before the first observation/at first observation were excluded); 2) the first parent died along the observation period of a respondent; 3) the person was observed at least once before the death of the first parent (individuals who were not followed after the death event were included in the sample); 4) the death month was known for the respondent to depict better comparability between the yearly and monthly analyses. In total, after all sample restrictions, 2106 respondents who experienced their first parent's death met these criteria. We additionally included in the analysis those whose both parents remained alive along the panel to better estimate contemporaneous effects. Altogether, 43,636 persons comprised the analysis of the first parental death (see Supplementary Material, Appendix 1, Fig. 1 for a detailed sample selection flow chart).

The inclusion criteria for the second parental death sample were: 1) at least one parent was alive at the first observation; 2) the second parent died across the observation period; 3) the person was observed at least once before the death of the second parent (individuals who were not interviewed after the death event were included in the sample); 4) the death month was known for the respondent to depict better comparability between the yearly and monthly analyses. In total, after all sample restrictions, 1338 respondents met these criteria. For this sample, we also considered those who did not lose their second parent. Altogether, 58,644 persons were included in the second parent's death analysis (see Supplementary data, Appendix 1, Fig. 2 for a detailed sample selection flow chart). The samples of first and second parental death slightly overlapped. Only 182 persons lost their first and second parent along the observation window. We excluded the unusual instances in which 93 individuals lost both parents in the same year in the first parental death sample and 71 individuals experienced the same situation in the second parental death sample. Overall, the analysis covered up to 12 annual measurements. We restricted the respondent's age to individuals aged 18 to 85 to ensure that individuals have reached adulthood and are still at risk of experiencing parental loss.

Tables 2 and 3 provide a descriptive overview of the first and second parental death samples, along with the samples that did not encounter these events (see Supplementary data, Appendix 2 for the samples by gender). Overall, the sample of those who experienced the death of a first parent was notably larger (2106 individuals) than those who lost

Table 2

First parent death sample and those who did not lose the first parent.

Variable	Lost their first parent					Did not lose their first parent					Variable description
	M	SD	min	max	N	M	SD	min	max	N	
Mental Health	49.2	9.8	10.2	75.5	2106	49.7	10.0	0.6	79.6	41,530	Mcs. Measured biannually 2002–2014. Then annually 2016–2020. Based on SF-12v2
Age	40.6	10.2	18	73	2106	33.1	12.7	18	85	41,530	Age of a respondent
Year of First Parent Death	2012.2	5.5	2003	2020	2106						Survey year when the first parent death occurred
Child's age at First Parent Death	46.8	10.8	19	81	2106						Age of a respondent at first parent death
Year of Panel Entry	2006.0	5.5	2002	2018	2106	2011.7	6.6	2002	2020	41,530	First year in which a respondent was interviewed in the mcs first parent death sample
Years observed	6.5	2.8	2	10	2106	2.6	2.2	1	10	41,530	Number of unique years observed in the mcs first parent death sample
Attrition	0.4				2106	0.6				41,530	Respondent dropped out of the panel before the most recent wave of 2020
Father's age at Death	75.9	10.2	41	99	1189						Age of the father if died first
Mother's age at Death	75.8	11.6	41	102	704						Age of the mother if died first

Note: All statistics for time-changing variables are calculated for respondents' first observation in the panel.

Source: SOEP, v37, release 2022.

Table 3

Second parent death sample and those who did not lose the second parent.

Variable	Lost their second parent					Did not lose their second parent					Variable description
	M	SD	min	max	N	M	SD	min	max	N	
Mental Health	49.9	9.8	8.8	73.9	1338	49.7	10.0	0.6	79.6	57,306	Mcs. Measured biannually 2002–2014. Then annually 2016–2020. Based on SF-12v2
Age	48.6	9.6	18	73	1338	36.1	13.6	18	85	57,306	Age of a respondent
Year of Second Parent Death	2012.4	5.4	2003	2020	1338						Survey year when the first parent death occurred
Child's age at Second Parent Death	55.1	9.5	22	81	1338						Age of a respondent at first parent death
Year of Panel Entry	2005.9	5.4	2002	2018	1338	2011.1	6.7	2002	2020	57,306	First year in which a respondent was interviewed in the mcs second parent death sample
Years observed	6.7	2.7	2	10	1338	3.0	2.5	1	10	57,306	Number of unique years observed in the mcs second parent death sample
Attrition	0.4				1338	0.6				57,306	Respondent dropped out of the panel before the most recent wave of 2020
Father's age at Death	77.8	8.8	53	104	343						Age of the father if died second
Mother's age at Death	75.3	8.7	55	107	895						Age of the mother if died second

Note: All statistics for time-changing variables are calculated for respondents' first observation in the panel.

