Family Spillovers of Dementia[*]

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Abstract

We use population-wide administrative data from Denmark and an event-study design spanning nearly two decades to examine the impact of having a parent with dementia on adult children's labor market, physical health, and mental health outcomes. We find no meaningful effects on labor supply, earnings, or physical health care use. In contrast, mental health care use increases substantially, driven by daughters, beginning five years before a parent's dementia related death, peaks around the time of death, and converges to the counterfactual trend over seven years. Results suggest that robust long-term care policy can largely insulate adult children economically from parental dementia, but mental health spillovers persist, spurring nearly a decade of elevated use.

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1 Introduction

Alzheimer's disease and related dementias (ADRD) affect nearly 50 million people worldwide, and this number is expected to rise significantly in the coming decades, imposing substantial pressures on healthcare systems, federal budgets, and families (OECD 2020; Alzheimer's Association 2021; Knopman et al. 2021). ADRDs are among the most costly diseases in high-income countries, primarily due to the demanding, inflexible, and round-the-clock long-term care required for patients (Chandra et al. 2020; Frahm-Falkenberg et al. 2016; Rocard and Llena-Nozal 2022). Estimates of the indirect costs of ADRDs are at least as significant as direct medical expenses (Nandi et al. 2024; Hurd et al. 2013). However, indirect cost estimates typically only account for forgone wages due to family caregiving, while a comprehensive understanding of the economic impacts of ADRDs must also account for spillovers on the broader well-being of family members (Chandra et al. 2020; Freedman and Wolff 2020; Riffin et al. 2017; Friedman et al. 2015; Coe et al. 2018; Vestergaard et al. 2020).

In this paper, we provide population-level estimates of the comprehensive cost of having a parent with ADRD, focusing on three sets of outcomes: labor supply, physical health, and mental health. Our analysis combines national vital statistics, administrative health records, and death registries in Denmark to identify the universe of individuals who died with an ADRD diagnosis between 2002 and 2013. We then link these individuals to their children, creating an 18-year balanced panel that spans from 10 years before to 7 years after parental death. The long panel allows us to comprehensively capture children's employment and health care use during three distinct phases in the parental dementia trajectory: (1) a pre-clinical, or mild cognitive impairment phase when symptoms become apparent but normal functioning remains largely intact, (2) a phase leading up to death when cognitive, physical and psychological symptoms progress from mild to severe, and (3) a post-death phase when the direct impact of ADRD ceases (Davis et al. 2018; Alzheimer's Association 2024). We then use the year of death as the index year in an event study design. Our identification is based on the progressive nature of ADRD, where the years before death are marked by significant disability and dependence among patients (Alzheimer's Association 2015). We hypothesize that within-family spillovers appear and intensify in the second phase and diminish thereafter.

We compare labor market outcomes and health care use across the disease trajectory between individuals with a parent who died with or of ADRD (the treatment group) and a matched group whose parent neither had ADRD nor died in the index year (the placebo comparison group). We show remarkably similar levels and trends in all outcomes between the two groups up to five years before parental death, corresponding to the early phase of the disease trajectory, where we expect minimal spillovers. Furthermore, we find no systematic differences in labor market outcomes or use of health care related to physical health across the full disease trajectory. Population level estimates show no clear effects of having a parent with dementia on children's labor supply, earnings, or physical health care use. These null effects are estimated with considerable precision, allowing us to rule out even moderately sized impacts. However, the treated group shows a marked increase in mental health care visits and psychiatric medication use beginning around five years before a parent's ADRD-related death. These outcomes rise steadily thereafter, deviating sharply from the control group trajectory until parent's death, consistent with spillovers of ADRD on the mental health of children.

The increase in mental health care use among treated children is driven by women and is large in magnitude. For example, women are 10 percent more likely to see a mental health care provider 4-5 years preceding a parent's death relative to the counterfactual trend. This difference increases to 14.6 percent in the 2-3 years before death and peaks at 28.3 percent during the three years around a parent's death. These increases are driven by visits to psychologists, though visits to primary care providers (PCPs) for mental health concerns also contribute. Prescriptions for psychiatric medications similarly start to diverge in the treated group 5 years before death. Women are 3.8 percent more likely to use a psychiatric medication 4-5 years before their parent's ADRD-related death and this difference increases to 7.4 percent during the three-year window surrounding parental death. These increases are driven by prescriptions for anti-depressant, anti-anxiety, and sleep medications.

Parental ADRD has more muted effects on men, whose baseline use of mental health services is substantially lower than that of women. Increases in mental health care use among the treated men appear only around the time of parental death, with relative effects of 16.7 percent for visits and 6.6 percent for psychiatric medication prescriptions during the three-year period surrounding the death, and remain slightly elevated up to seven years after a parent's death. These results suggest that the adverse mental health spillovers of parental ADRD persist even after demands associated with dementia cease. Overall, our results show that the disruptive mental health effects of parental ADRD are concentrated within a roughly decade-long window surrounding parental death.

We next examine what drives the substantial increases in mental health care use preceding a parental death with ADRD. The pattern of effects makes it unlikely that the results reflect heightened concerns about one's own future health, since such worries would not produce the the observed tendency for outcomes to revert toward to counterfactual levels after the parent's death while the underlying familial risk of dementia remains constant. Moreover, we find only muted heterogeneity by the availability of alternative caregivers, such as being an only child or whether the other parent is alive when the parent with ADRD dies, indicating that the mental health spillovers of dementia affect all children. Descriptive evidence from a nationally representative caregiving survey of the Danish population supports the interpretation that unpaid family caregiving is not a widespread practice in Denmark. Detailed labor market outcomes are also consistent with this pattern. The most notable heterogeneity we observe beyond gender is by age at parental loss: despite a lower baseline use of mental health services, both absolute and relative effects are substantially larger for women who lose a parent with ADRD at or below age 50. We also find that more educated individuals (college and above) experience larger and more persistent increases in mental health care use, although these patterns are less distinct than those by age at parental loss.

Next, we test whether the experience of parental loss itself can explain our results. Using an alternative treatment group that includes children who lose a parent without an ADRD diagnosis, we find that parental death, regardless of cause, leads to short-lived increases in mental health care use concentrated around the year of death, in contrast to the decade of elevated mental health care use observed in children who lose a parent with ADRD. We formally test and reject equality in the mental health effects of parental ADRD versus other causes of death. This alternative treatment group captures the full spectrum of deaths outside ADRDs, including those preceded by prolonged illness and disability as well as sudden, unanticipated deaths. Taken together, these findings rule out heightened concern about one's own health, caregiving demands, and parental loss or grief as primary explanations for the prolonged and persistent mental-health-related distress. Instead, they point to mechanisms consistent with psychological strain that is specific to the symptoms and trajectory of ADRD.

Our study builds upon three different strands of the literature. First, we contribute to a large body of social science research around the economic and health impact of dementia on family members.[1] We build on this body of evidence in several ways. Most existing studies are survey-based and rely on small samples which lack the statistical power to provide precise estimates for the population and key subgroups. Even the largest, nationally representative surveys of older adults, such as the Health and Retirement Study (HRS) and National Health and Aging Trends Study (NHATS) in the US and the Survey of Health, Ageing and Retirement in Europe (SHARE) do not include sufficiently large samples to fully examine the impact of having a parent with ADRD. We use population-level data which ensures enough statistical power to study key subgroups. Additionally, using administrative data, we are able to construct a long event time window which allows us to causally study the evolution of outcomes across the disease trajectory, rather than focusing on a particular disease phase such as the period between diagnosis and death, and to follow children even after the death of their parent.

Furthermore, the dementia literature focuses on effects for self-identified caregivers, finding that people caring for a family member with dementia experience higher levels of psychological distress, physical health issues and employment disruption than both non caregivers and caregivers for persons without dementia (Neubert et al. 2021). Meanwhile, the neuropsychological characteristics of dementia, including cognitive impairment, delirium, and psychosis, also affect family members who may not be directly involved in the daily provision of hands-on care. For example, adult children may experience role reversal, assuming responsibilities such as arranging care and medical services and handling financial decisions or estate planning when a parent's executive functioning becomes increasingly compromised (Chandra et al. 2020). These dynamics can lead to increased inter-family conflict and stress. Our approach captures average outcomes over all children, regardless of their specific caregiving role, and our estimates capture the costs of dementia to family members at a national level.

Second, our paper complements a growing literature in economics on the impact of health shocks on family members that also leverage rich administrative data.[2] These stud-

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[1] For example Schulz et al. (1995); Pinquart and Sörensen (2003); Langa et al. (2001); Moore et al. (2001); Coe et al. (2018); Connors et al. (2020); Quinn et al. (2024); Mudrazija and Aranda (2025); Neubert et al. (2021).

[2] For example, Frimmel et al. (2020); Fadlon and Nielsen (2021); Rellstab et al. (2020); Ramirez Lizardi et al.

ies typically focus on unanticipated health events, such as heart attack, stroke, or sudden death to establish a plausibly causal research design. Our context instead addresses a progressive chronic disease whose prevalence and costs are growing rapidly as a direct result of population aging. ADRD is characterized by the gradual and progressive deterioration of functional and social capacity, making it difficult to identify precisely when spillovers begin and how they evolve over time, and health and behavioral implications of the disease can appear well before before a diagnosis (Rocard and Llena-Nozal 2022; Nicholas et al. 2021; Jeong et al. 2024; Gresenz et al. 2024). Our empirical approach centers on death as an objective and well-measured event and identification relies on the well established disease progression prior to death (Houser et al. 2015).

Third, our findings contribute to the literature on substitutions between paid and unpaid care and specifically the degree to which a robust formal care system can mitigate family costs of chronic disease by reducing reliance on unpaid care provided by adult children, particularly women (Løken et al. 2017; Massner and Wikström 2024; Shen 2024; Frimmel et al. 2020). Denmark, the setting of our study, has one of the most comprehensive public long-term care systems in the world. Consistent with prior evidence, we show that while such a comprehensive system can minimize the economic costs of family health spillovers borne by family members, the mental health costs remain significant.

The rest of the paper proceeds as follows. We describe the institutional setting for the study in Section 2. Section 3 introduces the data and lays out the empirical framework. Section 4 presents our results, and Section 5 concludes.

2 Institutional Background

The Danish welfare state is characterized by universal access to long-term care, health care, social support, public pensions, and generous family policies that include caregiving leave to care for ill or dying family members. These features reflect a de-familiarized welfare model in which caregiving responsibilities rest primarily with the state rather than with families (Larsen 2020; Jensen 2008). Thus we study family spillovers of ADRD in a setting where access to supports for both ADRD patients and their families are readily available. We summarize relevant institutional features of this setting below and include more detail

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(2024); Jensen and Zhang (2024)

in Appendix B.

Long-term Care Denmark is among the OECD countries with the highest long-term care (LTC) spending per capita (OECD 2020). LTC is organized and financed by municipalities, which assess needs, allocate services, and deliver, or outsource, care. Eligibility is based on a professional needs assessment, and does not depend on income or insurance status. Services include home-based care (e.g., personal care, nursing, and practical assistance at home), respite and day care services, and residential care in nursing homes (including elder housing with care support). A central feature of the Danish approach is its emphasis on "aging in place", supporting older adults to remain in their own homes for as long as possible, and nursing homes are primarily used for individuals with extensive care needs. Approximately 75% of nursing homes residents have dementia (Glavind 2022) and nursing homes account for more than half of all direct expenses related to ADRD (Vestergaard et al. 2020).

Labor Markets and Workplace Benefits Denmark has relatively high labor market participation rates, particularly among women (OECD 2017). Standard full-time employment consists of 37 hours per week (established by collective agreements which cover the vast majority of Danish employees). Part-time arrangements must be negotiated directly between the employer and the employee and are common, though not guaranteed. Workers with caregiving responsibilities have access to three types of leave: First, Caregiver's Leave (pasningsorlov)[3], which provides up to 9 months of paid leave to care for family members or close relatives with a severe illness living at home. Second, End-of-Life Leave (plejeorlov)[4], which provides an allowance for individuals caring for a relative who is in the last 6 months of life. While Caregiver's Leave is eligible only for people in the labor market, End-of-life Leave is for everybody and both types of leave are administered by the municipality. Both types of leave have been used by relatively few people.[5] Third, wage-earners also have access to short unpaid leave (up to five days per calendar year) to care for family members

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[3] Serviceloven: https://www.retsinformation.dk/eli/retsinfo/2017/10284.

[4] Serviceloven: https://www.retsinformation.dk/eli/retsinfo/2015/9341.

[5] The number of people using End-of-life leave was approx. 2,500 in 2014 (https://www.statistikbanken.dk/statbank5a/Graphics/mapanalyser.asp?maintable=RESPLEJV&lang=0). Individuals who receive these two types of leave appear in the national employment registries as employed as they are employed by the municipality (and if employed they will be on leave from their job). The allowance for End-of-life care is registered in the official registries from 2014.

or cohabitants.[6] A detailed description of these policies is included in Appendix B.

Health Care Denmark has a tax-funded, universal health care system where most services are free of charge and prescription medication is highly subsidized (Birk et al. 2024). Primary care physicians (PCPs) are usually the first point of contact with the system and manage initial diagnoses, therapeutic interventions, chronic condition management, preventive care, and can make referrals to specialists as necessary.

When seeking mental health care, most people receive treatment first from their PCP who can provide basic mental health support, prescribe medication (e.g., antidepressants or anxiolytics) or refer the patient to more specialized care, including private practice psychologists, psychiatrists or public psychiatric hospitals. The latter also include emergency services which do not require referrals. While access to private psychiatrists with a referral is free of charge, access without a referral is paid out-of-pocket. Access to psychologists with a referral typically involves a copayment. For individuals who experience one of a predetermined set of significant life events, including having a relative with a serious mental health condition or debilitating illness, and bereavement, the public insurance scheme subsides 60% of the cost of up to 12 sessions with a psychologist.[7] All citizens can consult directly with private psychologists. In these cases, treatment is not covered by public health insurance and services must be paid out of pocket.[8]

3 Data, Sample Construction, and Empirical Approach

3.1 Data Sources and Variable Definitions

Our analysis uses Danish administrative registry data for the full population from 1980 through 2018.[9] Using a personal identification number, we link parents to their children and combine information from multiple registries. The Civil Registration System includes information on family relationships, gender, birth dates, and migration status.[10] The

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[6] Bekendtgørelse af lov om lønmodtageres ret til fravær fra arbejde af særlige familiemæssige årsager: https://www.retsinformation.dk/eli/lta/2024/915. Short unpaid leave is registered by the employer and does not appear in the official registries.

[7] See appendix B for the full list of life events that trigger subsidized psychological treatment.

[8] Voluntary private health insurance usually covers part of the cost (Birk et al. 2024).

[9] Most Danish registries begin in 1980. We restrict the sample to 2018 to avoid COVID-19 related disruptions, particularly in mortality.

[10] Data from the Danish Civil Registration System include a link between parents and their children for cohorts born in 1960 and after. To link parents and their children from earlier cohorts, we added information

Danish Registry of Cause of Death provides exact dates and specific causes for all deaths in Denmark. Educational information comes from the Danish Registry of Education.

To construct outcome variables related to health, we obtain information from Denmark's universal healthcare system, which records all services covered by public health insurance in primary and secondary care in the National Patient Registry or the Psychiatric Central Registry. From these registries, we construct annual measures of physical and mental health encounters. Our measures exclude self-financed services (for example privately paid psychotherapy), as data on private paid health services do not exist in the registries.

We identify visits to a primary care physician (PCP), specialist physicians, in- and outpatient hospital visits and preventative care exams. Using codes that identify provider type and specific services provided, we identify mental health-related PCP encounters if the provider billed for cognitive therapy services or psychometric testing. We also separately identify specialist visits to psychiatrists, psychologists, and psychiatric hospitalizations.

All medication prescribed in primary care are recorded in the Danish National Prescription Registry. We classify all prescriptions as either psychiatric or non-psychiatric. Within psychiatric drugs, we further classify prescriptions into four subgroups: antidepressants (ATC code N06A, except N06AX12), hypnotics (ATC code N05C), anxiolytics (ATC code N05B) and antipsychotics (ATC code N05A).

Using employment and income registries, we construct four labor market outcomes. An individual is defined as participating in the labor force if they were active in the labor force for the majority of a given year. This includes anybody who was working for pay, self-employed, working for a family business, unemployed, or on paid leave. Similarly, we define employed as anybody who was working for pay for the majority of the year. Total wage income is defined as annual employer-paid wages and total labor income includes wage income as well as net profits from self employment.[11] Both income measures are inflation-adjusted to 1995 Danish Kroner. Details of all data sources and variable construction are provided in Appendix A.

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from the Danish Multi-Generation Registry - Lite. (Due et al. 2024) to the Civil Registration registry.

[11] Total wage income includes all taxable income including employer-paid wage during sickness leave and child care leave.

3.2 Sample Construction

Our population of interest consists of child–parent pairs in which the parent died between 2005 and 2011. We designate the parent's year of death as the index year and follow the child's outcomes over an 18-year window, spanning 10 years before to 7 years after the parent's death, covering the 1995 to 2018 period. Our main treatment group consists of child–parent pairs in which the parent died with a clinically verified diagnosis of Alzheimer's Disease and Related Dementias (ADRD), based on diagnostic codes from medical encounters, prescriptions for anti-dementia medications, and official cause-of-death codes from national registries.[12] Our secondary treatment group consists of child-parent pairs in which the parent died between 2005 and 2011 without an ADRD diagnosis.

To construct a credible counterfactual, we adopt a sample construction strategy similar to that of Jäger and Heining (2022), matching each treated child-parent pair to a demographically similar child-parent pair whose parent was never diagnosed with ADRD and did not die in the same year as the parent in the treatment arm.[13] The matched control child is assigned the index year of the treated child as a placebo, aligning event time across both groups. This approach allows us to compare differences in outcomes over an 18-year window while holding constant age, calendar year, and individual characteristics that do not vary over time.[14] We begin by exactly matching on baseline covariates measured ten years prior to the event year ($d - 10$). These include the child's year of birth, gender, educational attainment, region of residence, and employment status, as well as the parent's year of birth and gender. Given the size of the administrative data, multiple control candidates typically satisfy these criteria. We refine the match using a propensity score as a tie-breaker. The propensity score is estimated using the same baseline covariates along with the child's average labor income over a three year period ($d - 11$ to $d - 9$). We then

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[12] Specifically, we identify ADRD using three sources: (1) the National Patient Registry and the Psychiatric Central Registry, which record inpatient and outpatient visits with ADRD-related ICD codes (F00, F01, F02.0, F03.9, G30, G31.8, or G31.9); (2) the National Prescription Registry, which captures at least two prescriptions for anti-dementia drugs (ATC code N06D); and (3) the Danish Registry of Cause of Death, which lists ADRD as a primary or secondary cause of death. We include individuals who meet any one of these criteria, even if there was no prior clinical diagnosis before death (Taudorf et al. 2021).

[13] A "control parent" is defined as a parent who was never diagnosed with ADRD, did not die in the year of the treated parent's death (i.e., not at $t = 0$), and may have died from any other cause in any other period. In addition, both treated and control parents must be alive at least ten years prior to the treated parent's death, i.e., at $t = -10$.

[14] Following Jäger and Heining (2022), we assign year of death d based on the 12 month period spanning July of year $d - 1$ to July of year d so that event year zero captures fully the effect of death and its immediate aftermath.

select the nearest-neighbor match (with replacement) based on the estimated propensity score, resulting in a one-to-one matched sample.

For clarity, we introduce the following notation used throughout the manuscript: Children with a parent who died with an ADRD diagnosis, referred to as ADRD children (T1) and their deceased parents (P1); Children with a parent who dies without an ADRD diagnosis, referred to as non-ADRD children (T2) and their deceased parents (P2); matched controls for T1, referred to as placebo-ADRD Children (C1); and matched controls for T2, referred to as placebo-non-ADRD Children (C2).

When constructing treatment and control samples of equal size, we exclude all ADRD children (T1) from the potential pool of control observations (both C1 and C2) to eliminate exposure to dementia-related parental illness or death during the 18-year observation window. Additionally, if a child has both parents diagnosed with ADRD (12.9% of the sample), we only consider the first parent's death. If both parents die with ADRD in the same year, we randomly select one parent for the analysis. To maintain a balanced panel across event years and a consistent matched comparison, the analysis sample (both treatment and matched control groups) is restricted to children alive throughout the entire 18-year observation period (we lose 2,052 observations, or 5.3% of the initial sample, due to this restriction). Furthermore, we require children in the treatment group to be at least 35 years old at the time of their parent's death so that they have completed university education (if attended) by the start of the event period (we lose 72 observations, or 0.2% of the initial sample, due to this restriction). The final sample includes 36,112 ADRD children representing 94.5% of the initial sample without these restrictions.

In Table 1, we present basic demographic information for the two treatment groups of child–parent pairs and their matched counterfactuals. Columns 1–3 display summary statistics for the main ADRD treatment group: ADRD children (T1), their deceased parents (P1), and the matched placebo controls (C1). Columns 4–6 show the corresponding statistics for the secondary treatment group where the parents die without an ADRD diagnosis: non-ADRD children (T2), their deceased parents (P2), and the matched placebo controls (C2). All matching variables (birth year, age at parent's death, sex, and education) are balanced by design between each treatment group and their respective controls. The samples are also well balanced on non-matched variables, including number of children, marital status, and immigrant status. ADRD children (T1) in our sample lose their index parent, on average, just before age 50. Fifty percent are female, one third have a college degree, and 76 percent are married with an average of 1.8 children. Non-ADRD children (T2) are slightly younger at the time of parental death (47.5) and somewhat less educated but otherwise similar in demographic characteristics. This group is substantially larger (N=195,687), reflecting the fact that it includes all parental deaths without an ADRD diagnosis. The larger size of the T2 group improves statistical precision when differentiating the specific effect of ADRD from the general impact of parental loss due to other causes.

Table 1 also reports parent characteristics. Average age at death for ADRD parents (P1) is 82.6. Fifty-two percent are female and 11 percent have a college education. Non-ADRD parents (P2) are younger at death (78.2), less likely to be female (44 percent), and have similar education levels. Appendix Table A1 reports primary cause of death in broad ICD categories for parents by treatment group. Leading cause of death among ADRD parents (P1) are mental, behavioral and nervous system disorders (35 percent – compared with 2 percent among P2), and cancer among non-ADRD parents (P2) (37 percent– compared with 9 percent among P1). Deaths caused by circulatory or respiratory diseases are equally common and involve about 40 percent of deaths in each group.

Appendix Figure A.1 illustrates the distinct health care use trajectories preceding death for these groups. More than 50 percent of ADRD parents have ever lived in a nursing home in the year of death, compared to 10 percent of non-ADRD parents. Use of psychiatric drugs and mental health care visits are also markedly higher for ADRD parents and rise steadily in the decade before death. Pain medication use and emergency department visits begin to diverge 5 to 6 years before death, increasing more rapidly among parents who die with ADRD. Outpatient and specialist visits peak mid-period for both groups but decline earlier for ADRD parents, consistent with a transition to institutional care. Late spikes in hospital care and screenings among non-ADRD parents likely reflect acute diagnostic workups. These patterns underscore the prolonged and resource-intensive end-of-life needs associated with ADRD and validate the empirical algorithm used to identify ADRD cases in our data.

