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Spousal Caregiving and Incident Hypertension

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Abstract

Background: Caring for one's spouse has been associated with poor health, including risk of cardiovascular disease onset and mortality. However, few studies have assessed the risk of incident hypertension associated with spousal caregiving. This paper investigates this association in a large, nationally representative sample of American older adults.

Methods: Married, hypertension-free, Health and Retirement Study (HRS) respondents aged 50+ in 2000, (n=5,708) were followed up to 8 years (1,708 new self-reported hypertension diagnoses). Current caregiving exposure was defined as assisting a spouse with instrumental or basic activities of daily living (I/ADLs) 14+ hours/week; we define providing ≥14 hours/week of care at two consecutive biennial surveys as "long-term caregiving." We used inverse probability weighted discrete-time hazard models with time-updated exposure and covariates to estimate effects of current and long-term caregiving on incident hypertension. We tested for effect modification by race, gender, and recipient memory illness. Sensitivity analyses restricted to respondents whose spouses had care needs.

Results: After adjusting for demographic, socioeconomic and health factors, (including risk behaviors, comorbid conditions, and self-rated health), current caregiving significantly predicted hypertension incidence (RR=1.36, 95% CI: 1.01, 1.83). For long-term caregivers, there was significant evidence of risk of hypertension onset associated with caregiving (RR=2.29, 95% CI: 1.17, 4.49). The risk of hypertension onset associated with both current and long-term caregiving did not vary by race, gender, or recipient memory illness diagnosis. Sensitivity analyses supported the primary findings.

Conclusions: Providing I/ADL care to a spouse significantly predicted hypertension onset in a nationally-representative sample of US adults.

Keywords

spouse caregivers; caregiver; spouses; hypertension; longitudinal study; incidence

Introduction

Providing care to an ill-family member, particularly a spouse, is socially normative and very common.[1] Although providing care to a loved one can be a positive and rewarding experience,[2] there is overwhelming evidence that caregiving is also frequently financially, socially and physically taxing.[1] Caregiving has been associated with a variety of deleterious health behaviors,[3,4] biomarkers,[5-7] and outcomes,[8,9] most notably a significant 63% excess

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mortality risk among stressed caregivers.[10] Spousal caregiving is also associated with cardiovascular disease[11]: caregivers in the Nurses' Health Study had an almost two-fold elevation in risk of coronary heart disease[8,9] and in recent work,[12] we found evidence of spousal caregiving associated with a significant elevation in risk of cardiovascular disease in a nationally representative sample of US adults.

Hypertension may help explain this connection between caregiving and CVD but its association with caregiving remains under-studied. A few studies estimate cross-sectional associations of elevated blood pressure in caregivers.[13-15] Shaw, et al. in the only longitudinal studies we know of to date, found higher levels of ADL care were associated with elevation in diastolic blood pressure[16] and caregivers were at increased risk for hypertension onset[17] compared to non-caregivers over 5+ years of follow-up. However, these studies were conducted in a sample of only Alzheimer's caregivers and its results may not be generalizable to the general population. Furthermore, prior research has also faced a number of methodological limitations, because spousal health and social resources are likely to influence who becomes a caregiver.

In this study, we use the Health and Retirement Study (HRS), a nationally representative cohort study of Americans aged 50+, to estimate the risk of onset of hypertension associated with caring for one's spouse and whether this risk varies by gender, race, depression, and recipient's cognitive status.

Methods

Study Population

HRS is a longitudinal survey of a national sample of US adults aged 50+ years and their spouses. Details of the study are provided elsewhere.[18,19] Enrollments occurred in 1992, 1993, or 1998 (based on respondent and spouse's birth year) with biennial interviews (or proxy interviews for decedent participants) through 2008. Retention rates through 2008 were above 80%. HRS was approved by the University of Michigan Health Sciences Human Subjects Committee and these analyses were determined exempt by Harvard School of Public Health Office of Human Research Administration.

