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Abstract

This study analyzes the effect of a partner's stroke on labor market, informal caregiving, and mental health outcomes in Japan. Using the Longitudinal Survey of Middle-aged and Elderly Persons and a staggered difference-in-differences, we show that males' labor supply and informal caring were not affected by partner's stroke, but female's informal caring and hours of care were affected by partner's stroke. Moreover, our research shows that females change the subject of informal caring, and female's mental health worsens after their partner experiences a stroke. We interpret this result as females face time constraints between hours worked and hours of care, leading to worsening females' mental health.

Keywords: Stroke, added worker effect, informal care, mental health, labor supply

JEL codes: I10, J22

1. Introduction

Japan is aging at a rapidly rate due to a declining birthrate, leading to workforce shortage and posing a significant challenge to Japanese government. (National Institute of Population and Social Security Research, 2023)(Statistics Bureau Japan, n.d.)Approximately half of the employed population comprises people aged 50 years and above.

According to the Employment Status Survey, 15.98% of middle-aged and elderly individuals left their positions due to their illness or old age, and 4.55% resigned due to providing long-term care or nursing (Statistics Bureau Japan, n.d.). Additionally, the economic loss of leaving a job to care for a family is estimated at almost 64 million US dollars in Japan (Ishiyama et al., 2023).

In this study, we study how the partner's health shock affects the outcomes of the other partner. Specifically, we utilize the partner's stroke as an exogenous shock to the couple, employing a staggered difference-in-differences.

Existing literature examine the effect of sudden health shocks on labor force participation. However, the results are inconclusive across gender. For males, Böckerman et al. (2023), Fadlon and Nielsen (2021), Jolly and Theodoropoulos (2023), and Macchinoni Giaquinto et al. (2022) all report no impact of sudden health shocks on the probability of employment. For females, Böckerman et al. (2023) amd Fadlon and Nielsen (2021) report the probability of employment is increased and Jolly and Theodoropoulos (2023) and

Macchinoni Giaquinto et al. (2022) report the probability of employment is not changed after partner's health shock. Only Jeon and Pahl (2017) show a significant negative impact of sudden health shocks on employment for male and female. For females, Böckerman et al. (2023) and Fadlon and Nielsen (2021) report husbands' health shocks increased females' labor supply. By contrast, Jeon and Pahl (2017) show that females' *decreased* labor supply if their husbands experienced health shocks. Finally, Jolly and Theodoropoulos (2023) and Macchinoni Giaquinto et al. (2022) report that husband's health shocks do not affect women's labor supply.

Most studies focused on the impact on labor market outcomes, but some studies also examined the impact on informal caregiving or mental health (Böckerman et al., 2023; Jolly & Theodoropoulos, 2023; Macchinoni Giaquinto et al., 2022). Some studies showed that a partner's health shock increased the extensive margin of informal caregiving for both males and females (Jolly & Theodoropoulos, 2023; Macchinoni Giaquinto et al., 2022). Other study showed that extensive margin of informal caregiving increased for females only (Macchinoni Giaquinto et al., 2022). Finally, Böckerman et al. (2023) showed that a partner's cancer increased the usage of psychotropic drugs for both men and women.

This research contributes to two strands of literature. First, our study adds the new evidence to the relationship between informal care and labor market outcomes by showing

the substitutional effect on the subject of informal caring. Previous literature only show the effect on informal caring to partner. Therefore, we examine they change the subject of informal caregiving or not. Second, to best out knowledge, this research is first study shows the effect of sudden health shock on both the informal caring and the mental health using the staggered difference-in-differences setting. Some literature show the relationship between informal caring and caregivers' mental health using the Gaussian Mixture Model and the Instrumental Variable (Bom, 2019; Oshio & Usui, 2018). However, no studies show the effect on both informal caring and mental health using difference-in-differences.

This article consists of the following sections. Section 2 describes data and sample construction. Section 3 discusses the identification strategy. Section 4 presents the results. Section 6 concludes with a discussion and an implication.

2. Data and Sample Construction

We used 2005–2018 the Longitudinal Survey of Middle-aged and Elderly Persons, an annual panel survey that focused on collecting familial, health, social activity, housing, and socioeconomic information from Japanese above the age of 50 by the Ministry of Health, Labor, and Welfare. The survey was designed as a volunteer-based paper survey that sent directly to the address of the respondents every year. And, the initial respondents were selected randomly from 2,515 areas that were parts of the area surveyed by the

Comprehensive Survey of Living Conditions. The initial number of respondents was 34,505 in 2005, and the final number of respondents was 20,677 in 2018 as shown in Table A1. The average response rate was 93.9%.

We defined our treatment variable as follows. First, the treatment group was defined as the individuals who were married and their partner was diagnosed with a stroke between 2006 to 2018. To facilitate comparison, we defined the control group as those who were married but their patterner never diagnosed with a stroke or a heart attack during the period. It was also important to note that we limited the treatment variable to only those who never experience any stroke or heart attack due to the fact that we are interested in the "pure" effect of a partner's health shock on outcomes and not the effect of one's own health shock on outcomes.

We generated a set of binary and continuous variables for our outcomes: labor market, informal caregiving, and mental health outcomes. For labor mark outcomes, three outcomes were generated: employment status, weekly hours worked, and couple's income. We defined the employment status as a binary variable that equaled to one if a respondent currently working, and zero otherwise. The weekly hours worked is a continuous variable that represents the hours of work by the individual, not partner. For informal caregiving outcomes, we defined three variables that are informal caring, informal caring to whom, and

hours of care. The informal caring was equaled to one if a respondent provides informal care to any family members, and zero otherwise. The informal caring to whom is conditional on informal care provision. The dataset allows us to see if the respondent provides care to his or her spouse, non-partner family, or both partner and non-partner family members. The informal care to the spouse was equaled to one if a respondent provides care to his or her partner, and zero otherwise. The informal care to non-partner was equaled to one if a respondent provides care to non-partner family members, and zero otherwise. The informal care to partner and non-partner was equaled to one if a respondent provides care to both partner and non- partner family members, and zero otherwise. However, the dataset did not collect the informal caring to partner between 2005 and 2007. Finally, mental health outcome is represented by the Kessler 6-score (K6), a continuous variable from 0 to 24. The higher the score the worse the mental health was for the individual.

For independent variables, we generated a set of continuous variables for an individual and his or her partner. That is, we generated two variables to be included: age and age-squared for own and the associated partner. Survey year fixed-effect was also generated for each respective year as a binary variable.

To construct the analytic sample, we first remove respondents who have missing value in marital status. Second, we trimmed the individuals to those who were married regardless of

whether they cohabitate, given that our research focused on the intrahousehold effect of couples. Third, we removed respondents whose partenrs are not observed in LSMEP. Additionally, we restricted the respondents who were never diagnosed with or hospitalized for a stroke or a heart attack between 2005 and 2018. Furthermore, we excluded individuals who did not respond the survey at the previous year and the year ot the partner's stroke or had implausible values in the variables required for constructing the sample. For example, hours worked more than 168 hours per week, as it was impossible to work over 24 hours per day.