Source: SOEP, v37, release 2022.

their second parent (1338 individuals). Both first and second parental death samples were balanced enough in general, including the distribution by child's gender within the samples. The mean adult child's age at the first parent's death was logically a bit lower (46.8) than the age at the second parent's death (55.1) and almost identical for adult daughters and sons. However, the second parental death sample was somewhat limited in terms of the parent's gender (30% of father's deaths versus 70% of mother's deaths), which may be attributed to the typical tendency of fathers to pass away first (Crimmins et al., 2021). For the first parental death sample, the gender distribution of the parent still maintained satisfactory balance (60% of father's deaths versus 40% of mother's deaths), making it possible to observe differences in gender dyads: mother first - daughter, father first - son. As a result, all analyses of parent-child gender dyads were confined to the first parental death sample.

Individuals who experienced a parental death (either first or second) exhibit mean mental health similar to those who have not encountered this event. Despite the similarity in mean values between these groups, the range (min/max) was wider for individuals who did not experience parental death, with notably poorer mental health at the lower bound. Moreover, the attrition rate was higher among individuals who experienced parental loss. There is an unavoidable risk of positive selection bias in long-running panels, as those with superior mental health, greater resilience, and the capacity to participate in the panel for an

extended period are more likely to have their experience of parental death captured.

3.3. Measures

3.3.1. Dependent variable

The outcome variable, mental health, is measured by the mental health component scale in the GSOEP. This scale, based on the SF-12v2 questionnaire, includes four dimensions: Vitality, Role Emotional, Mental Health, and Social Functioning. Each dimension is scored on a scale from 0 to 100, with a mean of 50 and a standard deviation of 10 (Andersen et al., 2007). This variable has been measured since 2002: every second year from 2002 to 2016 and every year from 2016 to 2020, providing up to 12 measurements per individual for the analysis.

3.3.2. Independent variable

We generated the yearly and monthly dummy impact functions to track changes in mental health following parental death. First, to identify the death year, we combined the reported year information from 1) prospective survey question about the current status (dead or alive) of the mother or father ('Has your family situation changed since the last interview?' Yes/No) and 2) retrospective biographical questionnaire that pinpointed the actual calendar year of death ('What year did your mother/father die?'). The design required a combined measure of the

death year because not all respondents received both prospective (death year at the moment of interview) and retrospective (calendar year of death) information. However, the rule was to trust the real calendar year of death when possible. The calendar death values from the retrospective survey in the GSOEP always preceded the reported death years at the moment of the interview. This way, for instance, if both prospective and retrospective measures were available, we depicted the calendar year from the retrospective (biographical) questionnaire. In case only the death year from the prospective survey was known, it remained in the analysis as the closest available documentation of death.

Finally, we defined the parental death index for the estimation of the yearly impact function.

- 1 '>2 years before'
- 2 '1 year before'
- 3 'death year'
- 4 '1 year after'
- 5 '>2 years after'

Second, the question about the month of parental death was included exclusively in the prospective survey. We subsequently merged it with the newly generated death year measure. To calculate the months before, at, and after the death, we employed the Century Month Codes (CMC) methodology (Rutstein and Rojas, 2006). We calculated the difference between the century code for the survey month-year and the century code for the month-year of the parent's death. Given the GSOEP annual data structure, every respondent was not interviewed on a monthly basis. It means that any given person was not going to have mental health measurements for every month before and after the death event. Each monthly time measure corresponded to the mental health score from the survey wave closest to death instead. As an illustration, in case a respondent, whose parent died in December 2017, participated in the survey conducted in December 2016, January 2018, and February 2019, then for this individual, the monthly measurement included the mental health scores for three time periods: 12 months before the death, one month after the death and 14 months after the death.

This way, we defined the parental death index for the estimation of monthly impact function.

1 - '>2 years before'	8 - '1-2 months after'
2 - '1-2 years before'	9 - '3-5 months after'
3 - '9-11 months before'	10 - '6-8 months after'
4 - '6-8 months before'	11 - '9-11 months after'
5 - '3-5 months before'	12 - '1-2 years after'
6 - '1-2 month before'	13 - '>2 years after'
7 - 'death month'	

Given that not every respondent received the month category, the monthly variable comprised up to 350 observations per scale point which was sufficient to observe the monthly changes in mental health. The numbers of observations seemed to be at their lowest at death month and 1-2 months prior to the event. This can be partially attributed to the interviews being delayed around the time of the death experience (for a detailed distribution of observations per month see Supplementary data, Appendix 1; Figs. 4 and 5).

3.3.3. Controls

Each model, similar to the yearly study by Leopold and Lechner (2015) examining the impact of parental death on life satisfaction, controlled for age, period, marital status, and employment status. Both age (with the reference 'aged 46 to 50 years old') and period (with the reference '1999-2003') as time-varying characteristics were estimated as categorical variables to minimize the collinearity with yearly and monthly time dummies.