3.3 Empirical Framework

Unlike much of the family health spillovers literature, which relies on discrete health shocks such as heart attacks or strokes, we do not treat ADRD onset as a sharply defined exogenous event. Instead, our empirical design leverages the irreversible progression of ADRD. The disease follows a unidirectional path without remission and typically becomes acute in the final 3 to 5 years of life, when neuropsychological symptoms, including cognitive impairment, personality changes, and delirium, become more acute and care needs increase (Cummings et al. 2019; Alzheimer's Association 2024). Accordingly, we expect caregiving and related responsibilities such as managing daily logistics, navigating healthcare and financial decisions, and coordinating with other family members to build gradually and intensify in the final years of life. We hypothesize that spillovers on adult children's health and labor market outcomes will reflect this progression. Because care needs and family responsibilities tend to escalate significantly in the period leading up to death and dissipate significantly afterward, we view death as a particularly salient event in the ADRD trajectory. Unlike ADRD symptom onset, which does not always correspond with diagnosis, death is precisely measured (Nicholas et al. 2021; Jeong et al. 2024). These features motivate our decision to center the empirical design around the exact timing of a parent's death.

We track adult children's outcomes over an 18-year window, spanning from 10 years before to 7 years after a parent's death. The extended pre-death period is crucial for capturing the early onset of mild or preclinical ADRD symptoms, when parental illness likely has limited observable impact on children's lives. During this phase, we compare outcomes for children of ADRD parents (T1) and their matched controls (C1) to assess similar baseline trends and identify when, if at all, their trajectories begin to diverge. This also allows us to examine whether the timing of divergence aligns with the natural course of the disease. The post-death period captures the phase after acute care needs end, allowing us to assess whether outcomes stabilize or move back toward counterfactual levels. This design captures both the peak and the resolution of dementia-related spillovers in the lives of adult children.

We estimate an event-study model with individual and calendar-year (or equivalently, age) fixed effects to trace the year-by-year impact of parental ADRD exposure on children's outcomes. Our main estimating equation is:

$$y_{it} = \theta_i + \gamma_t + \sum_{k=-9}^{7} \beta_k D_{k,it} + \sum_{k=-9}^{7} \delta_k (D_{k,it} \times T_i) + \varepsilon_{it} \tag{1}$$

where y_{it} is the outcome for individual i in year t, θ_i denotes individual fixed effects, γ_t

denotes calendar-year (or equivalently, age) fixed effects, $D_{k,it}$ are event-time indicators, and T_i is an indicator for whether the individual's parent died with ADRD. The coefficients δ_k capture the differential outcome path for treated individuals relative to the baseline year $k = -10$. This specification allows us to visualize dynamic response patterns and assess the presence of differential pre-trends in the early stages of parental ADRD.

To improve precision, we also estimate a version of the model with event-time indicators grouped into broader periods.

$$y_{it} = \theta_i + \gamma_t + \sum_{k=-9}^{7} \beta_k D_{k,it} + \sum_{g} \delta_g (G_{g,it} \times T_i) + \varepsilon_{it} \tag{2}$$

where $G_{g,it}$ denotes grouped event-time indicators corresponding to seven mutually exclusive event-time bins relative to the year of parental death. The period $k \in [-10, -8]$ serves as the omitted reference group.[15] All other terms are defined as in Equation (1) and all standard errors are clustered at the individual level.

Given the large number of estimates across outcome domains and event periods, we report both unadjusted and adjusted p-values that correct for multiple hypothesis testing using the sharpened false discovery rate (FDR) procedure of Benjamini et al. (2006). Following Field et al. (2021), adjustments are made within outcome domains corresponding to each main table. For implementation, we follow Anderson (2008): we first apply the conservative Benjamini–Hochberg procedure to estimate the number of true null hypotheses, and then use the two-stage algorithm of Benjamini et al. (2006) to obtain "sharpened q-values." These sharpened q-values are directly comparable to standard p-values and indicate statistical significance while controlling the expected proportion of false discoveries.[16]

A key empirical challenge is isolating ADRD-specific spillovers from those associated with parental illness and death more broadly. To address this, we re-estimate Equations (1) and (2) using a separate analysis sample consisting of individuals whose parents died without an ADRD diagnosis (T2) and their matched placebo controls (C2). In these models, T_i is an indicator for non-ADRD-related parental death. This non-ADRD sample provides a benchmark for bereavement effects that are not specific to dementia. Finally, we test for

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[15] We define the grouped bins as follows: $g_1 = \{-7, -6\}$, $g_2 = \{-5, -4\}$, $g_3 = \{-3, -2\}$, $g_4 = \{-1, 0, 1\}$, $g_5 = \{2, 3\}$, $g_6 = \{4, 5\}$, and $g_7 = \{6, 7\}$.

[16] See Benjamini et al. (2006) for the formal description of the two-stage sharpened FDR algorithm and Anderson (2008) for an applied implementation in program evaluation settings.

differences in treatment effects using a pooled regression framework that includes both the ADRD and non-ADRD samples. As the two treatment groups are not directly comparable, we interpret these estimates as a conservative lower bound on the differential impact of parental ADRD.

4 Findings

We first present our primary analysis of the impact of having a parent with dementia on adult children's labor market, physical health, and mental health outcomes. In our context, having a parent with dementia has no discernible effect on labor supply, earnings, or physical health over the 18-year window surrounding the parent's death. However, we find large effects of having a parent with dementia on children's mental health, and in the remainder of the paper, we focus on studying these mental health outcomes in greater detail.

4.1 Main outcomes

We estimate all models by gender, reflecting well-documented gender differences in caregiving roles, labor market outcomes, and health care use across the life course. Figures 1–5 plot unadjusted labor market, physical health, and mental health trajectories of adult children over the 18-year period surrounding their parent's dementia-related death. In each figure, black circles indicate means for the treated group, defined as adult children who experience a parent's dementia-related death, while red triangles represent the placebo group, defined as adult children whose parents never have ADRD and do not die in the index year. The dotted vertical line marks the index year (the year of parental death for the treated group and a placebo year for the control group).

Each figure is complemented by three sets of additional analyses. First, Appendix Figures A.2-A.6 plot adjusted event-study coefficients and 95 percent confidence intervals from Equation (1). Second, we conduct a sequence of joint F-tests (Appendix Tables A2 -A6) and report the tests of the parallel-trends assumption between the ADRD and placebo groups. Specifically, we test for equality of event-time coefficients in the pre-treatment period, starting with a test of $t = -10$ equal to $t = -9$, then $t = -10 = t = -9 = t = -8$, and so on, incrementally adding one pre-period at a time up to the event year. This approach allows us to detect the earliest point at which outcome trajectories begin to diverge, if any divergence exits. Third, we report results from Equation (2), which summarizes effect sizes in two-year bins using event years $t = -10$ to $t = -8$ as the reference period (Table 2, and Appendix Tables A7-A10).[17]

Figure 1 presents labor market trajectories for adults who experience a parent's dementia-related death relative to their matched counterparts. Panel A plots annual labor force participation, and Panel B plots annual employment rates.[18] We observe remarkably similar levels and trends in both outcomes for the treatment and control groups throughout the entire observation period. For both men and women, we fail to reject the null of identical year-to-year trends in labor force participation and employment across the full pre-event window ($t = -10$ to $t = 0$) (Appendix Table A2, Appendix Figure A.2). Consistently, the estimated binned event-time coefficients are small in magnitude and show no evidence of differences in labor market outcomes before or after parental death (Appendix Table A7).

We next examine conditional wage and labor income (in logs), with unadjusted trends shown in Figure 2. Again, we observe very similar levels and trends between the treatment and placebo groups, resulting in adjusted year-to-year fluctuations in the event-study coefficients that center around zero (Appendix Figure A.3), and we fail to reject the null hypothesis of equal pre-trends for men and women between $t = -10$ and $t = 0$ for both wage and labor income (Appendix Table A3). The binned event-study coefficients in Table A8 likewise show precise null effects for women. For men, we estimate a statistically significant decline of 0.021–0.025 log points (approximately 2.1–2.5 percent) in real wages and income during the three-year window around parental death ($t = -1, 0, 1$). Given that all the binned event-time coefficients are negative and the sample size is large however, these negative coefficients likely reflect slightly lower baseline levels in the reference category.

Using Anderson's sharpened false discovery rate (FDR) procedure, we further assess the robustness of these findings to multiple hypothesis testing (Appendix Table A18). After this adjustment, the decline in wage income around the year of death is no longer significant, and the decline in labor income is only marginally significant. We therefore refrain from interpreting these estimates as causal and conclude that parental ADRD has no systematic impact on adult children's labor market outcomes.

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[17] All event-time intervals span two years, except the event window, which covers three years ($t = -1, 0, 1$).

[18] Employment is defined as working for pay or self-employed. Labor force participation is defined as being employed, unemployed, or on paid leave.

Figure 3 plots unadjusted annual likelihood of physical health encounters for adult children, including primary care visits, specialist visits, and prescription drug use unrelated to mental health, over an 18-year window centered on the parental death event. We again observe no discernible differences in levels or trends between the ADRD and placebo groups during the pre period, and these trajectories remain closely aligned throughout the full observation window (Appendix Figure A.4). Consistent with this visual evidence, joint F-tests fail to reject the null of equal pre-trends at any point between $t = -10$ and $t = 0$ (Appendix Table A4), with the exception of a one-period deviation at the beginning of the event window (e.g., $t = -9$), which quickly reverts and does not affect the overall pattern.

Figure 4 plots unadjusted trends for inpatient and outpatient hospital visits as well as preventive screenings. Among men, inpatient hospital visits show some trend differences at the beginning of the event period preceding parental death, suggesting that the parallel-trend assumption may not hold perfectly. For women, these series show no differences between the ADRD and placebo groups, and the formal tests again suggest no significant differences in pre-trends or in overall trajectories during the 10 years before and 7 years after parental death (Appendix Figure A.5; Appendix Table A5).

Appendix Tables A9 and A10 report the corresponding binned event-study coefficients. We confirm that there are no systematic differences in any outcome between the treatment and matched control groups. Among 84 individual estimates, two are significant at the 1 percent level and three at the 5 percent level. None of these estimates remain significant after adjusting for multiple hypothesis testing (Appendix Table A18). Overall, these findings suggest that having a parent with dementia does not lead to meaningful changes in physical health care seeking or underlying physical health, based on a broad range of outcomes and limited to conditions serious enough to result in a recorded health care encounter.

Figure 5 plots unadjusted measures of annual mental health care use and reveals a markedly different pattern relative to labor market and physical health outcomes. Panel A shows the share of individuals with at least one mental health encounter, including visits to a primary care physician, psychologist, psychiatrist, or a psychiatric hospitalization. Panel B shows the share with any mental health prescriptions, including antidepressants, hypnotics, anxiolytics, and antipsychotics. In this sample, mental health care use increases with age and is significantly higher among women than men, consistent with prior research.

Five to ten years before the year of parental death, the treatment and placebo groups display nearly identical levels and trends in both outcomes. Beginning around event year −5, however, both mental health visits and prescription rise sharply for women in the ADRD group, consistent with spillovers of intensifying parental dementia symptoms. Mental health care use peaks in the year of the parent's death and gradually converges back to the placebo trend within six years. These patterns suggest a substantial mental health burden associated with parental ADRD, concentrated among women and spanning roughly five years before and after the parent's death. For men, the effects are smaller and more concentrated around the year of death, with some evidence of persistent increases in mental health care use up to 7 years after death. Consistent with the visual evidence, event-study estimates show statistically indistinguishable trends in mental health care use between the treatment and control groups from event years $t = -10$ to $t = -6$ for both men and women (Appendix Figure A.6). Starting in event year $t = -5$, however, mental health care use for women in the ADRD group begin to diverge sharply from the counterfactual trend. The joint F-tests for both outcomes in Appendix Table A6 formally confirm that these divergences begin about five years before parental death for women, whereas for men the corresponding divergence occurs only around the year of death.

Table 2 reports the estimated effects of parental ADRD on men and women's mental health care use. Four to five years before a parent's death, women whose parent dies with dementia are 0.77 percentage points more likely to have a mental health-related visit, corresponding to a 10 percent increase relative to a baseline rate of 7.7 percent. They are also 0.65 percentage points more likely to use psychiatric medication, a 3.8 percent increase relative to a baseline of 17.2 percent.

Mental health visits remain elevated by 1.12 percentage points (14.6 percent) and psychiatric medication use by 0.55 percentage points (3.2 percent) during the three- to two-year period preceding parental death for women. During the three-year window surrounding the parent's death ($t = -1, 0, 1$), the likelihood of a mental health–related visit rises by 2.17 percentage points (28.3 percent), while prescription use increases by 1.27 percentage points (7.4 percent). Elevated mental health care use persists for up to three years after the parent's death: women remain 0.74 percentage points (9.6 percent) more likely to have a mental health–related visit and 0.6 percentage points (3.5 percent) more likely to use psychiatric medication. By event year $t = 7$, both outcomes converge back to the counterfactual trend, and women's mental health care use in the treatment group is statistically indistinguishable from that of the placebo group.

For men, the estimated coefficients are small and imprecise, remaining statistically indistinguishable from zero throughout the $t = -7$ to $t = -2$ period. The first clear increase appears in the three-year window around parental death ($t = -1, 0, 1$), with mental health visits rising by 0.66 percentage points (16.7 percent of the baseline mean of 4 percent). Psychotropic prescriptions also increase by 0.67 percentage points (6.6 percent of the baseline mean of 10.2 percent). Post-death estimates remain positive for up to seven years (ranging from 0.21 to 0.51 percentage points for mental health visits and 0.38 to 0.62 percentage points for psychiatric prescriptions), suggesting a possible persistence in elevated mental health care use.

Taken together, these estimates suggest a large and sustained increase in mental health care use during the ten year period around a parent's dementia-related death, concentrated among women. The effects emerge around five years before the parent's death, intensify as the disease progresses, peak during the bereavement period, and gradually return to baseline around five years after death. In contrast, men exhibit lower baseline use, smaller and less consistent increases, and effects concentrated narrowly around the year of death, highlighting marked gender differences in mental health care responses to parental ADRD. As shown in Table A18, and in contrast to labor market and physical health outcomes, most of the estimated effects for both men and women remain statistically significant after adjusting for multiple hypothesis testing. In the next section, we decompose the two mental health outcomes into specific types of visits and medications by gender to identify the primary drivers of increased mental health care use.

4.2 Mental Health Care Use by Visit and Medication Type

Figure 6, Panel A, displays estimates of mental health related encounters by provider type: visits to a psychologist (black circles), a primary care physician (PCP) for a mental health concern (red triangles), a psychiatrist (blue squares), and other mental health visits including psychiatric hospitals (purple x markers). Appendix Table A11 presents the corresponding regression coefficients, their standard errors, and the mean values of the outcomes.

The overall increase in mental health visits among the treated group is driven primarily by visits to psychologists. For women, the rise in psychologist visits is both statistically and substantively significant, with effects emerging well before the parental dementia-related death. At event time −5 to −4, psychologist visits increase by 0.43 percentage points (21.7 percent relative to the baseline mean of 1.98 percent). The effect grows to 0.57 percentage points at −3 to −2 (28.8 percent) and peaks in the index period (-1,0,1) at 1.77 percentage points (89.4 percent). In the post-death period, psychologist visits remain elevated by 0.46 percentage points (23.2 percent) in years 2-3, before returning to the counterfactual mean by years 4-5.

For men, the increases in psychologist visits are smaller in both absolute and relative terms and are only different from the counterfactual trend in the 3 years around parental death. At event time −1 to 1, visits increase by 0.34 percentage points (54.0 percent). The effect persists through year 5, but dissipates by event years 6 to 7.

Increases in PCP visits for mental health concerns exhibit similar trends and contribute to the overall increase in demand for mental health care, but are smaller in magnitude and less precisely estimated. For women, the effects range from approximately 0.30 to 0.71 percentage points (relative to a baseline mean of 4.11 percent), and for men from 0.07 to 0.31 percentage points (relative to a baseline mean of 1.85 percent). PCP visits for mental health concerns remain elevated for men up to 7 years after parental death. Most of these estimates are not statistically significant, though they suggest a broadly similar trajectory of elevated mental health care use. In contrast, visits to psychiatrists and other mental health care providers show no consistent or meaningful changes for either gender.

Figure 6, Panel B, presents the event-study coefficients for psychiatric medication use, disaggregated into four categories: anxiolytics (used to treat anxiety, ATC classification N05B), hypnotics (used to treat insomnia, ATC classification N05C), antidepressants (used to treat depression, ATC classification N06A, except N06AX12), and antipsychotics (used to treat more severe mental illness, including major depression and psychotic disorders, ATC classification N05A). Appendix Table A12 reports the corresponding regression estimates, standard errors and outcome means.

For women, the use of anxiolytics, hypnotics, and antidepressants all exhibit a similar pattern: estimates are relatively flat prior to event year −5, increase beginning in event years −5 to −4, peak around the time of parental death, and gradually decline thereafter, returning to counterfactual levels by event years 6 to 7. Across these drug classes, the estimated increases peak between 0.57 and 0.74 percentage points, corresponding to relative rises of

5.6 percent for antidepressants, 13.2 percent for hypnotics, and 13.6 percent for anxiolytics. Post-event estimates decline over time and are no longer statistically distinguishable from zero in years 6 to 7. In contrast, antipsychotic use remains flat across the entire period, with estimates close to zero in all event windows.

For men, the increases in psychiatric medication use are smaller, less consistent, and less precisely estimated. The only suggestive pattern appears for antidepressants, hypnotics, and anxiolytics in the narrow window spanning event years -1 to 1. During this period, estimated increases range from 0.27 to 0.51 percentage points, corresponding to relative increases of 9.3 percent for antidepressants, 11.5 percent for hypnotics, and 9.3 percent for anxiolytics. Effects beyond the parental death period are positive but imprecise, suggesting persistence in use of antidepressants and hypnotics. As with women, antipsychotic use remains flat throughout the observation window.

Overall, the disaggregated results provide evidence that the mental health response to a parent's ADRD trajectory and subsequent death is concentrated in increased outpatient care, particularly among women. The primary driver is psychologist visits, followed to a lesser extent by primary care visits for mental health concerns. Women also increase their use of psychiatric medication during a ten-year period around parental death. This increase is driven by medication for depression, anxiety and insomnia, rather than for more severe mental health disorders. For men, baseline use of mental health care is substantially lower, and the effects are muted. These results further underscore gender differences in mental health care use in response to parental ADRD. In the next section, we examine how the mental health effects of parental ADRD vary by additional key demographic characteristics.

4.3 Mental Health: Demographic Subgroups

The median age at which children in our sample lose a parent with ADRD is 50. We split the sample at this threshold to compare mental health effects for those experiencing parental ADRD and death at younger versus older ages. Figure 7 presents estimates from Equation 2; corresponding coefficients and outcome means are reported in Appendix Table A13.

These estimates indicate that the mental health effects among women are concentrated among those who experience a parent's ADRD-related death at younger ages. Among women under 50, the probability of any mental health encounter rises substantially, ranging between 1.24 and 3.10 percentage points between event years -5 and +3 and corresponding to relative increases of 15.1 to 37.8 percent from a baseline mean of 8.2 percent. For women aged 50 and older, the increase is smaller—0.19 to 1.44 percentage points (2.6 to 19.8 percent relative to a 7.26 percent baseline)—and statistically significant only in the three years surrounding the year of death.

Psychiatric medication use shows a similar pattern across age groups. Among younger women, prescriptions increase by 1.21 to 1.76 percentage points between event years -5 and +3, corresponding to 8.2 to 11.9 percent relative to a 14.8 percent baseline. For older women, the effects are smaller—0.02 to 0.88 percentage points (0.1 to 4.6 percent relative to a higher baseline of 19.1 percent)—and statistically significant only in the three years surrounding the event period, consistent with the pattern of mental health visits.

Mental health visits for men show no meaningful variation by age. Younger men exhibit a statistically significant increase in psychiatric medication use, beginning in event years -1 to 1 (0.93 percentage points, or 10.2 percent) and medication use remains elevated seven years after parental death. Estimated effects for older men are small and not statistically different from zero.

In Figure 8 we report estimated coefficients separately for individuals with and without a college degree; Appendix Table A14 reports the corresponding values and baseline means. Among women, mental health related visits and psychiatric medication use increase across all education levels, with somewhat larger and more persistent effects among those with a college degree. Men without a college degree exhibit increases in mental health care use that are concentrated in the years around a parent's death, while the effects college-educated men appear later but are more persistent.

4.4 Comparing Parental Loss from ADRD to Other Causes of Death

The decline and death of a family member from any cause can negatively affect mental health (Jensen and Zhang 2024) and thus far, we have not considered the direct effect of parental death on mental health care use in our findings.

To assess if the experience of having and losing a parent with ADRD systematically differs from the more general experience of the decline and death of a parent in old age, we estimate Equation (1) on the sample of children who experience a parent's death unrelated to ADRD in the index year (T2). We plot the unadjusted mental health care use trajectories for T2 (red circles) and their matched comparison group C2 (blue triangles) in Figure 11.

We report the corresponding F-test results for pre-event trend equivalence in Appendix Table A16 and the regression estimates for aggregated event periods in Table 3.

Figure 11 confirms that parental death is associated with a sharp increase in mental health care use regardless of the cause. However, in contrast to women with a parent diagnosed with ADRD, women who lose a parent to other causes do not diverge from the counterfactual trend until the year immediately preceding death ($t = -1$). Among women in the second treatment group (T2), we observe no significant differences relative to their matched placebo group (C2) between event years $t = -10$ and $t = -2$, as shown in Appendix Table A16.

There is a sharp increase of 2.35 percentage points (31.5 percent) in mental health visits and 1.17 percentage points (7.3 percent) in psychiatric prescriptions in the three years centered on the year of death. Visits converge to the counterfactual trend after year 3, while use of medication persists through the study period, as shown in Table 3. Coefficients are estimated more precisely than in the ADRD sample, reflecting the substantially larger sample size. For men, we find no systematic differences between the effects of ADRD-related and non-ADRD parental deaths; in both cases, increases in mental health care use are modest and confined to the short period surrounding the year of death.

Appendix Table A17 reports estimates from a pooled event-study model that combines the ADRD and non-ADRD samples to test whether the effects of parental death differ by cause. The specification includes a full set of interactions between treatment status, event-time bins, and an ADRD sample indicator, along with all corresponding two-way interactions (treatment-by-period, treatment-by-sample, and period-by-sample). The model additionally includes individual, event-year, and age fixed effects. Reported coefficients correspond to the three-way interaction and capture the *difference in event-time treatment effects* between ADRD and non-ADRD parental deaths (ADRD minus non-ADRD).[19]

Among women, we find economically meaningful and statistically significant differences in mental health care use between those whose parent died with ADRD and those whose parent died without such a diagnosis. In event years $t = -6$ to -2, increases in mental health visits and psychiatric medication use among women who's parents die with ADRD exceed those of women who's parents die without ADRD by 0.75 and 0.60 percent-

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[19] To gain precision, event time is aggregated into three bins (-6 to -2, -1 to $+1$, and $+2$ to $+7$), with -10 to -7 as the reference period. Standard errors are clustered at the individual level.

age points, respectively. Despite the large sample size and the aggregation of event periods to improve precision, we cannot statistically distinguish the effects of ADRD-related and non-ADRD parental deaths during or after the year of death. For men, consistent with the earlier analysis, we find no evidence of differential effects by cause of parental death.

The pooled comparison helps illuminate differences in the timing mental health spillovers between individuals experiencing ADRD-related parental loss and more general parental bereavement. However, we caution against interpreting the estimates in the pooled regression as the true difference in mental health care use between the two samples who experience a parental death. ADRD is often underdiagnosed or miscoded, and some parents classified as non-ADRD may have ADRD, which contaminates the comparison group and biases the estimated differences toward zero. In addition, the two treatment groups are not directly comparable on observables. Taken together, these factors suggest that our estimates represent a conservative, lower bound on the excess mental health burden associated with ADRD. The earlier onset and steeper trajectory of mental health impacts among women experiencing ADRD-related parental loss indicate spillovers that extend beyond general parental bereavement.