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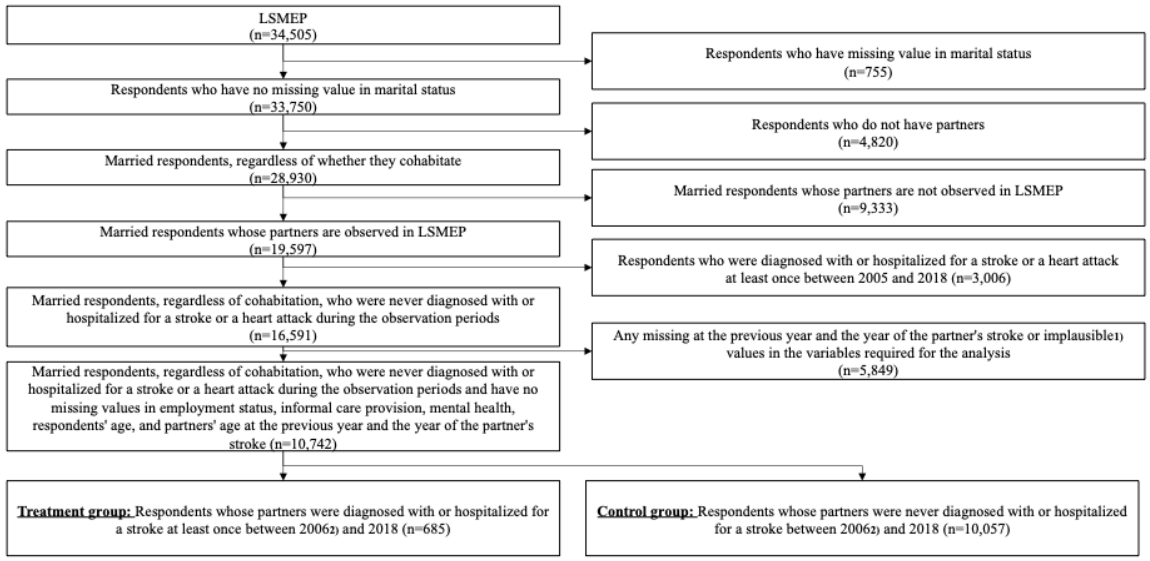

Figure 1 Here]

3. Identification Strategy

We applied a staggered difference-in-differences (DD) approach to investigate the intra-couple effect of sudden health reduction on outcomes. We estimated the following equation (1) with a panel fixed-effect (FE) model:

$$y_{it} = \delta Postdisease_{it} + \boldsymbol{X}'\boldsymbol{\beta}_{it} + \mu_i + \eta_t + \varepsilon_{it}, (1)$$

where y_{it} is labor market, informal caregiving, and mental health outcomes for respondent *i* at year *t*. $Postdisease_{it}$ is the treatment variable that was defined in the Section 3 for respondent *i* at year *t*.[7] $\boldsymbol{X}'_{it}$ is a vector that contains respondent's own age and age squared, and partner's age and age squared for respondent *i* at year *t*. μ_i is an individual fixed effect. η_t is survey year fixed-effect. ε_{it} is an error term. The standard errors were clustered by individual levels. The main parameter was δ which represent the causal effect of partner's stroke on a respondent's outcomes.

Given our estimations using a DD approach, we also implemented an event-study to examine the common trend assumption. To implement an event-study, we estimated the equation (2) with FE:

$$y_{it} = \sum_{k=-3,\ k\neq-1}^{3} \alpha_k Disease_{it} + \boldsymbol{X}'\boldsymbol{\beta}_{it} + \mu_i + \eta_t + \varepsilon_{it}, (2)$$

[7] $Postdisease_{it}$ is generated by multiplying treatment by post. The treatment variable is 1 if the individual is in the treatment group; otherwise, 0. The post variable is 1 if the spouse, individual j, is already diagnosed with the disease; otherwise, 0.

where $\sum_{k=-3,k\neq-1}^{3} \alpha_k Disease_{it}$ is a vector that contains the leads and lags of stroke for a respondent *i* at year *t*. The omitted year was one year prior to the onset of a partner's stroke.

To further test the robustness, we performed a placebo test by randomly assigning a fake disease and a fake stroke timing for a respondent's partner in the control group as a treatment group. We regressed using the same estimation methods on the same outcomes for placebo regressions. This allowed us to test whether our DD results were driven by spurious shocks. Finally, we stratified the estimations by gender. The comprehensive survey of daily living shows the difference between males and females in terms of the burden of informal caring, 31 percent of informal caregivers are male, while 69 percent are female.

4. Result

4.1. Summary Statistics

Table 1 presents summary statistics for male and female respondents one year prior to their partner's stroke, comparing control and treatment groups.

[

Table 1 Here]

Demographics and household composition were largely comparable between groups except the educational attainment. The mean age was 60.9 years for control and 60.8 years for treatment groups among males, while female respondents averaged 59.1 and 59.3 years in control and treatment groups, respectively. Educational attainment was 34.4% of males in the control group and 25.3% in the treatment group completing education beyond junior high school. For females, these proportions were 34.0% and 29.5%, respectively. Household size, defined as the number of family members living together excluding the partner, was showed similarity for males and females.

Health behaviors were consistent across groups for females. The difference in exercise habit was observed between the treatment and the control. The proportion of respondents who do light physical activity at least once per week was different between the treatment and the control for both males and females. The moderate intensive activity was different between male's treatment and male's control. Smoking behavior showed differences for both males and females. The current smoker and the past smoker was different for males and the past smoker for females.

Medical history characteristics were also similar, with minor variations in diabetes prevalence among males and hypertension and hyperlipidemia rates across both genders.

4.2. Main Result

Table 1

Table 2 shows the effect of a partner's stroke baseline DD results of the effect of partner's stroke on labor market, informal caregiving, and mental health outcomes. The estimates demonstrated that a partner's stroke did not affect labor market outcomes, including employment status and weekly hours worked, for both male and female. By contrast, our estimates suggested there was a significant the gender difference on couple's income, informal caregiving outcomes, and mental health. The probability of employment was increased by 0.5 percentage points for males and 0.4 percentage points for females. The hours worked was increased by 0.54 hours per week for males and 0.42 hours per week for females. The effect on the employment and hours worked were statistically insignificant. The couple's income was decreased by 2.4 percentage points for males and by 10.2 percentage points for females, the effect on males was statistically insignificant. Males increased the informal caregiving provision by 6 percentage points, but hours of care were increased by 3.2 hours and insignificant. Males reduced the care to non-partner only by 18.9 percentage points. The effects on the care to partner's only and to partner and non-parter family were insignificant. Females increased informal caregiving by 6.8 percentage points and hours of care was by 2.2 hours per week after their partners have was diagnosed with a stroke, but the effect on hours was statistically insignificant. In addition, females changed the subject of informal caregiving. They reduced the care to non-partner family members and increased care to their spouses or their partners and non-partners. Informal caregiving care to non-

partner only decreased by 19.2 percentage points, informal caregiving to partner only increased by 12 percentage points, and informal caregiving care to both partner and non-partner increased by 7.2 percentage points. Males' K6-score was not changed after the partner's stroke. Only Females' K6-score worsened by 0.41.

[

Table 2 Here]

Figure 2 shows the coefficient plot of the event study model. Each panel reports the estimate for a different dependent variable. Within each panel, each figure represents the estimate for each gender. For both males and females, we did not observe significant estimates on lead estimates for most outcomes. Overall, this implied that the common trend may not be violated when estimating the effect of partner's stroke on outcomes in Japan.