We included married HRS participants born 1900 to 1947 and interviewed in 2000; this was the first year caregiving assessments were consistently worded and asked with respect to spouses.

HRS included 11,474 respondents, or 5,737 couples, who were age-eligible and married/partnered with both spouses in the study in 2000. Additional exclusions were: 5,640 (49.2%) respondents who reported a prior diagnosis of hypertension in 2000, and 126 (1.1%) respondents who were missing information on basic demographic factors (age, sex, race, and ethnicity). The primary analyses were based on 5,708 individuals.

Spousal Caregiving

Spousal caregiving demand was measured at each survey administration between 2000–2006. It was assessed by the care recipient's report of how much assistance they received with activities of daily living (ADLs; including help with getting across a room, dressing, bathing, eating, getting in and out of bed, and using the toilet) and instrumental activities of daily living (IADLs; prepare meals, shop for groceries, make telephone calls, take medications) in the last month. First, respondents were asked if they needed help with ADLs or IADLs; respondents were then asked to list everyone from whom they received care; and finally, how often they received care from each caregiver. From this, we identified spouses

who were caregivers and the hours of care they provided; we use units of hours of care per week.

The measure of spousal caregiving used in this study was a dichotomized indicator of providing 14 or more hours of care per week. We chose 14 hours as a threshold to be consistent with previous studies of caregiving using these data.[20,21] As previously reported,[12] we found this cut-point had construct validity: respondents who provided more than 14 hours/week of spousal care were significantly more likely to report to report their spouse "made too many demands" of them than either those who provided <14 hours/week or no care at all (details available from authors).

Any respondent who was classed as a caregiver (14+ hours/week) during both of the most recent two prior interview waves (separated by approximately two years) was classified as a "long-term caregiver."

Incident Hypertension

Onset of hypertension between 2000 and 2008 was assessed biennially by the caregiver's self-report of a doctor's diagnosis of hypertension or high blood pressure. For participants who had died and those unavailable for a direct interview, interviews were conducted with proxy informants, typically spouses. The outcome variable is thus an indicator (yes/no) of the respondent's report. In the 2006 survey waves, HRS measured blood pressure directly in a sub-sample of the total cohort. In other analyses,[22] we have documented that in this older sample, self-reported hypertension has a high sensitivity (>83%) for measured hypertension defined according to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure[23].

Covariates

We consider four groups of covariates that potentially influence both caregiving risk and hypertension onset and are thus plausible confounders: demographic, socioeconomic status (SES), caregiver and care recipient health risk factors.. Demographic characteristics consisted of baseline age and age-squared, race (white/non-white), Hispanic ethnicity, and gender (male/female). SES variables included years of education and household income at baseline. Caregiver health risk factors included current smoking status; body mass index in kg/m^2; vigorous physical activity (dichotomized at 3+ times per week); alcohol use in the last 2 weeks (any/none); and self-reported diagnoses of diabetes. Care recipient's health risk factors consisted of a self-report of a doctor's diagnosis of a memory-related problem, a summary of total number of other self-reported conditions (high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric problems, and arthritis) calculated in the RAND Corporation version of the HRS dataset[24], and self-rated health (excellent/very good/good v. fair/poor). Item missingness was quite rare (<3% for all variables) and therefore we retained all observations with missing variables using a missing indicator in the weighting models.

Many of these covariates potentially mediate the pathway between caregiving and risk of hypertension—that is, they may be affected by caregiving (e.g., health risk factors) and may influence hypertension onset. We therefore used the values of all caregiver and care recipient health covariates reported in the wave *prior* to the caregiving assessment (e.g. 1998 covariates to control for caregiving demands in 2000) in weighting models to adjust for confounding (detailed below). All demographic and SES covariates were time-constant and used the values reported in 2000 (baseline).