Given that single individuals in education are more likely to not achieve the 'on-time' age for the parent's death and can have selectively better mental health as compared with widowed or full-time workers,

this study controlled for both marital and employment statuses. The marital status included categories for married, divorced, and widowed respondents, using 'single' as the reference group. Employment status comprised part-time, in education, not employed, registered as unemployed categories, with 'full-time employed' as the reference group. Within-person variation accounted for 14% of total variation in marital status and 35% of total variation in employment status. Finally, time dummies for the first or second parent were included to control for changes associated with both considering a little overlap between the samples of the first and second parental deaths.

3.3.4. Analytic strategy

We estimated FE regression models for both yearly and monthly analyses of the impact of parental death on adult children's mental health (Brüderl and Ludwig, 2014; Ludwig and Brüderl, 2021). FE effectively eliminates all time-invariant unobserved heterogeneity, yielding estimates that are closer to the 'pure within-person comparison'. This advantage of FE was beneficial when evaluating the yearly-scale impacts and the initial monthly effect compared to >2 years before the event. The estimated monthly-scale effects when compared to each other, though, reflected the between-person differences in mental health given the annual structure of the data and that every respondent did not receive the mental health measurement for every month category.

The main time effects were estimated only for people who experienced the parental death event during the observation period. However, those who did not lose their parents contributed to the estimation of contemporaneous effects and were retained to serve as a control group for estimating the common age effect (Brüderl and Ludwig, 2014).

In line with the successful application of FE models with yearly and monthly dummy impact functions in the analysis conducted by Hudde and Jacob (2023) that enables a more granular view on an annual scale, we employed yearly and monthly FE models in this study (see Supplementary data, Appendix 1 (3A and B) for the detailed equations and description of the estimates) that cover the whole phase of the parental death experience: pre-event levels and anticipation, death event, and adaptation periods.

4. Results

4.1. Yearly and monthly parental death effects on mental health

Fig. 1 demonstrates the yearly and monthly changes in mental health for the samples of respondents who lost their first and second parent. The left-side graph presents yearly within-person estimates of mental health, illustrating changes in individual mental health over time. Conversely, the right-side graph shows monthly between-person changes in mental health at different time points. The monthly graph underscores variations in mental health across different individuals and therefore does not represent the lines connecting the monthly measurement points compared to the yearly graph. For the interpretation, however, the monthly estimates represent a within-person change when compared to the reference category (>2 years before) because almost every person from each month category was observed >2 years before the event. When the monthly effect is compared to the other month category, it demonstrates the estimation between different individuals. Tables 4 and 5 represent the estimates of the FE regression models, forming the basis for the constructed figures.

First, the deeper drops in mental health were evident on a monthly compared to the annual timescale for both first and second parent's deaths (Hypothesis 1 is supported). Additionally, the harshest period of adaptation was found to occur within the initial two months following the loss, displaying a slight delay rather than an immediate onset during the initial weeks of loss, as proposed in the theoretical framework (Bowlby, 1980; Shuchter and Zisook, 1993; Umberson, 2003). Compared with the average mental health prior to the event (>2 years