[Figure 2 Here]

4.3. Heterogeneous Effect

We investigate heterogeneity by two dimensions: breadwinner status and household composition at the previous year of the partner's stroke. The breadwinner status is defined as follows: the respondent is the breadwinner if the respondent's income is higher than half of the couple's income at the one year prior to the onset, and zero if non-breadwinner. This definition follows Böckermann et al. (2023).

Additionally, Table 3 reports the estimates of the effect of being a breadwinner on outcomes by gender. The results suggest that non-breadwinner females were affected negatively by the partners' stroke. The effects on couple's income, informal caring outcomes, K6-score were stastiscally significant only for non-breadwinner status. The couple's income was decreased by 12 percentage points, the probability of informal care provision was increased by 9.5 percentage points, and K6-score worsened by 0.39 for non-breadwinner

females. Additionally, they reduced the informal caret to non-partner only and increased the care to partner only. The main differece from the baseline results is that the added worker effect was observed for breadwinner males. They increased the hours worked by 1.7 hours per week after the partners' stroke.

[Table 3 Here]

Table 4 shows the estimates by household composition in the previous year of the partner's stroke. This result also suggests that females were more affected negatively by the partners' stroke regardless of household composition. If the respondent was male, the effect on K6-score depended on whether or not he lived with their family. The effect on labor market outcomes were insignificant for males. Males increased the informal caregiving regardless of household composition. K6-score worsened by 0.71 for males who live only with their partners. This result suggests that loneliness affected mental health for males negatively. If the respondent was female, household composition affected labor market outcomes If females live with their family, they increased the labor supply by 4.7 percentage points. The couple's income was decreased, the informal care probvision was increased, and the K6-score worsened for both group of females. Both females reduced the care to non-

partner only. However, females live with their family only increased the care to partner only.

[Table 4 Here]

4.4. Robustness Check

We also conducted additional robustness checks: checking the validity of the two-way fixed estimator, the exclusion of individuals experienced a parental mortality, the multiple imputation, the exclusion observations that include missing values on employment, informal caring, mental health, respondent's age and partner's age, and checking the including and excluding age squared or age cubic. When the timing or the effect of treatment varies across units, a two-way fixed estimator may have a negative weight for bad comparison (Goodman-Bacon, 2021). We checked the weight by using decomposition of de Chaisemartin and D'Haultf'euille (2020). Appendix Table A reports the results of diagnostic tests by de Chaisemartin and D'Haultf'euille (2020). The results from the diagnosis suggests that the biases were small; that is, from –0.04 to 0. Therefore, we employed the two-way fixed effect estimator in this setting. Second, besides a partner's health shocks, the death of a parent can affect outcomes. We estimated using the same model as in the baseline after dropping couples whose parents dropped from the data. The estimates were similar to the baseline estimations with respect to the direction, sign, and magnitude. We conducted the multiple imputation using the same model as in the baseline. The result was similar to the baseline

estimations with respect to the direction, sign. We checked whether missing values affect the baseline result or not by removing the individuals who have missing values for employment, informal care provision, mental health, respondent's age, and partner's age. After removing that individuals, the informal caring outcomes for males, K6-score for females turn to insignificant. This test suggests that non-response bias may affect the baseline result (Kumagai, 2017). Lastly, we compared the baseline result with the result that excluded the age squared from the baseline model and the result that included the age cubic in the baseline model. Both results were similar with baseline result.

5. Discussion and Conclusion

This study examines the effect of a partner's stroke on labor market outcomes, informal caregiving, and mental health outcomes. We found that there was gender difference in informal caregiving and mental health. The partner's stroke negaticely affected the well-being of females, through time and budget constraints.

We did not observe both the added-worker effect and caregiving effect. They may be to compensate for the reduced household income by keeping hours worked. As a result, females may have to reduce their leisure or sleeping time to care for their partner. Not only informal caregiving but constrained time allocation may worsen females' mental health.

This study has limitations. First, this study cannot analyze the effect of public long-term care insurance. Fu et al. (2017) reveal the positive spillover effect of introducing public long-term care insurance on labor force participation. However, the survey does not contain information on public long-term care services. Lastly, this dataset does not allow us to the effect by the child's gender. The dataset does not include information on the gender of children living with the respondents. If the children are female, they may provide an informal care to the stroke survivors.

The policy for informal caregiver's budget constraint is required. Public cash transfers could mitigate the effect of a partner's health shock on well-being. However, the Japanese government's budget constraint may not allow this. Therefore, encouraging private health insurance enrolment is one measure to address income reduction due to stroke. Additonally, the results imply challenges facing the long-term care insurance in Japan. Individuals did not change both their labor supply and informal care provision after their partners' stroke. As the number of couple-only households and dual-income households increase, more people may need to rely on the long-term care insurance when family members experience a health shock.

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Reference

Acuña, Carlos, Héctor Acuña, and Diego Carrasco. 2019. "Health Shocks and the Added Worker Effect: A Life Cycle Approach." *Journal of Applied Economics* 22 (1): 273–86. https://doi.org/10.1080/15140326.2019.1613089.

Anand, Priyanka, Laura Dague, and Kathryn L. Wagner. 2022. "The Role of Paid Family Leave in Labor Supply Responses to a Spouse's Disability or Health Shock." *Journal of Health Economics* 83 (May):102621. https://doi.org/10.1016/j.jhealeco.2022.102621.

Andrew Goodman-Bacon, Thomas Goldring, and Austin Nichols. 2019. "BACONDECOMP: Stata Module to Perform a Bacon Decomposition of Difference-in-Differences Estimation." Boston College Department of Economics. https://ideas.repec.org/c/boc/bocode/s458676.html.

Aouad, Marion. 2023. "The Intracorrelation of Family Health Insurance and Job Lock." *Journal of Health Economics* 90 (July):102749. https://doi.org/10.1016/j.jhealeco.2023.102749.

Bergeot, Julien, Irene Ferrari, and Ya Gao. 2024. "The Effect of Parental Health Shocks on Living Arrangements and Employment." *Health Economics*, September, hec.4893. https://doi.org/10.1002/hec.4893.

Berthung, Espen, Nils Gutacker, Oddgeir Friborg, Birgit Abelsen, and Jan Abel Olsen. 2021. "Who Keeps on Working? The Importance of Resilience for Labour Market Participation." Edited by Roxanna Morote Rios. *PLOS ONE* 16 (10): e0258444. https://doi.org/10.1371/journal.pone.0258444.

Böckerman, Petri, Mika Kortelainen, Henri Salokangas, and Maria Vaalavuo. 2023. "Family Affair? Long-Term Economic and Mental Effects of Spousal Cancer."

Bom, Judith. 2019. "Health Effects of Caring for and about Parents and Spouses." *The Journal of the Economics of Ageing*.

Bom, Judith, Pieter Bakx, Frederik Schut, and Eddy Van Doorslaer. 2018. "The Impact of Informal Caregiving for Older Adults on the Health of Various Types of Caregivers: A Systematic Review." *The Gerontologist*, November. https://doi.org/10.1093/geront/gny137.

Cabinet Office. 2023. "Annual Report on the Ageing Society." https://www8.cao.go.jp/kourei/whitepaper/index-w.html.

Cai, Lixin, Kostas Mavromaras, and Umut Oguzoglu. 2014. "THE EFFECTS OF HEALTH STATUS AND HEALTH SHOCKS ON HOURS WORKED: HEALTH AND HOURS WORKED." *Health Economics* 23 (5): 516–28. https://doi.org/10.1002/hec.2931.