Methods of Statistical Analysis

Discrete-time hazard models were used to estimate elevation in hazard of hypertension associated with high caregiving. HRS respondents contributed person-time to the models so long as they remained alive and married and had not yet reported a diagnosis of hypertension; persons are censored after first reported incidence of hypertension. However, to avoid conflating caregiving strain with bereavement effects,[25] participants were censored after dissolution of the marriage by widowhood or divorce. Crude and adjusted hazard ratios (HRs) are presented. Moreover, the groups of covariates defined above were added to the models sequentially, consistent with the likely temporal ordering of the confounders. For current caregiving, 2000 was the first exposure year; for long-term caregiving, 2002 was the first exposure year, since this exposure included, by definition, a respondent's 2000 and 2002 caregiving behavior. These analyses were completed using SAS 9.2 with PROC GENMOD with a logit link, robust variance estimates, and weights as described below. The crude incidence of hypertension in this sample was approximately 5/100 person years, and so the odds ratio closely approximates the risk ratio; for clarity, we therefore refer to the risk ratio or relative risk throughout the results.

Inverse probability weights (IPWs) were employed to adjust for time-varying confounding.[26,27] Using IPWs allows us to adjust for variables likely to be both mediators and confounders; for example, a health behavior like smoking may be affected by high caregiving and may also compromise a spouse's ability to provide care. All time-varying covariates were lagged by one survey wave (behind the exposure definition) to avoid bias from adjusting for mediators. There are three IPWs calculated, one for "treatment" (caregiving), a second for study drop-out and a third weight for survival. Thus, each observation was weighted by the product of: the inverse of the probability that individual was alive at the exposure wave; the inverse of the probability that individual (conditional on having survived) participated in the study at both exposure and outcome waves; and the inverse of the probability that the individual received the treatment he or she actually received. Stabilized weights were calculated using previously described protocols.[27] The weights were truncated at the value of 99th percentile to improve the weights' skewed distribution and reduce influence of a small number of outliers.

To test for possible differences in the effects of caregiving across subgroups defined by sex, race, elevation in depressive symptoms for the caregiver and care recipient cognitive status, both the stratified effect estimates and a test of interaction in the pooled model are presented. The interaction tests are on the log odds scale and therefore test for deviation from multiplicative effects.

Although much of the extant caregiving literature compares caregivers to non-caregivers, others have noted[28] a better construction of the comparison for a caregiver would be a "potential" caregiver, or a non-caregiver whose spouse has care needs. To test this idea in our sample, we conducted sensitivity analyses of our final model in a sample restricted to only spousal dyads where care needs were present at the exposure wave.

HRS used a multistage, clustered sample design. The HRS sampling weights were applied to make the population representative of the 2000 US population aged 50+ years. No difference between models that account for clustering at the household level and those that did not was found; thus, the presented models do not account for clustering.

Results

In this sample, there were 1,708 reports of new hypertension diagnoses during 31,194 person-years of follow-up (Table 1). Over all person-years of follow-up, 3.6% (person-

years=562) were classified as current caregivers, and 0.3% were long-term caregivers (person-years=101). Sample characteristics of the full sample by gender are included in Table 1.

We also present baseline sample characteristics of the full and sensitivity analysis sample (respondents whose spouses had care needs) by incident hypertension status over follow-up in Table 2.

Current high caregiving was associated with a 59% excess relative risk of hypertension diagnosis in a crude/unadjusted model (Table 3; RR=1.59, 95% CI: 1.21, 2.08). When adjusted for demographic and socioeconomic factors and recipient cognitive status and inverse probability weighted for both caregiver and recipient health status, current high caregiving was associated with a 36% excess relative risk of hypertension incidence (RR=1.36, 95% CI: 1.01, 1.83). In a crude model, long-term high caregiving was associated with nearly a two-fold increase in relative risk of hypertension onset in a crude model (RR=1.91, 95% CI: 1.08-3.35). In the fully adjusted model, long-term high caregiving was associated with more than doubling of the relative risk of new hypertension diagnosis (RR=2.29, 95% CI: 1.17, 4.49).

