The Cost of Widowhood: A Matching Study of Process and Event

Zachary Van Winkle

Sciences Po, Center for Research on Social Inequalities (CRIS), CNRS, Paris

Department of Sociology and Nuffield College, University of Oxford

Thomas Leopold

University of Cologne, Institute of Sociology and Social Psychology

Abstract

We examine the mental health and economic consequences of widowhood in a novel way by assessing meaningful comparison groups allowing us to evaluate the impact of bereavement before and after the event. The analysis for focuses on two scenarios: unexpected and expected widowhood. The first scenario models a two-period process in which effects of widowhood occur only after the event. The second models a three-period process in which effects of widowhood also occur before spousal loss. HRS data and a combination of random-coefficient modelling, propensity score matching, and regressions are used to estimate the consequences of widowhood from ten years before to six years after spousal loss. Results on mental health show a slow but full recovery for unexpected widowhood, but larger and lasting declines for expected widowhood. Findings on economic wellbeing show sizable losses for expected widowhood due to the economic cost of the pre-widowhood period.

Keywords

Widowhood, Depression, Economic Wellbeing, Life Course, HRS

INTRODUCTION

Widowhood is a critical life event entailing short-term and long-term consequences in general well-being, health, and finances. It remains one of the prime life course risks in contemporary societies. Widowhood is also a common experience: Despite high separation rates, the majority of unions in old age ends with the death of a partner (Mayol-García, Gurrentz, and Kreider 2021). The Covid-19 pandemic has also made widowhood even more prevalent across a larger age-span than would have been predicted before its outbreak.

Despite its high prevalence and far-reaching consequences, social science research has been less interested in widowhood than in other disruptive life events, such as job loss or divorce. Knowledge about the consequences of widowhood is concentrated in the domains of health (Elwert and Christakis 2006) and social support (Ha 2008; Pai and Ha 2012). The few studies on the impact of widowhood on economic wellbeing date from the 1980s, 1990s (e.g., Bound et al. 1991; Holden and Smock 1991), and early 2000s (e.g., Angel, Jimenez, and Angel 2007; Gillen and Kim 2009; Hungerford 2001). Despite the merits of this research, we have only begun to understand the consequences of widowhood.

In this article, we take a new approach to studying the consequences of widowhood that advances on previous research in two main ways. First, our approach recognizes that widowhood is not only an event but also a process. Widowhood is typically not caused by a sudden death, but is preceded by declining health that often last several years. Research that focuses only or mainly at changes across shorter time periods opens the observation window too late and closes it too early.

Closing the window too early means that the analysis underestimates the consequences *after* widowhood. Opening the window too late means that consequences of the widowhood process that accumulate *before* the event are missed. For example, the economic costs of losing

a partner accumulate before widowhood in terms of out-of-pocket medical expenses and reduced work capacities of both the dying and the surviving partner. The mental health cost of the bereaved partner is also partly incurred before widowhood, as research on anticipatory grief and coping has amply demonstrated (Coelho and Barbosa 2017).

If the costs of widowhood begin to accumulate long before and persist long after spousal loss, then the assessment of consequences for economic and health outcomes requires an extensive observation window opening not only before the widowhood event has occurred, but before the widowhood *process* has started. The first contribution of our approach is to meet this requirement. We draw on data from the US Health and Retirement Study (HRS) to assess the consequences of widowhood for household income and mental health across individual observation periods of 16 years. Our observation window opens a decade before widowhood, ensuring that pre-event changes in economic and health outcomes are captured.

Second, our approach recognizes that the consequences of widowhood must be assessed relative to meaningful comparison groups. The resulting comparisons allow us to assess changes across the entire process of widowhood, capturing and quantifying the consequences accumulated before and after the event of a partner's death. Our approach creates different comparison groups representing different counterfactual scenarios estimated by a novel twofold matching method. We match not only on the event of widowhood but also on the preceding process, here defined as *spousal health decline*. We then estimate the consequences of widowhood by comparing treated T (i.e., widowed in the panel) and controls C (i.e., not widowed in the panel) in two ways: (1) T and C *not* experiencing spousal health decline; and (2) *only* T experiencing spousal health decline.

Our approach not only advances on previous research on widowhood, but also contributes to research on life events more generally. The problem of modelling pre-event

process effects on an outcome of interest – labelled "lead effects" (Clark et al. 2008) or "anticipation effects" (Siflinger 2017) – is well-known but its empirical solution is unclear and theoretical guidance absent (Ludwig and Brüderl 2021). With our approach, we address this gap. We study widowhood as a case in point, but the implications extend to other processes and events. A second more general contribution is that our approach recognizes the *cumulative* nature of the costs associated with a life event and the surrounding process. The usual approach of studies on the consequences of life events is to assess costs only in terms of point-in-time comparisons – relative to a reference period located somewhere before the event. Our approach, instead, assesses how costs accumulate across the process – before, upon, and after the event.

PREVIOUS RESEARCH

Widowhood and Mental Health

The consequences of spousal loss have been assessed for a wide range of psychological and mental health outcomes, such as suicidal ideation, anxiety, distress, somatic symptoms, insomnia, and social dysfunction (see Stroebe, Schut, and Stroebe 2007 for an overview). In the present study, we concentrate on depression as a global measure of negative affect and symptomology (e.g., Utz, Caserta, and Lund 2012), a measure that has been studied in both the clinical and social scientific literatures. Although studies agree that spousal loss is linked with depression and that the association weakens over time, review articles from these fields come to different conclusions on the severity and persistence of depressive symptoms following widowhood and its implications. For example, in a recent review Carr and Utz (2020) conclude that older bereaved spouses are vulnerable to depression, but that most return to pre-loss levels within two years. However, a recent meta-analysis of the clinical literature by Kristiansen and colleagues (2019) on the association of time since bereavement and depression found that 10.5

percent of widows and widowers exhibited depressive symptoms well after two years. Some of these differences are attributable to studies' window of observation as well as their ability to include control samples and pre-loss measures.

Longitudinal studies on depression often used prospective data to follow widows and widowers, although the follow-up rarely extended past two years (e.g., Ha 2008; Mullan 1992). For example, Utz and colleagues (2012) found that those in poor health had initially higher levels of grief and depressive symptoms, but that trajectories of change over time were similar regardless of health status.

Research that extended the window of observation beyond two years commonly used only two survey waves and information on time since widowhood to assess the long-term relationship between spousal loss and widowhood (e.g., Arbuckle and de Vries 1995). Others applied prospective data to establish typologies of mental health trajectories following widowhood. For example, Galatzer-Levy and Bonanno (2012) identified four discrete patterns. Roughly two-thirds of their sample was characterized by a resilience pattern of little or no depression. Others were characterized by chronic grief, i.e., depression following loss lasting until four years post-loss, pre-existing chronic depression, i.e., ongoing high pre- and post-loss depression, and an improving depressed pattern characterized by high pre-loss depression and recovery following spousal loss.

Widowhood and Economic Wellbeing

Previous studies on the association between widowhood and economic wellbeing varied in terms of observation span and in their use of comparison samples. Most longitudinal studies demonstrating that widowhood reduces men and women's economic wellbeing compared only two time points. Some studies assessed change in economic wellbeing one year

pre- and post-bereavement (e.g., Hungerford 2001), while other studies compared two survey waves. For example, Haveman and colleagues (2003) examined recipients of social security retired-work benefits in 1982 and 10 years later in 1992. Women who lost their spouses experienced large declines in economic status, measured as family income, income-to-needs ratio, and poverty. Gillen and Kim (2009) estimated the effect of widowhood on income source change and poverty across events occurring between 2002 and 2004 in the HRS. Widowhood decreased income from all sources, but an increase in social security benefits drastically decreased the probability that widowed women entered poverty.

Research that assessed change across two survey waves often used information on the timing of bereavement to draw conclusions as to whether the association between widowhood and economic wellbeing was short-lived or persistent (e.g., Angel et al. 2007). For example, Sevak (2004) used the 1992 and 1998 HRS waves to demonstrate that younger widows' risk of economic hardship increased with the number of years since widowhood. However, few studies used prospective information on widows' and widowers' economic wellbeing in the years following widowhood. Those studies that included prospective information tended to follow the bereaved for only two years (e.g. Morgan 1981), but rarely longer than five years (e.g., Bound et al. 1991).

Although many longitudinal studies included descriptive information on married individuals, they were often not used as a comparison group when quantifying the association between spousal loss and economic wellbeing. In addition, little thought was given to generating a control sample of continuously married individuals similar to the widowed group. Zick and Smith's (1986) study is an early exception, including a comparison group similar to the widowed sample and following them prospectively in the years following spousal loss. Their study analysed PSID data on change in family income, poverty, and income-to-needs ratio among households that were non-poor prior to widowhood. Compared to a sample of

continuously married individuals, which were assigned a random year of widowhood and re-weighted to the same age distribution as the widowed sample, widowed individuals suffered considerable losses in economic wellbeing. The negative impact of widowhood both on women and men persisted throughout a five-year observation period.

THEORETICAL BACKGROUND

Over two decades ago, Carr and Utz (2001) argued that widowhood should be conceptualized as a process that occurs over a prolonged time span rather than a point-in-time dichotomous event that occurs at the moment of spousal death. As our review of previous research demonstrates, empirical studies have not sufficiently captured the widowhood process. We develop our model for the impact of the widowhood process on mental health and economic outcomes that consists of three periods: the pre-widowhood period, the widowhood period, and the post-widowhood period

The Pre-Widowhood Period

We define the pre-widowhood period as the process leading up to the event. In the case of widowhood, this process is commonly understood as the spouse's *terminal health decline (THD)*. For our purposes, it is important to clarify some aspects of this period. First, it may be entirely absent. This applies to all cases in which the death is not health-related (e.g., traumatic death) and to cases in which health problems that cause the death accumulate (a) suddenly or (b) in ways that are not noticeable to those affected or measurable to an analyst. In all of these cases, we assume no pre-widowhood effects on any outcome of interest, and our model collapses to two periods, widowhood and post-widowhood.