Candon, David. 2018. "The Effect of Cancer on the Labor Supply of Employed Men over the Age of 65." *Economics & Human Biology* 31 (September):184–99. https://doi.org/10.1016/j.ehb.2018.08.010.

Cheng, Terence C., Jing Li, and Rhema Vaithianathan. 2019. "Monthly Spending Dynamics of the Elderly Following a Health Shock: Evidence from Singapore." *Health Economics* 28 (1): 23–43. https://doi.org/10.1002/hec.3824.

Coyne, David, Itzik Fadlon, Shanthi P. Ramnath, and Patricia K. Tong. 2024. "Household Labor Supply and the Value of Social Security Survivors Benefits." *American Economic Review* 114 (5): 1248–80. https://doi.org/10.1257/aer.20190813.

De Chaisemartin, Clément, and Xavier D'Haultfœuille. 2020. "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects." *American Economic Review* 110 (9): 2964–96. https://doi.org/10.1257/aer.20181169.

Do, Young Kyung, Edward C. Norton, Sally C. Stearns, and Courtney Harold Van Houtven. 2015. "Informal Care and Caregiver's Health." *Health Economics* 24 (2): 224–37. https://doi.org/10.1002/hec.3012.

Dureja, Abhishek, and Digvijay S. Negi. 2022. "Coping with the Consequences of Short-term Illness Shocks: The Role of Intra-household Labor Substitution." *Health Economics* 31 (7): 1402–22. https://doi.org/10.1002/hec.4514.

Fadlon, Itzik, and Torben Heien Nielsen. 2019. "Family Health Behaviors." *American Economic Review* 109 (9): 3162–91. https://doi.org/10.1257/aer.20171993.

———. 2021. "Family Labor Supply Responses to Severe Health Shocks: Evidence from Danish Administrative Records." *American Economic Journal: Applied Economics* 13 (3): 1–30. https://doi.org/10.1257/app.20170604.

García Gómez, Pilar, and Angel López Nicolás. 2006. "Health Shocks, Employment and Income in the Spanish Labour Market." *Health Economics* 15 (9): 997–1009. https://doi.org/10.1002/hec.1151.

García-Gómez, Pilar, Hans Van Kippersluis, Owen O'Donnell, and Eddy Van Doorslaer. 2013. "Long-Term and Spillover Effects of Health Shocks on Employment and Income." *Journal of Human Resources* 48 (4): 873–909. https://doi.org/10.1353/jhr.2013.0031.

Hiel, Laura, Mariëlle A. Beenackers, Carry M. Renders, Suzan J.W. Robroek, Alex Burdorf, and Simone Croezen. 2015. "Providing Personal Informal Care to Older European Adults: Should We Care about the Caregivers' Health?" *Preventive Medicine* 70 (January):64–68. https://doi.org/10.1016/j.ypmed.2014.10.028.

Ishiyama, Taishi, Akiko Kojima, and Yotaro Ishida. 2023. "Economic Losses Due to Difficulties in Balancing Work and Nursing Care in Japan." The Japan Research Institute, Limited. https://www.jri.co.jp/page.jsp?id=105238.

Jeon, Sung-Hee, and R. Vincent Pohl. 2017. "Health and Work in the Family: Evidence from Spouses' Cancer Diagnoses." *Journal of Health Economics* 52 (March):1–18. https://doi.org/10.1016/j.jhealeco.2016.12.008.

Jolly, Nicholas A., and Nikolaos Theodoropoulos. 2023. “Health Shocks and Spousal Labor Supply: An International Perspective.” *Journal of Population Economics* 36 (2): 973–1004. https://doi.org/10.1007/s00148-022-00929-7.

Jones, Andrew M., Nigel Rice, and Francesca Zantomio. 2020. “Acute Health Shocks and Labour Market Outcomes: Evidence from the Post Crash Era.” *Economics & Human Biology* 36 (January):100811. https://doi.org/10.1016/j.ehb.2019.100811.

Junya Hamaaki and Haruko Noguchi. 2010. “Health Effects on Labor Participation by the Elderly.” *The Japanese Journal of Labour Studies* 601:5–24.

Kohara, Miki. 2010. “The Response of Japanese Wives’ Labor Supply to Husbands’ Job Loss.” *Journal of Population Economics* 23 (4): 1133–49. https://doi.org/10.1007/s00148-009-0247-6.

Kumagai, Narimasa. 2017a. “Distinct Impacts of High Intensity Caregiving on Caregivers’ Mental Health and Continuation of Caregiving.” *Health Economics Review* 7 (1): 15. https://doi.org/10.1186/s13561-017-0151-9.

———. 2017b. “Non-Response Bias in the Longitudinal Survey of Middle-Aged and Elderly Persons : Focusing on Non-Respondents in Informal Caregiving.” *Japanese Journal of Health Economics & Policy* 29 (2): 120–31.

Lee, Siha. n.d. “Household Responses to Disability Shocks: Spousal Labor Supply, Caregiving, and Disability Insurance.”

Lenhart, Otto. 2019. “The Effects of Health Shocks on Labor Market Outcomes: Evidence from UK Panel Data.” *The European Journal of Health Economics* 20 (1): 83–98. https://doi.org/10.1007/s10198-018-0985-z.

Lundberg, Shelly. 1985. “The Added Worker Effect.” *Journal of Labor Economics* 3 (1, Part 1): 11–37.

Macchioni Giaquinto, Annarita, Andrew M. Jones, Nigel Rice, and Francesca Zantomio. 2022. “Labor Supply and Informal Care Responses to Health Shocks within Couples: Evidence from the UK.” *Health Economics* 31 (12): 2700–2720. https://doi.org/10.1002/hec.4604.

Mata, Jutta, Ronald Frank, and Gerd Gigerenzer. 2014. “Symptom Recognition of Heart Attack and Stroke in Nine European Countries: A Representative Survey: Heart Attack and

Stroke in Nine European Countries." *Health Expectations* 17 (3): 376–87. https://doi.org/10.1111/j.1369-7625.2011.00764.x.

Mincer, Jacob. 1962. "Labor Force Participation of Married Women: A Study of Labor Supply." In *Aspects of Labor Economics*, 63–105. Princeton University Press.

National Institute of Population and Social Security Research. 2023. "Population Projections for Japan: 2021 to 2070." https://www.ipss.go.jp/pp-zenkoku/e/zenkoku_e2023/pp_zenkoku2023e.asp.

Oshio, Takashi, and Emiko Usui. 2017. "Informal Parental Care and Female Labour Supply in Japan." *Applied Economics Letters* 24 (9): 635–38. https://doi.org/10.1080/13504851.2016.1217303.

———. 2018. "How Does Informal Caregiving Affect Daughters' Employment and Mental Health in Japan?" *Journal of the Japanese and International Economies* 49 (September):1–7. https://doi.org/10.1016/j.jjie.2018.01.001.

Parro, Francisco, and R. Vincent Pohl. 2021. "The Effect of Accidents on Labor Market Outcomes: Evidence from Chile." *Health Economics* 30 (5): 1015–32. https://doi.org/10.1002/hec.4230.

Roth, Jonathan, Pedro H.C. Sant'Anna, Alyssa Bilinski, and John Poe. 2023. "What's Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature." *Journal of Econometrics* 235 (2): 2218–44. https://doi.org/10.1016/j.jeconom.2023.03.008.