Interaction terms included in the models found no evidence that the relative risk of hypertension onset associated with caregiving varied significantly by caregiver race or gender or care recipient memory for either current or long-term caregivers (Table 4). However, some sub-strata did have a significant elevation in relative risk of hypertension onset. For example, female current caregivers, white current caregivers, and current caregivers of recipient spouses without memory illnesses had significantly elevated relative risk of hypertension onset compared to the non-caregiving reference group of that stratum. Long-term caregivers of recipient spouses without memory illnesses had significant elevated relative risk of hypertension onset. Also, among men, long-term caregivers had a 3.5-fold excess risk of hypertension (RR=3.48, 95% CI: 1.56, 7.80).

In the sensitivity analyses restricted only to couples with care needs at the exposure wave, there were 256 new diagnoses of hypertension and 3,948 person years; among couples with a care recipient with long-term needs, there were 162 incidents of hypertension onset in 2,628 person-years. The estimated relative risk of onset of hypertension associated with current caregiving was lower (RR=1.14, 95%CI: 0.77-1.68) and the CI included both the null and our estimate from the primary analyses (RR=1.36) among current caregivers. In the sample restricted to couples with care needs, the estimated risk ratio of hypertension onset associated with long-term caregiving was significant (RR=2.14, 95% CI: 1.05-4.36) and similar to the point estimate from our primary analysis (results available from authors).

Discussion

In a nationally representative sample of Americans aged 50+ years, providing care for one's spouse ≥14 hours/week predicted onset of hypertension after controlling for a number of covariates, including demographic, socioeconomic and care recipient and care provider health-related factors. Long-term caregiving was also associated with risk of hypertension onset.

Extant evidence suggests caregiving may operate through a stress pathway to manifest in physical health outcomes[29]. Perceived stress prompts both physiological (e.g., allostatic load) and behavioral (e.g., adaptation) responses. One behavioral response to perceived stress may be a psychological process; for example, some evidence suggests depression mediates the pathway between caregiving and cardiovascular disease onset.[30] Caregivers also have elevated levels of many key physiological markers of stress and cardiovascular

risk, such as higher allostatic load[31] and inflammatory markers,[5,32] or decreased immune function.[7,33] In addition, duration of caregiving has been shown to be an important factor in this process; years of Alzheimer's care to a spouse was significantly associated with lower reactive hyperemia-induced flow-mediated dilation[34]. Our study finds evidence that chronicity of caregiving also affects risk of hypertension onset. These results showed a significant increased risk of hypertension associated with caregiving, which may be a mechanism by which caregiving is associated with decreased cardiovascular health.

Study Limitations

Despite the advantages of HRS for addressing our research questions, there are some important limitations of these data and analyses. Self-reported outcome events were subject to misclassification and have been shown to be imperfectly correlated with clinically verified outcomes in other studies.[35] However, other studies have found high sensitivity and specificity associated with self-reported hypertension,[36] and the self-report of hypertension status in HRS has been shown to have a high sensitivity[22]. Caregivers may also be better connected to the health care system than non-caregivers through having an ill-spouse, which could lead to higher rates of hypertension diagnosis. However, the evidence of caregiver health seeking behavior is mixed[37] and our sensitivity analysis comparing caregivers to others whose spouses have care needs help address this and suggest our results are robust to this threat.

The caregiving exposure was assessed by report of the recipient rather than the provider, an unusual approach with both advantages and disadvantages. Care recipients may not be aware of the amount of time providers spend on care, especially if the recipient is herself facing serious health difficulties. This misclassification may attenuate the association between caregiving and hypertension. However, this measurement of the exposure avoided same-source bias for reporting of the exposure and the outcome, a key advantage which may offset the potential misclassification.