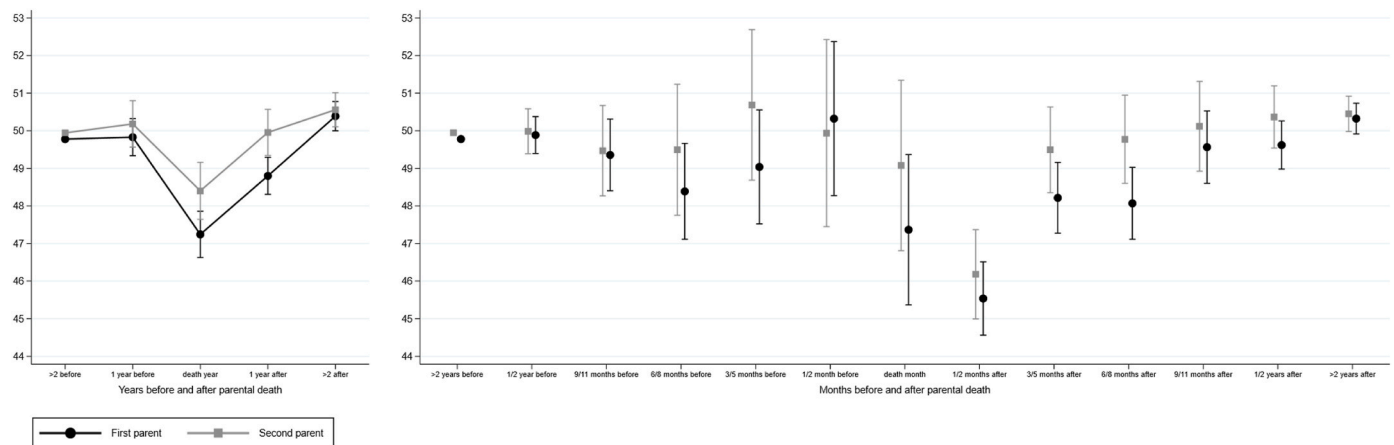


Fig. 1. Parent's death and change in mental health: Yearly and monthly

Note: Data are from the German Socio-Economic Panel Study, 2002–2020, v37, release 2022. Sample 1 (death of first parent): $n = 2106$ individuals (who lost the first parent), $n = 41,530$ individuals (who do not experience the death of the first parent). Sample 2 (death of second parent): $n = 1338$ individuals (who lost the second parent), $n = 57,306$ observations (who do not experience the death of the second parent). The y-axis shows mental health scores (range: 0 to 100, Mean = 50, SD = 10). Bars represent 95% confidence intervals. Yearly estimates are presented in Model 1 (first parent death) and Model 2 (second parent death) (see Table 4). Monthly estimates are presented in Model 3 (first parent death) and Model 4 (second parent death) (see Table 5).

The overall sample of respondents who lost their first and second parent additionally includes adult children who are at risk of losing their first and second parent, but do not experience this event along the observation period in the SOEP (v37).

before), the initial two months after the death decreased the mental health of adult children by 4.24 points for the first and 3.77 points for the second parent, holding other covariates constant. This was almost two times the negative effect of death year/death month for the first parent (-2.41) and more than four times the negative effect of death month for the second parent (-0.87). Both yearly and monthly 'at death' effects were, however, moderate in size, accounting for 0.25 SD and 0.15 SD of the overall variation for the first and second parent's death respectively, when monthly '1–2 months after' effects were stronger and accounted for 0.42 SD and 0.38 SD of the overall variation for the first and second parent's death respectively ($SD(mcs) = 10$).

Second, the most recovery was evident within the first year, precisely in the first half a year after loss, meaning the recovery was occurring faster than seen on the annual timescale (*Hypothesis 2* is supported). Hence, the substantial recovery was noticed four months following the event, with an effect that was twice less negative than during the '1–2 months after' the loss of the first parent and more than six times less negative following the loss of the second parent.

4.2. First and second parent's death

Overall, adult children who experienced the loss of their first parent demonstrated lower levels of mental health '1 year after' compared to those who lost their second parent (see Fig. 1, annual graph). The pattern of mental health change on a monthly timescale appeared similar for both events, however, with a slightly insignificant variation in the adaptation stage occurring '7 months after' the loss (see Fig. 1, monthly graph). Adults grieving their first parent's death seemed to have a slower recovery compared to those mourning their second loss. Even though the pattern of mental health alterations was alike, the adaptation process was slower for those who undergo the loss of their first parent.

4.3. Gender of an adult child

Figs. 2 and 3 show the overall annual and monthly changes in mental health of adult sons and daughters for the first and second parent's death. Overall, adult sons initially exhibited better mental health scores compared to adult daughters.

In the initial two months, the most pronounced difference between

adult sons and daughters was observed, with adult daughters experiencing the most decline in mental health after the death of the first parent. This decline accounted for 6.01 points drop in mental health compared with the reference period (>2 years before), holding other covariates constant (see Supplementary data, Appendix 4 for the detailed estimates). This effect was three times as large the drop in the death month (2.07 points). In contrast, for adult sons a decrease comprised 2.83 points in the death month, with a slight increase in mental health occurring immediately after the death of the first parent (during the first two months following). Therefore, the declines in mental health when seen on a monthly timescale appeared to be deeper for adult daughters than sons.

In contrast to the first parent's death, adult sons experienced a more pronounced drop in mental health during the initial months following the second parent's loss, with a decrease of 3.12 points. In summary, the first few post-loss months appeared to be particularly challenging for adult daughters, with sons encountering a challenging stretch only after the second parent's loss. It took more than two years for both daughters and sons to reach their pre-event levels of mental health.

4.4. Change in mental health by gender of a parent and age at parental death

4.4.1. Gender of a parent and child

Fig. 4 demonstrates the mental health change by parent's gender. Overall, a mother's death being first for adult daughters and sons had the most severe negative effects on mental health than father's death. The negative effect at event was much stronger for adult daughters as compared with sons.

Notably, distinct patterns of anticipation and adaptation were observed for daughters and sons during the months leading up to and following the death of a mother. For anticipation, months before the mother's death, mental health fluctuated for both daughters and sons, however, demonstrated the peak (best) mental health of daughters four months before the event followed by the deepest decline of 8.33 points in the first months after the loss (for the detailed estimated see Supplementary data, Appendix 4; Table. 1.2). This most severe impact accounted for nearly one standard deviation ($1SD = 10$ points), a pattern not evident among sons. Sons underwent a much more moderate decline in the initial months (1.93 points). Nevertheless, the sons' adaptation

Table 4
Fixed effects models for mental health change of the first and second parent's death: Yearly.