4.5 The Role of Caregiving

Our findings imply large mental health spillovers of having a parent with ADRD which are consistent with existing studies (Ask et al. 2014; Brodaty et al. 2014; Chiao et al. 2015; Schmitz and Westphal 2015). While null effects on labor supply and physical health run contrary to a large literature documenting substantial spillovers on these dimensions, this literature is concerned directly with caregivers (Maestas et al. 2024; Schmitz and Westphal 2017; Fevang et al. 2012; Bom et al. 2019). Denmark has both high public funding for long-term care and generous work-family policies that support family caregivers. In this setting, it is possible that there is less need for children to provide substantial unpaid care, and those who choose to do so have sufficient flexibility to manage both work and caregiving responsibilities. Although the administrative data does not allow us to observe who is providing hands-on care, we present some suggestive evidence about the role of caregiving in driving our findings.

We first consider spillovers to subgroups who are most at risk of needing to provide care when alternative caregivers are not available. Spouses and children are the primary family caregivers to older adults with dementia (Choi et al. 2021), so we examine heterogeneity by presence of siblings in Figure 9 and the affected parent's spouse in Figure 10. We find suggestive evidence of higher use of psychiatric medication among only children of both genders, although effects are imprecise due to small sample sizes among the only children subgroup. Moreover, we do not observe differences in mental health related visits. We also find no differences for either mental health outcome by parent's partnership status. These results imply that mental health spillovers do not vary drastically by propensity to become a caregiver.

We also draw on descriptive evidence from a nationally representative caregiving survey conducted by the Danish Center for Social Science Research in the spring of 2023. The survey was distributed to a random sample of adults aged 18 and older, and 26,274 respondents completed it (response rate: 27.8 percent).[20] Table 5 presents descriptive statistics for the sample of respondents who report having a parent with age-related care needs in column 1 and a parent with care needs related to ADRD in column 2. The survey sample of adult children differs demographically from our main analytic sample: respondents are older, more educated, less likely to be married, and more likely to be immigrants (8–10 percent versus 1 percent in the administrative data).[21] Nonetheless, the survey provides a useful snapshot of having a parent with care needs, with and without ADRD, in the Danish context.

Among respondents with a parent requiring care, whether with or without ADRD, approximately 80 percent report providing some form of support. Support includes not only hands-on assistance but also social, emotional, and coordination-related help (Madsen et al. 2025). Although the share providing support is high, the reported intensity is modest: respondents spend on average 2.8 hours per week when the parent has age-related care needs and 3.8 hours when the parent has care needs associated with ADRD. These figures suggest that while adult children of parents with ADRD devote somewhat more time to caregiving, the overall amount of hands-on care provided by children in Denmark remains limited. These numbers are consistent with estimates from the 2015 Danish SHARE survey

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[20] Invitations were sent to 100,000 individuals via Digital Post, Denmark's secure national e-mail system linked to the personal identification number. All citizens aged 15 or older are required to maintain a digital mailbox, with exemptions for certain groups (about 5 percent of the population). The response rate is adjusted for these exemptions (Madsen et al. 2025).

[21] The lower share of immigrants in the administrative sample reflects Denmark's relatively young immigrant population and the fact that few older immigrants die with ADRD.

of unpaid care hours received by older adults (Gørtz et al. 2025).[22]

Given Denmark's extensive workplace leave policies, these descriptive results align with our null findings for labor market outcomes, including labor supply and wages. Existing supports appear to allow adult children to assist their parents without leaving the workforce. Unfortunately, our administrative data do not include measures of caregiving-related leave, so we cannot directly test this mechanism. However, existing indicators of social benefit receipt do not change along the event trajectory.[23]

5 Discussion

ADRD imposes severe and rising budgetary pressure on health and social care systems in OECD counties, with similar pressures looming in other rapidly aging societies. Costs are high in part because the disease requires intensive caregiving, whether delivered through expensive formal services or unpaid care by spouses and other family members, and no reliable disease-modifying treatment exists. Standard cost estimates typically include labor-market opportunity costs of hands-on caregiving but omit substantial mental health burdens associated with coordinating care schedules, managing financial and medical decisions, coping with personality change, and within-family conflict.

We estimate the broad impacts of parental dementia on adult children's well-being using population-wide longitudinal data from Denmark and an event-study design spanning nearly two decades around parental death. We find no meaningful changes in labor supply, earnings, or physical health care use. In contrast, mental health care use rises substantially, especially among daughters, beginning five years before a parent's ADRD-related death, peaking around the time of death, and gradually converging to the counterfactual trajectory within about five years. We also compare ADRD-related loss to other causes, showing that the timing and magnitude of mental health effects differ in ways consistent with the progressive nature of dementia.

The patterns we document are less consistent with the practical demands of caregiving and more aligned with the sustained emotional burden of the disease process itself. This burden includes coping with personality changes, witnessing the loss of autonomy, and

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[22] In comparison, adult daughters in the US report providing care approximately 15 hours per week to a parent with care needs but no dementia and approximately 25 hours per week to a parent with dementia, while sons report 14 and 19 hours, respectively (Kasper et al. 2015).

[23] Results are omitted but available upon request.

bearing the responsibility of major decisions on behalf of an increasingly incapacitated parent. The results also are unlikely to be driven by concerns about one's own genetic risk of developing dementia. If genetic risk were the primary mechanism, we would not expect mental health care use to fall sharply and converge back to its counterfactual trajectory four to five years after the parent's death. Instead, the timing of the effects closely mirrors the parental disease trajectory, not long-run concerns about personal health risk.

The implications of these results are twofold. First, robust formal long-term care and flexible leave policies appear sufficient to prevent sizable disruptions in work on both the extensive and intensive margins when a parent develops dementia. Our findings are consistent with existing studies that find limited labor market spillovers in countries with generous and readily available public long-term care options (Ramirez Lizardi et al. 2024; Crespo and Mira 2014; Rellstab et al. 2020). Second, the substantial increase in mental health service use underscores the gendered burden of parental dementia that formal care provisions do not fully offset. Supporting a parent through prolonged cognitive decline is associated with higher demand for mental health services, especially among daughters who lose a parent at younger ages, even when hands-on caregiving by adult children is limited. For many women in mid-life, these responsibilities likely layer onto existing career and family obligations, amplifying the emotional and organizational strain of a parent's illness. These patterns suggest a need for earlier, targeted support such as counseling or easier access to mental health services.

Taken together, our results suggest that strong public insurance systems can largely insulate adult children from financial and physical health consequences of parental dementia, while non-economic costs to mental health remain significant. While Denmark's welfare state can minimize economic and health spillovers and respond to remaining psychological pressures on family members, comparable disease-related demands are likely to generate larger labor market and health disruptions in settings with weaker social safety nets, such as the United States. Moreover, our estimates likely capture the lower bound of mental health costs: we only observe mental health spillovers that result in an encounter with a health professional, whereas many affected individuals may not seek psychological support despite experiencing distress. They may also rely on alternative coping strategies such as increased alcohol use, changes in sleep or daily routines, or greater social withdrawal, none of which are measured in our data. The psychological toll of parental dementia may also spillover on to other family members including straining relationships with own children and partners. A comprehensive assessment of dementia's societal burden should therefore recognize these persistent emotional spillovers in addition to direct medical and long-term care expenditures.

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Table 1: Summary Statistics for Treated and Matched Placebo Child–Parent Pairs, by Cause of Parental Death

	ADRD			**Non-ADRD**		
	Treatment (T1) (1)	Matched Placebo (C1) (2)	Parent (P1) (3)	Treatment (T2) (4)	Matched Placebo (C2) (5)	Parent (P2) (6)
Birth year	1959.3	1959.3	1926.2	1961.1	1961.1	1930.4
	(4.83)	(4.83)	(6.32)	(5.27)	(5.27)	(7.36)
Age at parent's death	49.5	49.5		47.5	47.5	
	(4.99)	(4.99)		(5.34)	(5.34)	
Age at death			82.6			78.2
			(6.3)			(7.3)
Female	0.50	0.50	0.52	0.50	0.50	0.44
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Basic education	0.23	0.23	0.59	0.24	0.24	0.56
	(0.42)	(0.42)	(0.49)	(0.43)	(0.43)	(0.50)
College or more	0.33	0.33	0.11	0.29	0.30	0.10
	(0.47)	(0.47)	(0.31)	(0.46)	(0.46)	(0.30)
Married	0.76	0.76	0.44	0.75	0.75	0.56
	(0.43)	(0.43)	(0.50)	(0.43)	(0.43)	(0.50)
Number of children	1.8	1.8	2.2	1.8	1.8	2.3
	(1.13)	(1.12)	(1.12)	(1.13)	(1.13)	(1.15)
Immigrant	0.01	0.01	0.02	0.01	0.01	0.02
	(0.09)	(0.10)	(0.16)	(0.10)	(0.10)	(0.15)
Observations	36,112	36,112	20,274	195,687	195,687	101,486

Notes: The table reports summary statistics for the analytic sample of child–parent pairs used in the study. Columns 1–3 present means and standard deviations for children whose parent died with ADRD (T1), their deceased parents (P1), and matched placebo controls (C1). Columns 4–6 report the same information for children whose parent died without ADRD (T2), their deceased parents (P2), and matched placebo controls (C2). Matching was performed one-to-one based on child and parent demographic characteristics, education, region, and pre-event labor market status. All variables are measured ten years prior to the index year.

Table 2: Event Study Estimates: Mental Health Service Use Around Parental Death from ADRD

	Men		Women	
Event Years	Psychiatric Visits (1)	Medication Use (2)	Psychiatric Visits (3)	Medication Use (4)
-10 to -8	Reference Category		Reference Category	
-7 to -6	-0.12	-0.20	-0.33	0.07
	(0.16)	(0.20)	(0.23)	(0.25)
-5 to -4	0.17	-0.06	0.77***	0.65**
	(0.19)	(0.24)	(0.26)	(0.29)
-3 to -2	0.12	-0.11	1.12***	0.55*
	(0.20)	(0.26)	(0.27)	(0.32)
-1 to 1	0.66***	0.67**	2.17***	1.27***
	(0.19)	(0.27)	(0.27)	(0.33)
2 to 3	0.28	0.46	0.74***	0.60*
	(0.21)	(0.30)	(0.28)	(0.36)
4 to 5	0.21	0.38	0.32	0.38
	(0.21)	(0.31)	(0.28)	(0.37)
6 to 7	0.51**	0.62**	0.01	0.11
	(0.21)	(0.31)	(0.28)	(0.37)
Outcome mean	3.96	10.20	7.67	17.20
N	650,340	650,340	649,692	649,692

Notes: The table reports estimated effects of having a parent who died with an ADRD diagnosis on adult children's annual mental health care use, based on Equation (2). Estimates show the effect of parental death on psychiatric medication prescriptions and mental health visits (in percentage points) relative to the reference period (–10 to –8 years before death). Sample includes children whose parent died from ADRD and their matched controls. Standard errors are clustered at the individual level and are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Event Study Estimates: Mental Health Service Use Around Parental Death from Non-ADRD Causes

	Men		Women	
Event Years	Psychiatric Visits (1)	Medication Use (2)	Psychiatric Visits (3)	Medication Use (4)
-10 to -8	Reference Category		Reference Category	
-7 to -6	-0.03	-0.04	-0.16	0.03
	(0.07)	(0.08)	(0.10)	(0.11)
-5 to -4	0.04	0.04	0.03	0.11
	(0.08)	(0.10)	(0.11)	(0.13)
-3 to -2	0.05	0.06	0.16	0.10
	(0.08)	(0.11)	(0.12)	(0.14)
-1 to 1	0.69***	0.49***	2.35***	1.17***
	(0.08)	(0.12)	(0.12)	(0.14)
2 to 3	0.16*	0.19	0.32***	0.27*
	(0.09)	(0.13)	(0.12)	(0.16)
4 to 5	0.08	0.08	0.15	0.38**
	(0.09)	(0.13)	(0.12)	(0.16)
6 to 7	0.01	0.07	0.19	0.42**
	(0.09)	(0.14)	(0.12)	(0.16)
Outcome mean	3.85	9.70	7.47	16.09
N	3,544,452	3,544,452	3,500,280	3,500,280

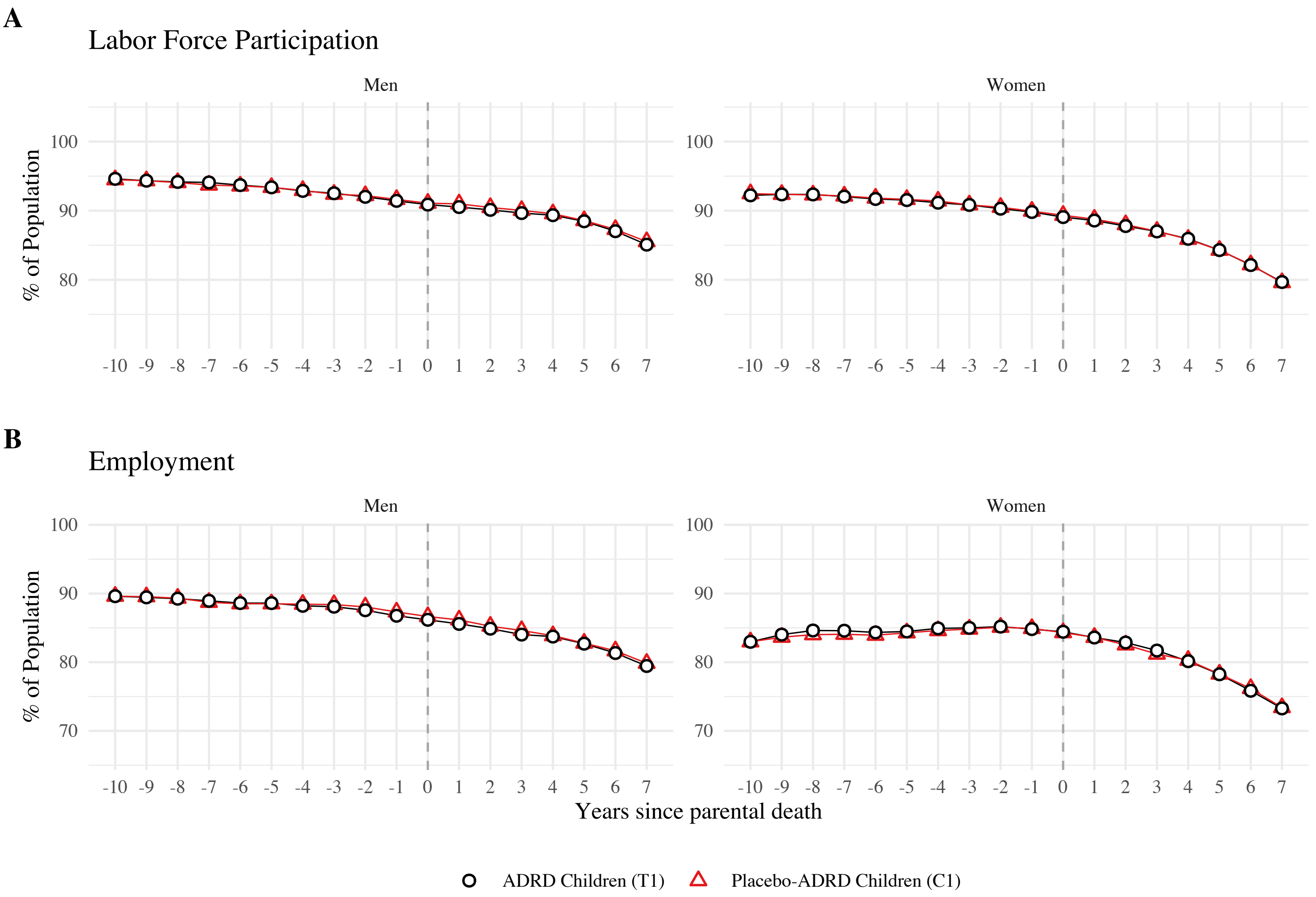
Notes: The table reports estimated effects of having a parent who died without an ADRD diagnosis on adult children's annual mental health care use, based on Equation (2). Estimates show the effect of parental death on psychiatric medication prescriptions and mental health visits (in percentage points) relative to the reference period (–10 to –8 years before death). The sample includes children whose parent died without ADRD and their matched controls. Standard errors are clustered at the individual level and are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Characteristics of Respondents and Their Parents by Parental Care Needs

	Age-related care needs	ADRD and Care needs
Respondent		
Female (%)	51.03	54.62
	(1.50)	(2.66)
Age (years)	53.84	52.94
	(0.36)	(0.56)
Married (%)	59.75	58.75
	(1.49)	(2.64)
Immigrant (%)	7.89	9.54
	(1.05)	(1.94)
Further education (%)	41.39	47.68
	(1.43)	(2.62)
In the labor market (%)	73.81	79.13
	(1.33)	(2.16)
Working part time (%)	15.30	17.90
	(1.02)	(1.93)
Days with sickness leave (last 4 weeks)	0.70	0.71
	(0.09)	(0.18)
Provides support to parents (%)	81.00	79.53
Time spend caregiving (hours/week)	2.78	3.81
	(0.13)	(0.32)
Parents		
Female (%)	71.43	69.90
	(1.36)	(2.47)
Parent older than 75 (%)	82.84	80.46
	(1.30)	(2.29)
N	1,334	428
Weighted N	199,446	63,609

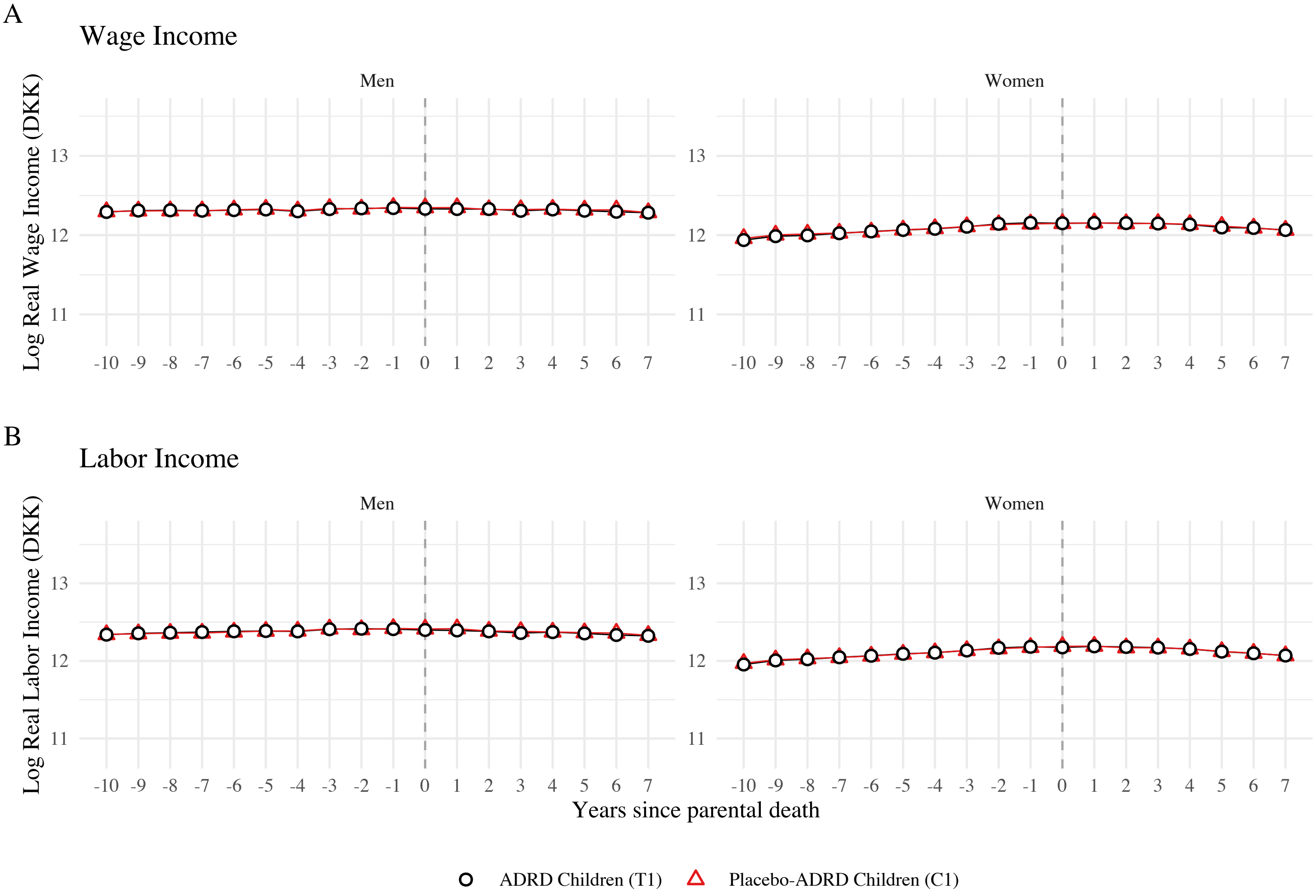
Notes: The table reports descriptive statistics from the 2023 nationally representative caregiving survey conducted by the Danish Center for Social Science Research. The sample includes adult respondents who report having a parent with care needs due to age-related conditions or ADRD. Statistics are weighted to represent the Danish adult population. Variables include demographic characteristics, caregiving status, and reported hours of weekly support. Standard deviations are in parentheses.

Figure 1: Labor Supply Around Parental Dementia-related Death



Notes: The figure plots unadjusted mean labor market outcomes by event year relative to parental death (year 0). Panel A shows labor force participation; Panel B shows employment. Black circles denote children whose parent died with ADRD; red triangles denote matched placebo children whose parent neither had ADRD nor died in the index year. Series are shown separately for women and men as indicated in the legend. The vertical dotted line marks the index year.

Figure 2: Earnings Around Parental Dementia-related Death

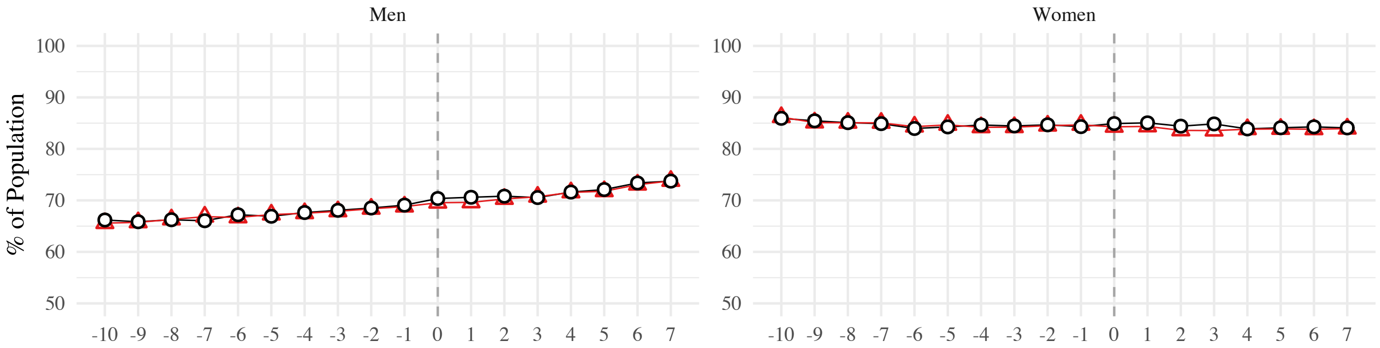


Notes: The figure plots unadjusted mean log annual earnings by event year relative to parental death (year 0). Black circles denote children whose parent died with ADRD, and red triangles denote matched placebo children whose parent neither had ADRD nor died in the index year. Series are shown separately for women and men as indicated in the legend. The vertical dotted line marks the index year.