Second, our model links changes observed during the pre-widowhood period to a spouse's THD. This entails that our model separates process-related changes in the outcomes of interest – i.e., those changes that are caused by the THD – from other temporal changes occurring during the period. Third, the start of the pre-widowhood period is defined as the onset of the THD. Some declines are rapid, some are gradual and may involve extended periods of disease. If the observation window opens only a few years before widowhood, the THD may often already be at an advanced stage. To capture the THD more fully, our model extends the window to open already a decade before widowhood.

Fourth, the process of a spouse's THD is often not defined prospectively because the terminal nature of a health decline may be known only after the death. Some people may be entirely unaware of their spouse's THD; some may be (initially) unaware that the decline is terminal; others may be fully aware from the onset of the decline and of its terminal nature. One implication is that theoretical ideas about anticipatory coping (Coelho and Barbosa 2017) apply only to some of the bereaved, even if widowhood is preceded by THD. Another implication concerns comparison groups. For processes censored before widowhood, whether a THD is present or absent remains conjecture: One the one hand, a THD may be erroneously assumed for comparison groups with steeper observable health declines of the spouse; on the other, a THD may be erroneously missed for comparison groups with flatter health declines of the spouse.

With these clarifications and limitations in mind, we turn to the substantive changes that may occur during the pre-widowhood period. Specifically, THD-related changes in the outcomes of interest that constitute and should be included in the assessment of the consequences of the widowhood process. Considering mental health, spouses often face numerous challenges in the pre-widowhood period, including difficult caregiving duties that task them both physically and psychologically (Keene and Prokos 2008). Spousal health

decline may also be met with increased emotional and social isolation from both family and friends (Williams et al. 2008). Moreover, those who experience their spouse's THD may neglect their own physical and mental health due to increased labour market participation to cover the financial burden of illness and the physical and emotional burden of caregiving duties.

The grieving process may start already in the moment in which people become aware that their spouse's health decline is terminal (Coelho and Barbosa 2017). Anticipatory grieving may thus shift some of the negative effects on mental health to the pre-widowhood period, and potentially promote recovery in the periods that follow. Couples who are aware of the THD may also have the chance to resolve "unfinished business" (Carr and Utz 2001), and have the time and opportunity to say goodbye.

Considering economic wellbeing, financial strain during the pre-widowhood period is caused by three main factors. First, out-of-pocket medical and long-term care expenses may make it difficult to make ends meet, especially in the US context of the present study. Second, if dying spouses still work for pay, the THD may cause reduced work hours and an earlier withdrawal from the labour market. Third, if surviving spouses perform caregiving duties, further costs may be incurred by forgone labour income. Moreover, couples may need to consume wealth holdings prematurely to cover financial gaps.

The Widowhood Period

We define the widowhood period as the death event and the year that follows. It is often the most intense part of the process, both emotionally and financially, and some of the shock and adaptation occurring during this period are not captured by the annual or biannual panel data available to track changes. If the widowhood period is not preceded by what we defined

as a pre-widowhood period, a larger immediate mental health shock can be expected, as a sudden loss is an especially traumatic and disruptive experience to the surviving spouse. Conversely, if widowhood follows a pre-widowhood period, mental health effects may be alleviated by anticipatory grief and stress relief, in particular for caregiving spouses. As the pre-event baseline of mental health is already lowered, the additional loss may be less severe. Yet, the immense amount of energy spent might also leave the bereaved with depleted mental resources to cope with the loss of their spouse. Regardless of whether the loss was expected or not, surviving spouses often experience immediate grief-symptoms that extend beyond affective reactions, such as loneliness, shock and yearning, as well as behavioural and physiological-somatic symptoms (Stroebe et al. 2007).

In financial terms, the absence of a THD means less economic hardship and reduced cumulative costs of widowhood compared to events following a pre-widowhood period. After the event, all surviving spouses are immediately confronted with funeral and burial costs. The extent to which widowhood also entails a drop in labor or retirement incomes depends on the status of the deceased. In the presence of a pre-widowhood period, labor incomes may already have been reduced partly or entirely, leaving less room for additional declines compared with cases in which a pre-widowhood period is absent. An absent pre-widowhood period also deprives the bereaved of the time and opportunity needed to make financial arrangements.

The Post-Widowhood Period

We define the post-widowhood period as starting one year after the death of a spouse. In terms of mental health, empirical studies have shown considerable if not full recovery during this period (Carr and Springer 2010; Carr and Utz 2020). According to adaptation level theory (Brickman and Campbell 1971; Soloman and Corbit 1974), the surprising resilience of

surviving spouses partly reflects an automatic and physiological stress response that gradually shifts constant stimuli caused by widowhood into the background. Later theories have emphasized additional active coping processes that foster adaptation, but also recognized that recovery often remains incomplete (Diener, Lucas, and Scollon 2009; Headey 2008).

According to much of the literature, most bereaved individuals prove to be resilient to the mental health challenges posed to them in the long term. According to the task-model used in guidance counselling and therapy (Worden and Winokuer 2021), this involves accepting the reality of loss, going through the pain of grief, adjusting to a life without the spouse, and relocating the deceased emotionally. Positive support from family and friends as well as re-engaging socially and participating in social life as well as re-partnering are all factors that facilitate an emotional and psychological recuperation.

As in other critical life events, whether people's mental health recovers partly or fully depends on the comparison. In the presence of a pre-widowhood period, the before-after comparisons made by previous studies may be misleading given that the pre-widowhood baseline of mental health is already lowered by the widowhood process. The same problem applies to assessing the economic impact of widowhood. For economic wellbeing, there are additional reasons for expecting that for most widows and widowers, the economic burden of bereavement will persist. Research has shown that large decreases in household income and increased risk of poverty following bereavement are due to the loss of spousal annuities and pensions as well as the loss of Social Security Disability and Retirement benefits (e.g., Gillen and Kim 2009). These losses are unlikely to be covered by any increased labour market participation of the surviving spouse, but rather by windfall income from life insurances. However, many couples do not have adequate life insurance or their policies have already ended by the time of death. In addition, spouses that drew on capital holdings to cover costs prior to widowhood have less capital income post-widowhood.

Comparison Groups

Studies on the consequences of life events have made substantial progress in the selection of comparison groups. Similar to pioneering studies on other life events, initial studies of widowhood compared widowed to married individuals in cross-sectional data. The advent of panel data shifted the comparison to before-after assessments of the same individuals. Many of these studies kept "control groups", but interest in these samples was limited to improving the estimation of time-varying control variables.

More recent work has improved the selection of control groups by matching techniques. The initial focus of these techniques was ensuring that event and control groups were similar on observable characteristics, including survey year in the panel (Yap, Anusic, and Lucas 2012). Later work has added a focus on the timescale of the process, defining a common starting point at which event and control groups were matched, and endowing the control group with "fictive" events occurring in years that were borrowed from their matches in the event group (van Scheppingen and Leopold 2019).

A benefit of the latter approach is that it creates a comparison group of untreated individuals observed across the entire, albeit fictitious, process consisting of pre-event, event, and post-event periods. A limitation is that matching is conducted only on the propensity of experiencing the event of interest. This limitation is irrelevant for events that occur "out of the blue" and in cases in which a pre-event process is of no substantive interest. Yet, in the presence of a pre-event process as defined above, the comparison becomes obscure. Specifically, a comparison group that is matched on the propensity of experiencing an event that is preceded by a process implicitly matches on this preceding process.

The extent to which event and control groups are similar in their pre-event processes depends on the extent to which initial characteristics are predictive of subsequent trajectories. In the case of widowhood, for example, a control group that is "perfectly" matched on the process (i.e., identical pre-event trajectories) would show similar spousal health declines but no death event despite a similar initial propensity of death occurrence. The problem with this type of comparison is twofold. First, it is unlikely to work satisfactorily in empirical applications, given that event and control group can differ on factors that are predictive of the pre-event process but remain unobserved or measured with error. Second, this comparison is not meaningful if the research interest is in the consequences of the entire process rather than in the event only. For this purpose, a meaningful control group consists of those who are similar at the starting point but remain "untreated" regarding both process *and* event. In our study, this comparison group includes those who are married and experience neither a pre-widowhood process, i.e. THD, nor widowhood.

Matching on Process and Event

To create meaningful comparison groups, we broaden the matching idea to include process and event. A process can only be captured if the observation window covers the (potentially extensive) pre-widowhood period. Consequently, we define a starting point at ten years before widowhood to ensure that even long-term THDs are adequately captured. Next, we define four groups by matching on (a) characteristics observed at the starting point (cross-sectional matching) combined with (b) process information observed in the decade that follows. As per our definition of the pre-widowhood period, process information is obtained from data on spousal health declines. The resulting comparison groups are as follows:

- Group A experience process and event, i.e., their spouses' THD is followed by widowhood.
- Group B experience process but no event, i.e., their spouses' health resembles a THD but widowhood does not occur during the observation period.
- Group C experience no process but an event, i.e., their spouses' health does not resemble a THD but widowhood occurs.
- Group D experience no process and no event, i.e., their spouses' health does not resemble a THD and widowhood does not occur.

Taken together, these four groups allow six comparisons (A vs. B, A vs. C, A vs. D, B vs. C, B vs. D, C vs. D) to assess the consequences of widowhood for economic wellbeing and mental health for different scenarios. Yet, not all groups and comparisons are theoretically meaningful for our purposes, in particular comparison of A and C as well as all comparisons involving group B, in which the presence and duration of the spouse's THD remains speculative. We focus our analysis on two comparisons, C vs. D and A vs. D.

The C vs. D comparison estimates the effects of "unexpected widowhood." It follows the logic of a research design leveraging an exogenous death (e.g., by traumatic cause) to estimate a causal effect of widowhood. The unexpected widowhood comparison represents a two-period process modelled as the scenario of a sudden widowhood event followed by a post-widowhood adjustment phase. A pre-widowhood THD is absent. We expect no differences between C and D in the outcomes of interest to arise pre-widowhood and interpret subsequent differences as the cost of the widowhood and post-widowhood periods. Considering the mental health consequences of widowhood in this scenario, we expect large declines at widowhood and delayed recovery post widowhood, given the absence of anticipatory grief and coping. Considering the economic consequences of widowhood in this scenario, we expect a smaller

cumulative impact, as the costs of a pre-widowhood period (e.g., medical expenses, forgone income) are absent.