Schmitz, Hendrik, and Matthias Westphal. 2017. "Informal Care and Long-Term Labor Market Outcomes." *Journal of Health Economics* 56 (December):1–18. https://doi.org/10.1016/j.jhealeco.2017.09.002.

Shen, Zheng, and Tan. 2019. "The Spillover Effects of Spousal Chronic Diseases on Married Couples' Labour Supply: Evidence from China." *International Journal of Environmental Research and Public Health* 16 (21): 4214. https://doi.org/10.3390/ijerph16214214.

Simard-Duplain, Gaëlle. 2022. "Heterogeneity in Informal Care Intensity and Its Impact on Employment." *Journal of Health Economics* 86 (December):102647. https://doi.org/10.1016/j.jhealeco.2022.102647.

Skajaa, Nils, Dóra Körmendiné Farkas, Kristina Laugesen, Cecilia Hvitfeldt Fuglsang, Victor W. Henderson, Oleguer Plana-Ripoll, David Gaist, and Henrik Toft Sørensen. 2024. "Mental

Health Conditions in Partners and Adult Children of Stroke Survivors." *JAMA Network Open* 7 (3): e243286. https://doi.org/10.1001/jamanetworkopen.2024.3286.

Skira, Meghan M. 2015. "DYNAMIC WAGE AND EMPLOYMENT EFFECTS OF ELDER PARENT CARE." *International Economic Review* 56 (1): 63–93. https://doi.org/10.1111/iere.12095.

Statistics Bureau Japan. n.d. "The Labor Supply Survey." Accessed September 22, 2023. https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00200531&tstat=000000110001.

Tanaka, Atsuko. 2021. "The Effects of Sudden Health Reductions on Labor Market Outcomes: Evidence from Incidence of Stroke." *Health Economics* 30 (6): 1480–97. https://doi.org/10.1002/hec.4259.

Urwin, Sean, Yiu-Shing Lau, Gunn Grande, and Matt Sutton. 2023. "Informal Caregiving, Time Use and Experienced Wellbeing." *Health Economics* 32 (2): 356–74. https://doi.org/10.1002/hec.4624.

Valle, Giuseppina, Janet A. Weeks, Miles G. Taylor, and Isaac W. Eberstein. 2013. "Mental and Physical Health Consequences of Spousal Health Shocks Among Older Adults." *Journal of Aging and Health* 25 (7): 1121–42. https://doi.org/10.1177/0898264313494800.

Van Houtven, Courtney Harold, Norma B. Coe, and Meghan M. Skira. 2013. "The Effect of Informal Care on Work and Wages." *Journal of Health Economics* 32 (1): 240–52. https://doi.org/10.1016/j.jhealeco.2012.10.006.

World Health Organization. 2023. *Global Report on Hypertension: The Race against a Silent Killer*. Geneva.

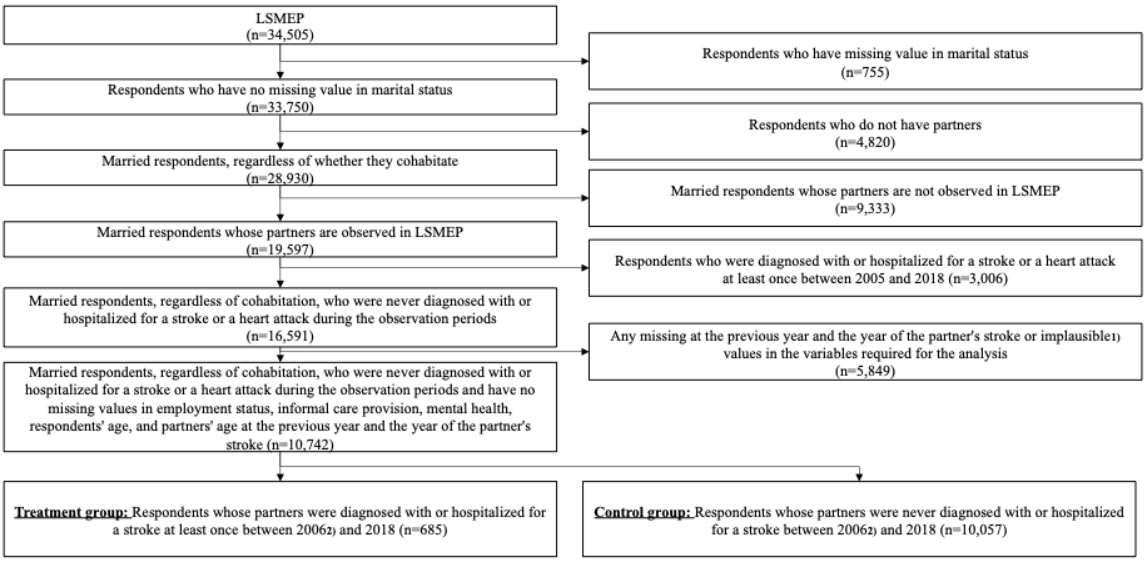

Figure 1. Flow chart for sample selection process.

Note:

1) For implausible values, we excluded individuals who reported working more than 168 hours per week, as it is not possible to work over 24 hours per day.

2) The LSMEP collected information on the diagnosis of stroke or heart attack in the baseline year of 2005. However, we cannot determine whether these diagnoses occued newly between 2004 and 2005 or prior to 2004.

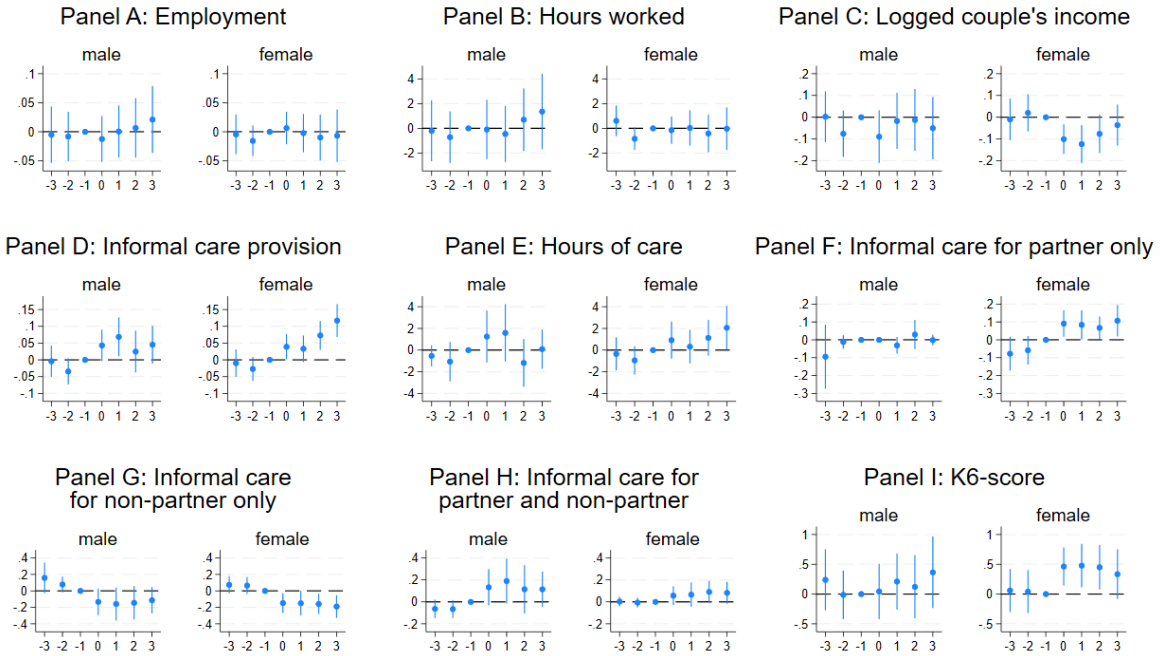

Figure 2**.** Event study coefficient plot.