FIGURE 3: Physical Health Care Visits Around Parental Dementia-related Death

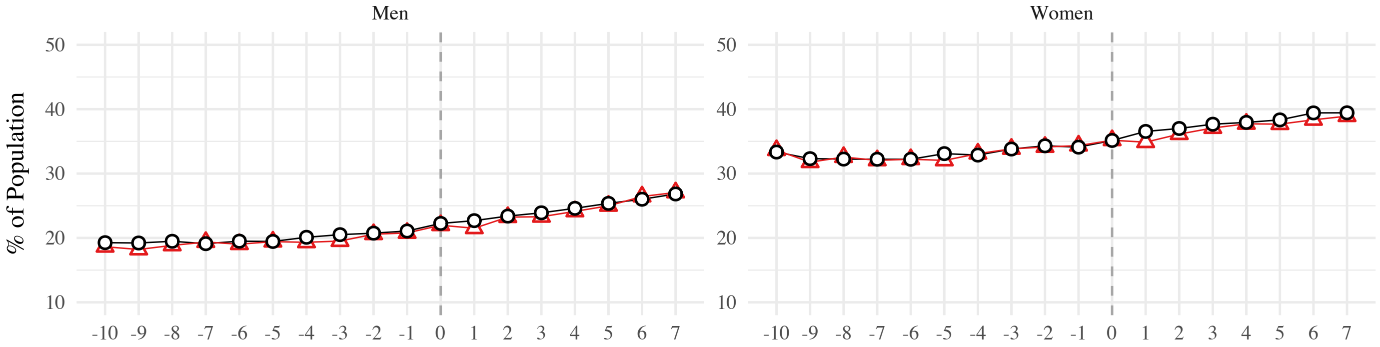
A

Primary Care Physician Visits (PCP)



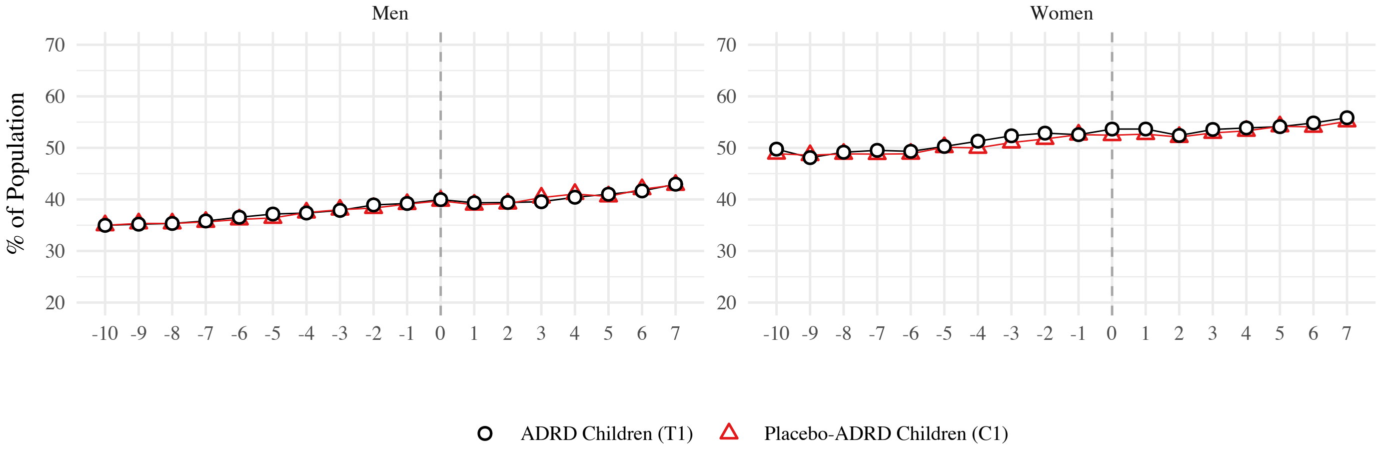
B

Specialist Physician Visits



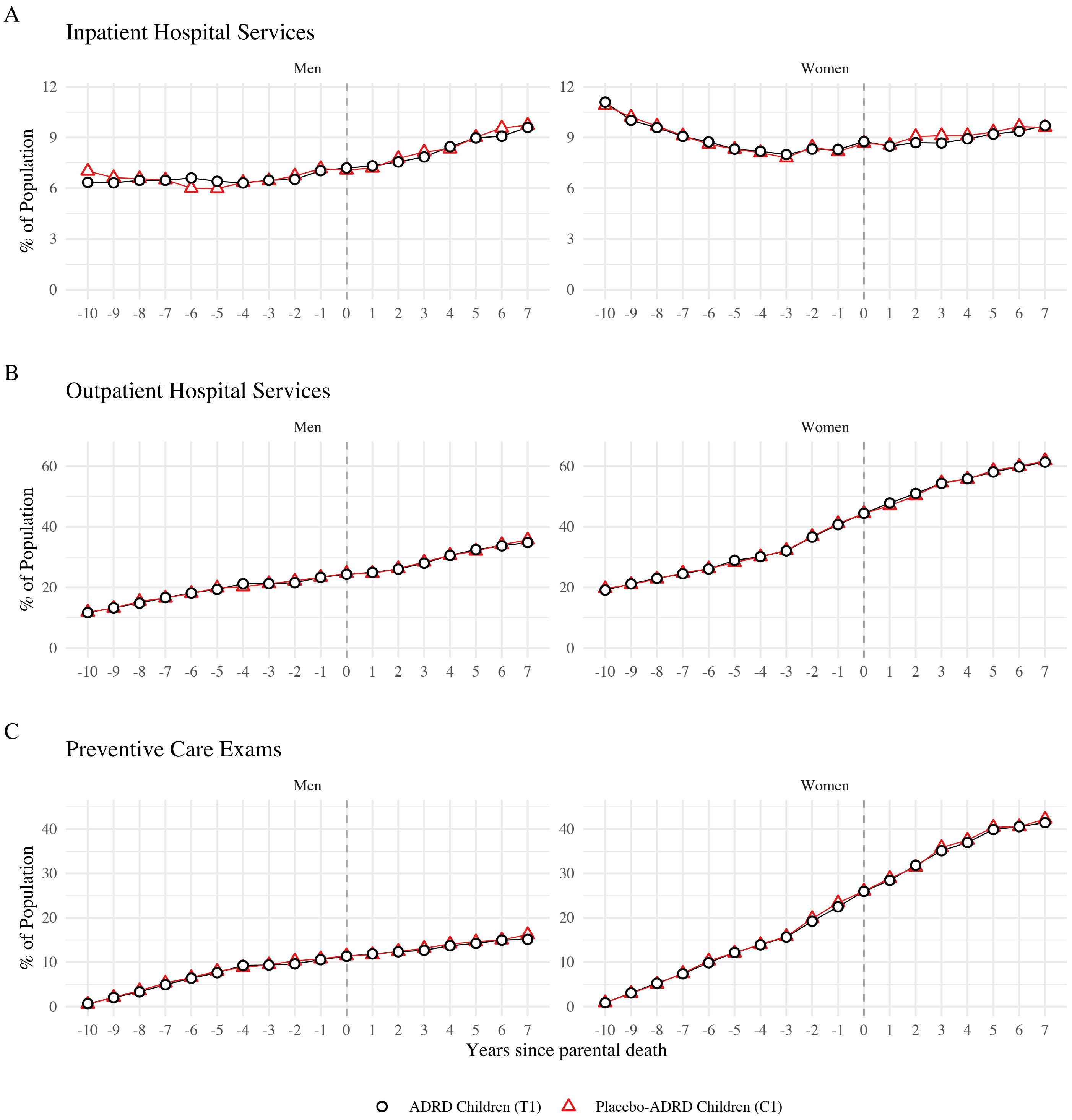
C

Prescription Drugs (Non-Mental Health)



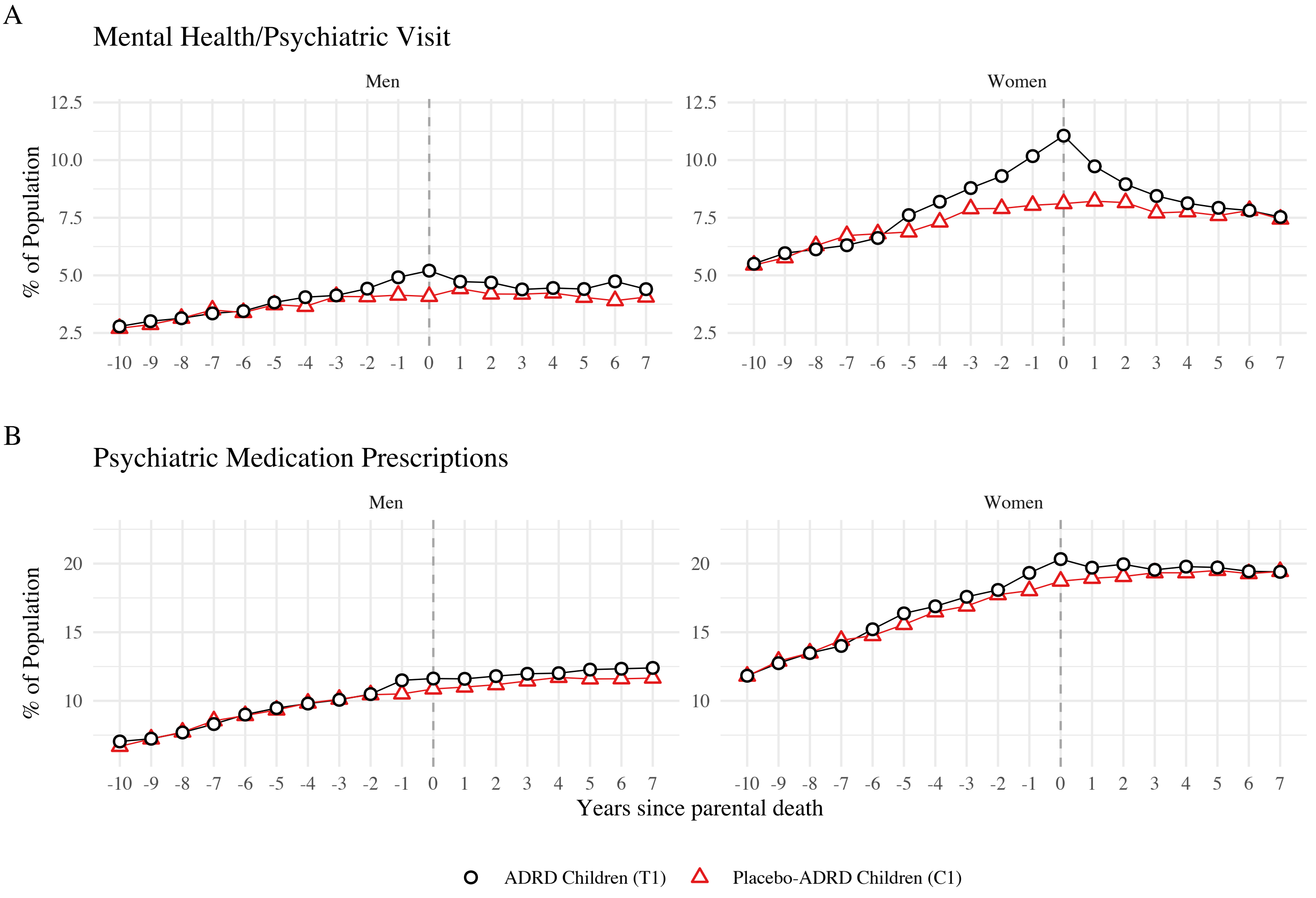
Notes: The figure plots unadjusted mean annual physical health care use by event year relative to parental death (year 0). Outcomes are indicators for at least one primary care visit, at least one specialist visit, and at least one non-psychiatric prescription fill within the year. Black circles denote children whose parent died with ADRD, and red triangles denote matched placebo children whose parent neither had ADRD nor died in the index year. The vertical dotted line marks the index year.

FIGURE 4: Hospital and Preventative Care Use Around Parental Dementia-Related Death



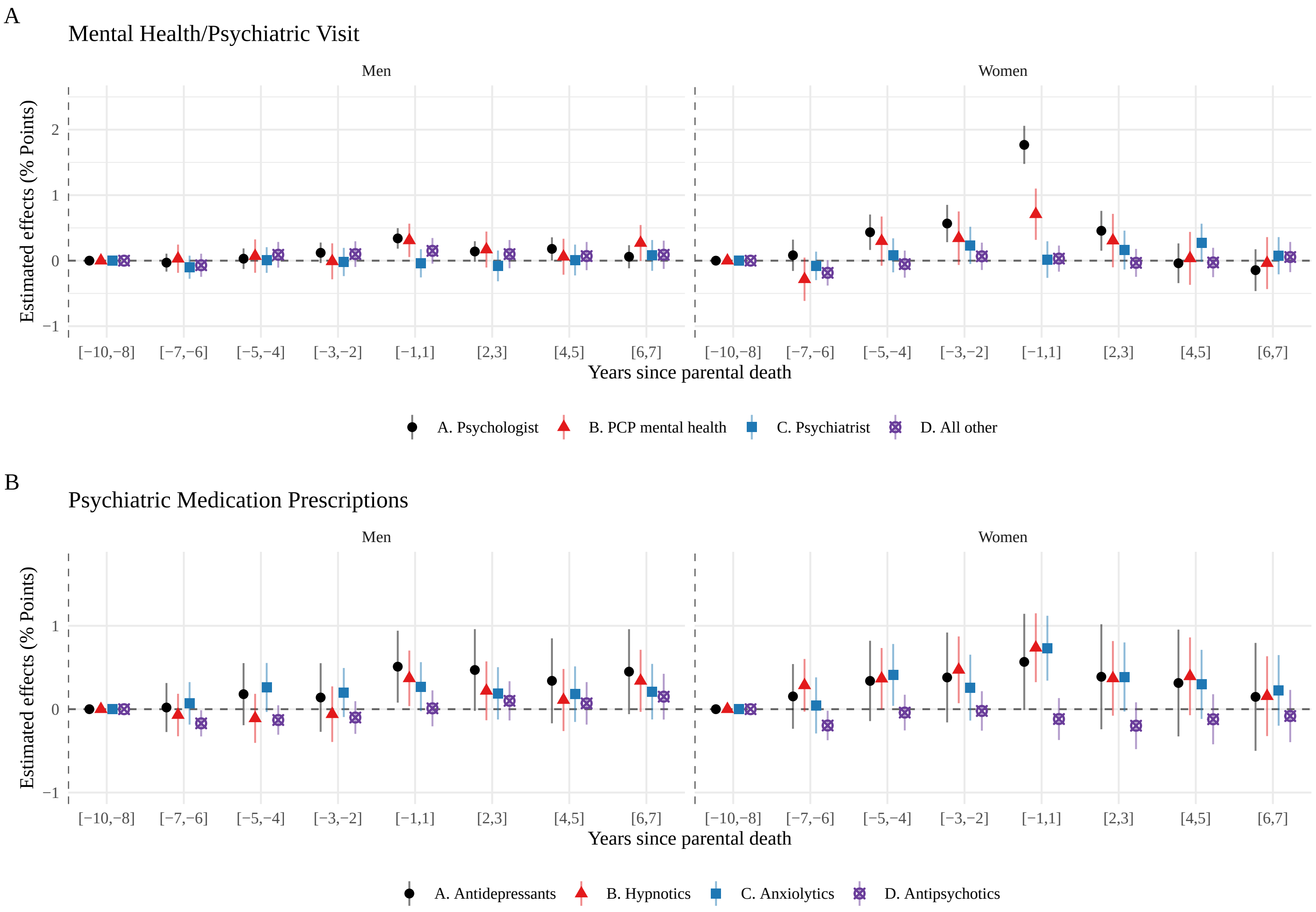
Notes: The figure plots unadjusted mean annual hospital contacts by event year relative to parental death (year 0). Outcomes include any inpatient admission or outpatient specialist visit for somatic conditions and preventative care exams within the year. Black circles denote children whose parent died with ADRD, and red triangles denote matched placebo children whose parent neither had ADRD nor died in the index year. The vertical dotted line marks the index year.

Figure 5: Mental Health Care Use Around Parental Dementia-related Death



Notes: The figure plots unadjusted mean annual mental health care use by event year relative to parental death (year 0). Outcomes include any psychiatric hospital or outpatient contact and any filled prescription for antidepressant, anxiolytic, or antipsychotic medication within the year. Black circles denote children whose parent died with ADRD, and red triangles denote matched placebo children whose parent neither had ADRD nor died in the index year. The vertical dotted line marks the index year.

Figure 6: Mental Health Care Use Around Parental Dementia-related Death: Subgroups


A

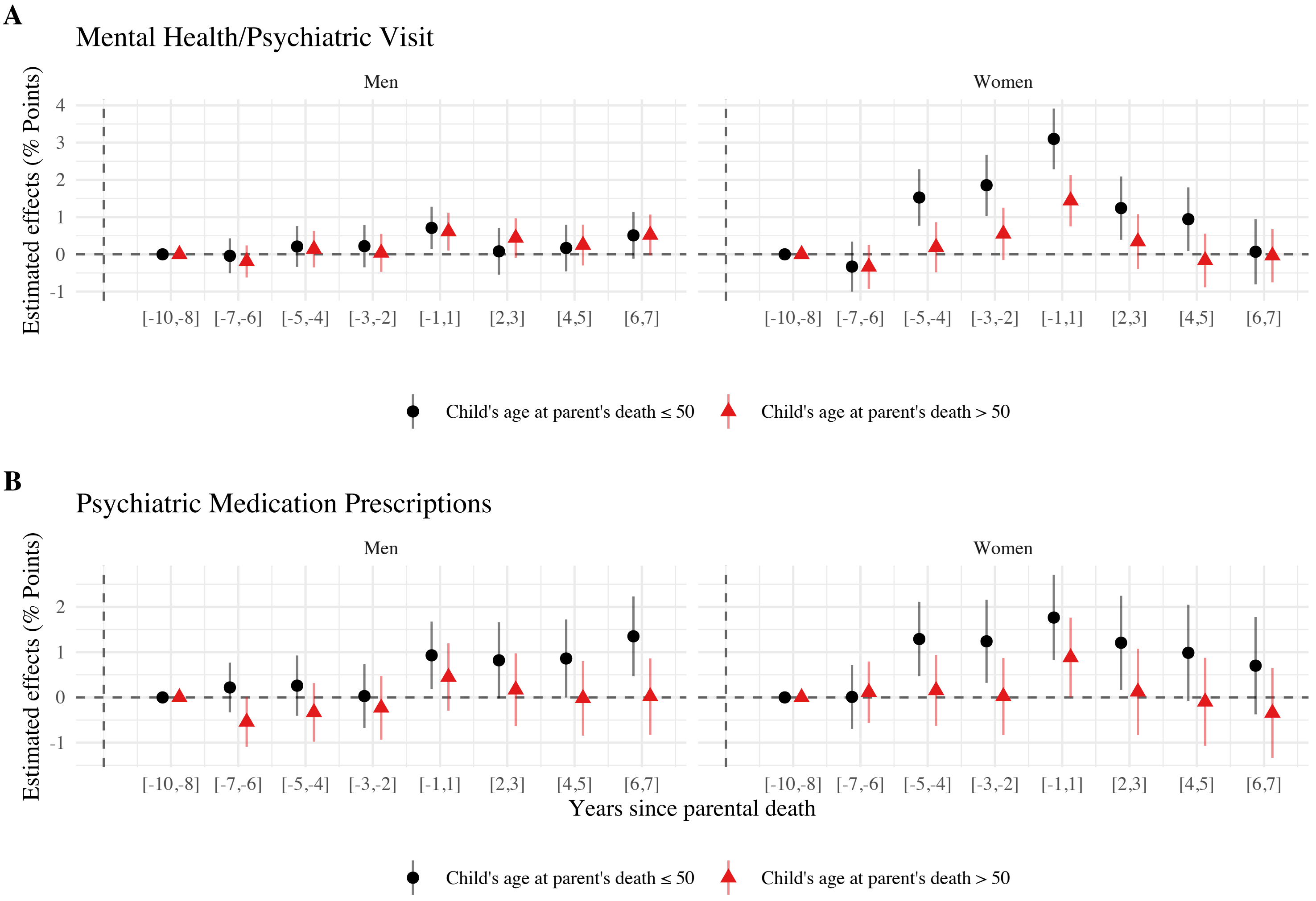
Mental Health/Psychiatric Visit

B

Psychiatric Medication Prescriptions

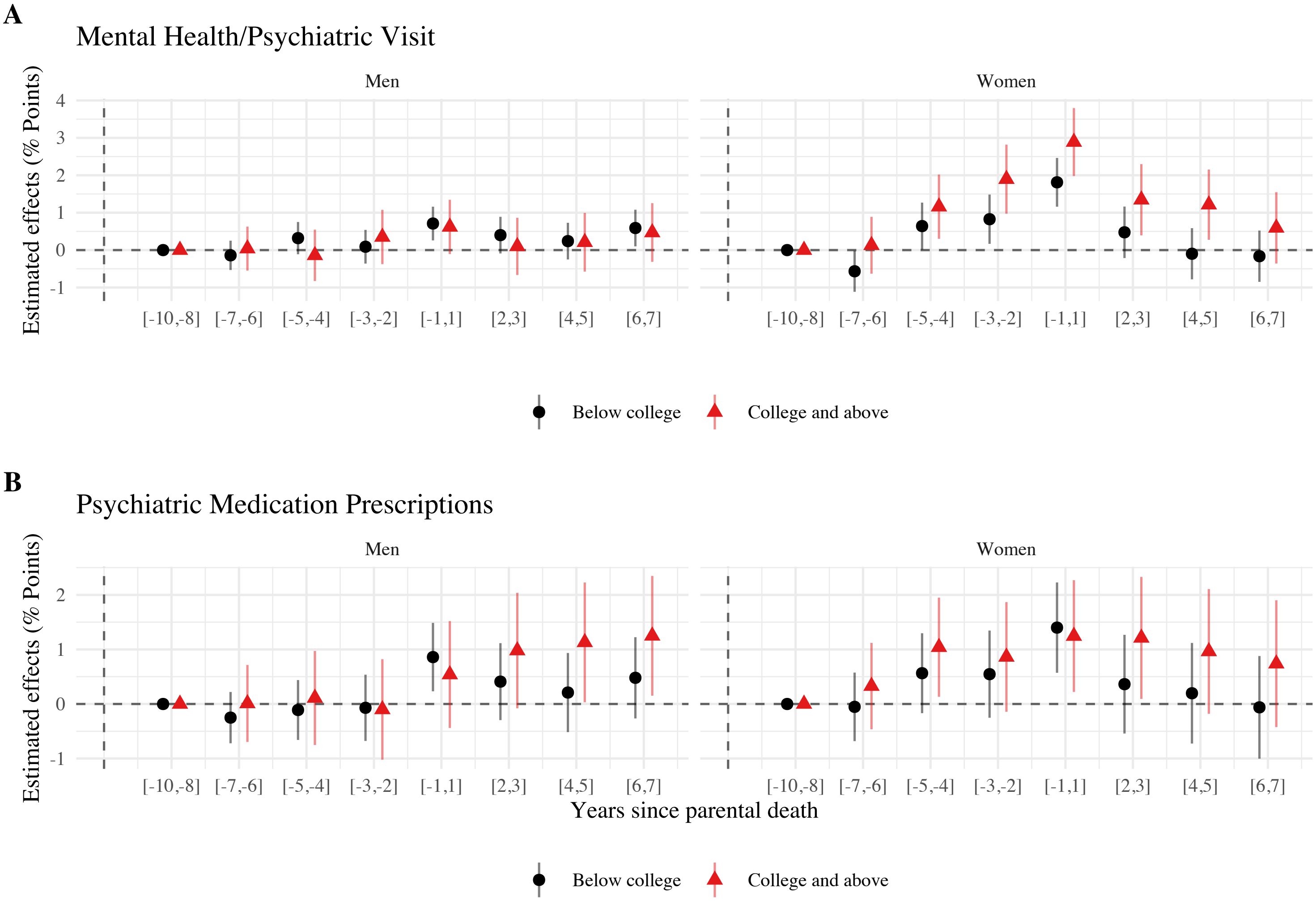
Notes: The figure plots estimated effects of having a parent who died with ADRD on adult children's annual mental health care use by outcome type, based on Equation (2). Outcomes include any psychiatric hospital or outpatient contact, antidepressant prescriptions, anxiolytic prescriptions, and antipsychotic prescriptions. Estimates are expressed in percentage points relative to the reference period (–10 to –8 years before death). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

Figure 7: Mental Health Care Use Parental Dementia-related Death by Age at Parent's Death



Notes: The figure plots estimated effects of having a parent who died with ADRD on adult children's annual mental health care use by age at the time of the parent's death, based on Equation (2). The sample is split at the median age of loss: under 50, and 50 and older. Outcomes include any mental health related visit and any psychiatric medication use. Estimates are expressed in percentage points relative to the reference period (–10 to –8 years before death). Ninety-five percent confidence intervals are shown, with standard errors clustered at the individual level.