The A vs. D comparison estimates the effects of "expected widowhood" as a three-period process model. It differs from unexpected widowhood in that the groups share neither the event of spousal loss nor the preceding process of spousal THD. The resulting comparison resembles the demographically prevalent scenario of a widowhood event that is preceded by a THD. Consequently, we expect differences between A and D to emerge and develop both before and after widowhood. Considering the mental health consequences in this scenario, we expect declines to emerge already during the pre-widowhood periods, followed by smaller additional declines and faster recovery after widowhood – alleviated and facilitated by anticipatory grief and coping. Considering the economic consequences of widowhood in this scenario, we expect a larger cumulative impact due to the costs of the pre-widowhood period.

Cumulative Costs of Widowhood

Research to date focuses exclusively on cross-sectional costs, i.e., the point-in-time consequences of widowhood. This can lead to a substantial underestimation and under-appreciation of its consequences. When taking a processual approach, it is important to assess the cumulative costs of the entire process, including a potential pre-widowhood period. This requirement is particularly obvious for the economic costs that accumulate over several years before and after widowhood. For mental health declines, the concept of cumulative losses is perhaps less obvious but even in a scenario in which mental health recovers fully, losses across the process represent the accumulation of years of life spent in worse mental health due to the experience of widowhood. To capture cumulative costs in economic wellbeing and mental

health, we take the sum of all point-in-time differences estimated between our comparison groups.

DATA & METHODS

Analytical Strategy

Our analytical strategy proceeded in four steps. The first step created an indicator variable for whether an individual was treated (i.e., widowed) or not. For this split into treated and control groups, we relied on a sample of individuals who were observed at least 10 and up to 16 years. The treated consisted of men and women who were observed to transition from marriage to widowhood, while the control group consisted of individuals observed continuously within marriage. Second, we used random effects regression models to create an indicator variable for whether a pre-widowhood process – i.e., a spousal THD – was present or absent in treated and control groups. For this distinction, we relied on data from observed trajectories of spousal self-rated health across the first 10 years of observation. The presence of a pre-widowhood process (i.e., spousal THD) was indicated by steeper declines in spousal self-rated health. The absence of a pre-widowhood process was indicated by flatter declines, stable patterns, or even improvements in spousal self-rated health.

The event indicator created in the first step (event present or absent) and the process indicator created in the second step (pre-widowhood process present or absent) allowed us to represent all groups defined above (A, B, C, D) empirically. In a third step, we used propensity score matching to create our comparison groups of interest, unexpected widowhood and expected widowhood. To ensure that the matching took place before a potential THD had started, the matching was carried out at a measurement point that preceded widowhood, as observed in the treated group, by one decade. In a fourth step, we used regression modelling to

estimate the cross-sectional and cumulative costs of widowhood for two outcomes: mental health measured by feelings of depression, and economic wellbeing measured by total household income minus out-of-pocket medical expenditures.

Sample Construction

The analysis was based on data from the US Health and Retirement Study (HRS), a biennial household panel study that first collected data in 1992 on members of the original cohort, respondents born 1931-1941, and their spouses. In 1993, data on the Asset Health and Dynamics among the Oldest-Old cohort born before 1924 were collected and eventually integrated with the original cohort. In 1998, two new cohorts were added to the study, the Children of the Great Depression cohort born 1924-1930 and the War Babies cohort born 1942-1947. Additional cohorts have been added to the sample every six years.

Our goal was to follow to-be widows and widowers for 10 years before widowhood and up to six years following spousal loss. This requirement excluded cohorts born 1954-1965 (sampled in 2010 and 2016) for which observation periods were not long enough. In addition, we omitted the first wave of the HRS, because information on out-of-pocket medical expenditures and items to construct the feelings of depression scale were either not collected or could not be harmonized across waves. Therefore, our initial sample included 19,482 respondents observed in marriage with an interview between 1994 and 2008.

In this initial sample of married individuals, widowhood was observed for n = 5,435 respondents. Their observation periods spanned up to 24 years before widowhood (i.e., first observation in 1994 and observed widowhood in 2018) and up to 22 years following widowhood (i.e., observed widowhood in 1996 and final observation in 2018). We constrained this treated group to observation points within an interval of ten years before to six years after

widowhood. To ensure that a pre-widowhood process was captured fully, we restricted the treated group to those observed at least at five waves before widowhood, i.e., ten years before spousal loss. We also required the treated group to be observed in the year of spousal loss or in the year after. These sample cuts left us with 3,147 widows and widowers. We constructed two indicators for the treated group: a transition variable and a duration variable. The transition indicator was coded 0 at all observations before widowhood and 1 after. The duration variable counted the years until and since widowhood.

In our initial sample of married individuals, the control group consisted of 14,047 men and women, of whom 5,651 were observed continuously in marriage for at least six waves. As explained below, it was important to match treated and control groups in the year of first observation. In the treated group, the year of first observation (i.e., five waves prior to widowhood) was distributed relatively equally across the years from 1994 to 2008. In the control group, the year of first observation was clumped around the cohort study entry years 1994, 1998, and 2004. We therefore expanded the control group so that each person-year was defined as the beginning of a new nine wave sequence of person-years that could be used for matching.

In a final step, we restricted our sample to persons with spouses report excellent, very good, or good self-rated health at the first year of observation. This was important to ensure that we were able to observe a THD process. If we had included spouses with fair or poor health, the process of a THD might have been underway already upon first observation.

Self-Rated Health as a Measure for the Pre-Widowhood Process

We opted for spousal self-rated health to capture the pre-widowhood process of a THD. Self-rated health has important advantages compared to objective physical health measures

included in HRS. First, self-rated health has been shown to be one of the strongest predictors of mortality amongst a wide range of subjective and objective indicators of mental and physical health, such as previous cancer diagnosis, as well as health-related behaviours, such as alcohol use (Ganna and Ingelsson 2015). This is particularly important for our purpose in using self-rated health to divide our treated and control groups into one that is experiencing a (potential) spousal THD and one that is not. Self-rated health is an independent statistical predictor of mortality that captures not only the direct causes of mortality, but an inclusive review of knowledge of medical diagnoses, self-observation of functional health, experienced bodily sensations and symptoms, formal signs of illness as well as individual risks and strengths expected to influence future health (Jylhä 2009). In addition, self-rated health is a globally strong predictor of mortality across age, gender, race and ethnicity as well as social class.

Spouses were asked to rate their health on a five point scale from poor (5) to excellent (1). We reverse-coded this scale so that higher values represented better health. This non-comparative self-rated health scale has been shown to perform well in terms of item response rates and the proportion of variance accounted for by factors linked directly with mortality, such as health-related behaviors and physical health (Eriksson, Undén, and Elofsson 2001). We analyzed spousal self-rated health responses from the five waves prior to death for the treated group or from the first five observations from the control group as the outcome variable in a random-effects linear regression with clustered standard errors to account for the duplicates in the control sample. Time was included as a continuous variable ranging from one to five (first to fifth observation) and was allowed to vary across persons (and duplicates). We estimated an unstructured covariance matrix and allowed the random intercept and random slope of the time variable to correlate. The regression results are displayed in Table 1.

Table 1. Results from Random Effects Regression of Process Time on Spousal Self-Rated Health

The intercept estimate of average self-rated spousal health upon initial observation corresponded to a level close to very good health, an expected values given our sample selection. On average, spousal self-rated health declined by 0.09 scale points with each observation point (i.e., every two years). This corresponds with self-rated health declining by slightly more than half a scale point across 10 years. Both the estimated constant and time coefficient showed substantial variance across individuals, as indicated by the random parameters. We used empirical Bayes predictions to estimate person-specific self-rated health slopes. Figure 1 shows the distribution of the empirical Bayes estimates. For the treated group, initial self-rated health (random intercept) was worse and health declines (random slope) slightly steeper.

Figure 1. Distribution of Empirical Bayes Predicted Random Process Time Coefficients by Sample

We consider respondents to have experienced a spousal THD if their estimated coefficient was in the bottom tertile of the distribution, representing the 33% steepest estimated declines in spousal self-rated health. Among those with the steepest THD, spousal self-rated health declined by 0.4 scale points with each observation point (i.e., every two years) or two points across the pre-widowhood period (roughly 225 percent of a standard deviation). Respondents with an estimated coefficient above the median are considered to not have experienced a spousal THD. We omit respondent with a spousal health decline between the lower 33% and the upper 50% of the distribution, because they cannot be categorized as either having or not having experienced a spousal THD based on the observed data. Our results for

mental health are largely robust to the inclusion of these respondents as either members of the treated or control group. Income differences between the treated and control group tend to be smaller if these respondents are included. However, the results lead to the same substantive conclusions.

Figure 2. Spousal Self-Rated Health across Process Time by THD and Sample

Figure 2 shows average spousal self-rated health across process time for all four treatment-by-process groups. All groups had an average spousal self-rated health between good and very good at the beginning of the observation period. Group A (event and process) and group C (event and no process) had slightly lower average health ten years prior to widowhood compared to group B (no event despite process) and group C (no event and no process). Average spousal self-rated health remained nearly constant or even increased slightly across the process period for both no-process groups (B and D). In contrast, spousal self-rated health of to-be-widowed respondents who experienced a THD (group A) declined by over 1.5 points from nearly "very good" to "fair" over ten years. Summary statistics on these samples can be found in Table 2.

Table 2. Summary Statistics of the Treatment-by-Process Samples at First Observation

Dependent Variables

We used the Center for Epidemiologic Studies Depression Scale (*CESD*) as our indicator for mental health. CESD is the sum of binary "yes" or "no" answers to whether

respondents felt 1) depressed, 2) that everything was an effort, 3) that sleep was restless, 4) happy (reversed), 5) lonely, 6) sad, 7) that they could not get going, 8) that they enjoyed life most of the time (reversed). We reversed the scale so that higher values indicated better mental health.