Although HRS is among the largest longitudinal studies of older US adults, it is underpowered to estimate many of the stratified analyses of interest. For example, CIs in many cases were relatively wide; only a small number of events were observed in several sub-strata (e.g., racial/ethnic minorities). However, further meta-analyses on these topics may be valuable when more studies become available.

Our findings have several methodological advantages and build importantly on prior research in spite of these limitations. First, this study uses a longitudinal design. Many caregiving studies have been limited by a cross-sectional measure of caregiving. We used inverse probability weights to model selection into caregiving roles without biasing the effect estimates by controlling mediating pathways. Using a large, nationally representative dataset offers more generalizable evidence about the health risks associated with caregiving in a diverse, community-dwelling population offers. This dataset also includes rich information on socioeconomic and other factors that many prior studies have not been able to consider fully. For example, HRS collects information on a respondent and his/her spouse, which allowed this study to adjust for care recipient's health characteristics, a challenge for much prior caregiving research.

Comparisons to Prior Literature

This study is consistent with a large body of research that identifies caregiving as an independent risk factor for a variety of negative health outcomes. For example, other studies have established caregiving for an ill or disabled adult as a risk factor for onset of

depression,[38] cognitive decline,[39] coronary heart disease[9], cardiovascular disease[12], and mortality[10].

This is one of the first studies of risk of hypertension onset associated with caregiving, certainly the first in a nationally representative sample of its size. Our results are consistent with the small literature on this topic, including cross-sectional and other smaller observational studies that find elevated blood pressure among caregivers compared to non-caregivers.[15,40,41] One such study found caregivers had a significant increase in systolic blood pressure (SBP) upon returning home to the care recipient compared to non-caregivers decline in SBP upon leaving work and returning home[41]. Shaw and colleagues[17] compared Alzheimer's caregivers to non-caregiving controls. Their sample was slightly older than HRS (70 v. 65) and better educated (mean years of education of caregivers: 14.2 v. 12.6 in the total HRS sample). They found caregivers were at a significant 47% increased risk of hypertension risk compared to non-caregiving controls at two years of follow-up. Our results are fairly consistent with these findings (RR=1.36) after adjusting for a more robust set of confounders and using a time-updated exposure.

Sensitivity Analyses

Restricting the sample to couples where one spouse has care needs addresses additional potential confounders, such as perceived stress about the spouses care needs, of comparing caregivers to non-caregivers. The long term caregiving effect estimate was statistically significant and similar to the effect estimate found in the full data set. It may be that using a longer duration of caregiving is a more robust, homogeneous exposure than shorter duration of caregiving exposure (e.g., current caregiving) which includes a more diverse set of care needs. Although these estimates are still merely associations, they suggest our primary analyses are robust and may offer a closer approximation of a causal effect of caregiving.

Caregiving, while socially normative, poses unique and often overlooked health risks. Care needs typically emerge in middle and older-adulthood, often at the same time as risk of hypertension onset is increasing dramatically[42]. Future studies should investigate factors that may exacerbate or remediate the long term health effects of caregiving. As there is evidence that caregivers have difficulty managing their own medications in light of caregiving demands[15], future studies should also consider the extent to which caregiving is associated with hypertension management. Many US adults provide care for their spouses; we found that providing spousal care was associated with a modest, significant elevation in risk of hypertension onset. Further research is needed to explicate mechanisms of resilience and support[43] that may ameliorate the detrimental health-related risks of caregiving.

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Table 1

Sample Characteristics Among Study Participants: Health and Retirement Study, United States, 2000