	Model 1: First parent		Model 2: Second parent	
	Coefficient	SE	Coefficient	SE
Parent's death (ref.: >2 years before)				
1 year before	0.051	0.257	0.238	0.318
death year	−2.535 ^c	0.317	−1.543 ^c	0.389
1 year after	−0.979 ^c	0.257	0.012	0.316
>2 years after	0.610 ^c	0.208	0.615 ^c	0.236
Age (ref.: 46–50)				
18–30	−0.291	0.285	−0.351	0.242
31–35	−0.341	0.221	−0.388 ^b	0.186
36–40	−0.337 ^b	0.170	−0.334 ^b	0.141
41–45	−0.160	0.125	−0.187 ^a	0.101
51–55	0.230 ^a	0.138	0.200 ^a	0.105
56–60	0.209	0.202	0.228	0.152
61–65	1.478 ^c	0.281	1.676 ^c	0.207
66–70	2.281 ^c	0.371	2.288 ^c	0.266
71–80	2.005 ^c	0.476	1.658 ^c	0.334
81–85	−0.284	0.786	−0.202	0.520
Period (ref.: 1999–2003)				
2004–08	0.146	0.104	0.204 ^b	0.084
2009–12	−0.560 ^c	0.146	−0.456 ^c	0.119
2013–15	−0.061	0.180	−0.023	0.147
2016–18	0.304	0.201	0.371 ^b	0.166
2019–20	−0.399 ^a	0.235	−0.372 ^a	0.194
Marital status (ref.: single)				
Married	0.240	0.162	0.306 ^b	0.147
Divorced	0.756 ^c	0.260	1.036 ^c	0.220
Widowed	−2.436 ^c	0.486	−2.082 ^c	0.336
Employment status (ref.: full time)				
Part time	0.369 ^c	0.108	0.294 ^c	0.091
In education	0.203	0.168	0.012	0.156
Not employed	−0.025	0.108	−0.131	0.091
Unemployed	−0.440 ^c	0.135	−0.700 ^c	0.112
Constant	49.599 ^c	0.631	50.203 ^c	0.287
N	124,888		181,134	

Note: Data are from the German Socio-Economic Panel Study, 2002–2020, v37, release 2022. Model 1 additionally controls for the second parent death time dummies. Model 2 controls for the first parent death time dummies. *N* represents the person-years.

Ref. = reference category.

^a *p* < 0.10.

^b *p* < 0.05.

^c *p* < 0.01.

process occurred somewhat later than that of daughters', around six to eight months subsequent to the event.

The notable finding was that despite the fluctuations in mental health during the first year, both adult sons and daughters managed to stabilize their mental health two years after the death of either parent. The dynamics of mental health varied for sons and daughters during the first year as the most critical period of adaptation process. Due to insufficient variation in parental gender within the sample, the analysis did not assess the impact of the death of a second parent by the parent's gender.

4.4.2. Age at parental death

Regarding 'off-time' and 'on-time' parental death and unlike the study of Leopold and Lechner (2015) on life satisfaction, no substantial age differences were found in mental health change before, at, and after parental death. Overall, the effects were found to be small in size. The differences were almost not present for every gender combination but the 'mother first–daughter'. For instance, for the daughter who lost her mother first at 48 years (median age), the death year decreases her mental.

Health by 4.90 points compared with the reference period (for the detailed estimates see Supplementary data, Appendix 5; Tables 1.1 and 1.2). This drop was 1.3 times larger for the daughter's off-time loss at 25 years and comprised 6.48 (−4.896 − 23*0.0687) points. For sons, these

Table 5
Fixed effects models for mental health change of the first and second parent's death: Monthly.

	Model 3: First parent		Model 4: Second parent	
	Coefficient	SE	Coefficient	SE
Parent's death (ref.: >2 years before)				
1/2 years before	0.106	0.255	0.039	0.312
9/11 months before	−0.423	0.499	−0.478	0.664
6/8 months before	−1.393 ^b	0.709	−0.454	0.899
3/5 months before	−0.742	0.841	0.741	0.936
1/2 month before	0.543	1.011	−0.009	1.128
death month	−2.414 ^c	0.926	−0.871	1.162
1/2 months after	−4.244 ^c	0.610	−3.767 ^c	0.623
3/5 months after	−1.565 ^c	0.537	−0.455	0.553
6/8 months after	−1.711 ^c	0.514	−0.173	0.543
9/11 months after	−0.215	0.560	0.172	0.612
1/2 years after	−0.159	0.360	0.421	0.415
>2 years after	0.545 ^b	0.254	0.503 [†]	0.272
Age (ref.: 46–50)				
18–30	−0.297	0.299	−0.359	0.256
31–35	−0.347	0.238	−0.395 ^b	0.201
36–40	−0.338 ^a	0.182	−0.338 ^b	0.151
41–45	−0.159	0.130	−0.189 ^a	0.105
51–55	0.227	0.146	0.201 ^a	0.111
56–60	0.200	0.222	0.230	0.165
61–65	1.468 ^c	0.307	1.681 ^c	0.225
66–70	2.262 ^c	0.408	2.294 ^c	0.289
71–80	1.984 ^c	0.515	1.659 ^c	0.355
81–85	−0.308	0.890	−0.198	0.591
Period (ref.: 1999–2003)				
2004–08	0.149	0.103	0.208 ^b	0.083
2009–12	−0.554 ^c	0.149	−0.451 ^c	0.121
2013–15	−0.050	0.185	−0.018	0.151
2016–18	0.311	0.209	0.379 ^b	0.170
2019–20	−0.411 [†]	0.244	−0.383 ^a	0.199
Marital status (ref.: single)				
Married	0.233	0.181	0.303 [†]	0.165
Divorced	0.750 ^b	0.309	1.034 ^c	0.257
Widowed	−2.437 ^c	0.664	−2.091 ^c	0.469
Employment status (ref.: full time)				
Part time	0.368 ^c	0.117	0.295 ^c	0.099
In education	0.204	0.175	0.017	0.165
Not employed	−0.025	0.123	−0.131	0.105
Unemployed	−0.442 ^c	0.164	−0.704 ^c	0.136
Constant	49.728 ^c	0.732	50.140 ^c	0.326
N	124,888		181,134	