We used *total household income minus out-of-pocket medical expenses* as our indicator for economic wellbeing. Household income was measured as the sum of the respondents' and their spouses' earnings, pensions and annuities, Supplemental Security Income and Social Security Disability, Social Security retirement, unemployment and workers compensation, other government transfers, household capital income, and any other income. To ensure that this outcome measure captured potential pre-widowhood process costs, we subtracted out-of-pocket medical expenses from total household income. How these expenses were measured changed slightly across the HRS. Initially, only the financial respondent of a household was asked about two categories: (1) nursing home costs and (2) all other costs. In waves 3, 4 and 5, the components were expanded to (1) hospital and nursing home costs, (2) doctor, dentist and outpatient surgery costs, (3) average monthly prescription drug costs, and (4) home health care and special facilities or services costs. Prescription drugs were multiplied by 24 months. From wave 6 forward, the components were (1) hospital costs, (2) nursing home costs, (3) doctor visits costs, (4) dentist costs, (5) outpatient surgery costs, (6) average monthly prescription drug costs, (7) home health care costs, and (8) special facilities costs. Following the second wave, out-of-pocket medical expenditures pertained to the previous two years. We therefore divided expenditures by two before subtracting them from total household income. We adjusted household income and expenses for inflation to 2019 US dollars.

Propensity score matching on process and event

We used propensity score matching to create meaningful comparison groups for (1) unexpected widowhood and (2) expected widowhood. Our sample indicator – treated vs. control – was the treatment variable for both outcomes, mental health and economic wellbeing. For each outcome, we conducted two sets of propensity score matching analyses, one corresponding to each comparison: (1) For the analysis of unexpected widowhood, we compared treated individuals not experiencing a pre-widowhood process (i.e., no THD as defined above) to controls not experiencing a pre-widowhood process. (2) For the analysis of expected widowhood, we compared treated individuals experiencing a pre-widowhood process (i.e., THD as defined above) to controls not experiencing a pre-widowhood process. The aim of matching was to create comparison groups for each analysis that were highly similar to one another at their initial point of observation. This means that within each comparison, treated and controls should be highly similar on the outcome variables – mental health and economic wellbeing – and on other variables included in the matching model.

We used a wide range of predictor variables to create treated and control groups. These included spousal self-rated health, year of birth, gender, race, age, number of children, years of education (quadratic), spouse's years of education (quadratic), labour market status, years of work experience (quadratic), spouse's years of work experience (quadratic), labor market income and social security retirement income including an interaction between both indicators, capital income, net total wealth, household out-of-pocket medical expenses, and whether respondents responded affirmatively to more than one item in the CESD battery (see Tables 3A-3D). For the unexpected widowhood comparison, we also included the predicted process time coefficient on spousal self-rated health from the random effects linear models described above. This ensures that our treated and control samples are highly similar in their pre-widowhood THD process.

We matched on the first year of observation to create comparison groups that were similar before the potential process of a spousal THD began. Observations that violated the overlap assumption were excluded. We used a caliper of 0.1 in all analyses. Each treated case was assigned its three nearest neighbors as control cases. These control cases were then assigned their treated case's transition and duration values (see van Scheppingen & Leopold 2019). We conducted four matching analyses in total: one for each comparison group and each outcome variable. Table 3A-3D displays summary statistics, such as the averages for all outcome and predictor variables, for each of the four treatment-by-process comparison groups, including results from t-tests for statistically significant differences between the matched treated and control cases.

Table 3A. Summary Statistics of the Matched Treatment and Control Samples – Unexpected Widowhood Comparison for Mental Health (Reverse CESD Score)

Table 3B. Summary Statistics of the Matched Treatment and Control Samples – Expected Widowhood Comparison for Mental Health (Reverse CESD Score)

Table 3C. Summary Statistics of the Matched Treatment and Control Samples – Unexpected Widowhood Comparison for Household Income Net of Out-of-Pocket Medical Expenditures

Table 3D. Summary Statistics of the Matched Treatment and Control Samples – Expected Widowhood Comparison for Household Income Net of Out-of-Pocket Medical Expenditures

Altogether, the summary statistics displayed in these tables show that the matching procedures performed satisfactorily. Across all four matchings, we found no statistically significant differences between the matched control and treatment groups in any of the outcome or predictor variables at initial observation, i.e., ten years prior to widowhood. Importantly, this means that the matched treated and control groups began with nearly equal levels of mental

health (reverse CESD score) and household income, respectively. In addition, the average difference in spousal self-rated health between the groups displayed in Figure 2 were no longer present in the matched samples.

Linear regression models

We estimated two sets of linear regressions on our two outcome variables. Each outcome variable was modelled as a function of the transition, duration, and sample indicators including their two-way and three-way interactions. The transition indicator captured the immediate change in the outcome following widowhood and the duration indicator captured the trend in the outcome across process time. By interacting the transition and duration variables, we allowed the pre- and post-widowhood trends to differ. Once we included the sample indicator and its interactions in the model, we allowed the transition and duration coefficients to vary for the treated and control samples. For CESD, we modelled pre- and post-bereavement changes as a quadratic function to allow for an initially more rapid recuperation in mental health as has been shown in the literature. For total household income minus out-of-pocket medical expenses, we estimated linear pre- and post-bereavement trends.

RESULTS

Results from Regressions on Mental Health

Estimated mental health (i.e., reversed CESD scores) for the matched treated control and treated samples across the process of widowhood are displayed in Figure 3 (see Table 4 for regression results). Estimates comparing the cumulative mental health cost of unexpected and expected widowhood are shown in Figure 4.

For unexpected widowhood, pre-event differences in symptoms of depression between the widowed and controls were negligible and statistically insignificant. In the year of the event, the widowed group dropped by roughly one point from 6.9 to 5.8. In the years following spousal loss, we observed only a slow recovery from unexpected widowhood. Two years following widowhood – the period for which many studies have claimed near or full recovery – CESD scores remained 0.5 points below those estimated for the control sample. Differences between the treated and control samples became small and statistically insignificant only after four to six years.

For expected widowhood, a clear divergence between the comparison groups emerged several years prior to spousal loss. Six years before the event, mental health scores of to-be-widowed persons were 0.2 points lower, a difference that grew to 0.4 points in the year before widowhood. In the year of widowhood, a further substantial drop amounting to almost one full point lowered mental health scores to a nadir of 5.4 CESD points. Recovery in the years following widowhood was substantial but slow and incomplete, as surviving spouses did not fully return to the estimated mental health levels of the comparison group.

Figure 3. Differences in Mental Health across Process Time

Figure 4. Cumulative Differences in Mental Health across Process Time

Figure 4 shows differences between unexpected and expected widowhood in terms of cumulative mental health costs. The cumulative perspective recognizes time spent in worse mental health across the widowhood process as a life-course penalty even in the presence of longer-term convergence in mean levels of mental health. Results show divergence across the

pre-event period of expected widowhood. In the year prior to spousal loss, the group difference had accumulated to approximately 2 points. In the year of widowhood and the years that followed, this accumulated difference remained stable. Across the entire observation time, the cumulative mental health cost amounted to 3.3 points for unexpected widowhood and 7 points for expected widowhood.

Results from Regressions on Household Income

Figure 5 and Figure 6 show an equivalent set of results for the second outcome, economic wellbeing measured by total net household income minus out-of-pocket medical expenses. Results from the regression model upon which these estimates are based are located in Table 5.

For unexpected widowhood, initial differences in household income between the widowed and controls were small and statistically insignificant. Up to the pre-event year, the income curves of both groups were parallel at almost identical levels. In the year of the event, the widowed group dropped from 63,700 USD to 41,100 USD, which corresponds 23,000 USD less compared to the control group. In the years following spousal loss, the difference between the groups reduced slightly due to lower medical expenses for surviving spouses.

For expected widowhood, statistically significant group differences of roughly 6,000 USD emerged four years prior to spousal loss and grew to approximately 8,200 USD one year prior to widowhood. In the year of widowhood, a sizable drop in the widowed group from 55,800 USD to 38,800 USD doubled the estimated difference between both groups to approximately 22,400 USD. In the years that followed, the gap between the widowed group and the control group remained unchanged.

Figure 5. Differences in Household Income minus Out-of-Pocket Medical Expenses across Process Time

Figure 6. Cumulative Differences in Household Income minus Out-of-Pocket Medical Expenses across Process Time

Figure 6 shows differences between unexpected and expected widowhood in terms of cumulative economic costs. Two years prior to widowhood cumulative costs were 15,300 USD for unexpected widowhood and 52,000 USD for expected widowhood, a difference of 36,700 USD. This difference grew to 41,000 USD in the year of bereavement (41,600 USD for unexpected widowhood and 82,600 USD for expected widowhood). These differences continued to grow in the post-widowhood period, although at a slow rate. The cumulative cost six years after widowhood was roughly 161,400 USD for unexpected widowhood and 218,200 USD for expected widowhood, a difference of 56,800 USD.

DISCUSSION

This study provides a novel assessment of the consequences of widowhood. The main innovation is to assess these consequences for meaningful comparison groups that allow studying widowhood effects before and after the event. For both outcomes – mental health and economic wellbeing – findings demonstrate how unexpected widowhood differs from expected widowhood. Results on mental health show slow but full recovery for unexpected widowhood compared with larger and lasting declines for expected widowhood. Results on economic wellbeing show more sizable losses for expected widowhood, mainly due to the added economic cost of the pre-widowhood period. In contrast to theoretical ideas about anticipatory coping alleviating some of the costs associated with expected events, our findings for

widowhood clearly demonstrate that the total impact in terms of both outcomes was smaller for unexpected events and larger for expected events.

In light of this evidence, we contend that research on the consequences of life events tends to underestimate their total impact. This applies to cases in which this impact includes a pre-event period in which the process leading up to the event already causes changes in outcomes. Assessments that limit causal identification to those events that hit people unexpectedly (e.g., Andersen and Nielsen 2011) are limited in their external validity because they disregard events that are typically preceded by processes. Assessments that include a – usually arbitrary – number of pre-event dummy variables are limited regarding their distinction between pre-event process effects and unobserved heterogeneity (Ludwig and Brüderl 2021). Both of these limitations indicate the promise of our approach.