Characteristics	Men (N=2,956) No. (%)	Women (N=2,752) No. (%)
Years of follow-up, mean (SD)	5.0 (1.1)	5.0 (1.1)
Total person-years of follow-up	16,178	14,896
Provided any care during follow-up	651 (8.2)	683 (9.3)
Incident events	841	867
Crude rate/1000 person-years	52.0	58.2
Age, mean (SD), years	66.3 (8.9)	63.5 (7.9)
Non-White Race	110 (3.7)	94 (3.4)
Hispanic Ethnicity	228 (7.7)	195 (7.1)
Education, mean (SD), years	12.55 (3.4)	12.67 (2.8)
Household income, median (IQR), $000	47.39 (54.1)	49.03 (53.2)
Vigorous Activity	1735 (58.9)	1404 (51.0)
Current drinking	1208 (40.9)	812 (29.5)
Current smoker	523 (17.7)	398 (14.5)
BMI, mean (SD), k/m^2	26.7 (3.9)	25.8 (4.8)
Diabetic History	272 (9.2)	137 (4.9)
Spouse with cognitive limitation	113 (3.8)	108 (3.9)
Spouse with fair/poor self-rated health	600 (20.3)	595 (21.6)
Spouse's number of health conditions, mean (SD)	1.3 (1.2)	1.4 (1.2)

Note: CES-D = Centers for Epidemiologic Studies Depression scale. SD indicates standard deviation. IQR indicates inter-quartile range. BMI indicates Body Mass Index (kg/m2).

Table 2

Study Participant Characteristics by Incident Hypertensive Status over Follow-up for the Full Sample and the Sub-Sample of Those with Spouses who Had Care Needs at Exposure, 2000

	Full Sample		Sample of Respondents whose Spouses Had Care Needs During Follow-up	
Characteristics	**Incident Hypertensive (N=1,708) No. (%)**	**Normotensive (N=4,000) No. (%)**	**Incident Hypertensive (N=256) No. (%)**	**Normotensive (N=986) No. (%)**
Total person-years of follow-up	7,538	23,536	396	1,578
Provided any care during follow-up	332 (8.8)	1017 (8.6)	102 (39.8)	280 (28.4)
Age, mean (SD), years	64.2 (7.8)	65.2 (8.9)	66.5 (8.8)	66.9 (9.4)
Female	867 (50.1)	1885 (47.1)	125 (48.8)	519 (52.6)
Non-White Race	68 (3.9)	136 (3.4)	14 (5.5)	41 (4.2)
Hispanic Ethnicity	149 (8.7)	274 (6.9)	33 (12.9)	90 (9.1)
Education, mean (SD), years	12.5 (3.1)	12.7 (3.1)	11.4 (3.4)	12.1 (3.4)
Household income, median (IQR), $000	48.76 (49)	47.72 (56.5)	31.37 (35.1)	36.19 (44.3)
Vigorous Activity	937 (54.9)	2202 (55.1)	125 (48.83)	478 (48.5)
Current drinking	603 (35.3)	1417 (35.4)	62 (24.22)	280 (28.4)
Current smoker	289 (16.9)	632 (15.8)	50 (19.5)	183 (18.6)
BMI, mean (SD), k/m^2	26.9 (4.5)	25.9 (4.3)	27.2 (4.7)	26.2 (4.5)
Diabetic History	148 (8.7)	261 (6.5)	26 (10.2)	72 (7.3)
Spouse with cognitive limitation	39 (2.28)	182 (4.55)	13 (5.1)	61 (6.2)
Spouse with fair/poor self-rated health	363 (21.3)	832 (20.8)	135 (52.7)	432 (43.8)
Spouse's number of health conditions, mean (SD)	1.4 (1.2)	1.3 (1.2)	2.2 (1.5)	1.9 (1.3)

Note: CES-D = Centers for Epidemiologic Studies Depression scale. SD indicates standard deviation. IQR indicates inter-quartile range. BMI indicates Body Mass Index (kg/m2).