Note: Each plot reports the estimates of a partner's stroke and reports the estimate for a different dependent variable. The omitted category is 1 year prior to a partner's stroke. Control variables include respondent's age and age squared, partner's age and age squared, and the individual and time fixed effects. Standard errors are clustered at the individual levels. The dots represent point estimates, and the caps represent 95% confidence intervals.

Table 1. Summary Statistics

	Male					Female				
	Treatment		Control			Treatment		Control		
	Mean	SD	Mean	SD	p-value	Mean	SD	Mean	SD	p-value
Age	60.769	4.366	60.805	4.500	0.905	59.287	4.414	59.101	4.514	0.397
Education	0.253	0.436	0.344	0.475	0.006***	0.295	0.457	0.340	0.474	0.050*
Household size	1.333	1.547	1.208	1.342	0.174	1.126	1.345	1.215	1.339	0.173
Diabetes	0.182	0.387	0.120	0.325	0.009***	0.077	0.266	0.064	0.245	0.330
Hypertension	0.330	0.471	0.305	0.460	0.452	0.249	0.433	0.215	0.411	0.109
Hyperlipidemia	0.146	0.354	0.143	0.350	0.877	0.138	0.345	0.150	0.357	0.537
Lite intensive physical activity	0.308	0.463	0.377	0.485	0.038	0.429	0.496	0.476	0.499	0.059*
Moderate intensive activity	0.290	0.455	0.381	0.486	0.006***	0.335	0.472	0.360	0.480	0.292
High intensive activity	0.059	0.236	0.078	0.267	0.308	0.074	0.262	0.094	0.291	0.173
Non-smoker	0.004	0.067	0.015	0.123	0.191	0.063	0.244	0.077	0.266	0.302
Current smoker	0.471	0.500	0.357	0.479	0.001***	0.066	0.248	0.083	0.275	0.201
Past smoker	0.525	0.501	0.628	0.483	0.002***	0.871	0.336	0.841	0.366	0.087*

Note: Education is one if the final education institution of the respondent is higher than junior high school, zero if otherwise. Household size is the number of family members living together except the partner. Each physical activity is one if the respondent do that exercise at least once a week, zero if otherwise. The physical activity is one if the respondent exercise at least once a month, zero if otherwise.

Abbreviation: SD, Standard deviation.

*p < 0.1 **p < 0.05 ***p < 0.01

Table 2. The effect of partner's stroke on employment, informal caregiving, and mental health outcomes

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
Panel A: Males (Wives have a stroke)									
Partners' stroke	0.005	0.537	-0.024	0.060***	3.211	0.018	-0.189*	0.171	0.088
	(0.020)	(0.926)	(0.040)	(0.020)	(6.350)	(0.020)	(0.106)	(0.106)	(0.158)
Observations	30470	23768	27646	29209	2656	2468	2468	2468	29687
Panel B: Females (Husbands have a stroke)									
Partners' stroke	0.004	0.422	-0.102***	0.068***	2.284	0.120***	-0.192***	0.072	0.410***
	(0.015)	(0.537)	(0.029)	(0.016)	(4.987)	(0.039)	(0.066)	(0.044)	(0.122)
Observations	34922	19553	31355	33377	4741	4273	4273	4273	34205

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. Couple's income includes a pension.

*p < 0.1 **p < 0.05 ***p < 0.01

Table 3. The heterogeneous effect by breadwinner status

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care(conditional on informal caregiving)	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
Panel A: Males and Breadwinners (Wives have a stroke)									
Partner's stroke	0.005	1.791*	-0.016	0.064***	4.860	0.027	-0.291**	0.264*	0.231
	(0.021)	(1.088)	(0.041)	(0.024)	(9.614)	(0.032)	(0.148)	(0.150)	(0.189)
Observations	23644	19079	22458	22795	2077	1926	1926	1926	23146
Panel B: Males and Non-Breadwinners (Husbands have a stroke)									
Partner's stroke	-0.034	-4.099	-0.264***	0.028	8.771	0.000	-0.001	0.001	-0.262
	(0.091)	(2.718)	(0.079)	(0.053)	(6.353)	(.)	(0.010)	(0.010)	(0.535)
Observations	2534	1805	2441	2423	245	242	242	242	2483
Panel C: Females and Breadwinners (Husbands have a stroke)									
Partner's stroke	0.003	0.465	-0.105*	-0.008	-5.037	0.569*	-0.546*	-0.022	0.223
	(0.037)	(0.994)	(0.063)	(0.043)	(4.654)	(0.333)	(0.327)	(0.017)	(0.329)

Observations	4782	3617	4476	4571	737	667	667	667	4697
Panel D: Females and Non-Breadwinners (Husbands have a stroke)									
Partner's stroke	-0.010	0.093	-0.120***	0.095***	2.147	0.104**	-0.154**	0.050	0.388**
	(0.019)	(0.671)	(0.039)	(0.022)	(5.036)	(0.052)	(0.076)	(0.044)	(0.162)
Observations	18435	12659	17745	17789	2375	2156	2156	2156	18178

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. Couple's income includes a pension. The breadwinner status is the share of the average of an individual's earnings and pension in pre-trends that is higher or not the half of the average of household earnings and pension in pre-trends. *p < 0.1 **p < 0.05 ***p < 0.01

Table 4**.** The heterogeneous effect by household composition

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
Panel A: Males live with their family (Wives have a stroke)									
Partner's stroke	-0.005	-0.236	-0.074	0.058**	2.999	0.016	-0.204*	0.188*	-0.259
	(0.026)	(0.922)	(0.051)	(0.026)	(6.863)	(0.022)	(0.115)	(0.114)	(0.196)
Observations	19076	15349	17393	18285	2062	1908	1908	1908	18582
Panel B: Males live only with their partner (Wives have a stroke)									
Partner's stroke	0.023	1.981	0.064	0.063**	-2.594	0.016	-0.009	-0.007	0.708***
	(0.033)	(2.025)	(0.063)	(0.032)	(10.106)	(0.012)	(0.016)	(0.014)	(0.255)
Observations	11394	8419	10253	10924	594	560	560	560	11105
Panel C: Females live with their family (Husbands have a stroke)									
Partner's stroke	-0.024	0.264	-0.085**	0.063***	5.034	0.141***	-0.239**	0.099	0.465***
	(0.020)	(0.710)	(0.035)	(0.021)	(6.909)	(0.048)	(0.096)	(0.069)	(0.164)
Observations	21946	12816	19670	20959	3548	3154	3154	3154	21500

Panel D: Females live only with their partner (Husbands have a stroke)									
Partner's stroke	0.047**	0.628	-0.129***	0.076***	-0.830	0.095	-0.129**	0.034	0.330*
	(0.022)	(0.809)	(0.048)	(0.024)	(4.812)	(0.064)	(0.066)	(0.027)	(0.178)
Observations	12976	6737	11685	12418	1193	1119	1119	1119	12705

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. The couple's income includes a pension. Living with family or not is one year before the partner's stroke.