This promise is even more evident when considering other events for which pre-event process modelling is required. These include other bereavement events such as parental death that are often preceded by health declines, but also events such as divorce that is often preceded by an increase in marital conflict as well as job loss that is often preceded by a process of disengagement from work. Depending on the outcomes studied, a full appreciation of the consequences of these events requires a design that attends to pre-event process effects.

These considerations point to the relevance of the current widowhood study for advancing research on life events more generally. With our design of matching on process and event, we claim to offer a step ahead but not a fully adequate solution for the identification of pre-event process effects. Limitations of our design go beyond the empirical matching problem of finding comparison groups: First, our design comes with high demands on the data, as we had to define a pre-process point in time for matching and follow the process of widowhood through up to three periods in the process. These demands are met only by a selective subset

of respondents who survive and participate across several waves. Second, although it is easy to define the pre-event process of widowhood as a spouse's terminal health decline, is not easy to detect this process in prospective panel data. Although we relied on self-rated health as a pertinent indicator known as a powerful predictor of mortality (Eriksson et al. 2001; Jylhä 2009), deciding from declines in this measure whether a terminal health decline is present or absent is rough at best. Third, our empirical implementation relied on decisions that can be taken in different ways, with direct implications for the results on the accumulation of costs incurred by different comparison groups. For example, for expected widowhood, we defined the steepest tertile of self-rated health declines as terminal and the flatter half of the distribution as non-terminal. A practical constraint for placing these cut-offs was retaining sufficient case numbers for matching, but substantive theory provides only rough guidance about where to place them. We also lacked a direct validation of our empirical definitions of a terminal health decline, some of which might be obtained from exit interviews of the surviving spouse.

Despite these limitations, our approach illustrates the cost of widowhood for meaningful comparison groups that reflect, albeit roughly, the scenarios of unexpected and expected widowhood, and substantiates conclusions about how their impact differs. This benefit along with the accumulative assessment of costs is particularly relevant for understanding the consequences of widowhood, a life event of high prevalence, far-reaching consequences, and limited social-scientific understanding.

In this study, we demonstrated that the mental health consequences of expected widowhood emerge long before the event of spousal loss. Moreover, surviving spouses do not reach pre-process levels of mental health or those of the control group. This indicates that statements on the resilience of surviving spouses found in the literature are overstated. Our findings support the notion that the grieving process starts as soon as people become aware that their spouse's health decline is terminal (Coelho and Barbosa 2017). However, it does not seem

that anticipatory grieving and the chance to resolve unfinished business (Carr and Utz 2001) promote recovery in the post-widowhood period. Rather, results suggest that the numerous challenges in the pre-widowhood period, such as caregiving duties (Keene and Prokos 2008) and increased emotional and social isolation from family and friends (Williams et al. 2008), cost surviving spouses an immense amount of energy and may leave many bereaved persons without the resources to cope with the loss of their spouse. In addition, we find no evidence for an "expected" loss resulting in a less severe mental health decline following bereavement.

Finally, we show that the total costs of widowhood in terms of cumulative mental health and economic losses are considerable for both the expectedly and unexpectedly bereaved. However, the total cumulative costs tend to be far greater for the unexpectedly bereaved for whom the process began much earlier. This should be taken into account in future research, for example when scholars wish to identify factors associated with mental and financial resilience. Studies that use only the year prior to widowhood as a reference will overestimate the size of resilient surviving spouses, which could possibly lead to erroneous conclusions about factors associated higher levels of resilience. Addressing these issues, in turn, can advance research on the development of strategies to assist bereaved spouses coping with their loss.

REFERENCES

Andersen, Steffen, and Kasper Meisner Nielsen. 2011. "Participation Constraints in the Stock Market: Evidence from Unexpected Inheritance Due to Sudden Death." *Review of Financial Studies* 24(5):1667–97. doi: 10.1093/rfs/hhq146.

Angel, J. L., M. A. Jimenez, and R. J. Angel. 2007. "The Economic Consequences of Widowhood for Older Minority Women." *The Gerontologist* 47(2):224–34. doi: 10.1093/geront/47.2.224.

Arbuckle, Nancy Weber, and Brian de Vries. 1995. "The Long-Term Effects of Later Life Spousal and Parental Bereavement on Personal Functioning." *The Gerontologist* 35(5):637–47.

Bound, J., G. J. Duncan, D. S. Laren, and L. Oleinick. 1991. "Poverty Dynamics in Widowhood." *Journal of Gerontology* 46(3):S115–24. doi: 10.1093/geronj/46.3.S115.

Brickman, P. D., and D. T. Campbell. 1971. "Hedonic Relativism and Planning the Good Society." in *Adaptation-level Theory*, edited by M. H. Appley. New York: Academic Press.

Carr, Deborah, and Kristen W. Springer. 2010. "Advances in Families and Health Research in the 21st Century." *Journal of Marriage and Family* 72(3):743–61. doi: 10.1111/j.1741-3737.2010.00728.x.

Carr, Deborah, and Rebecca Utz. 2001. "Late-Life Widowhood in the United States: New Directions in Research and Theory." *Ageing International* 27(1):24.

Carr, Deborah, and Rebecca L. Utz. 2020. "Families in Later Life: A Decade in Review." *Journal of Marriage and Family* 82(1):346–63. doi: 10.1111/jomf.12609.

Clark, Andrew E., Ed Diener, Yannis Georgellis, and Richard E. Lucas. 2008. "Lags and Leads in Life Satisfaction: A Test of the Baseline Hypothesis." *The Economic Journal* 118(529):F222–43. doi: 10.1111/j.1468-0297.2008.02150.x.

Coelho, Alexandra, and António Barbosa. 2017. "Family Anticipatory Grief: An Integrative Literature Review." *American Journal of Hospice and Palliative Medicine®* 34(8):774–85. doi: 10.1177/1049909116647960.

Diener, Ed, Richard E. Lucas, and Christie Napa Scollon. 2009. "Beyond the Hedonic Treadmill: Revising the Adaptation Theory of Well-Being." Pp. 103–18 in *The Science of Well-Being: The Collected Works of Ed Diener*, *Social Indicators Research Series*, edited by E. Diener. Dordrecht: Springer Netherlands.

Elwert, Felix, and Nicholas A. Christakis. 2006. "Widowhood and Race." *American Sociological Review* 71(1):16–41. doi: 10.1177/000312240607100102.

Eriksson, Ingeborg, Anna-Lena Undén, and Stig Elofsson. 2001. "Self-Rated Health. Comparisons between Three Different Measures. Results from a Population Study." *International Journal of Epidemiology* 30(2):326–33. doi: 10.1093/ije/30.2.326.

Galatzer-Levy, Isaac R., and George A. Bonanno. 2012. “Beyond Normality in the Study of Bereavement: Heterogeneity in Depression Outcomes Following Loss in Older Adults.” *Social Science & Medicine* 74(12):1987–94. doi: 10.1016/j.socscimed.2012.02.022.

Ganna, Andrea, and Erik Ingelsson. 2015. “5 Year Mortality Predictors in 498 103 UK Biobank Participants: A Prospective Population-Based Study.” *The Lancet* 386(9993):533–40. doi: 10.1016/S0140-6736(15)60175-1.

Gillen, Martie, and Hyungsoo Kim. 2009. “Older Women and Poverty Transition: Consequences of Income Source Changes From Widowhood.” *Journal of Applied Gerontology* 28(3):320–41. doi: 10.1177/0733464808326953.

Ha, Jung-Hwa. 2008. “Changes in Support From Confidants, Children, and Friends Following Widowhood.” *Journal of Marriage and Family* 70(2):306–18. doi: 10.1111/j.1741-3737.2008.00483.x.

Haveman, Robert, Karen Holden, and Kathryn Wilson. 2003. “Social Security, Age of Retirement, and Economic Well-Being: Intertemporal and Demographic Patterns among Retired-Worker Beneficiaries.” *Social Security* 40(2):26.

Headey, Bruce. 2008. “Life Goals Matter to Happiness: A Revision of Set-Point Theory.” *Social Indicators Research* 86(2):213–31. doi: 10.1007/s11205-007-9138-y.

Holden, Karen, and Pamela J. Smock. 1991. “The Economic Costs of Marital Dissolution: Why Do Women Bear a Disproportionate Cost?” *Annual Review of Sociology* 17:51–78.

Hungerford, Thomas L. 2001. “The Economic Consequences of Widowhood on Elderly Women in the United States and Germany.” *The Gerontologist* 41(1):103–10. doi: 10.1093/geront/41.1.103.

Jylhä, Marja. 2009. “What Is Self-Rated Health and Why Does It Predict Mortality? Towards a Unified Conceptual Model.” *Social Science & Medicine* 69(3):307–16. doi: 10.1016/j.socscimed.2009.05.013.

Keene, Jennifer Reid, and Anastasia H. Prokos. 2008. “Widowhood and the End of Spousal Care-Giving: Relief or Wear and Tear?” *Ageing and Society* 28(4):551–70. doi: 10.1017/S0144686X07006654.

Ludwig, Volker, and Josef Brüderl. 2021. “What You Need to Know When Estimating Impact Functions with Panel Data for Demographic Research.” *Comparative Population Studies* 46. doi: 10.12765/CPoS-2021-16.

Mayol-García, Yerís, Benjamin Gurrentz, and Rose M. Kreider. 2021. *Number, Timing, and Duration of Marriages and Divorces: 2016*. P70-167. US Census Bureau.

Morgan, Leslie A. 1981. “Economic Change at Mid-Life Widowhood: A Longitudinal Analysis.” *Journal of Marriage and the Family* 43(4):899. doi: 10.2307/351346.

Mullan, Joseph. 1992. “The Bereaved Caregiver: A Prospective Study of Changes in Wellbeing.” *The Gerontologist* 32(5):673–83.