Note: Data are from the German Socio-Economic Panel Study, 2002–2020, v37, release 2022. Model 3 additionally controls for the second parent death time dummies. Model 4 controls for the first parent death time dummies. *N* represents the person-years.

Ref. = reference category.

^a *p* < 0.10.

^b *p* < 0.05.

^c *p* < 0.01.

negative effects at 48 and 25 years were expected to be 3.30 points lower (weaker) at the death year. However, the deepest negative adaptation for sons who lost their mother first at age 25 occurred six to eight months after the event (the effect by 3.44 points more negative compared to daughters at age 25). Taken together, for both adult daughters and sons, the effects were more pronounced at younger ages, however, exclusive to instances where the mother deceased first.

5. Discussion

This investigation's objective was to substantively evaluate the impact of parental death on adult mental health at two different time-scales: yearly and monthly. Existing research in grief and coping studies suggested that the stress response, subsequent grief, and adaptation mechanisms in individuals coping with loss were often manifested within a relatively brief span (Bowlby, 1980; DeVaul et al., 1979; Shuchter and Zisook, 1993). Consequently, monthly timescales might

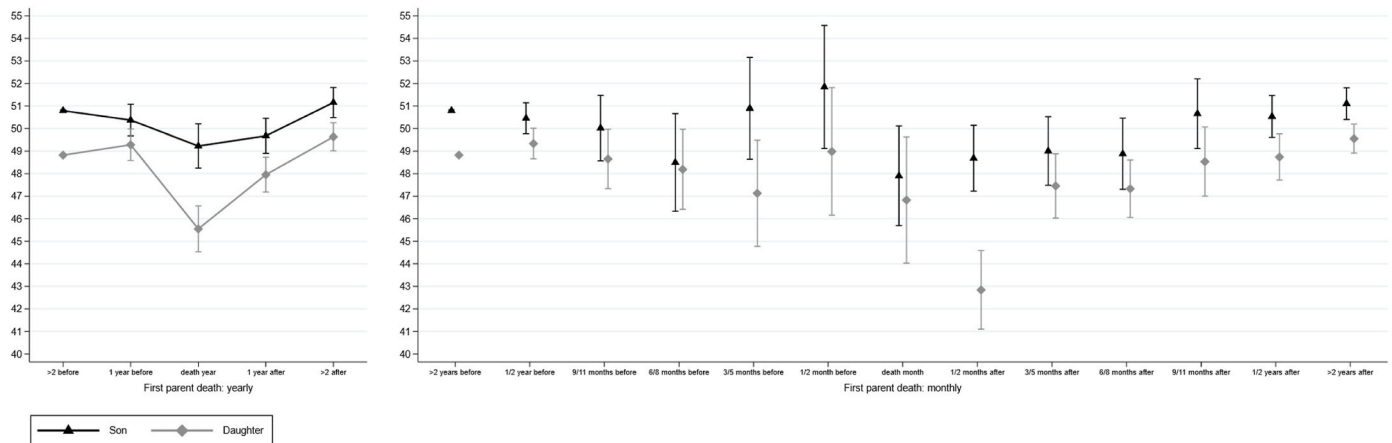


Fig. 2. First parent death and change in mental health: By gender of an adult child yearly and monthly

Note: Data are from the German Socio-Economic Panel Study, 2002–2020, v37, release 2022. Each model controls for age, period, marital status, employment status. The y-axis shows mental health scores (range: 0 to 100, Mean = 50, SD = 10). Bars represent 95% confidence intervals.

First parent death:

n = 2106 individuals who lost the first parent.

n = 41,530 individuals who did not experience the death of the first parent.