*p < 0.1 **p < 0.05 ***p < 0.0

Appendix

Table A1: The Attrition of the Longitudinal Survey Middle-aged and Elderly Persons

Year	Age	The number of survey subject	The number of respondents	Response rate	Attrition rate
2005	50-59	40,877	34,240	83.8%	-
2006	51-60	35,007	32,285	92.2%	94.3%
2007	52-61	32,195	30,730	95.40%	95.2%
2008	53-62	30,773	29,605	96.20%	96.3%
2009	54-63	29,548	28,736	97.30%	97.1%
2010	55-64	28,554	26,220	91.80%	91.2%
2011	56-65	28,137	25,321	90.00%	96.6%
2012	57-66	26,428	24,026	90.90%	94.9%
2013	58-67	25,261	23,722	93.90%	98.7%
2014	59-68	24,231	22,748	93.90%	95.9%
2015	60-69	23,485	22,595	96.20%	99.3%
2016	61-70	22,845	21,916	95.90%	97.0%
2017	62-71	22,253	21,168	95.10%	96.6%
2018	63-72	21,587	20,677	95.80%	97.7%

Note: The response rate is the number of survey subject divided by the number of respondents. The attrition rate is the number of the respondents in a year divided by the number of respondents in the previous year.

Table A2. The event study for male

Time since the partner's stroke	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
-3	-0.005	-0.245	0.002	-0.004	0.289	-0.094	0.158*	-0.064	0.240
	(0.025)	(1.011)	(0.060)	(0.024)	(3.669)	(0.091)	(0.095)	(0.043)	(0.262)
-2	-0.008	-0.353	-0.076	-0.034*	-2.027	-0.012	0.078	-0.066	-0.013
	(0.022)	(0.840)	(0.054)	(0.020)	(6.684)	(0.019)	(0.049)	(0.042)	(0.208)
-1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
0	-0.012	0.553	-0.089	0.043*	0.573	-0.000	-0.133	0.133	0.044
	(0.020)	(1.220)	(0.062)	(0.024)	(8.298)	(0.005)	(0.083)	(0.084)	(0.238)
1	0.000	-0.472	-0.017	0.069**	11.071	-0.031	-0.159	0.190*	0.211
	(0.023)	(1.055)	(0.066)	(0.030)	(8.581)	(0.024)	(0.102)	(0.104)	(0.240)
2	0.007	0.689	-0.012	0.025	-1.069	0.030	-0.145	0.115	0.121
	(0.026)	(1.097)	(0.072)	(0.032)	(7.742)	(0.041)	(0.104)	(0.112)	(0.271)
3	0.021	0.779	-0.050	0.045	-0.666	-0.001	-0.114	0.115	0.365
	(0.029)	(1.449)	(0.073)	(0.029)	(7.596)	(0.015)	(0.082)	(0.082)	(0.306)
Observations	30470	23768	27646	29209	2656	2468	2468	2468	29687

Note: Covariates are respondent's age, respondent's age squared, partner's age, and partner's age squared. Individual fixed effect and time fixed effect are also included. The omitted category is 1 year prior to a partner's stroke.

*p < 0.1 **p < 0.05 ***p < 0.01

Table A3. The event study for female

Time since the partner's stroke	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
-3	-0.005	0.985	-0.010	-0.010	1.993	-0.077	0.074	0.003	0.060
	(0.017)	(0.654)	(0.048)	(0.021)	(7.917)	(0.048)	(0.053)	(0.021)	(0.184)
-2	-0.016	-0.375	0.020	-0.027	-4.155	-0.059	0.065	-0.006	0.041
	(0.013)	(0.616)	(0.044)	(0.018)	(7.540)	(0.041)	(0.053)	(0.022)	(0.185)
-1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
0	0.006	0.131	-0.101***	0.039**	1.884	0.091**	-0.148**	0.057	0.463***
	(0.014)	(0.638)	(0.035)	(0.019)	(4.683)	(0.038)	(0.061)	(0.044)	(0.163)
1	-0.002	1.109	-0.124***	0.033*	1.690	0.084**	-0.150**	0.066	0.478**
	(0.017)	(0.908)	(0.044)	(0.020)	(5.098)	(0.041)	(0.076)	(0.057)	(0.186)
2	-0.010	-0.077	-0.076*	0.073***	2.582	0.067**	-0.159**	0.091*	0.451**
	(0.020)	(0.849)	(0.045)	(0.022)	(5.569)	(0.032)	(0.063)	(0.051)	(0.191)
3	-0.007	1.352	-0.036	0.117***	2.000	0.107**	-0.190***	0.083	0.334
	(0.023)	(0.996)	(0.048)	(0.025)	(6.314)	(0.045)	(0.071)	(0.051)	(0.213)
Observations	34922	19553	31355	33377	4741	4273	4273	4273	34205

Note: Covariates are respondent's age, respondent's age squared, partner's age, and partner's age squared. Individual fixed effect and time fixed effect are also included. The omitted category is 1 year prior to a partner's stroke.
*p < 0.1 **p < 0.05 ***p < 0.01

Table A4. The decomposition of effect of partner's stroke

	(1)	(2)	(3)	(4)	(5)
	Employment	Hours worked	Informal care provision	Hours of care	K6-score
Panel A: Males (Wives have a stroke)					
Partner's stroke	0.000	0.000	-0.029	-0.448	0.000
Panel B: Females (Husbands have a stroke)					
Partner's stroke	0.000	-0.136	0.000	0.000	-0.024

Note: Columns (1)-(5) report weights for employment, hours worked informal care provision, hours of care, and K6-score, respectively. Covariates are respondent's age, respondent's age squared, partner's age, and partner's age squared.

Table A5: The effect of placebo partner's stroke

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to spouse only	(7) Informal care to non-spouse	(8) Informal care to spouse and non-spouse	(9) K6-score
Panel A: Males (Wives have a stroke)									
Partner's stroke	0.002	-0.038	0.015	-0.012	3.991	-0.006*	0.011*	-0.005	0.025
	(0.010)	(0.441)	(0.019)	(0.008)	(2.672)	(0.004)	(0.006)	(0.003)	(0.007)
Observations	34447	26888	31414	33110	2895	2601	2601	2601	33470
Panel B: Females (Husbands have a stroke)									
Partner's stroke	-0.002	-0.176	0.008	-0.006	-0.513	0.006	-0.01	0.003	0.001
	(0.010)	(0.357)	(0.020)	(0.010)	(2.449)	(0.010)	(0.010)	(0.003)	(0.006)
Observations	33678	18487	30474	32299	4606	4062	4062	4062	32720

Note: Standard errors in parentheses. Standard errors are clustered by individual level. The original control group was divided in half, and a placebo partner's stroke was assigned to one of the halves. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision.

*p < 0.1 **p < 0.05 ***p < 0.01

Table A6: The effect of partner's stroke after excluding those who experienced the parental shock

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to spouse only	(7) Informal care to non-spouse	(8) Informal care to spouse and non-spouse	(9) K6-score
Males (Wives have a stroke)									
Partner's stroke	0.012	0.473	-0.027	0.057***	7.521	0.021	-0.149	0.128	0.131
	(0.020)	(0.861)	(0.039)	(0.019)	(5.855)	(0.026)	(0.098)	(0.104)	(0.148)
Observations	34640	26954	31605	33265	2890	2618	2618	2618	33800
Females (Husbands have a stroke)									
Partner's stroke	0.007	0.348	-0.082***	0.053***	4.810	0.081**	-0.190**	0.108**	0.369***
	(0.016)	(0.568)	(0.030)	(0.016)	(5.775)	(0.034)	(0.075)	(0.055)	(0.127)
Observations	35391	19342	31983	33855	4704	4179	4179	4179	34642

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. The couple's income includes a pension.