Pai, Manacy, and Jung-Hwa Ha. 2012. “Impact of Widowhood on Parent-Child Relations: Does Parents’ Personality Matter?” *Journal of Marriage and Family* 74(3):494–509. doi: 10.1111/j.1741-3737.2012.00975.x.

van Scheppingen, Manon A., and Thomas Leopold. 2019. “Trajectories of Life Satisfaction before, upon, and after Divorce: Evidence from a New Matching Approach.” *Journal of Personality and Social Psychology*. doi: 10.1037/pspp0000270.

Sevak, Purvi. 2004. “The Economic Consequences of a Husband’s Death: Evidence from the HRS and AHEAD.” *Social Security Bulletin* 65(3):14.

Siflinger, Bettina. 2017. “The Effect of Widowhood on Mental Health - an Analysis of Anticipation Patterns.” *Health Economics* 26:1505–23.

Soloman, R. L., and J. D. Corbit. 1974. “An Opponent-Process Theory of Motivation: I. Temporal Dynamics of Affect.” *Psychological Review* 81(2):119–45.

Stroebe, Margaret, Henk Schut, and Wolfgang Stroebe. 2007. “Health Outcomes of Bereavement.” *The Lancet* 370(9603):1960–73. doi: 10.1016/S0140-6736(07)61816-9.

Utz, R. L., M. Caserta, and D. Lund. 2012. “Grief, Depressive Symptoms, and Physical Health Among Recently Bereaved Spouses.” *The Gerontologist* 52(4):460–71. doi: 10.1093/geront/gnr110.

Williams, Beverly R., Patricia Sawyer, Jeffrey M. Roseman, and Richard M. Allman. 2008. “Marital Status and Health: Exploring Pre-Widowhood.” *Journal of Palliative Medicine* 11(6):848–56. doi: 10.1089/jpm.2007.0190.

Worden, William, and Howard Winokuer. 2021. *A Task-Based Approach for Counseling the Bereaved*. Routledge.

Yap, Stevie C. Y., Ivana Anusic, and Richard E. Lucas. 2012. “Does Personality Moderate Reaction and Adaptation to Major Life Events? Evidence from the British Household Panel Survey.” *Journal of Research in Personality* 46(5):477–88. doi: 10.1016/j.jrp.2012.05.005.

Zick, Cathleen, and Ken Smith. 1986. “Immediate and Delayed Effects of Widowhood on Poverty: Patterns from the 1970s.” *The Gerontologist* 26(6):669–75.

TABLES

Table 1. Results from Random Effects Regression of Process Time on Spousal Self-Rated Health

Fixed Effects	
Process Time	-0.090***
	(0.001)
Constant	3.921***
	(0.005)
Random Effects	
Var(Process Time)	0.013***
	(0.000)
Var(Constant)	0.349***
	(0.006)
Covar(Process Time, Constant)	-0.004***
	(0.001)
Residual	-0.004***
	(0.001)
N – Persons	28,407
N – Person-Years	139,963

Note: Unstandardized coefficients and standard errors in parentheses displayed; significant levels denoted as * p<0.05, ** p<0.01, *** p<0.001.

Table 2. Summary Statistics of the Treatment-by-Process Samples at First Observation

	No Process Decline		Process Decline	
	Control	Treated	Control	Treated
Household Income Net of Medical Expenditures	111,797.44	81,445.21	87,390.78	69,586.49
Mental Health (Reverse CESD Score)	7.21	7.00	6.93	6.82
Spousal Self-Reported Health	4.02	3.81	3.78	3.63
Process Time Random Coefficient	-0.04	-0.05	-0.18	-0.21
Birth Year	1939.52	1934.42	1938.63	1933.65
Women	1.43	1.70	1.47	1.72
Age	60.21	65.05	61.25	65.53
White	0.92	0.87	0.84	0.87
Black	0.06	0.10	0.10	0.10
1 Child	0.09	0.08	0.10	0.11
2 Children	0.33	0.27	0.29	0.29
3 Children	0.26	0.24	0.26	0.24
4+ Children	0.24	0.31	0.28	0.29
Years of Education	13.67	12.69	12.50	12.36
Spousal Years of Education	13.71	12.62	12.46	12.23
Retired	1.49	1.65	1.53	1.70
Work Experience	34.47	30.24	33.49	30.07
Spousal Work Experience	32.67	38.01	32.21	37.29
Labor Market Income	74,876.71	40,467.15	53,152.74	29,031.24
Income from Capital	36,922.89	21,401.04	22,599.95	18,127.65
Net Total Wealth	721,552.46	648,011.85	500,731.75	493,498.78
Household Out-of-Pocket Medical Expenditures	2,815.61	3,249.79	3,228.32	3,763.74
Lower Mental Wellbeing	0.19	0.23	0.27	0.28
N	14,168	488	5,904	1,176

Table 3A. Summary Statistics of the Matched Treatment and Control Samples – Unexpected Widowhood Comparison for Mental Health (Reverse CESD Score)

	Control	Treated	Difference	t-Statistic
Mental Health (Reverse CESD Score)	7.10	7.11	-0.01	-0.15
Spousal Self-Reported Health	3.86	3.80	0.06	1.28
Process Time Random Coefficient	-0.05	-0.05	-0.00	-0.81
Birth Year	1933.84	1933.91	-0.07	-0.14
Women	1.70	1.70	-0.01	-0.21
Age	66.97	66.87	0.10	0.20
White	0.92	0.90	0.02	1.31
Black	0.08	0.10	-0.02	-1.31
Number of Children	2.65	2.61	0.04	0.54
Years of Education	12.97	12.98	-0.00	-0.02
Spousal Years of Education	12.84	12.88	-0.04	-0.21
Retired	1.73	1.72	0.01	0.39
Work Experience	32.06	31.78	0.28	0.29
Spousal Work Experience	39.17	39.03	0.14	0.14
Labor Market Income	33,612.90	31,532.80	2,080.10	0.41
Income from Capital	21,776.93	22,512.78	-735.86	-0.22
Net Total Wealth	640,152.98	630,092.51	10,060.47	0.14
Household Out-of-Pocket Medical Expenditures	2,846.12	3,210.09	-363.97	-1.39
Lower Mental Wellbeing	0.20	0.20	-0.00	-0.02
N	837	335		

Table 3B. Summary Statistics of the Matched Treatment and Control Samples – Expected Widowhood Comparison for Mental Health (Reverse CESD Score)

	Control	Treated	Difference	t-Statistic
Mental Health (Reverse CESD Score)	6.92	6.92	0.00	0.03
Spousal Self-Reported Health	3.59	3.63	-0.04	-1.40
Process Time Random Coefficient	-0.04	-0.21	0.17	99.29
Birth Year	1933.16	1933.27	-0.12	-0.32
Women	1.71	1.72	-0.01	-0.58
Age	67.06	66.93	0.13	0.40
White	0.93	0.93	-0.00	-0.45
Black	0.07	0.07	0.00	0.45
Number of Children	2.51	2.53	-0.03	-0.50
Years of Education	12.67	12.65	0.02	0.19
Spousal Years of Education	12.55	12.50	0.05	0.39
Retired	1.76	1.75	0.01	0.84
Work Experience	31.50	31.27	0.23	0.36
Spousal Work Experience	38.38	38.18	0.20	0.33
Labor Market Income	23,056.42	24,585.88	-1,529.47	-0.82
Income from Capital	19,481.27	19,091.00	390.27	0.20
Net Total Wealth	495,136.58	530,539.15	-35,402.57	-1.14
Household Out-of-Pocket Medical Expenditures	3,499.09	3,767.80	-268.71	-0.88
Lower Mental Wellbeing	0.25	0.25	-0.00	-0.02
N	2,037	817		

Table 3C. Summary Statistics of the Matched Treatment and Control Samples – Unexpected Widowhood Comparison for Household Income Net of Out-of-Pocket Medical Expenditures

	Control	Treated	Difference	t-Statistic
Household Income Net of Medical Expenditures	84,444.19	83,434.53	1,009.66	0.27
Spousal Self-Reported Health	3.86	3.80	0.06	1.22
Process Time Random Coefficient	-0.05	-0.05	-0.00	-0.73
Birth Year	1933.75	1933.91	-0.16	-0.31
Women	1.71	1.70	0.01	0.18
Age	67.03	66.87	0.16	0.31
White	0.92	0.90	0.02	1.25
Black	0.08	0.10	-0.02	-1.25
Number of Children	2.62	2.61	0.01	0.14
Years of Education	13.00	12.98	0.02	0.14
Spousal Years of Education	12.96	12.88	0.08	0.43
Retired	1.74	1.72	0.01	0.45
Work Experience	31.66	31.78	-0.12	-0.12
Spousal Work Experience	39.40	39.03	0.37	0.39
Labor Market Income	34,501.37	31,532.80	2,968.57	0.58
Income from Capital	22,583.41	22,512.78	70.63	0.02
Net Total Wealth	648,912.22	630,092.51	18,819.71	0.26
Household Out-of-Pocket Medical Expenditures	2,793.78	3,210.09	-416.31	-1.61
Lower Mental Wellbeing	0.22	0.20	0.02	0.64
N	839	335		

Table 3D. Summary Statistics of the Matched Treatment and Control Samples – Expected Widowhood Comparison for Household Income Net of Out-of-Pocket Medical Expenditures

	Control	Treated	Difference	t-Statistic
Household Income Net of Medical Expenditures	75,676.64	71,909.69	3,766.94	1.72
Spousal Self-Reported Health	3.60	3.63	-0.03	-1.12
Process Time Random Coefficient	-0.04	-0.21	0.17	99.07
Birth Year	1933.29	1933.27	0.02	0.06
Women	1.71	1.72	-0.01	-0.59
Age	66.95	66.93	0.02	0.05
White	0.93	0.93	-0.00	-0.14
Black	0.07	0.07	0.00	0.14
Number of Children	2.51	2.53	-0.02	-0.39
Years of Education	12.68	12.65	0.03	0.32
Spousal Years of Education	12.51	12.50	0.01	0.10
Retired	1.75	1.75	0.01	0.31
Work Experience	31.77	31.27	0.50	0.78
Spousal Work Experience	38.31	38.18	0.12	0.20
Labor Market Income	23,834.39	24,585.88	-751.50	-0.39
Income from Capital	19,418.69	19,091.00	327.69	0.17
Net Total Wealth	504,292.39	530,539.15	-26,246.76	-0.84
Household Out-of-Pocket Medical Expenditures	3,492.47	3,767.80	-275.33	-0.90
Lower Mental Wellbeing	0.25	0.25	-0.00	-0.02
N	2,021	817		