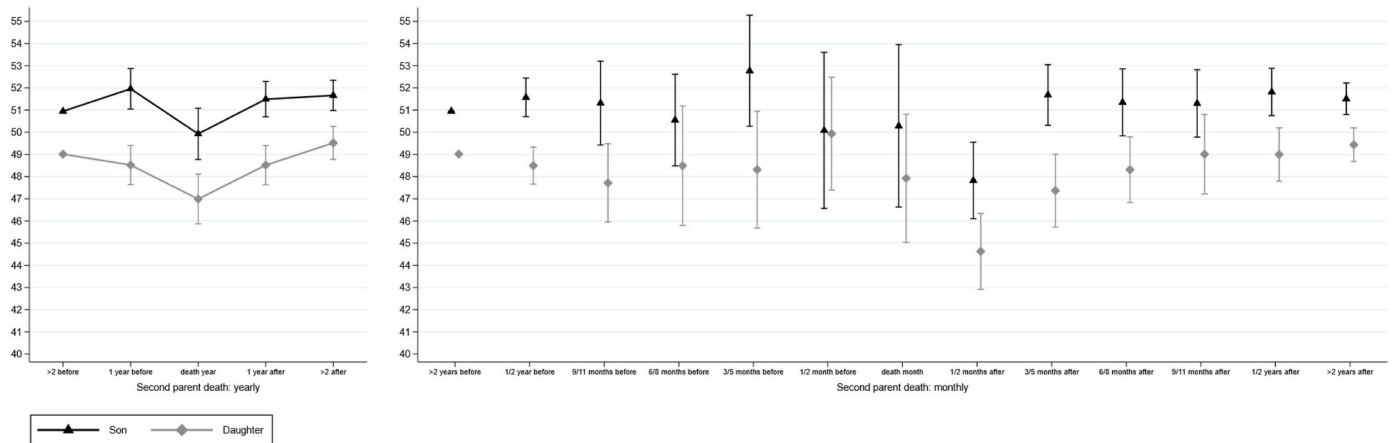


Fig. 3. Second parent death and change in mental health: By gender of an adult child yearly and monthly

Note: Data are from the German Socio-Economic Panel Study, 2002–2020, v37, release 2022. Each model controls for age, period, marital status, employment status. The y-axis shows mental health scores (range: 0 to 100, Mean = 50, SD = 10). Bars represent 95% confidence intervals.

Second parent death:

n = 1338 individuals who lost the second parent.

n = 57,306 individuals who did not experience the death of the second parent.

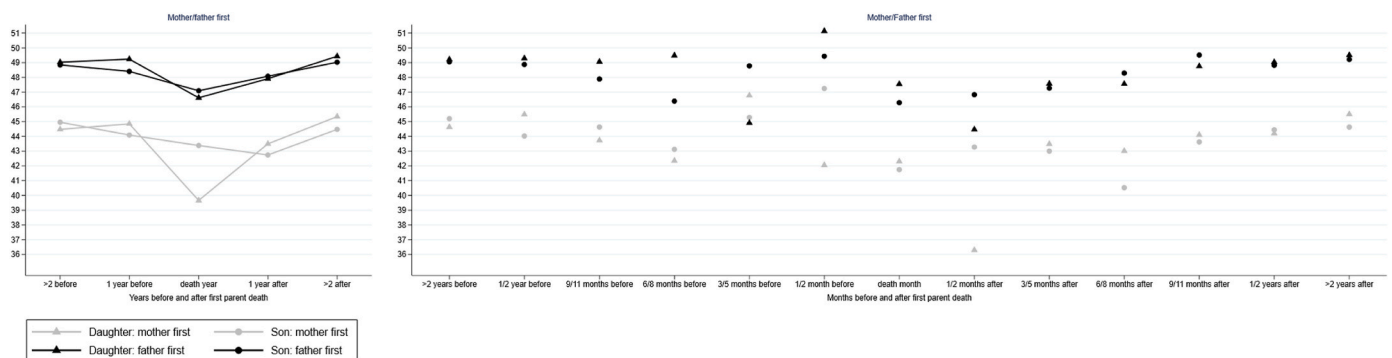


Fig. 4. Change in mental health: By parent's and adult child's gender

Note: Data are from the German Socio-Economic Panel Study, 2002–2020, v37, release 2022. Each model controls for age, period, marital status, employment status. Models 5, 6, 7, 8 additionally control for the second parent death time dummies. See [Tables 1.1](#) and [1.2](#) for the detailed estimates.

First parent death: mother first (n = 5139 (person years)), father first (n = 8464 (person years)).

provide a more accurate representation of these processes as compared to the traditionally employed yearly timescales. For the purpose of this comparison, we used detailed prospective data from the German Socio-Economic Panel (GSOEP).