*p < 0.1 **p < 0.05 ***p < 0.01

Table A7: The effect of partner's stroke using the multiple imputation

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to spouse only	(7) Informal care to non-spouse	(8) Informal care to spouse and non-spouse	(9) K6-score
Panel A: Males (Wives have a stroke)									
Partner's stroke	0.011	0.254	-0.016	0.052***	6.728	0.020	-0.144	0.124	0.076
	(0.020)	(0.753)	(0.037)	(0.020)	(5.741)	(0.025)	(0.094)	(0.101)	(0.151)
Observations	37494	37494	37494	37494	3061	2765	2765	2765	37494
Panel B: Females (Husbands have a stroke)									
Partner's stroke	0.008	0.200	-0.061**	0.050***	4.168	0.075**	-0.176**	0.102*	0.354***
	(0.016)	(0.578)	(0.029)	(0.015)	(5.421)	(0.033)	(0.071)	(0.052)	(0.121)
Observations	37836	37836	37836	37836	4950	4392	4392	4392	37836

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. The couple's income includes a pension.

*p < 0.1 **p < 0.05 ***p < 0.01

Table A8: The comparing between the sample including missing values and the sample excluding missing values

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to spouse only	(7) Informal care to non-spouse	(8) Informal care to spouse and non-spouse	(9) K6-score
Panel A: Males (Wives have a stroke)									
Partner's stroke	0.013	0.385	-0.025	0.051***	6.728	0.020	-0.144	0.124	0.095
	(0.020)	(0.857)	(0.039)	(0.020)	(5.741)	(0.025)	(0.094)	(0.101)	(0.147)
Observations	35906	28025	32727	34480	3061	2765	2765	2765	35038
Missing values	All	All	All	All	All	All	All	All	All
Panel B: Males (Wives have a stroke)									
Partner's stroke	-0.021	2.231	-0.078	0.026	4.607	0.051	0.004	-0.054	0.048
	(0.036)	(1.400)	(0.061)	(0.033)	(6.085)	(0.051)	(0.004)	(0.049)	(0.169)
Observations	15428	12042	14421	15428	1507	1437	1437	1437	15428
Missing values	No	No	No	No	No	No	No	No	No

Panel C: Females (Husband have a stroke)									
Partner's stroke	0.008	0.377	-0.071**	0.056***	4.168	0.075**	-0.176**	0.102*	0.365***
	(0.015)	(0.556)	(0.030)	(0.015)	(5.421)	(0.033)	(0.071)	(0.052)	(0.124)
Observations	36417	19947	32905	34859	4950	4392	4392	4392	35657
Missing values	All	All	All	All	All	All	All	All	All
Panel D: Females (Husband have a stroke)									
Partner's stroke	-0.016	0.626	-0.000	0.049**	14.967*	0.125**	-0.294**	0.169**	0.053
	(0.022)	(0.824)	(0.045)	(0.025)	(8.520)	(0.061)	(0.119)	(0.081)	(0.180)
Observations	16023	8533	14800	16023	2599	2500	2500	2500	16023
Missing values	No	No	No	No	No	No	No	No	No

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. The couple's income includes a pension.

*p < 0.1 **p < 0.05 ***p < 0.01

Table A9: The effect of partner's stoke using multiple imputation

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care(conditional on informal caregiving)	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
Panel A: Males (Wives have a stroke)									
Partner's stroke	0.006	0.261	-0.007	0.061***	3.211	0.018	-0.189*	0.171	0.070
	(0.021)	(0.852)	(0.038)	(0.019)	(6.350)	(0.020)	(0.106)	(0.106)	(0.164)
Observations	31769	31769	31769	31769	2656	2468	2468	2468	31769
Panel B: Females (Husbands have a stroke)									
treat_post=1	0.004	0.312	-0.086***	0.063***	2.284	0.120***	-0.192***	0.072	0.403***
	(0.016)	(0.560)	(0.028)	(0.016)	(4.987)	(0.039)	(0.066)	(0.044)	(0.118)
Observations	36312	36312	36312	36312	4741	4273	4273	4273	36312

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. Couple's income includes a pension.
*p < 0.1 **p < 0.05 ***p < 0.01

Table A10: The checking covariates for males

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
Panel A									
Partner's stoke	0.005	0.491	-0.020	0.059***	3.486	0.018	-0.189*	0.171	0.103
	(0.021)	(0.925)	(0.040)	(0.020)	(6.328)	(0.020)	(0.106)	(0.106)	(0.158)
Observations	30470	23768	27646	29209	2656	2468	2468	2468	29687
Age squared	NO	NO	NO	NO	NO	NO	NO	NO	NO
Age cubuc	NO	NO	NO	NO	NO	NO	NO	NO	NO
Panel B									
Partner's stoke	0.007	0.597	-0.027	0.060***	3.111	0.018	-0.189*	0.172	0.103

	(0.021)	(0.921)	(0.040)	(0.020)	(6.341)	(0.020)	(0.106)	(0.106)	(0.158)
Observations	30470	23768	27646	29209	2656	2468	2468	2468	29687
Age squared	YES	YES	YES	YES	YES	YES	YES	YES	YES
Age cubuc	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. The couple's income includes a pension.

*p < 0.1 **p < 0.05 ***p < 0.01

Abbreviation: sq, square. cu, cubic.

Table A 11: The checking covariates for females

	(1) Employment	(2) Hours worked	(3) Log(couple's income with pension)	(4) Informal care provision	(5) Hours of care	(6) Informal care to partner only	(7) Informal care to non-partner only	(8) Informal care to partner and non-partner	(9) K6-score
Panel A									
Partner's stoke	0.003	0.346	-0.092***	0.070***	2.663	0.121***	-0.192***	0.071	0.410***
	(0.015)	(0.540)	(0.028)	(0.016)	(5.098)	(0.039)	(0.067)	(0.044)	(0.121)
Observations	34922	19553	31355	33377	4741	4273	4273	4273	34205
Age squared	NO	NO	NO	NO	NO	NO	NO	NO	NO
Age cubuc	NO	NO	NO	NO	NO	NO	NO	NO	NO
Panel B									
Partner's stoke	0.005	0.421	-0.103***	0.069***	2.281	0.119***	-0.189***	0.070	0.414***
	(0.015)	(0.537)	(0.028)	(0.016)	(5.003)	(0.039)	(0.066)	(0.044)	(0.121)
Observations	34922	19553	31355	33377	4741	4273	4273	4273	34205
Age squared	YES	YES	YES	YES	YES	YES	YES	YES	YES
Age cubuc	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Standard errors in parentheses. Standard errors are clustered by individual level. Covariates are age, age squared, partner's age, partner's age squared, individual fixed effect, and year fixed effect. Informal care to spouse only, informal care to non-spouse, and informal care to spouse and non-spouse is conditional on informal care provision. The couple's income includes a pension.

*p < 0.1 **p < 0.05 ***p < 0.01

Abbreviation: sq, square. cu, cubic.