Table 4. Results from Linear Regression on Mental Health (Reverse CESD Score)

	Unexpected Widowhood	Expected Widowhood
Transition (ref.: Not Widowed)		
Widowed	0.46	0.36
	(1.43)	(1.46)
Duration	0.01	0.07**
	(0.03)	(0.02)
Transition*Duration	-0.09	-0.12
	(0.23)	(0.23)
Sample (ref.: Control)		
Treated	0.05	-0.01
	(0.12)	(0.09)
Treated*Transition	-7.03*	-12.09***
	(3.26)	(2.48)
Treated*Duration	0.02	-0.04
	(0.04)	(0.03)
Treated*Transition*Duration	0.82	1.68***
	(0.51)	(0.39)
Sample*Transition*Duration2		
Control*Not Widowed	-0.00	-0.01***
	(0.00)	(0.00)
Treated*Not Widowed	-0.01	-0.01**
	(0.00)	(0.00)
Control*Widowed	0.00	0.00
	(0.01)	(0.01)
Treated*Widowed	-0.02	-0.05***
	(0.02)	(0.01)
Constant	7.07***	6.90***
	(0.07)	(0.06)
N – Person-Years	8,449	20,663

Table 5. Results from Linear Regression on Total Household Income Net Out-of-Pocket Medical Expenditures

	Unexpected Widowhood	Expected Widowhood
Transition (ref.: Not Widowed)		
Widowed	-19,043.07*	-16,626.46**
	(7,380.59)	(5,461.71)
Duration	-2,016.55***	-1,414.67***
	(298.71)	(226.28)
Transition*Duration	1,821.49**	1,517.20**
	(691.96)	(509.01)
Sample (ref.: Control)		
Treated	-439.62	-3,835.20
	(4,037.00)	(2,752.08)
Treated*Transition	-31,283.13**	-17,957.58*
	(11,876.44)	(7,656.86)
Treated*Duration	-315.31	-487.41
	(480.07)	(322.37)
Treated*Transition*Duration	1,186.50	428.87
	(1,068.13)	(706.15)
Constant	85,147.05***	76,789.30***
	(2,595.20)	(2,044.40)
N – Observations	8,651	21,067

FIGURES

Figure 1. Distribution of Empirical Bayes Predicted Random Process Time Coefficients by Sample