Figure 8: Mental Health Care Use Parental Dementia-related Death by Education

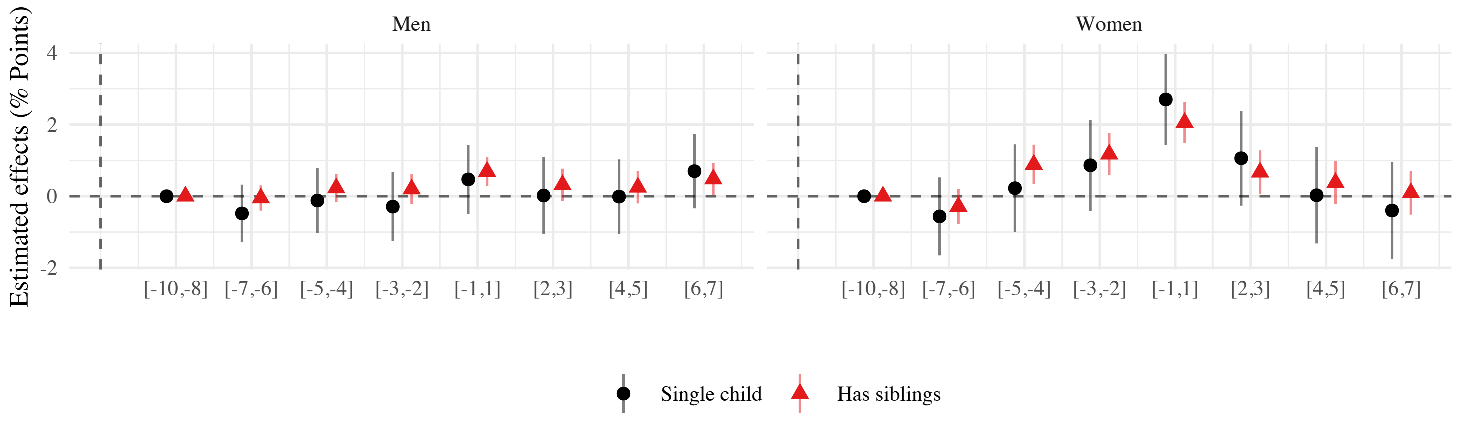


Notes: The figure plots estimated effects of having a parent who died with ADRD on adult children's annual mental health care use by education level at the time of the parent's death, based on Equation (2). The sample is divided into two groups: individuals with a college degree and those without. Outcomes include any mental health related visit and any psychiatric medication use. Estimates are expressed in percentage points relative to the reference period (–10 to –8 years before death). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

FIGURE 9: Mental Health Care Use Parental Dementia-related Death by Sibling Composition

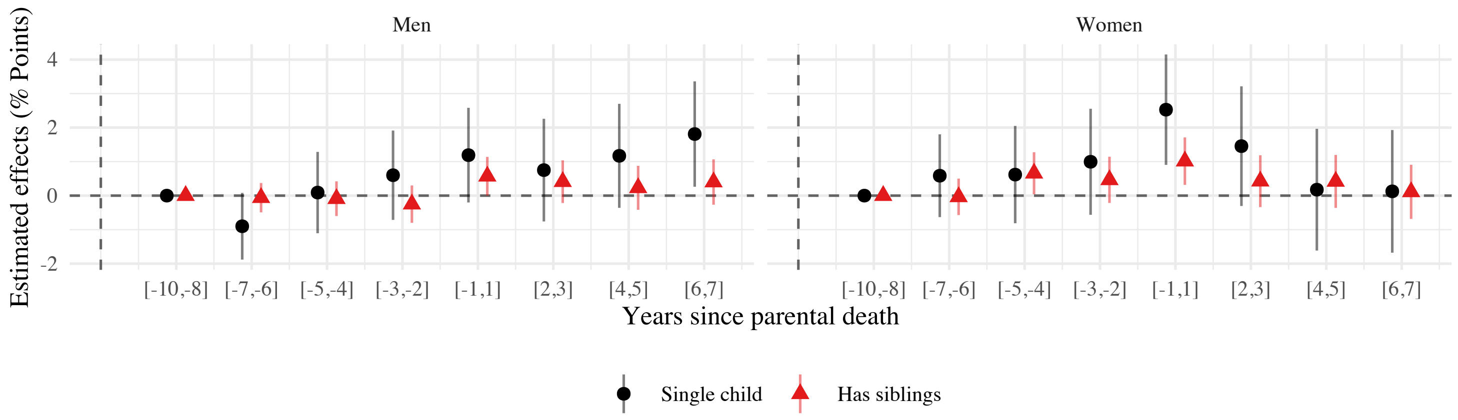
A

Mental Health/Psychiatric Visit



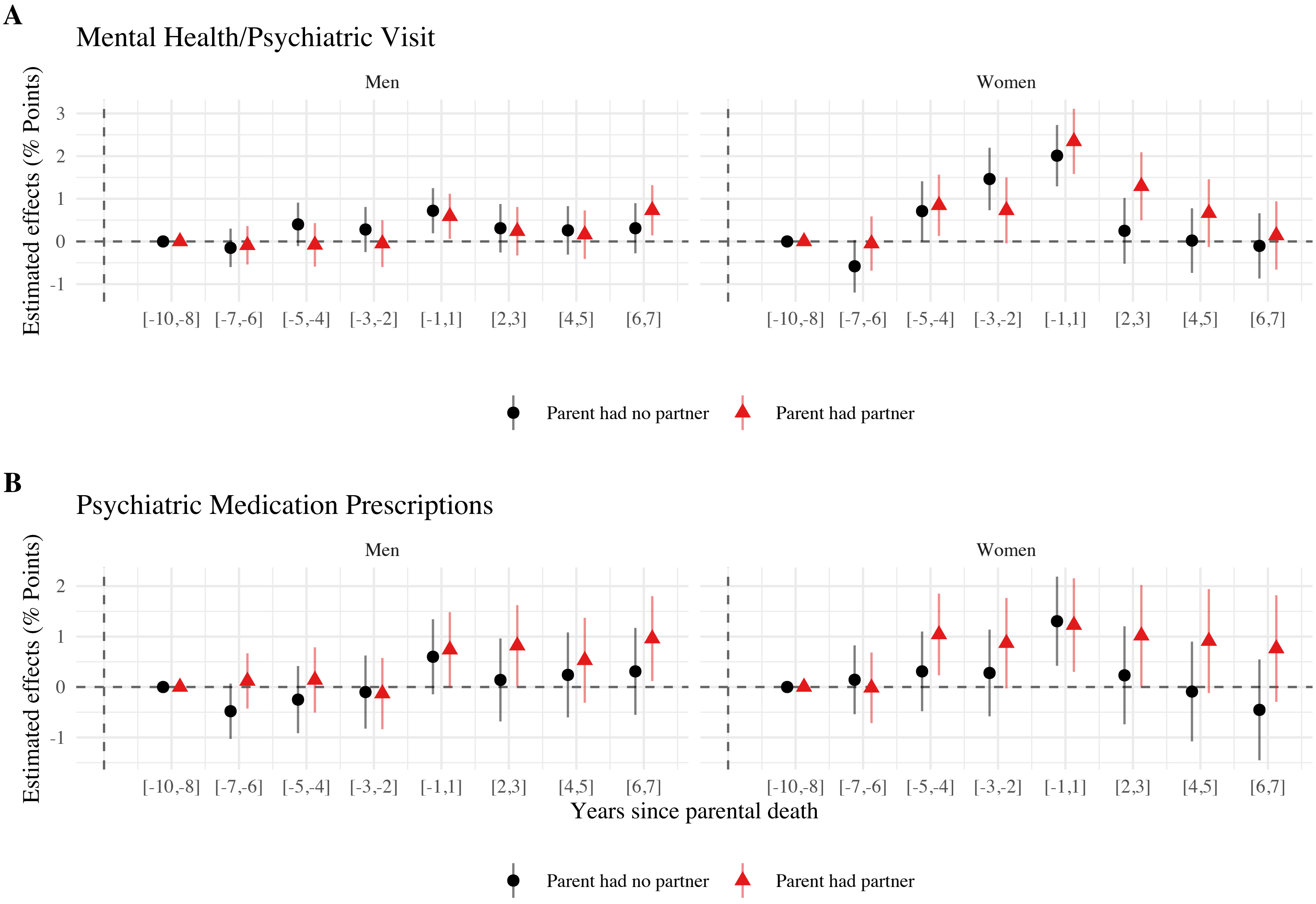
B

Psychiatric Medication Prescriptions



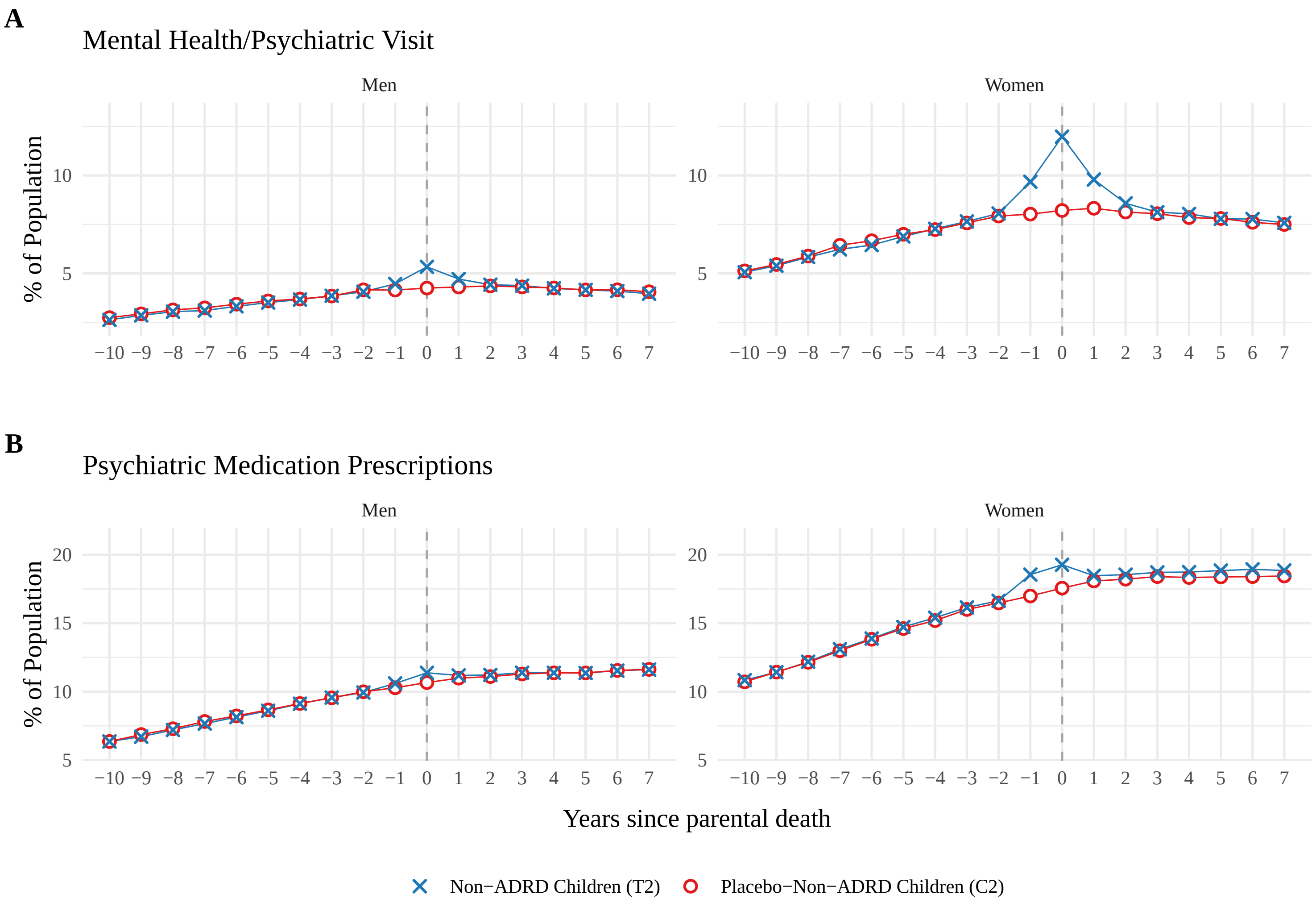
Notes: The figure plots estimated effects of having a parent who died with ADRD on adult children's annual mental health care use by sibling composition at the time of the parent's death, based on Equation (2). The sample is divided into two groups: individuals with at least one sibling and those without siblings. Outcomes include any mental health related visit and any psychiatric medication use. Estimates are expressed in percentage points relative to the reference period (–10 to –8 years before death). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

Figure 10: Mental Health Care Use Parental Dementia-related Death by Parent's Partner Status



Notes: The figure plots estimated effects of having a parent who died with ADRD on adult children's annual mental health care use by the deceased parent's partner status at the time of death, based on Equation (2). The sample is divided into two groups: parents who had a surviving partner (spouse or cohabiting partner) and those without a surviving partner. Outcomes include any mental health related visit and any psychiatric medication use. Estimates are expressed in percentage points relative to the reference period (–10 to –8 years before death). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

Figure 11: Mental Health Care Use Around Parental Death from Non-ADRD Causes



Notes: The figure plots unadjusted mean annual mental health care use by event year relative to parental death (year 0) for children whose parent died without an ADRD diagnosis and their matched controls. Outcomes include any psychiatric hospital or outpatient contact and any filled prescription for antidepressant, anxiolytic, or antipsychotic medication. Black circles denote children whose parent died without ADRD, and red triangles denote matched placebo children whose parent neither had ADRD nor died in the index year. The vertical dotted line marks the index year.

Appendix A Data Sources and Variable Construction

Our analysis uses Danish administrative registry data for the full population from 1980 (when most of the Danish registries begin) through 2018. Using a de-identified personal identification number, we can follow all individuals over time in the registries and link family members to one another. The final data set combines information from several administrative registries including information on death, family members, health care use, medication, education, labor supply, and income.

Below, we describe the data sources and the main variables used in our analysis. Exact variable definition appears in Table S1 below.

The Civil Registration System (Pedersen 2011) is used to link parents to children and includes information on family relationships (widow or single child), gender, birth dates, and migration status. To link children born before 1960 to their parents, we include information from the Multi-Generation Registry - Lite (Due et al. 2024).

To identify parents who died with or without a verified diagnosis of ADRD we use the Danish Registry of Cause of Death (Helweg-Larsen 2011) which provides exact dates and specific causes for all deaths in Denmark. We follow Taudorf et al. (2021) and identify people dying with ADRD using three sources: (1) the National Patient Registry and the Psychiatric Central Registry, which record inpatient and outpatient visits with ADRD-related ICD codes (F00, F01, F02.0, F03.9, G30, G31.8, or G31.9); (2) the National Prescription Registry, which captures at least two prescriptions for anti-dementia drugs (ATC code N06D); and (3) the Danish Registry of Cause of Death, which lists ADRD as a primary or secondary cause of death. Individuals who meet any one of these criteria, even if there was no prior clinical diagnosis before death, are defined as dying with an ADRD diagnosis.

The outcome variables related to health are based on Danish health registries. Denmark's universal healthcare system records all inpatient and outpatient encounters in the National Patient Registry (Lynge et al. 2011) or the Psychiatric Central Registry (Mors et al. 2011) and all services (and type of service) in primary and secondary care in the National Health Service Registry (Sahl Andersen et al. 2011). The National Health Service Registry provides information on reimbursements to private practices, both primary care physicians and specialists, such as psychiatrists and psychologists, for all health services covered by the national health insurance system. All prescription drugs, which are highly subsidized, are recorded in the Danish National Prescription Registry (Wallach Kildemoes et al. 2011).

We construct labor market outcomes using the Employment Classification Module (AKM) (Petersson et al. 2011) and the Income Registry (Baadsgaard and Quitzau 2011). Both registries are based on tax records.

Information on whether or not the individual lives in a nursing home comes from Statistics Denmark's registry on nursing homes. For a description of how Statistics Denmark identify nursing homes see https://www.dst.dk/da/TilSalg/data-til-forskning/generelt-om-data/dokumentation-af-data/hoejkvalitetsvariable/aeldreserviceindikator—imputeredeplejehjemsbeboere–afsluttet-.

We include a list of control and matching variables in the sample based on the Civil Registration System including gender, birth year, immigrant status, single child, number of children, and marital status. Furthermore, we include information on education from the Danish Registry of Education which is generated from the education institutions' administrative records (Jensen and Rasmussen 2011).

TABLE S.1: Variable Descriptions

Variable	**Description**
Labor Market Outcomes	
Labor Force Participation	Dummy variable equals 1 if the individual for the majority of the year is participating in the labor force (employed, self-employed, or unemployed). Based on the Danish Employment Classification Module (AKM).
Employed	Dummy variable equals 1 if the individual for the majority of the year is employed, including self-employed. Based on the Danish Employment Classification Module (AKM).
Wage Income	Total wage income earned during the year. Includes all wage income including bonuses and employer paid wage during sickness and leave. The variable is inflation adjusted to 1995 price-index. Based on the Danish Income Registry.
Labor Income	Total labor income earned during the year. Includes wage income, profits from self-employment and other fees subject to labor market contributions. The variable is inflation adjusted to 1995 price-index. Based on the Danish Income Registry.
Health/Health Care Outcomes	
Mental Health /Psychiatric Visit	Dummy variable that equals 1 if the individual has a mental health visit. Mental health visits include PCP consultations related to mental health problems, psychologist or psychiatrist visits, and psychiatric hospital admissions. Based on the Danish Patient Registry, the Danish Health Insurance Registry, and the Danish Psychiatric Hospital Registry.
Psychiatric Medication Prescriptions	Dummy variable that equals 1 if the individual receives a prescription for psychiatric medication. Psychiatric Medication Prescriptions include anxiolytics (ATC=N05B), hypnotics (ATC=N05C), antipsychotics (ATC=N05A) and antidepressants (ATC=N06A excluding ATC=N06AX12). Based on the Danish Prescription Registry.
Psychologist	Dummy variable that equals 1 if the individual has a psychologist visit. Based on the Danish Health Insurance Registry.
PCP Mental Health	Dummy variable that equals 1 if the individual has at least one PCP consultation related to mental health problems. Mental health related PCP consultations include cognitive therapy and psychometric test. Based on the Danish Health Insurance Registry.

Variable	**Description**
Psychiatrist	Dummy variable that equals 1 if the individual has a psychiatrist visit. Based on the Danish Health Insurance Registry.
All Other (Mental Health Visits)	Dummy variable that equals 1 if the individual has at least one psychiatric hospital admission. Based on the Danish Psychiatric Hospital Registry.
Antidepressants	Dummy variable that equals 1 if the individual receives at least one prescription for antidepressants (ATC=N06A excluding ATC=N06AX12). Based on the Danish Prescription Registry.
Hypnotics	Dummy variable that equals 1 if the individual receives at least one prescription for hypnotic medication (ATC=N05C). Based on the Danish Prescription Registry.
Anxiolytics	Dummy variable that equals 1 if the individual receives at least one prescription for anxiolytics (ATC=N05B). Based on the Danish Prescription Registry.
Antipsychotics	Dummy variable that equals 1 if the individual receives at least one prescription for antipsychotics (ATC=N05A). Based on the Danish Prescription Registry.
Primary Care Physician Visits (PCP)	Dummy variable that equals 1 if the individual has a PCP consultation excluding consultations regarding mental health problems. Based on the Danish Health Insurance Registry.
Specialist Visits	Dummy variable that equals 1 if the individual has a specialist visit. Based on the Danish Health Insurance Registry.
Prescription Drugs (Non-Mental Health)	Dummy variable that equals 1 if the individual receives at least one prescription. Prescriptions including the following drugs have been excluded from this variable: anxiolytics (ATC=N05B), hypnotics (ATC=N05C), antidepressants (ATC=N06A excluding ATC=N06AX12), and antipsychotics (ATC=N05A). Based on the Danish Prescription Registry.
Inpatient Hospital Visits	Dummy variable that equals 1 if the individual has at least one inpatient hospital visit excluding visits related to mental health problems and birth related visits. The following ICD codes have been excluded F00-F99 (Mental and behavioural disorders) and O80-O84 and Z37-Z38 (birth related). Based on the Danish Patient Registry.

Variable	**Description**
Outpatient Hospital Visits	Dummy variable that equals 1 if the individual has at least one outpatient hospital visit excluding visits related to mental health problems. The following ICD codes have been excluded: F00-F99 (Mental and behavioural disorders). Based on the Danish Patient Registry.
Emergency Department Visits	Dummy variable that equals 1 if the individual has at least one emergency department visit. Based on the Danish Patient Registry.
Pain Medication	Dummy variable that equals 1 if the individual receives a prescription for pain medication (ATC=N02). Based on the Danish Prescription Registry.
Preventive Care Exams	Dummy variable that equals 1 if the individual has at least one preventive care exam at a hospital. Preventive care exams are hospital contacts with the following ICD-code: Z00, Z010, Z011, Z013, Z014 and Z016. Based on the Danish Patient Registry.
Primary cause of death	
Cancer	Dummy variable that equals 1 if the parent had Malignant neoplasms (cancer) registered as the primary cause of death (ICD-10 beginning with C). Based on the Danish Cause of death register.
Mental and behavioral disorder	Dummy variable that equals 1 if the parent had mental and behavioral disorders registered as the primary cause of death (ICD-10 beginning with F). Based on the Danish Cause of death register.
Diseases of the nervous system	Dummy variable that equals 1 if the parent had diseases of the nervous system registered as the primary cause of death (ICD-10 beginning with G). Based on the Danish Cause of death register.
Diseases of the circulatory system	Dummy variable that equals 1 if the parent had diseases of the circulatory system registered as the primary cause of death (ICD-10 beginning with I). Based on the Danish Cause of death register.
Diseases of the respiratory system	Dummy variable that equals 1 if the parent had diseases of the respiratory system registered as the primary cause of death (ICD-10 beginning with J). Based on the Danish Cause of death register.
Other cause of death	Dummy variable that equals 1 if the parent had another cause of death than the selected, listed as primary cause of death. Based on the Danish Cause of death register.