FE models with monthly and yearly impact functions revealed two main findings. First, supporting our [Hypothesis 1](#), drops in bereaved adult children's mental health were substantially deeper on a monthly than on an annual timescale. The average maximum drops measured on a monthly scale were approximately twice of the size measured at a yearly scale. This difference between monthly and annual timescales was more pronounced in women than in men. For example, the estimated maximum drop in mental health was almost a full standard deviation for daughters assessed one to two months after their mother's death. The corresponding estimate on an annual scale was less than half of this magnitude. This contrast demonstrates that annual timescales underestimate the severity of the impact of parental loss on adult mental health.

Second, supporting our [Hypothesis 2](#), adaptation occurred much faster when measured on a monthly timescale. The most substantial recovery was completed already a few months after parental loss. More than half of the maximum loss recorded on a monthly scale had dissipated merely four months after a parent's death. This speed of mental health recovery was not evident on a yearly timescale. Hence, gender differences were most evident in the months surrounding a death event with the rapid adaptation process attenuating these differences in the succeeding months, especially if mother deceased first. This also implies something broader, suggesting that adaptation to loss events unfolds at a much faster pace than has been demonstrated by a large body of research using annual timescales ([Leopold and Lechner, 2015](#); [Kamis et al., 2022](#); [Liu et al., 2022](#)). Consequently, research into substantive processes of adaptation and heterogeneity therein – in this case by gender and death sequence – is better explored on monthly than on annual timescales ([Hudde and Jacob, 2023](#); [Marshall, 2004](#); [Umberson, 2003](#)).

Our study presented several challenges that warrant further exploration in future research. First, our study may not capture the full complexity of grief's impact on mental health. Moreover, although grief is considered a universal and natural experience, different cultural norms may influence the expression of grief and its impact on mental well-being ([Stroebe and Schut, 1998](#)). Our study represents the German population and is not necessarily applicable to other cultures or regions. Second, the study design did not guarantee that a parent's death occurred prior to the interview month. A scenario in which an interview preceded the parent's death within the same month might clarify why the most substantial mental health declines did not occur at death month immediately, but rather with a slight delay at one to two months after the event. Third, it seemed plausible that those experiencing intense grief might opt to postpone or forgo the interview, which could provide another potential reason for the slightly delayed mental health responses in the initial months after the death.

Our monthly assessment of mental health changes reflected within-individual comparisons only when compared to the reference category (the initial drop compared to >2 years before) and represented between-individual estimations when compared between the month categories (adaptation processes). This was a methodological compromise we accepted to prioritize fine-grained estimations using the available data. Even the monthly data extracted from an annual panel was limited, and future research might profit from employing data measured monthly, or at least quarterly, to investigate immediate reactions to loss.

Additionally, our causal conclusions can be true only under the assumption that our controls capture all relevant time-varying characteristics. Some confounders, such as changes in the living situation of a child/parent, might have adverse effects on the mental health of adult children and were not accounted for. Our data did not allow investigating other potential moderating or mediating factors such as pre-death parent-child relationship quality ([Umberson and Chen, 1994](#)), sibling

relationships before and after the event ([Hank, 2021](#)) as a proxy of family support, the role of the adult child as a caregiver before the parent's death ([Umberson, 2003](#)), accidental versus non-accidental death, or whether the parent suffered from long-term diseases prior to the death ([Burton et al., 2006](#)). Our study could not estimate the models for the child-parent gender dyads due to an underrepresentation of fathers in the second parental death sample. This might be attributable to the longer life expectancy of women compared to men ([Crimmins et al., 2021](#)), as well as their increased likelihood of surviving long enough to be the second parent to pass away.

Lastly, exploring separate dimensions of the broad construct of mental health might help to capture the mental health responses more precisely (e.g. depression sub-scale, positive/negative affect scale, anxiety sub-scale). While SF-12v2 mental scale is a reliable and valid measure, its construct validity might be compromised due to the omission of some theoretical dimensions of mental health ([Headey et al., 1993](#); [Keyes, 2005](#); [Massé et al., 1998](#); [Veit and Ware, 1983](#); [Zautra et al., 1988](#)) (see [Supplementary data](#), Robustness checks, Appendix 6).

Taken together, our study demonstrated that the mental health impact of parental loss unfolds faster and steeper on a monthly compared to yearly timescales. Societies should pay attention to the finely grained nature of this event and moderating roles of the child-parent gender, first and second loss, age in the effects on adult mental health that might matter for future adaptation and well-being of those dealing with the universally inevitable experience of losing a parent. The insights derived from our study will hopefully contribute to further informing researchers as well as practitioners in counseling and therapy. In light of our findings, providing clinical support to bereaved children within the first six months post-event appears particularly important. We also recommend that policymakers devise strategies to ensure equal access to mental and financial support for individuals experiencing parental loss, particularly in the critical initial period following the event.

6. Robustness checks

(see [Supplementary data](#), Appendix 6).

CRedit authorship contribution statement

Kateryna Sytkina: Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmmh.2024.100317>. Link to replication files: <https://osf.io/ry3cq/>.

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