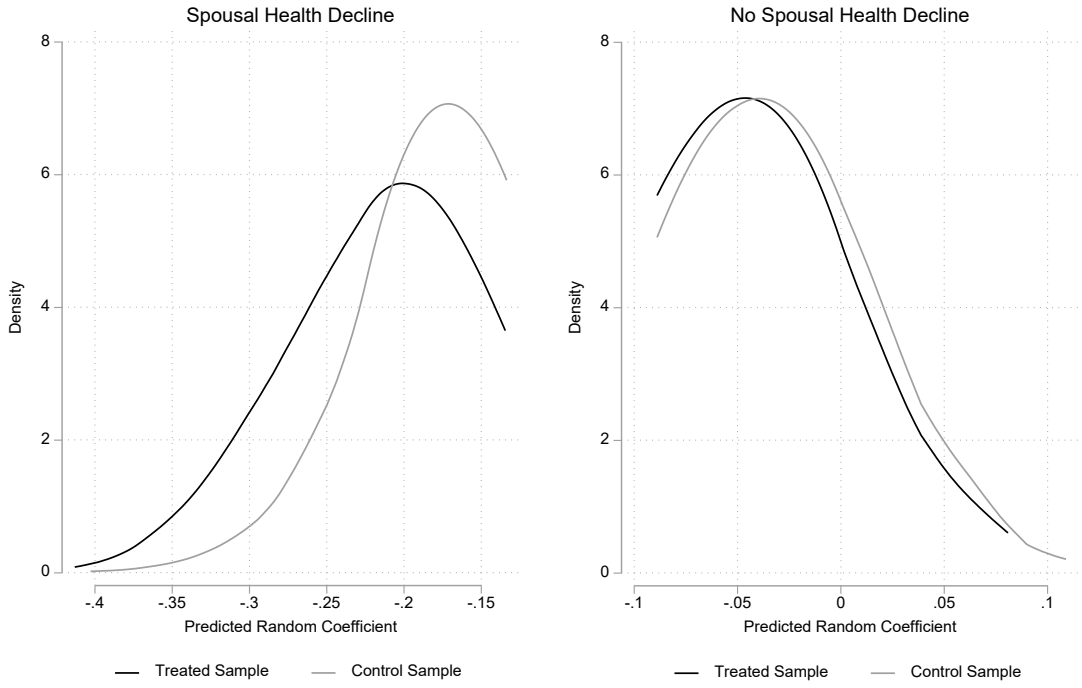


Figure 2. Spousal Self-Rated Health across Process Time by THD and Sample

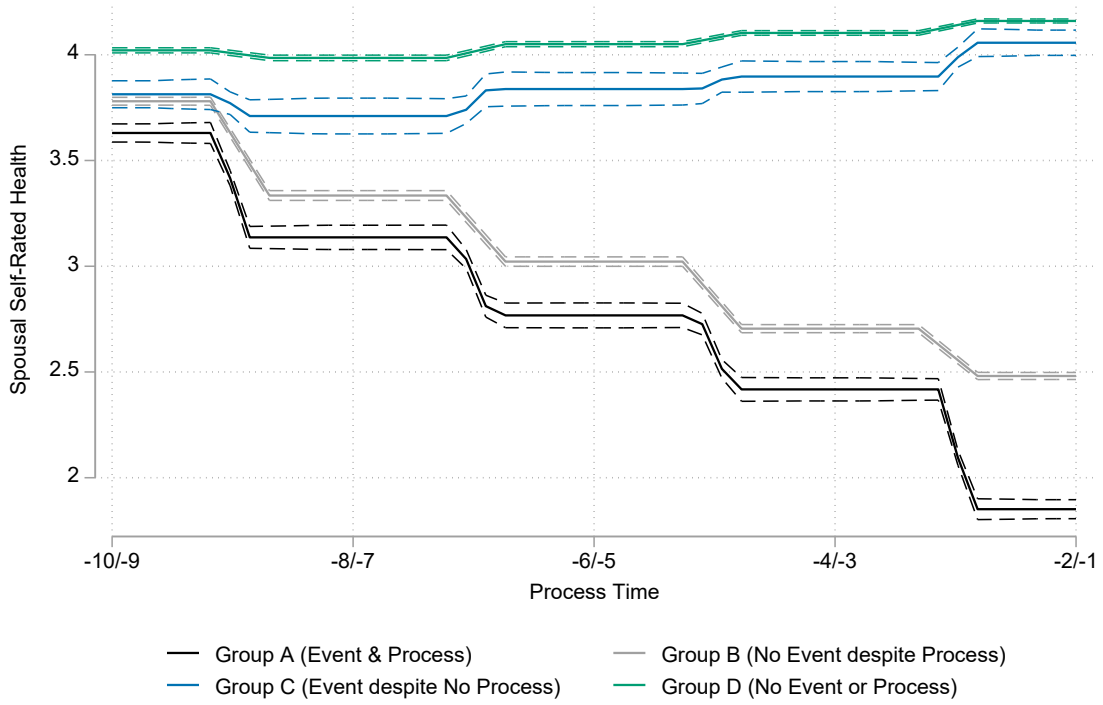


Figure 3. Differences in Mental Health across Process Time

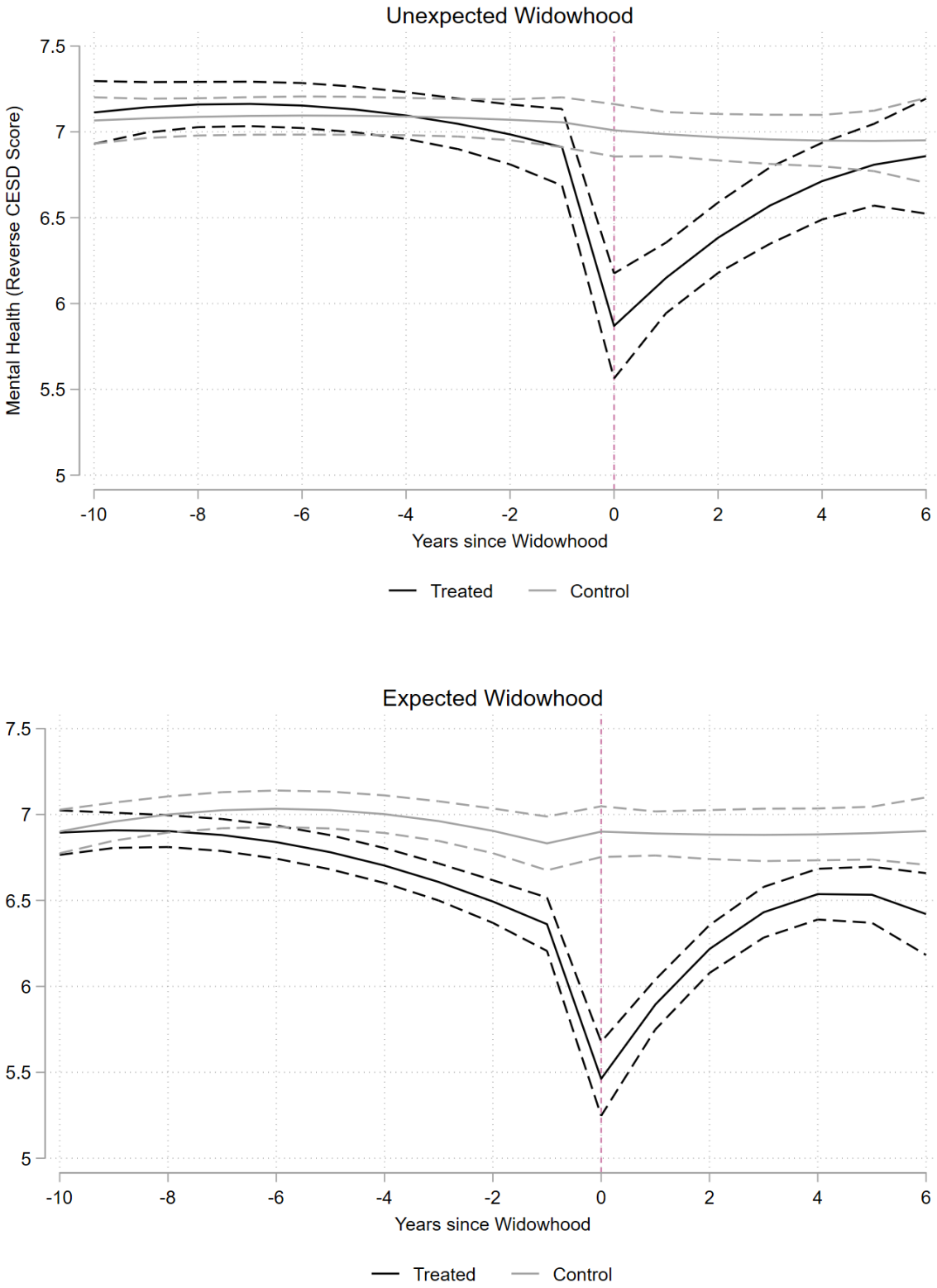


Figure 4. Cumulative Differences in Mental Health across Process Time

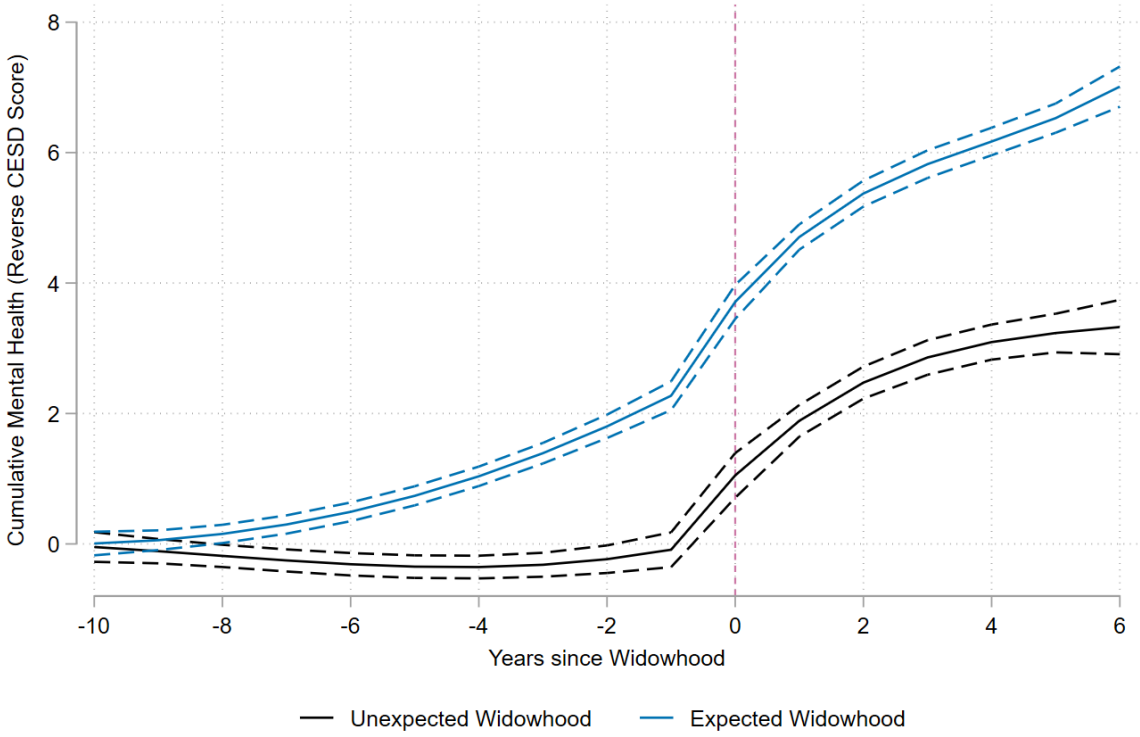
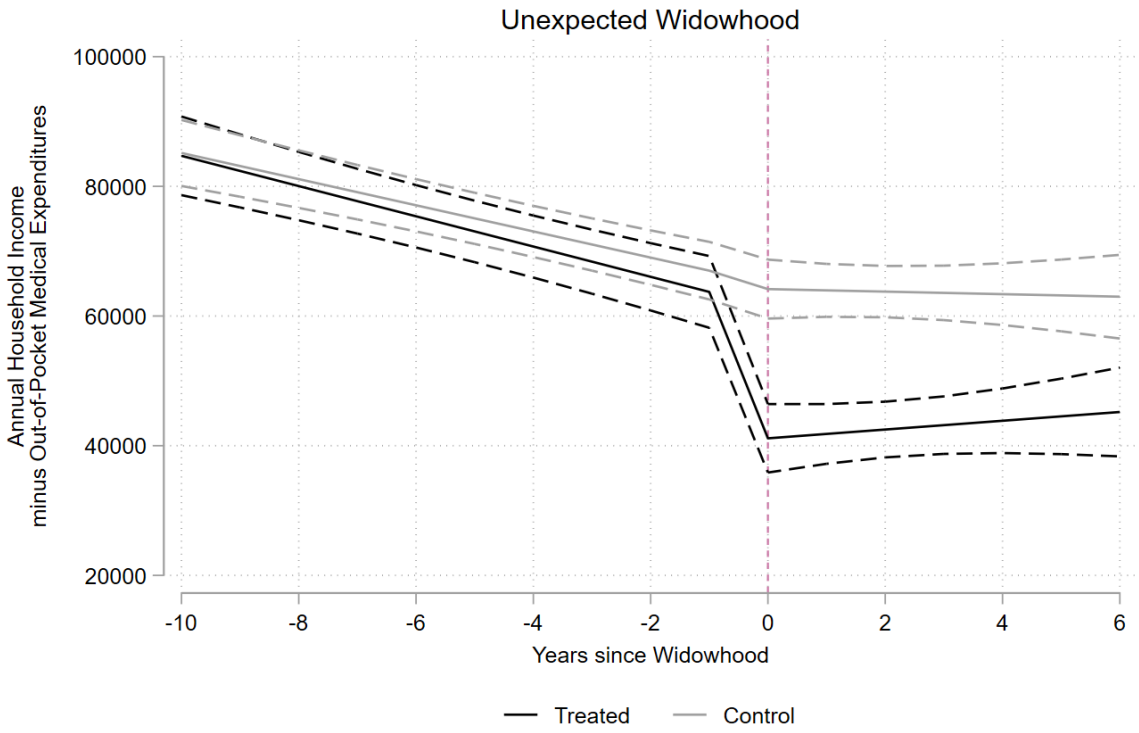


Figure 5. Differences in Household Income minus Out-of-Pocket Medical Expenses across Process Time



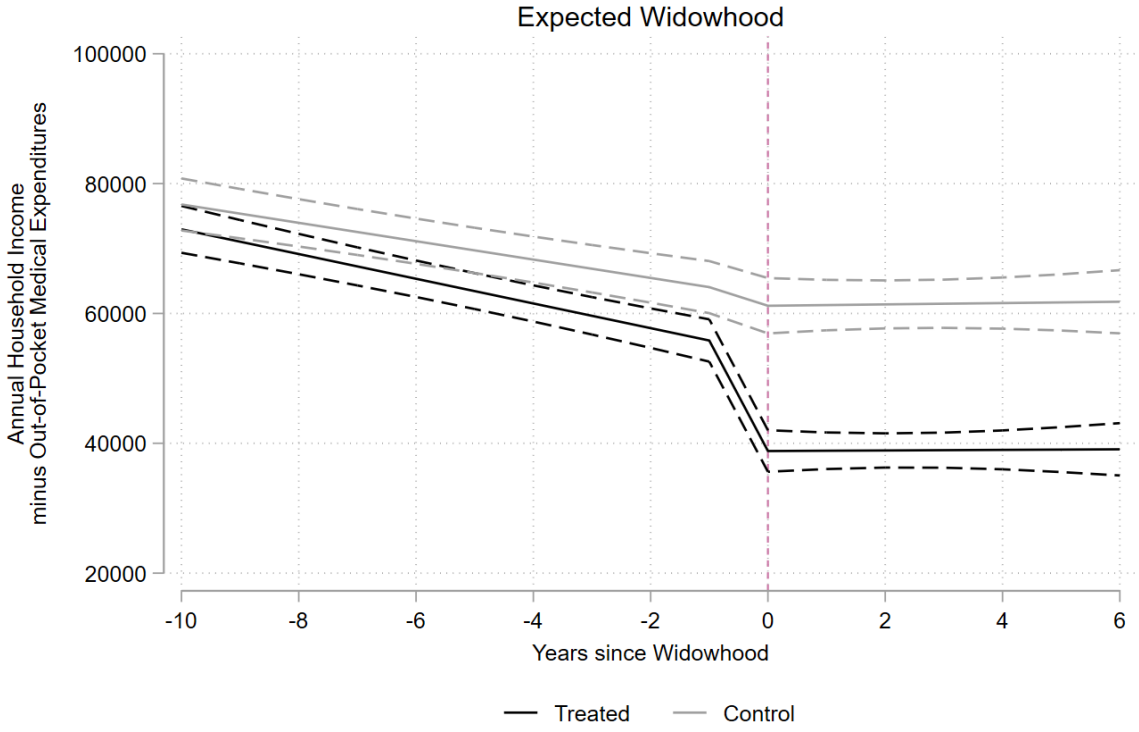


Figure 6. Cumulative Differences in Household Income minus Out-of-Pocket Medical Expenses across Process Time