Variable	**Description**
Other Variables	
Birth Year	The individual's birth year. Based on the Danish Population Registry .
Female	Dummy variable that equals 1 if the individual is female. Based on the Danish Population Registry.
Age at Parent's Death	Variable indicating the child's age at the time of their parent's death. Based on the Danish Population Registry and The Danish Registry of Cause of Death.
Basic Education	Dummy variable that equals 1 if the individual has attained a basic education as highest educational attainment. Basic education is any education below high school. Based on the Danish Education Registry.
College or More	Dummy variable that equals 1 if the individual has attained a college education or further education. Based on the Danish Education Registry.
Married	Dummy variable that equals 1 if the individual is married or in a registered partnership. Based on the Danish Population Registry
Number of Children	Number of registred parent-child relations in the Population Registry. Based on the Danish Population Registry
Immigrant	Dummy variable that equals 1 if the individual is immigrant or descendant. Based on the Danish Population Registry.
Single Child	Dummy variable that equals 1 if the index parent has only one child. Number of children is identified by counting number of parent-children relations for the index parent in the population registry. Based on the Danish Population Registry.
Has Siblings	Dummy variable that equals 1 if the child has siblings (and is not an only child). Number of children is identified by counting number of parent-children relations for the index parent in the population registry. Based on the Danish Population Registry.
Parent Had Partner	Dummy variable that equals 1 if the parent was married or in a registered partnership the year before death. The year before death is used due to prevalence of missing information in the year of death, dependent on which quarter the parent dies in. Based on the Danish Population Registry.

Variable	**Description**
Parent Had No Partner	Dummy variable that equals 1 if the parent was not married or in a registered partnership the year before death. The year before death is used due to prevalence of missing information in the year of death, dependent on which quarter the parent dies in. Based on the Danish Population Registry.
Nursing Home (Ever)	Dummy variable that equals 1 if the parent is registered at a nursing home in the index year or before. Identification of the nursing home followed the imputation procedure outlined by Statistics Denmark. An address is identified as a nursing home if there is more than 6 residents aged 80 or older and the share of residents aged 60 or below is less than 25%. Based on the Danish Address Registry and the Danish Population Registry.

Appendix B Institutional Context

A Long-term Care

In Denmark, municipalities have the comprehensive responsibility for the provision and financing of formal care allocated to individuals incapable of self-care. Formal care can be provided in the individual's own home (home care services), in a residential care facility (plejebolig) or nursing home (plejehjem) (Kvist 2018; Danish Ministry of Health 2017). Nursing homes are primarily used for older adults with extensive need of daily care. It is estimated that 65-80 percent of the residents at Danish nursing homes have ADRD (Danish Alzheimer Association 2021). Mandated to offer users a choice among care providers, municipalities can either be the direct provider or contract private entities. The scope of services delivered are largely dictated by the municipality, based on assessments of individual care needs. Private providers typically offer the option for users to purchase supplemental services that extend beyond the basic care package financed by the municipality (Amilon et al. 2022). While municipalities are responsible for providing and financing a certain standard of help with practical matters and personal hygiene to older adults in need of care, informal caregivers often give additional practical assistance (e.g., shopping, cleaning, transport, and accompanying at hospital or doctor's visit), social and emotional support and help with bureaucratic and administrative tasks (e.g., personal finances, correspondence with public authorities) (Madsen et al. 2025).

B Labor Market

Denmark has relatively high labor market participation rates, particularly among women, within a framework characterized by "flexicurity," which allows for both ease of hiring and firing, as well as a substantial unemployment benefit system (Kreiner and Svarer 2022). Standard full-time employment consists of 37 hours per week (the 37-hour workweek is typically established in collective agreements and the vast majority of Danish employees are covered by a collective agreement). Part-time arrangements must be negotiated directly between the employer and the employee. While transitioning from full-time to part-time employment is often feasible, it is not guaranteed as a right for the employee.

Three types of leaves are related to caregiving to people with ADRD: Caregivers' leave, end-of-life-leave, and short unpaid leave for wage-earners:

Caregivers' Leave

According to the Caregivers' leave provision (Pasningsorlov, § 118 of the Danish Social Service Act), a relative, including a partner, child, parent, or another closely related individual, is entitled to take up to six months leave to provide care for a person with a severe illness or a significant, permanent disability. Conditions for receiving caregivers' leave include:

- The illness or disability being chronic or long-term.

- The alternative to in-home care being a 24-hour facility stay.
- The care requirement is equitable to a full-time job.
- The individual receiving care resides in their own home and is not in assisted living or a nursing home.
- Both the caregiver and the individual receiving care agree on the caregiving arrangement.
- The municipality assesses that the caregiver is capable of fulfilling caregiving responsibilities.
- The caregiver must be engaged in the labor market (whether employed, unemployed, or self-employed).

During this leave, the caregiver is employed by the respective municipality and is entitled to a salary of DKK 25,138 (approx. USD 3,750) per month (as of 2023). The caregiver cannot receive a salary exceeding their previous earnings. The caregiver retains rights to unemployment benefits and holiday compensation.

End-of-Life Leave

Relatives of individuals close the end of life may take leave and receive a corresponding allowance (Plejevederlag til orlov, § 119 of the Danish Social Service Act). Conditions for this leave include:

- A medical assessment indicating that the individual is close to death, with treatment focused solely on palliative care.
- The individual requires caregiving.
- Both parties—the caregiver and the dying individual—must agree on the care arrangement.
- Care is to be provided either at the caregiver's home or at the dying person's residence.

During the leave, caregivers receive an allowance that is 1.5 times the sickness benefit eligible to them, without exceeding their current income. Multiple caregivers can share this allowance, which will also continue if the dying individual is temporarily hospitalized or in a respite care facility.

Short Unpaid Leave for Wage-Earners

Employees are entitled to five days of unpaid leave each calendar year (January 1 to December 31) to care for their own children, parents, spouse, or partners living in the same household.

Entitlement to this leave necessitates that the individual receiving care has a severe illness and requires significant assistance on the days the caregiver takes leave. Employers are not obligated to provide payment during this period and may request documentation (such as a medical assessment) preceding approval of the leave.

C Sickness Benefit and Retirement

If the caregiver is affected by a relative with a severe illness he/she can fall sick. Employees in permanent jobs are entitled to full payment during own sick leave. The employee is not obliged to inform the employer about the cause of illness/diagnose. Within four weeks after first day of sickness, the employee and employer will have a meeting about how to keep the employee in the job (en sygesamtale). The employer can ask for documentation for illness from the primary care physician (PCP). After 120 days of sickness the employer can fire the sick employee.

People not in employment can receive sickness benefit from the municipality. Only people entitled to unemployment benefits or who have completed a longer education within the last month can receive sickness benefits. The municipality decides if a person is entitled sickness benefits and has the right to ask for documentation from the PCP.

In Denmark, the official retirement age is 67. At age 67 citizens and residents of Denmark who meet the age requirement are entitled the universal old age public pension (Folkepensionen). The amount received is based on years of residency in Denmark. Beside old age pension, the Danish retirement system includes two types of pensions: Early retirement (Efterløn og Overgangsydelse) and disability pension. The retirement age threshold for early retirement pension (Efterlønsordningen) is age 60. This is an option for individuals who have been part of the labor market for around 25 years. In 1994, for a short period, people between 55 and 59 could receive an early retirement (Overgangsydelse). The disability pension is eligible only for individuals unable to work due to health conditions. Eligibility to disability pension is determined by local authorities and usually grated after an assessment from the PCP, and rehabilitation services and has no age restriction. The average effective age of labor market exit was in 2022 64.5 for men and 63.8 for women.

D Health Care

Denmark has a universal tax-funded health care system. Most health care services are free of charge including primary health care (PHC) and services offered by specialists in hospitals (Birk et al. 2024). PHC is delivered by privately-owned primary care clinics that are gatekeepers to secondary health care services. The primary care physician (PCP) plays a crucial role in the health care pathway, responsible for initial diagnoses, therapeutic interventions, chronic condition management, preventive care, and facilitating referrals to specialists in either clinics or hospitals. Approximately 85 percent of the population consults a PCP annually, with around 10 percent of those visits resulting in a referral to a specialist (Vedsted et al. 2008).

Access to specialist care—provided by private clinics offering services from physiotherapists, psychologists, and otolaryngologists—typically involves a copayment.

For individuals experiencing mental health issues, the treatment process generally begins with a consultation with the PCP, who may refer the patient to a psychiatrist, psychologist, or psychiatric hospital if necessary. Both inpatient and outpatient services at psychiatric hospitals are available at no cost, and referrals are not needed. Medical treatment within these facilities is also provided without charge.

In cases of moderate depression or anxiety, the PCP can offer cognitive treatment, prescribe medication, or refer the patient to specialized care. Estimates indicate that approximately 50 percent of PCPs provide cognitive treatment. To assess the progress of treatment, PCPs use standardized depression assessments such as the Hamilton Depression Scale and the Major Depression Inventory. Medications prescribed by PCPs are highly subsidized, and clinical guidelines recommend a combination of cognitive therapy and pharmacological treatment (Videbech et al. 2024).

Patients have the option to consult directly with psychologists and psychiatrists without a PCP referral. Data from 2022 shows that for 27 percent of individuals who consulted a psychologist the visit included personal expenses for the service (Gjensidige 2022). Psychologists, like other private therapists, offer a variety of services at differing price points. In 2024, the cost of a basic consultation with a psychologist was approximately DKK 1,150 (around USD 165). These cost can partly be covered by private health insurance.

Since 1992, individuals who have experienced a severe life event may with a referral from their PCP receive up to 12 subsidized consultations with a psychologist, with a coverage rate of 60 percent (https://www.retsinformation.dk/eli/lta/2006/1185) .

Eligible severe life events include:

- Victims of robbery, violence, or sexual assault
- Victims of traffic accidents or other incidents
- Relatives of individuals with serious mental health conditions
- Individuals suffering from serious physical illnesses
- Relatives of individuals affected by debilitating illnesses
- Bereaved individuals
- Individuals who have attempted suicide
- Induced abortions occurring after the 12th week of pregnancy
- Individuals under 18 years who have suffered incest or other sexual abuse
- Individuals aged 18 and older with mild to moderate depression

  - Effective since 2008 (initially limited to ages 18–37 until 2012)

- Individuals aged 18–28 with mild to moderate anxiety, including mild to moderate obsessive-compulsive disorder (OCD)
  - Law effective since 2011 (eligibility extended to ages 18–38 in 2012)

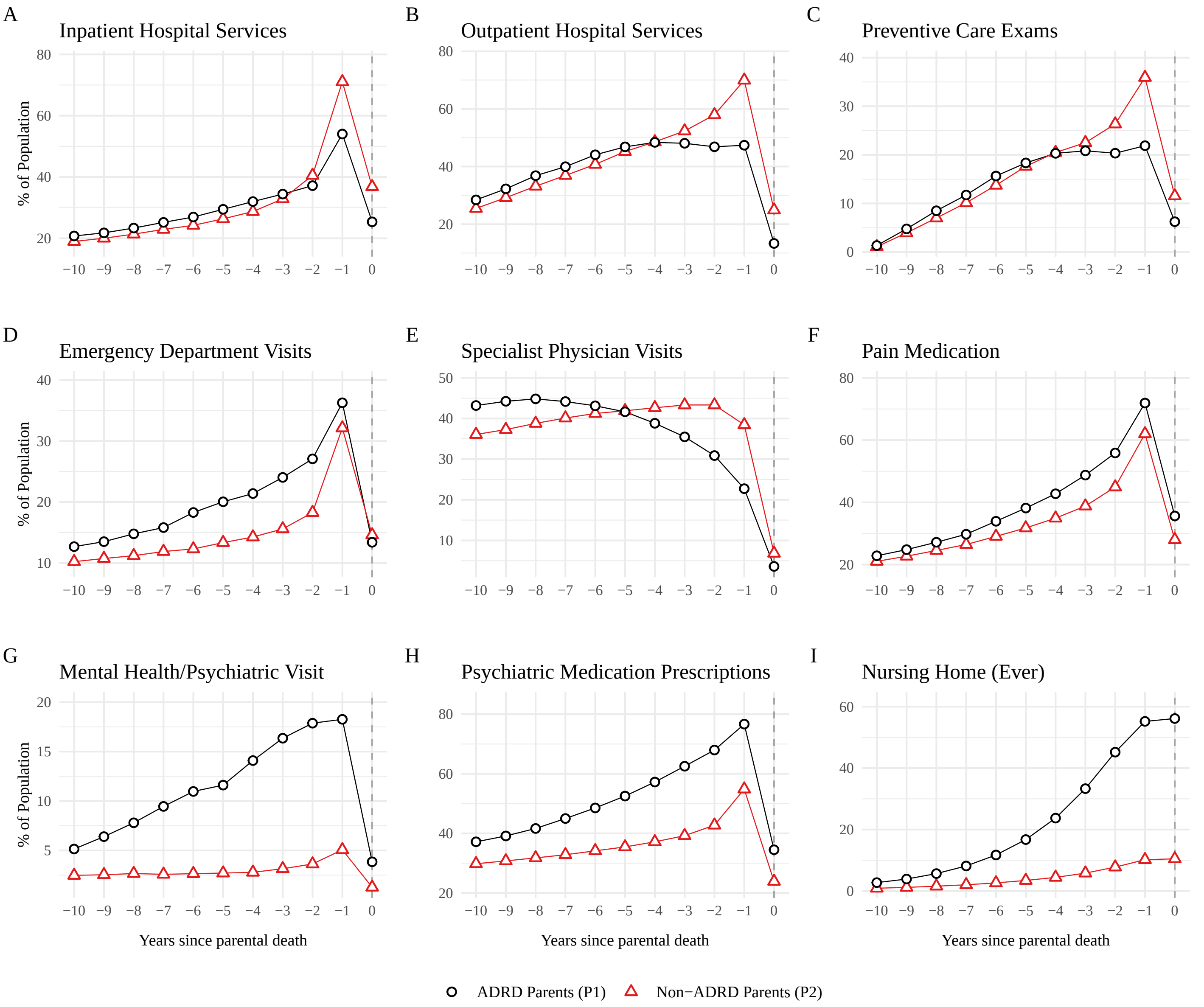
Additional provisions:

- Individuals meeting the criteria in items 10 and 11 may qualify for re-referrals, allowing access to up to 24 subsidized sessions with a psychologist.
- Individuals aged 18–20 who are referred under these criteria are entitled to free treatment.

There is a shared responsibility between the primary care physician (PCP) and the psychologist to ensure that referrals comply with the Health Act. Psychologists are required to conduct a specific assessment, as early as possible, of whether the stated reason for referral is appropriate. If the psychologist determines that the referral is incorrect, treatment must be discontinued. For referral categories 1–9, consultations are not eligible for reimbursement in cases of incorrect referral, and the patient is therefore responsible for the full cost. For referral categories 10 and 11, the psychologist must assess, no later than after the second consultation, whether the referral is incorrect. In these cases, the first two consultations remain eligible for reimbursement (see https://www.dp.dk/raadgivning/selvstaendig/psykolog-med-ydernummer/honorarer-afregning-og-omsaetning/praksishonorarer/).

Appendix C Tables and Figures

Figure A.1: Parent Health Care Use Before Death from ADRD and Non-ADRD Causes

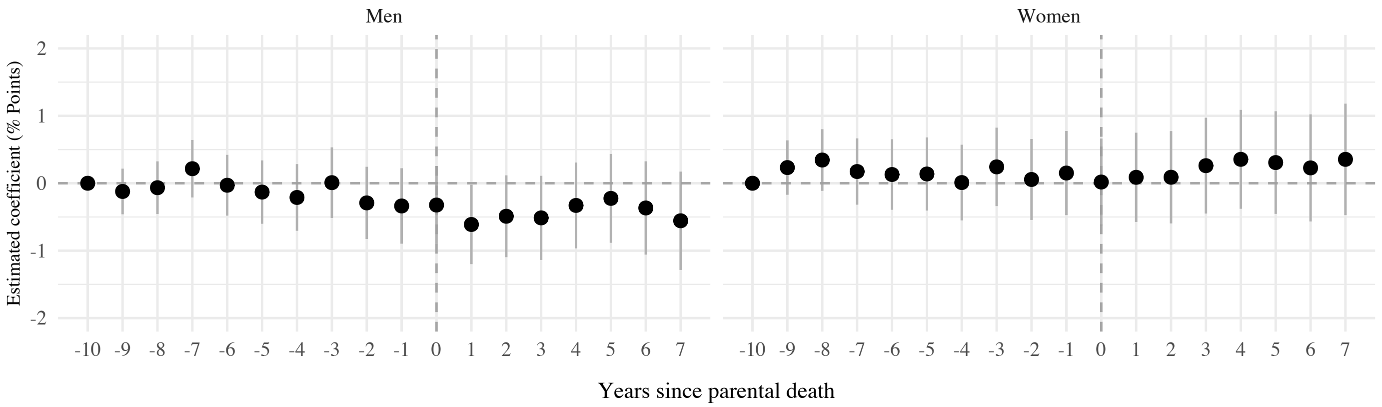


Notes: The figure plots unadjusted mean annual health care use of deceased parents by event year relative to the year of death (year 0). Outcomes include any hospital or outpatient contact and any filled prescription for medication. Black circles denote parents who died with ADRD, and red triangles denote parents who died from non-ADRD causes. The vertical dotted line marks the index year.

Figure A.2: Event-Study Estimates of Labor Market Outcomes Around Parental Dementia-Related Death

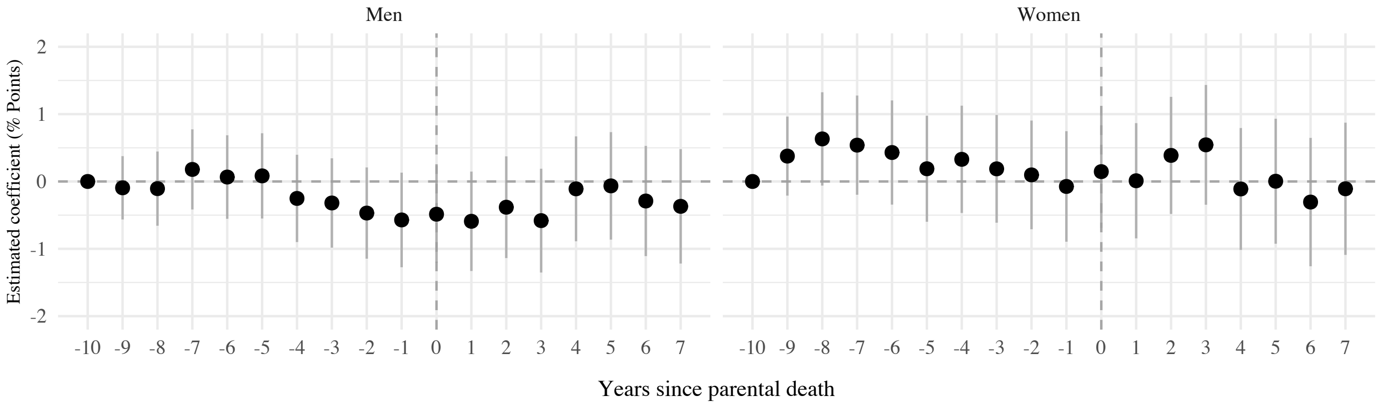
A

Labor Force Participation



B

Employment



Notes: The figure plots event-study estimates of adult children's annual labor market outcomes relative to the year of parental death, based on Equation (1). Outcomes include employment and labor force participation, expressed in percentage points relative to the baseline year ($k = -10$). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

Figure A.3: Event-Study Estimates of Earnings Around Parental Dementia-Related Death

A

Wage Income

B

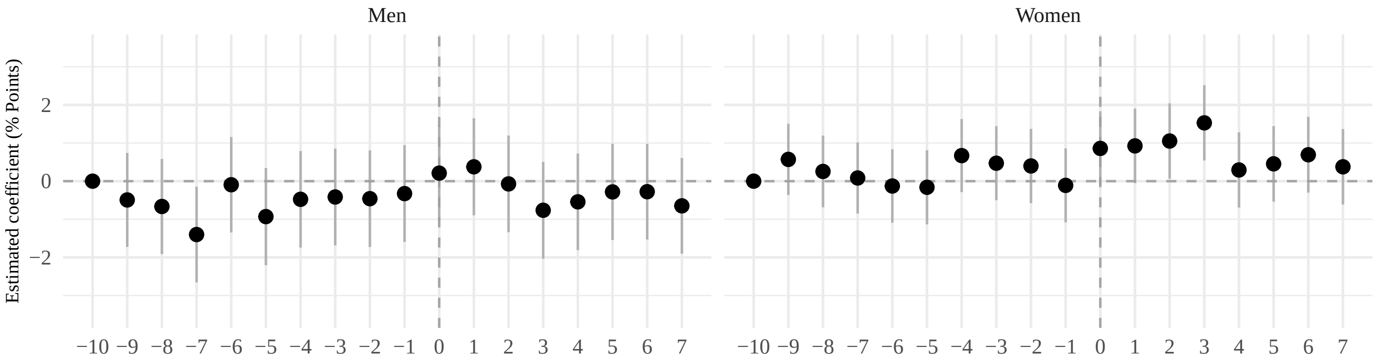
Labor Income

Notes: The figure plots event-study estimates of adult children's annual log wage and log labor income relative to the year of parental death, based on Equation (1). Coefficients are expressed relative to the baseline year ($k = -10$). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

Figure A.4: Event-Study Estimates of Physical Health Care Visits Around Parental Dementia-Related Death

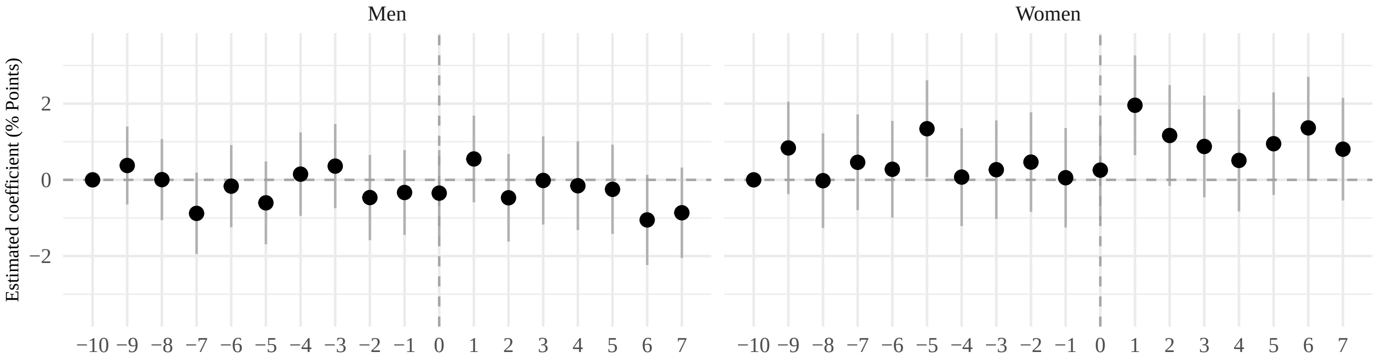
A

Primary Care Physician Visits (PCP)