Table 3

Risk Ratios for First Incident Hypertension for High Current (≥14 hours per week) and Long-term (≥14 hours per week over two years) Caregiving Status: Health and Retirement Study, United States, 2000-2008

	Current Caregiving		Long-term Caregiving	
	Risk Ratio (95% CI)	**P value**	**Risk Ratio (95% CI)**	**P value**
Unadjusted	1.59 (1.21 - 2.08)	<0.001	1.91 (1.09 - 3.35)	0.02
Demographics Adjusted *	1.54 (1.18 - 2.02)	<0.01	1.80 (1.03 - 3.13)	0.04
SES Adjusted †	1.50 (1.15 - 1.97)	<0.01	1.74 (0.99 - 3.03)	0.05
Caregiver Health Status Weighted ‡	1.46 (1.11 - 1.92)	<0.01	1.79 (1.03 - 3.12)	0.04
Recipient Health Status Weighted §	1.36 (1.01 - 1.83)	0.045	2.29 (1.17 - 4.49)	0.02

Each model used all 5,708 eligible HRS sample members. The current caregiving models assess the risk associated with ≥14 hours per week in a given survey waves for hypertension outcome at the next wave compared to those who provided <14 hours per week; they had 1,708 events and 31,074 person-years of follow-up. The long-term caregiving models assess the risk associated with ≥14 hours per week in two consecutive survey waves for hypertension outcome at the next wave; they had 1,127 events and 20,496 person-years of follow-up. CI: Confidence Interval

* Adjusted for demographic covariates: race, Hispanic ethnicity, baseline age and age-squared, and gender

† Adjusted for demographic, socioeconomic status (SES): own education, baseline per capita income

‡ Adjusted for demographic and SES and inverse probability weighted for health risk factors: vigorous physical activity, current drinking, current smoking, body mass index, self-reported history of diabetes

§ Adjusted for demographic and SES and inverse probability weighted for health risk factors, and recipient health status: self-reported doctor's diagnosis of memory-related illness, summary score of history of health conditions, and self-rated health.

Table 4

Risk Ratios (RR) for First Incident Hypertension for High Current (≥14 hours per week) and Long-term (≥14 hours per week over two years) Caregiving Status Stratified by Gender, Race, and Care Recipient's Cognitive Status: Health and Retirement Study, United States, 2000-2008

	Current Caregiving			Long-term Caregiving		
	Events/ Person-Years	**RR (95% CI)**	***P* for interaction**	**Events/ Person-Years**	**RR (95% CI)**	***P* for interaction**
Race			0.82			0.54
White	1,505/28,302	1.41 (1.02 - 1.95)		998/18,746	2.09 (0.94 - 4.65)	
Non-white	203/2,772	0.92 (0.41 - 2.07)		129/1,750	2.66 (0.64 - 11.03)	
Gender			0.12			0.15
Men	841/16,178	1.07 (0.68 - 1.68)		564/10,736	3.48 (1.56 - 7.80)	
Women	867/14,896	1.64 (1.10 - 2.46)		563/9,660	1.24 (0.39 - 3.87)	
Recipient Memory			0.41			0.25
No memory illness	1,681/30,612	1.39(1.01 - 1.90)		1,107/20,152	2.54 (1.20 - 5.35)	
Memory illness	27/462	1.33 (0.54 - 3.28)		20/304	2.32 (0.61 - 8.86)	

Each model used all 5,708 eligible HRS sample members. The current caregiving models assess the risk associated with ≥14 hours per week in a given survey waves for hypertension outcome at the next wave compared to those who provided <14 hours per week; they had 1,708 events and 31,074 person-years of follow-up. The long-term caregiving models assess the risk associated with ≥14 hours per week in two consecutive survey waves for hypertension outcome at the next wave; they had 1,127 events and 20,496 person-years of follow-up. CI: Confidence Interval The reported P value reflects the test of an interaction term of the covariate by which the reported models are stratified with high caregiving (e.g., gender × caregiving) included in the regression models.

All models are adjusted for race, Hispanic ethnicity, baseline age and age-squared, and gender, own education, per capita income, and inverse probability weighted for caregiver vigorous physical activity, current drinking, current smoking, body mass index, self-reported history of diabetes, care recipient self-reported doctor's diagnosis of memory-related illness, summary score of history of health conditions, and self-rated health.