B

Specialist Physician Visits



C

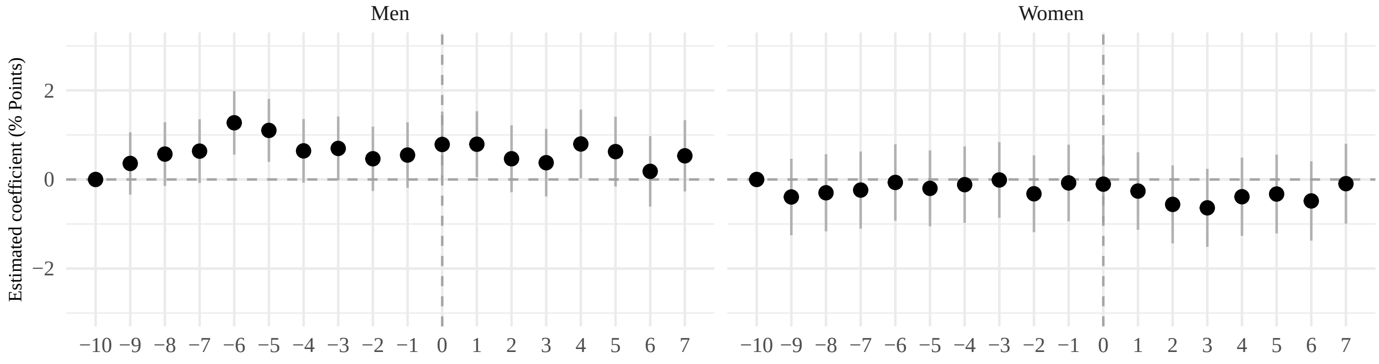
Prescription Drugs (Non−Mental Health)

Notes: The figure plots event-study estimates of adult children's annual physical health care use relative to the year of parental death, based on Equation (1). Outcomes include any primary care or specialist visit and prescription drug use unrelated to mental health. Coefficients are expressed in percentage points relative to the baseline year ($k = -10$). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

Figure A.5: Event-Study Estimates of Hospital and Preventive Care Use Around Parental Dementia-Related Death

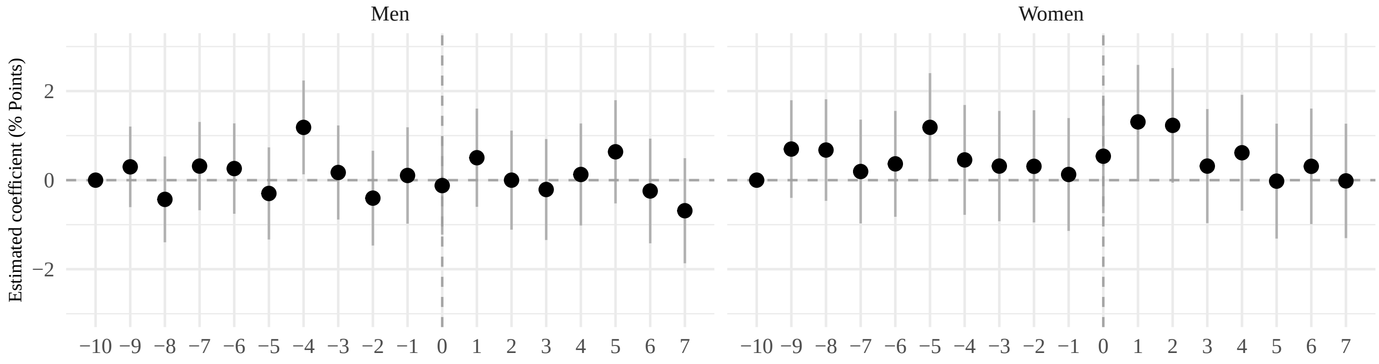
A

Inpatient Hospital Services



B

Outpatient Hospital Services



C

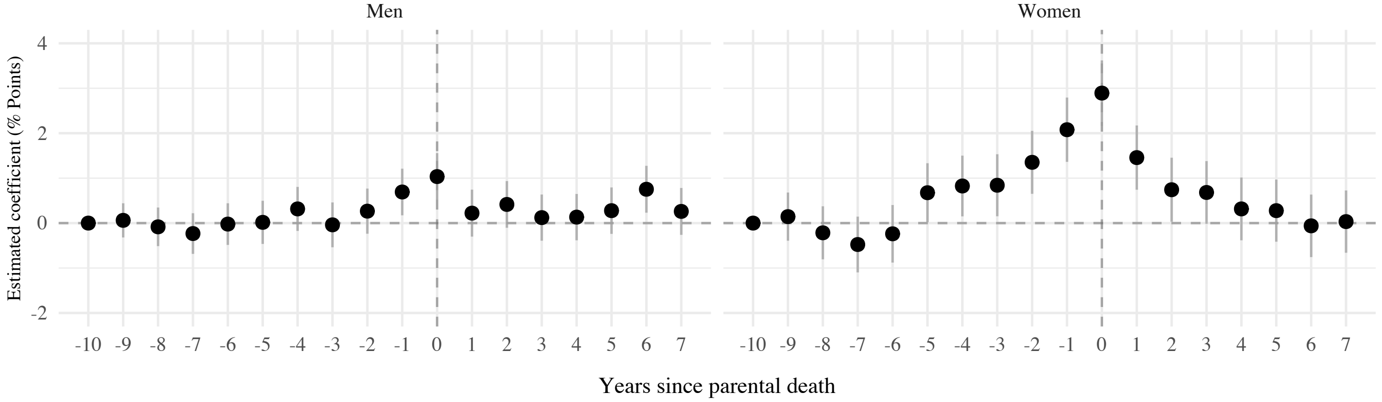
Preventive Care Exams

Notes: The figure plots event-study estimates of adult children's hospital and preventive health care use relative to the year of parental death, based on Equation (1). Outcomes include inpatient and outpatient hospital visits and preventive screenings unrelated to mental health. Coefficients are expressed in percentage points relative to the baseline year ($k = -10$). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level. The sample includes children whose parent died with ADRD and their matched controls.

Figure A.6: Event-Study Estimates of Mental Health Care Use Around Parental Dementia-Related Death

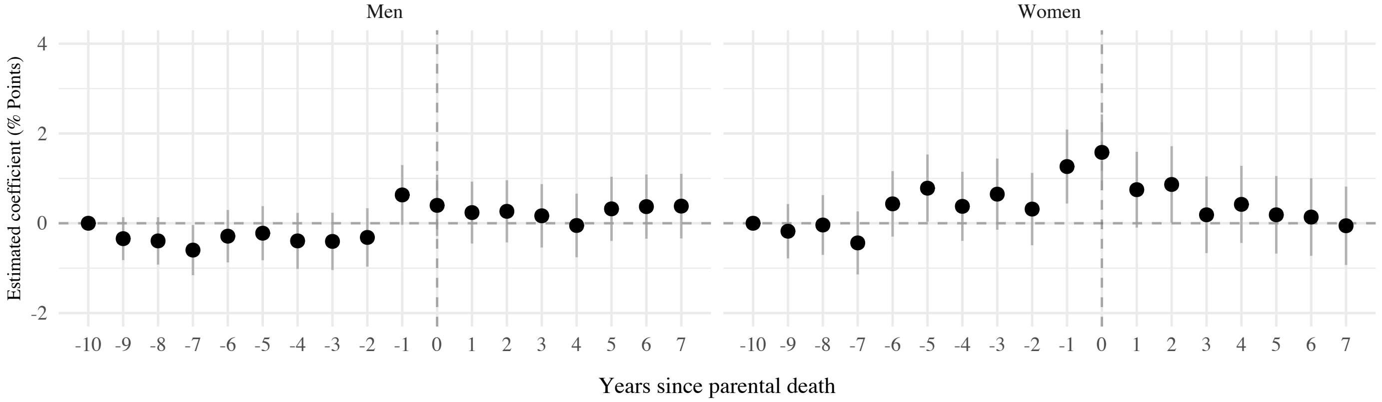
A

Mental Health/Psychiatric Visit



B

Psychiatric Medication Prescriptions



Notes: The figure plots event-study estimates of adult children's annual mental health care use relative to the year of parental death, based on Equation (1). Outcomes include any mental-health-related visit (primary care, psychologist, psychiatrist, or psychiatric hospitalization) and any psychiatric medication prescription. Coefficients are expressed in percentage points relative to the baseline year ($k = -10$). Ninety-five percent confidence intervals are shown around point estimates, with standard errors clustered at the individual level.

Table A1: Summary Statistics for Parent Samples by Cause of Death

	Parent (P1) **ADRD** (1)	**Parent (P2)** **Non-ADRD** (2)
Primary cause of death		
Cancer (ICD-10=C)	0.09	0.37
	(0.29)	(0.48)
Mental and behavioral disorder (ICD-10=F)	0.21	0.01
	(0.41)	(0.09)
Diseases of the nervous system (ICD-10=G)	0.14	0.01
	(0.35)	(0.12)
Diseases of the circulatory system (ICD-10=I)	0.27	0.29
	(0.45)	(0.45)
Diseases of the respiratory system (ICD-10=J)	0.10	0.12
	(0.30)	(0.32)
Other cause of death	0.18	0.22
	(0.38)	(0.40)
Observations	20,274	101,486

Notes: The table reports summary statistics of the primary cause of death of the analytic sample of parents used in the analysis Column 1 reports cause of death for parents who die with an ADRD diagnosis and column 2 reports cause of death for parents who die without an ADRD diagnsosi. standard deviations are in parentheses.

Table A2: Pre-Trend Tests for Labor Market Outcomes

Panel A: Men

	Labor Force Participation		Employment	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.50	0.48	0.15	0.69
-10 = -9 = -8	0.25	0.78	0.10	0.91
-10 = -9 = -8 = -7	1.24	0.29	0.50	0.68
-10 = -9 = -8 = -7 = -6	1.10	0.36	0.37	0.83
-10 = -9 = -8 = -7 = -6 = -5	1.02	0.40	0.31	0.91
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.96	0.45	0.56	0.76
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.93	0.48	0.60	0.76
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	1.10	0.36	0.72	0.68
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	1.08	0.37	0.80	0.62
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	1.04	0.40	0.73	0.68

Panel B: Women

	Labor Force Participation		Employment	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	1.28	0.26	1.58	0.21
-10 = -9 = -8	1.13	0.32	1.62	0.20
-10 = -9 = -8 = -7	0.85	0.47	1.10	0.35
-10 = -9 = -8 = -7 = -6	0.68	0.61	0.83	0.50
-10 = -9 = -8 = -7 = -6 = -5	0.54	0.74	0.84	0.52
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.57	0.76	0.70	0.65
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.68	0.69	0.65	0.71
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.68	0.71	0.62	0.76
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	0.62	0.78	0.69	0.72
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	0.63	0.78	0.55	0.84

Notes: The table reports F-tests of equality across pre-event coefficients from the event-study specification (Equation 1). Outcomes include labor force participation and employment for men (Panel A) and women (Panel B). Reported statistics test whether coefficients up to and including the year of parental death are statistically different from the baseline year ($k = -10$). Standard errors are clustered at the individual level.

TABLE A3: Pre-Trend Tests for Earnings

Panel A: Men

	Wage Income Income		Labor Income Income	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.27	0.61	0.05	0.82
-10 = -9 = -8	0.25	0.78	0.08	0.92
-10 = -9 = -8 = -7	0.19	0.90	0.15	0.93
-10 = -9 = -8 = -7 = -6	0.62	0.65	0.40	0.81
-10 = -9 = -8 = -7 = -6 = -5	0.58	0.72	0.45	0.82
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.48	0.82	0.68	0.66
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.70	0.68	0.88	0.52
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.70	0.70	0.86	0.55
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	0.73	0.68	1.01	0.43
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	0.91	0.52	1.36	0.20

Panel B: Women

	Wage Income Income		Labor Income Income	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.11	0.74	0.11	0.74
-10 = -9 = -8	0.06	0.94	0.09	0.92
-10 = -9 = -8 = -7	0.48	0.70	0.82	0.48
-10 = -9 = -8 = -7 = -6	0.72	0.58	0.73	0.57
-10 = -9 = -8 = -7 = -6 = -5	0.64	0.67	0.59	0.71
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.63	0.71	0.57	0.76
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.54	0.80	0.49	0.85
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.64	0.74	0.57	0.80
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	0.63	0.77	0.51	0.87
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	0.58	0.82	1.08	0.37

Notes: The table reports F-tests of equality across pre-event coefficients from the event-study specification (Equation 1). Outcomes include log wage income and log labor income for men (Panel A) and women (Panel B). Reported statistics test whether coefficients up to and including the year of parental death are statistically different from the baseline year ($k = -10$). Standard errors are clustered at the individual level.

Table A4: Pre-Trend Tests for Non-Mental Health Care Use

Panel A: Men

	Primary Care Physician Visits		Specialist Physician Visits		Prescription Drugs (Non-Mental Health)	
Equality Tests Across Pre-event Periods	F-test	p	F-test	p	F-test	p
-10 = -9	0.61	0.43	0.52	0.47	0.05	0.83
-10 = -9 = -8	0.59	0.56	0.35	0.70	0.03	0.97
-10 = -9 = -8 = -7	1.64	0.18	1.97	0.12	0.09	0.97
-10 = -9 = -8 = -7 = -6	1.59	0.18	1.48	0.21	0.23	0.92
-10 = -9 = -8 = -7 = -6 = -5	1.39	0.22	1.41	0.22	0.49	0.78
-10 = -9 =-8 = -7 = -6 = -5 = -4	1.18	0.32	1.35	0.23	0.49	0.81
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	1.02	0.41	1.36	0.22	0.48	0.85
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.90	0.51	1.33	0.23	0.55	0.82
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	0.82	0.60	1.20	0.29	0.49	0.88
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	1.08	0.38	1.20	0.29	0.49	0.89

Panel B: Women

	Primary Care Physician Visits		Specialist Physician Visits		Prescription Drugs (Non-Mental Health)	
Equality Tests Across Pre-event Periods	F-test	p	F-test	p	F-test	p
-10 = -9	1.43	0.23	1.83	0.18	4.68	0.03
-10 = -9 = -8	0.72	0.49	1.31	0.27	2.38	0.09
-10 = -9 = -8 = -7	0.55	0.65	0.93	0.43	1.85	0.14
-10 = -9 = -8 = -7 = -6	0.63	0.64	0.70	0.59	1.39	0.23
-10 = -9 = -8 = -7 = -6 = -5	0.64	0.67	1.45	0.20	1.17	0.32
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.95	0.46	1.41	0.21	1.59	0.14
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.90	0.50	1.22	0.29	1.69	0.11
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.81	0.59	1.07	0.38	1.56	0.13
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	0.85	0.57	1.01	0.43	1.69	0.09
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	1.00	0.44	0.96	0.47	1.47	0.15

Notes: The table reports F-tests of equality across pre-event coefficients from the event-study specification (Equation 1). Outcomes include primary care visits, specialist visits, and prescription drug use unrelated to mental health for men (Panel A) and women (Panel B). Reported statistics test whether coefficients up to and including the year of parental death are statistically different from the baseline year ($k = -10$). Standard errors are clustered at the individual level.

Table A5: Pre-Trend Tests for Hospital and Preventive Health Care Use

Panel A: Men

	Inpatient Hospital		Outpatient Hospital		Preventive Exams	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*	*F*-test	*p*
-10 = -9	1.02	0.31	0.42	0.52	1.55	0.21
-10 = -9 = -8	1.24	0.29	1.17	0.31	2.12	0.12
-10 = -9 = -8 = -7	1.20	0.31	1.07	0.36	2.27	0.08
-10 = -9 = -8 = -7 = -6	3.25	0.01	0.85	0.49	1.74	0.14
-10 = -9 = -8 = -7 = -6 = -5	3.21	0.01	0.85	0.51	1.59	0.16
-10 = -9 =-8 = -7 = -6 = -5 = -4	2.70	0.01	1.94	0.07	1.89	0.08
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	2.31	0.02	1.67	0.11	1.62	0.12
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	2.10	0.03	1.69	0.09	1.92	0.05
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	1.88	0.05	1.50	0.14	1.72	0.08
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	1.90	0.05	1.53	0.13	1.71	0.08

Panel B: Women

	Inpatient Hospital		Outpatient Hospital		Preventive Exams	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.81	0.37	1.56	0.21	0.27	0.60
-10 = -9 = -8	0.43	0.65	0.97	0.38	0.28	0.76
-10 = -9 = -8 = -7	0.29	0.84	0.75	0.52	0.30	0.82
-10 = -9 = -8 = -7 = -6	0.28	0.89	0.56	0.69	0.75	0.56
-10 = -9 = -8 = -7 = -6 = -5	0.23	0.95	1.00	0.42	0.63	0.68
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.20	0.98	0.84	0.54	0.53	0.78
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.21	0.98	0.74	0.63	0.47	0.86
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.23	0.99	0.66	0.72	0.66	0.73
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	0.22	0.99	0.64	0.77	0.97	0.47
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	0.21	0.99	0.59	0.80	0.59	0.81

Notes: The table reports F-tests of equality across pre-event coefficients from the event-study specification (Equation 1). Outcomes include inpatient hospital admissions, outpatient hospital visits, and preventive health exams for men (Panel A) and women (Panel B). Reported statistics test whether successive pre-event coefficients are jointly equal to the baseline year ($k = -10$). Standard errors are clustered at the individual level. Lower p-values indicate stronger evidence against equal pre-trends.

Table A6: Pre-Trend Tests for Mental Health Care Use

Panel A: Men

	Mental Health/ Psychiatric Visit		Psychiatric Medication Prescriptions	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.10	0.75	1.98	0.16
-10 = -9 = -8	0.27	0.77	1.34	0.26
-10 = -9 = -8 = -7	0.58	0.63	1.55	0.20
-10 = -9 = -8 = -7 = -6	0.49	0.75	1.22	0.30
-10 = -9 = -8 = -7 = -6 = -5	0.41	0.84	1.02	0.40
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.88	0.51	0.89	0.50
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.83	0.56	0.78	0.61
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.95	0.48	0.68	0.71
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	1.75	0.07	2.53	0.01
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	3.02	0.00	1.52	0.13

Panel B: Women

	Mental Health/ Psychiatric Visit		Psychiatric Medication Prescriptions	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.28	0.60	0.33	0.57
-10 = -9 = -8	0.83	0.43	0.19	0.83
-10 = -9 = -8 = -7	1.38	0.25	0.71	0.54
-10 = -9 = -8 = -7 = -6	1.03	0.39	2.03	0.09
-10 = -9 = -8 = -7 = -6 = -5	2.99	0.01	2.90	0.01
-10 = -9 =-8 = -7 = -6 = -5 = -4	3.49	0.00	2.42	0.02
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	3.55	0.00	2.28	0.03
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	4.61	0.00	2.01	0.04
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	6.94	0.00	2.99	0.00
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	10.94	0.00	3.60	0.00

Notes: The table reports F-tests of equality across pre-event coefficients from the event-study specification (Equation 1). Outcomes include any mental health or psychiatric visit and any psychiatric medication prescription. Results are shown separately for men (Panel A) and women (Panel B). Reported statistics test whether successive pre-event coefficients are jointly equal to the baseline year ($k = -10$). Standard errors are clustered at the individual level. Lower p-values indicate stronger evidence against equal pre-trends.

Table A7: Event-Study Estimates of Labor Market Participation Around Parental Dementia-Related Death

Event Years	Men		Women	
	Labor Force Participation (1)	Employment (2)	Labor Force Participation (3)	Employment (4)
-10 to -8	Reference Category		Reference Category	
-7 to -6	0.156	0.189	-0.041	0.149
	(0.15)	(0.22)	(0.18)	(0.27)
-5 to -4	-0.108	-0.017	-0.118	-0.077
	(0.19)	(0.25)	(0.22)	(0.31)
-3 to -2	-0.079	-0.327	-0.043	-0.193
	(0.22)	(0.27)	(0.25)	(0.33)
-1 to 1	-0.361	-0.483*	-0.106	-0.309
	(0.24)	(0.29)	(0.27)	(0.34)
2 to 3	-0.439	-0.415	-0.017	0.129
	(0.27)	(0.33)	(0.31)	(0.37)
4 to 5	-0.214	-0.021	0.139	-0.390
	(0.29)	(0.34)	(0.34)	(0.40)
6 to 7	-0.399	-0.263	0.099	-0.543
	(0.33)	(0.37)	(0.37)	(0.43)
Outcome mean	91.41	86.40	88.87	82.42
N	644,535	644,535	646,387	646,387

Notes: The table reports estimated effects of parental death from ADRD on adult children's labor force participation and employment by gender, based on Equation (2). Coefficients represent average differences across multi-year event windows relative to the reference period (–10 to –8 years before death). All regressions include individual and year fixed effects. Standard errors are clustered at the individual level and shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A8: Average Effects on Earnings Around Parental Dementia-Related Death

	Men		Women	
Event Years	Log Wage (1)	Log Labor Income (2)	Log Wage (3)	Log Labor Income (4)
-10 to -8	Reference Category		Reference Category	
-7 to -6	-0.006	-0.000	0.012	0.012*
	(0.008)	(0.006)	(0.008)	(0.007)
-5 to -4	-0.009	-0.010	0.003	0.005
	(0.009)	(0.008)	(0.009)	(0.009)
-3 to -2	-0.011	-0.011	0.006	0.007
	(0.010)	(0.008)	(0.010)	(0.009)
-1 to 1	-0.021**	-0.025***	0.007	-0.002
	(0.011)	(0.008)	(0.010)	(0.009)
2 to 3	-0.013	-0.019*	0.010	0.010
	(0.012)	(0.010)	(0.012)	(0.011)
4 to 5	-0.006	-0.008	-0.001	0.002
	(0.012)	(0.010)	(0.012)	(0.012)
6 to 7	-0.013	-0.021*	0.008	-0.001
	(0.013)	(0.012)	(0.014)	(0.013)
Dependent Variable Mean	12.32	12.38	12.09	12.11
N	551,270	584,907	552,232	569,231

Notes: The table reports estimated effects of having a parent who died with ADRD on adult children's annual log earnings, based on Equation (2). Estimates are expressed relative to the reference period (–10 to –8 years before death). Outcomes are defined for individuals with positive annual earnings only. Standard errors are clustered at the individual level and are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A9: Average Effects on Physical Health Care Use Around Parental Dementia-Related Death

Event Years	Men			Women		
	PCP Visits (Non-Mental) (1)	Specialist Visits (2)	Prescription Drugs (3)	PCP Visits (Non-Mental) (4)	Specialist Visits (5)	Prescription Drugs (6)
-10 to -8	Reference Category			Reference Category		
-7 to -6	-0.36 (0.42)	-0.65* (0.36)	0.36 (0.43)	-0.30 (0.32)	0.10 (0.42)	0.36 (0.43)
-5 to -4	-0.32 (0.43)	-0.35 (0.38)	0.38 (0.44)	-0.02 (0.33)	0.43 (0.44)	0.48 (0.45)
-3 to -2	-0.05 (0.44)	-0.18 (0.39)	0.28 (0.46)	0.16 (0.33)	0.09 (0.46)	0.97** (0.47)
-1 to 1	0.47 (0.41)	-0.17 (0.38)	0.29 (0.43)	0.28 (0.31)	0.48 (0.43)	0.48 (0.44)
2 to 3	-0.03 (0.45)	-0.37 (0.42)	-0.24 (0.48)	1.02*** (0.35)	0.75 (0.48)	0.24 (0.49)
4 to 5	-0.03 (0.45)	-0.33 (0.43)	-0.04 (0.48)	0.10 (0.35)	0.46 (0.49)	0.01 (0.49)
6 to 7	-0.08 (0.45)	-1.08** (0.44)	-0.04 (0.49)	0.26 (0.36)	0.81 (0.50)	0.49 (0.50)
Outcome mean	69.06	21.66	38.45	84.52	34.93	51.76
N	650,340	650,340	650,340	649,692	649,692	649,692

Notes: The table reports estimated average effects of parental death from ADRD on adult children's annual physical health care use, based on Equation (2). Outcomes include any primary care visit, any specialist visit, and any prescription drug use unrelated to mental health. Coefficients are expressed in percentage points relative to the reference period (–10 to –8 years before death). All regressions include individual and year fixed effects. Standard errors are clustered at the individual level and shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A10: Average Effects on Hospital and Preventive Care Use Around Parental Dementia-Related Death

Event Years	Men Inpatient Hospital (1)	 Outpatient Hospital (2)	 Preventive Care (3)	Women Inpatient Hospital (4)	 Outpatient Hospital (5)	 Preventive Care (6)
-10 to -8	Reference Category			Reference Category		
-7 to -6	0.64***	0.33	-0.20	0.08	-0.18	-0.36
	(0.24)	(0.35)	(0.20)	(0.28)	(0.40)	(0.24)
-5 to -4	0.56**	0.49	0.14	0.07	0.36	-0.09
	(0.24)	(0.38)	(0.23)	(0.29)	(0.43)	(0.29)
-3 to -2	0.27	-0.07	-0.29	0.06	-0.14	-0.47
	(0.25)	(0.39)	(0.25)	(0.29)	(0.44)	(0.31)
-1 to 1	0.40*	0.21	0.03	0.08	0.20	-0.54*
	(0.23)	(0.36)	(0.23)	(0.27)	(0.41)	(0.30)
2 to 3	0.11	-0.06	-0.20	-0.37	0.31	-0.25
	(0.27)	(0.42)	(0.28)	(0.30)	(0.44)	(0.35)
4 to 5	0.40	0.43	-0.29	-0.13	-0.16	-0.61*
	(0.28)	(0.43)	(0.29)	(0.30)	(0.44)	(0.35)
6 to 7	0.05	-0.42	-0.49	-0.06	-0.31	-0.48
	(0.29)	(0.44)	(0.31)	(0.31)	(0.43)	(0.36)
Outcome mean	7.31	23.17	9.56	8.99	39.72	21.80
N	650,340	650,340	650,340	649,692	649,692	649,692

Notes: The table reports estimated average effects of parental death from ADRD on adult children's annual hospital and preventive health care use, based on Equation (2). Outcomes include inpatient hospital admissions, outpatient hospital visits, and preventive health exams. Coefficients are expressed in percentage points relative to the reference period (–10 to –8 years before death). All regressions include individual and year fixed effects. Standard errors are clustered at the individual level and shown in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A11: Event Study Estimates: Subcomponents of Mental Health Care Visits Around Parental Death with ADRD

	Men				Women			
Event Years	PCP (1)	Psychologist (2)	Psychiatrist (3)	Other (4)	PCP (5)	Psychologist (6)	Psychiatrist (7)	Other (8)
-10 to -8	Reference Category				Reference Category			
-7 to -6	0.03 (0.11)	-0.03 (0.07)	-0.10 (0.09)	-0.07 (0.09)	-0.28* (0.17)	0.08 (0.12)	-0.08 (0.11)	-0.19* (0.10)
-5 to -4	0.07 (0.13)	0.03 (0.08)	0.01 (0.10)	0.09 (0.10)	0.30 (0.19)	0.43*** (0.14)	0.08 (0.13)	-0.05 (0.11)
-3 to -2	-0.01 (0.14)	0.12 (0.08)	-0.02 (0.11)	0.10 (0.10)	0.34 (0.21)	0.57*** (0.15)	0.23 (0.14)	0.07 (0.11)
-1 to 1	0.31** (0.13)	0.34*** (0.08)	-0.04 (0.11)	0.15 (0.10)	0.71*** (0.20)	1.77*** (0.15)	0.02 (0.14)	0.03 (0.10)
2 to 3	0.17 (0.14)	0.14 (0.08)	-0.08 (0.12)	0.10 (0.11)	0.31 (0.21)	0.46*** (0.16)	0.16 (0.15)	-0.03 (0.11)
4 to 5	0.06 (0.14)	0.18** (0.09)	0.01 (0.12)	0.07 (0.11)	0.04 (0.21)	-0.04 (0.15)	0.27* (0.15)	-0.03 (0.11)
6 to 7	0.27* (0.14)	0.06 (0.09)	0.08 (0.12)	0.09 (0.11)	-0.04 (0.20)	-0.14 (0.16)	0.08 (0.14)	0.06 (0.12)
Outcome mean	1.85	0.63	0.99	1.03	4.11	1.98	1.59	1.18
N	650,340	650,340	650,340	650,340	649,692	649,692	649,692	649,692

Notes: The table reports estimated effects of having a parent who died with ADRD on adult children's annual mental health care visits, based on Equation (2). Outcomes include visits to primary care physicians (PCP), psychologists, psychiatrists, and all other providers. Estimates are expressed in percentage points relative to the reference period (–10 to –8 years before death). Columns (1)–(4) present results for men and Columns (5)–(8) for women. Standard errors are clustered at the individual level and are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE A12: Event Study Estimates: Subcomponents of Psychiatric Medication Prescriptions Around Parental Death with ADRD

	Men				Women			
Event Years	Antidep. (1)	Hypnotics (2)	Anxiolyt. (3)	Antipsych. (4)	Antidep. (5)	Hypnotics (6)	Anxiolyt. (7)	Antipsych. (8)
-10 to -8	Reference Category				Reference Category			
-7 to -6	0.02	-0.07	0.07	-0.17**	0.15	0.29*	0.05	-0.20**
	(0.15)	(0.13)	(0.13)	(0.08)	(0.20)	(0.16)	(0.17)	(0.09)
-5 to -4	0.18	-0.11	0.26*	-0.13	0.34	0.37*	0.41**	-0.04
	(0.19)	(0.15)	(0.15)	(0.09)	(0.25)	(0.19)	(0.19)	(0.11)
-3 to -2	0.14	-0.06	0.20	-0.10	0.38	0.47**	0.26	-0.02
	(0.21)	(0.17)	(0.15)	(0.10)	(0.28)	(0.20)	(0.20)	(0.12)
-1 to 1	0.51**	0.37**	0.27*	0.01	0.57*	0.74***	0.73***	-0.12
	(0.22)	(0.17)	(0.15)	(0.11)	(0.29)	(0.21)	(0.20)	(0.13)
2 to 3	0.47*	0.22	0.19	0.10	0.39	0.37	0.39*	-0.20
	(0.25)	(0.18)	(0.16)	(0.12)	(0.32)	(0.23)	(0.21)	(0.14)
4 to 5	0.34	0.11	0.18	0.07	0.31	0.39*	0.30	-0.12
	(0.26)	(0.19)	(0.17)	(0.13)	(0.33)	(0.24)	(0.21)	(0.15)
6 to 7	0.45*	0.34*	0.21	0.15	0.15	0.16	0.23	-0.08
	(0.26)	(0.19)	(0.17)	(0.14)	(0.33)	(0.24)	(0.22)	(0.16)
Outcome mean	5.48	3.21	2.90	1.91	10.21	5.59	5.35	2.39
N	650,340	650,340	650,340	650,340	649,692	649,692	649,692	649,692

Notes: The table reports estimated effects of having a parent who died with ADRD on adult children's annual psychiatric medication prescriptions, based on Equation (2). Outcomes include filled prescriptions for antidepressants, hypnotics, anxiolytics, and antipsychotics. Estimates are expressed in percentage points relative to the reference period (–10 to –8 years before death). Columns (1)–(4) present results for men and Columns (5)–(8) for women. Standard errors are clustered at the individual level and are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A13: Event Study Estimates: Mental Health Service Use by Age Subgroups

	Men				Women			
	Age ≤ 50		Age > 50		Age ≤ 50		Age > 50	
Event Years	Mental Health Visit (1)	Psychiatric Medication Use (2)	Mental Health Visit (3)	Psychiatric Medication Use (4)	Mental Health Visit (5)	Psychiatric Medication Use (6)	Mental Health Visit (7)	Psychiatric Medication Use (8)
−10 **to** −8	Reference Category				Reference Category			
−7 **to** −6	-0.04 (0.24)	0.22 (0.28)	-0.19 (0.22)	-0.54* (0.28)	-0.33 (0.34)	0.01 (0.36)	-0.34 (0.30)	0.11 (0.35)
−5 **to** −4	0.21 (0.28)	0.26 (0.34)	0.14 (0.25)	-0.33 (0.33)	1.53*** (0.39)	1.29*** (0.42)	0.19 (0.34)	0.15 (0.40)
−3 **to** −2	0.22 (0.29)	0.03 (0.36)	0.04 (0.26)	-0.23 (0.36)	1.86*** (0.42)	1.24*** (0.47)	0.55 (0.36)	0.02 (0.43)
−1 **to** 1	0.71** (0.29)	0.93** (0.38)	0.61** (0.26)	0.45 (0.38)	3.10*** (0.42)	1.76*** (0.48)	1.44*** (0.35)	0.88** (0.45)
2 **to** 3	0.08 (0.32)	0.82* (0.43)	0.44 (0.27)	0.17 (0.41)	1.24*** (0.43)	1.21** (0.53)	0.34 (0.38)	0.12 (0.49)
4 **to** 5	0.17 (0.32)	0.86* (0.44)	0.25 (0.28)	-0.02 (0.42)	0.94** (0.44)	0.99* (0.54)	-0.16 (0.37)	-0.10 (0.50)
6 **to** 7	0.51 (0.32)	1.35*** (0.45)	0.52* (0.28)	0.02 (0.43)	0.07 (0.45)	0.70 (0.55)	-0.04 (0.37)	-0.34 (0.51)
Outcome mean	4.19	9.11	3.77	11.09	8.20	14.81	7.26	19.05
N	294,084	294,084	356,256	356,256	284,220	284,220	365,472	365,472

Notes: Table presents event study estimates of mental health service use by age subgroups (Child's age at parent's death 50 vs > 50) around the time of a parent's death from ADRD. Columns (1)–(4) show results for men by age subgroup; Columns (5)–(8) show results for women by age subgroup. Outcomes include any mental health visit and any psychiatric medication use. Estimates are relative to the reference period (−10 to −8 years). Reported values are the estimated point estimates with standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A14: Event Study Estimates: Mental Health Service Use by Education Subgroups

	Men				Women			
	Below college		College and above		Below college		College and above	
Event Years	Mental Health Visit (1)	Psychiatric Medication Use (2)	Mental Health Visit (3)	Psychiatric Medication Use (4)	Mental Health Visit (5)	Psychiatric Medication Use (6)	Mental Health Visit (7)	Psychiatric Medication Use (8)
−10 **to** −8	Reference Category				Reference Category			
−7 **to** −6	-0.14	-0.25	0.04	0.01	-0.57**	-0.05	0.13	0.33
	(0.20)	(0.24)	(0.30)	(0.36)	(0.28)	(0.32)	(0.39)	(0.40)
−5 **to** −4	0.32	-0.11	-0.14	0.11	0.64**	0.56	1.16***	1.04**
	(0.22)	(0.28)	(0.35)	(0.44)	(0.32)	(0.37)	(0.44)	(0.46)
−3 **to** −2	0.09	-0.07	0.35	-0.10	0.83**	0.55	1.90***	0.86*
	(0.23)	(0.31)	(0.37)	(0.47)	(0.34)	(0.41)	(0.47)	(0.51)
−1 **to** 1	0.71***	0.86***	0.62*	0.54	1.81***	1.40***	2.89***	1.25**
	(0.23)	(0.32)	(0.37)	(0.50)	(0.33)	(0.42)	(0.46)	(0.52)
2 **to** 3	0.40	0.41	0.10	0.98*	0.48	0.36	1.35***	1.21**
	(0.25)	(0.36)	(0.39)	(0.54)	(0.35)	(0.46)	(0.49)	(0.57)
4 **to** 5	0.24	0.21	0.21	1.13**	-0.10	0.20	1.21**	0.96*
	(0.25)	(0.37)	(0.40)	(0.56)	(0.35)	(0.47)	(0.48)	(0.58)
6 **to** 7	0.59**	0.48	0.47	1.25**	-0.16	-0.06	0.59	0.74
	(0.25)	(0.38)	(0.40)	(0.56)	(0.35)	(0.48)	(0.49)	(0.59)
Outcome mean	3.97	10.47	3.87	9.17	7.49	18.39	7.99	14.98
N	459,216	459,216	179,676	179,676	411,300	411,300	232,236	232,236

Notes: Table presents event study estimates of mental health service use by education subgroups (Below college vs College and above) around the time of a parent's death from ADRD. Columns (1)–(4) show results for men by education subgroup; Columns (5)–(8) show results for women by education subgroup. Outcomes include any mental health visit and any psychiatric medication use. Estimates are relative to the reference period (−10 to −8 years). Reported values are the estimated point estimates with standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A15: Event Study Estimates: Mental Health Service Use by Siblings Subgroups

	Men				Women			
	Single child		Has siblings		Single child		Has siblings	
Event Years	Mental Health Visit (1)	Psychiatric Medication Use (2)	Mental Health Visit (3)	Psychiatric Medication Use (4)	Mental Health Visit (5)	Psychiatric Medication Use (6)	Mental Health Visit (7)	Psychiatric Medication Use (8)
−10 **to** −8	Reference Category				Reference Category			
−7 **to** −6	-0.48	-0.90*	-0.05	-0.06	-0.56	0.59	-0.29	-0.04
	(0.41)	(0.50)	(0.18)	(0.22)	(0.56)	(0.62)	(0.25)	(0.27)
−5 **to** −4	-0.12	0.09	0.23	-0.09	0.22	0.62	0.89***	0.66**
	(0.46)	(0.61)	(0.20)	(0.26)	(0.62)	(0.73)	(0.28)	(0.32)
−3 **to** −2	-0.29	0.60	0.20	-0.25	0.86	1.00	1.17***	0.46
	(0.49)	(0.67)	(0.21)	(0.28)	(0.65)	(0.80)	(0.30)	(0.35)
−1 **to** 1	0.47	1.19*	0.69***	0.57*	2.70***	2.53***	2.06***	1.01***
	(0.49)	(0.71)	(0.21)	(0.29)	(0.65)	(0.83)	(0.29)	(0.36)
2 **to** 3	0.02	0.75	0.32	0.41	1.06	1.45	0.67**	0.42
	(0.55)	(0.77)	(0.23)	(0.32)	(0.68)	(0.90)	(0.31)	(0.39)
4 **to** 5	-0.01	1.17	0.25	0.23	0.03	0.17	0.38	0.42
	(0.53)	(0.78)	(0.23)	(0.33)	(0.69)	(0.91)	(0.31)	(0.40)
6 **to** 7	0.70	1.81**	0.48**	0.40	-0.40	0.13	0.09	0.11
	(0.53)	(0.79)	(0.23)	(0.34)	(0.69)	(0.92)	(0.31)	(0.41)
Outcome mean	3.98	10.96	3.95	10.05	7.58	18.97	7.69	16.84
N	103,788	103,788	546,552	546,552	109,728	109,728	539,964	539,964

Notes: Table presents event study estimates of mental health service use by siblings subgroups (Single child vs Has siblings) around the time of a parent's death from ADRD. Columns (1)–(4) show results for men by siblings subgroup; Columns (5)–(8) show results for women by siblings subgroup. Outcomes include any mental health visit and any psychiatric medication use. Estimates are relative to the reference period (−10 to −8 years). Reported values are the estimated point estimates with standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A16: Event Study Pre-trend F-tests: Non-ADRD Children Mental Health

Panel A: Men

	Mental Health/ Psychiatric Visit		Psychiatric Medication Prescriptions	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.17	0.68	2.26	0.13
-10 = -9 = -8	0.08	0.92	1.13	0.32
-10 = -9 = -8 = -7	0.16	0.92	0.94	0.42
-10 = -9 = -8 = -7 = -6	0.12	0.98	0.71	0.58
-10 = -9 = -8 = -7 = -6 = -5	0.11	0.99	0.60	0.70
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.22	0.97	0.57	0.75
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.35	0.93	0.57	0.78
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	0.35	0.95	0.51	0.85
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	2.64	0.00	1.90	0.05
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	16.85	0.00	5.67	0.00

Panel B: Women

	Mental Health/ Psychiatric Visit		Psychiatric Medication Prescriptions	
Equality Tests Across Pre-event Periods	*F*-test	*p*	*F*-test	*p*
-10 = -9	0.00	0.98	0.97	0.32
-10 = -9 = -8	0.01	0.99	0.49	0.61
-10 = -9 = -8 = -7	0.65	0.58	0.43	0.73
-10 = -9 = -8 = -7 = -6	0.68	0.61	0.33	0.86
-10 = -9 = -8 = -7 = -6 = -5	0.57	0.72	0.30	0.91
-10 = -9 =-8 = -7 = -6 = -5 = -4	0.81	0.56	0.43	0.86
-10 = -9 =-8 = -7 = -6 = -5 = -4 = -3	0.89	0.51	0.37	0.92
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2	1.00	0.43	0.33	0.95
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1	21.48	0.00	15.25	0.00
-10 = -9 = -8 = -7 = -6 = -5 = -4 = -3 = -2 = -1 = 0	88.74	0.00	15.45	0.00

Notes: Entries report F-statistics and p-values for cumulative pre-trend equality tests in an event-study design. Tests compare whether successive pre-event coefficients are jointly equal (see row labels). Outcomes: mental health/psychiatric visit and psychiatric medication prescriptions. Samples are estimated separately by gender. Lower p-values indicate greater evidence against equal pre-trends.

Table A17: Pooled Event-Study Estimates: Differences in Mental Health Service Use Around Parental Death with and without ADRD

	Men		Women	
Event Years	Mental Health Visit (1)	Psychotropic Medication (2)	Mental Health Visit (3)	Psychotropic Medication (4)
−10 **to** −7	Reference Category		Reference Category	
−6 **to** −2	0.13	-0.05	0.75***	0.60**
	(0.15)	(0.20)	(0.21)	(0.24)
−1 **to** 1	0.01	0.25	-0.11	0.21
	(0.19)	(0.27)	(0.27)	(0.33)
2 **to** 7	0.29*	0.45	0.21	0.11
	(0.18)	(0.28)	(0.24)	(0.33)
N	4,194,792	4,194,792	4,149,972	4,149,972

Notes: The table reports estimates from a pooled event-study model combining ADRD and non-ADRD samples to assess whether the effects of parental death differ by cause of death. The specification includes a full set of three-way interactions between treatment status, event-time bins, and an ADRD sample indicator, along with all corresponding two-way interactions. The model includes individual and calendar-year (or equivalently, age) fixed effects. Reported coefficients correspond to the three-way interaction and capture the *difference in event-time treatment effects* between ADRD and non-ADRD parental deaths (ADRD minus non-ADRD). To gain precision, event time is aggregated into three bins (−6 to −2, −1 to +1, and +2 to +7), with −10 to −7 as the reference period. Standard errors are clustered at the individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A18: Sharpened Q-values for Multiple Hypothesis Tests Across Outcome Domains

Panel T01: Mental Health Service Use

Period	Men-MH-Visit		Men-Psy-Med		Women-MH-Visit		Women-Psy-Med	
	p	q	p	q	p	q	p	q
−7 **to** −6	0.464	0.420	0.320	0.345	0.140	0.220	0.782	0.592
−5 **to** −4	0.349	0.354	0.794	0.592	0.003	0.013	0.025	0.060
−3 **to** −2	0.538	0.488	0.658	0.554	<0.001	0.001	0.082	0.156
−1 **to** 1	<0.001	0.004	0.013	0.046	<0.001	0.001	<0.001	0.001
2 **to** 3	0.186	0.268	0.121	0.202	0.010	0.039	0.095	0.168
4 **to** 5	0.310	0.345	0.212	0.287	0.255	0.316	0.304	0.345
6 **to** 7	0.015	0.047	0.045	0.095	0.971	0.714	0.761	0.592

Panel A06: Labor Market Participation

Period	Men-LFP		Men-Employ		Women-LFP		Women-Employ	
	p	q	p	q	p	q	p	q
−7 **to** −6	0.313	1.000	0.385	1.000	0.818	1.000	0.576	1.000
−5 **to** −4	0.570	1.000	0.945	1.000	0.585	1.000	0.802	1.000
−3 **to** −2	0.720	1.000	0.228	1.000	0.862	1.000	0.554	1.000
−1 **to** 1	0.132	1.000	0.094	1.000	0.697	1.000	0.361	1.000
2 **to** 3	0.108	1.000	0.202	1.000	0.955	1.000	0.730	1.000
4 **to** 5	0.465	1.000	0.953	1.000	0.683	1.000	0.326	1.000
6 **to** 7	0.224	1.000	0.480	1.000	0.791	1.000	0.203	1.000

Panel A07: Labor Market Income

Period	Men-Wage		Men-Labor		Women-Wage		Women-Labor	
	p	q	p	q	p	q	p	q
−7 **to** −6	0.459	1.000	0.973	1.000	0.129	1.000	0.094	0.904
−5 **to** −4	0.354	1.000	0.172	1.000	0.764	1.000	0.560	1.000
−3 **to** −2	0.267	1.000	0.172	1.000	0.529	1.000	0.412	1.000
−1 **to** 1	0.049	0.844	0.003	0.097	0.499	1.000	0.840	1.000
2 **to** 3	0.274	1.000	0.051	0.844	0.388	1.000	0.351	1.000
4 **to** 5	0.605	1.000	0.434	1.000	0.925	1.000	0.863	1.000
6 **to** 7	0.309	1.000	0.076	0.904	0.575	1.000	0.946	1.000

Panel A08: Primary Care Physical Health

Period	Men-PCP		Men-Spec		Men-Rx		Women-PCP		Women-Spec		Women-Rx	
	p	q	p	q	p	q	p	q	p	q	p	q
−7 **to** −6	0.388	1.000	0.071	1.000	0.402	1.000	0.348	1.000	0.819	1.000	0.412	1.000
−5 **to** −4	0.463	1.000	0.352	1.000	0.387	1.000	0.950	1.000	0.327	1.000	0.293	1.000
−3 **to** −2	0.906	1.000	0.649	1.000	0.536	1.000	0.632	1.000	0.838	1.000	0.037	0.971
−1 **to** 1	0.251	1.000	0.648	1.000	0.500	1.000	0.363	1.000	0.265	1.000	0.278	1.000
2 **to** 3	0.943	1.000	0.381	1.000	0.613	1.000	0.004	0.190	0.122	1.000	0.618	1.000
4 **to** 5	0.953	1.000	0.448	1.000	0.927	1.000	0.780	1.000	0.351	1.000	0.981	1.000
6 **to** 7	0.865	1.000	0.015	0.428	0.933	1.000	0.465	1.000	0.102	1.000	0.325	1.000

Panel A09: Hospital Care Physical Health

Period	Men-Inpat		Men-Outpat		Men-Prev		Women-Inpat		Women-Outpat		Women-Prev	
	p	q	p	q	p	q	p	q	p	q	p	q
−7 **to** −6	0.007	0.385	0.341	1.000	0.307	1.000	0.779	1.000	0.658	1.000	0.127	1.000
−5 **to** −4	0.021	0.751	0.194	1.000	0.545	1.000	0.798	1.000	0.404	1.000	0.760	1.000
−3 **to** −2	0.275	1.000	0.852	1.000	0.247	1.000	0.822	1.000	0.743	1.000	0.136	1.000
−1 **to** 1	0.089	1.000	0.571	1.000	0.888	1.000	0.758	1.000	0.623	1.000	0.071	1.000
2 **to** 3	0.678	1.000	0.884	1.000	0.490	1.000	0.221	1.000	0.473	1.000	0.474	1.000
4 **to** 5	0.148	1.000	0.320	1.000	0.321	1.000	0.676	1.000	0.712	1.000	0.082	1.000
6 **to** 7	0.870	1.000	0.342	1.000	0.107	1.000	0.853	1.000	0.474	1.000	0.190	1.000

Notes: The table reports Benjamini–Krieger–Yekutieli (BKY) sharpened q-values corresponding to p-values from event-study estimates across multiple outcome domains and event periods. See Anderson (2008) for the estimation procedure and the text for implementation details.