

# Medical Comorbidities of Dementia: Links to Caregivers' Emotional Difficulties and Gains

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**OBJECTIVES:** To evaluate how eight major medical comorbidities of dementia (arthritis, cancer, diabetes, heart disease, hypertension, lung disease, osteoporosis, and stroke) are associated with caregivers' perceptions of emotional caregiving difficulties and caregiving gains (ie, benefits or rewards from the care role).

**DESIGN:** Nationally representative cross-sectional surveys of community-dwelling persons living with dementia (PLWDs) and their co-resident family caregivers in the United States.

**SETTING:** The 2011 National Health and Aging Trends Study and National Study of Caregiving.

**PARTICIPANTS:** Total of 356 co-resident family caregivers of community-dwelling PLWDs.

**MEASUREMENTS:** Caregivers' sociodemographic and health characteristics, caregiving stressors, emotional caregiving difficulties, caregiving gains, and chronic health conditions of PLWDs.

**RESULTS:** Caregivers most commonly cared for a PLWD with arthritis (65.5%), followed by hypertension (64.9%), diabetes (30.1%), stroke (28.8%), osteoporosis (27.1%), heart disease (23.3%), cancer (21.5%), and lung disease (17.2%). Logistic regressions revealed that caregivers were 2.63 and 2.32 times more likely to report higher than median emotional caregiving difficulties when PLWDs had diagnoses of diabetes and osteoporosis, respectively, controlling for caregiver sex, relationship to the PLWD (spouse vs non-spouse), educational

attainment, self-rated health, and assistance with activities of daily living and medical care activities. Caregivers were also 2.10 times more likely to report lower than median caregiving gains when PLWDs had a diagnosis of osteoporosis.

**CONCLUSION:** Comorbid health conditions among PLWDs have distinct implications for caregiving outcomes. Clinical care and interventions to improve the well-being of both care dyad members should support caregivers in managing medical comorbidities of dementia. *J Am Geriatr Soc* 68:609-613, 2020.

**Key words:** Alzheimer's disease; caregiving; chronic illness; comorbidity

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Medical comorbidities are prevalent among persons living with dementia (PLWDs).<sup>1,2</sup> Relative to adults age 65 and older without dementia, PLWDs have significantly more chronic conditions and higher healthcare utilization.<sup>2</sup> PLWDs with greater medical morbidity also show increased rates of polypharmacy,<sup>1,3</sup> hospitalizations,<sup>4,5</sup> and cognitive and functional decline,<sup>6,7</sup> placing additional burden on caregivers. Yet little is known about comorbidities that are most consequential for caregiving outcomes. Drawing from a nationally representative US sample, we evaluated how PLWDs' medical comorbidities are associated with caregivers' emotional caregiving difficulties and caregiving gains (ie, benefits or rewards from caregiving).

Stress process models hold that dementia caregiving can be stressful and lead to greater emotional caregiving difficulties and lower caregiving gains.<sup>8</sup> Most studies have focused on PLWDs' difficulty with activities of daily living (ADLs; eg, bathing, dressing) and instrumental activities of daily living (IADLs; eg, preparing meals, shopping). Medical comorbidities may be an understudied source of caregiver stress that magnifies emotional difficulties and dampens gains from caregiving. Cognitive impairment limits PLWDs' capacity for self-care,<sup>9-12</sup> and so caregivers are often responsible for managing comorbid conditions.

Comorbid diabetes, heart disease, and stroke may be particularly consequential because they require daily management activities (eg, medication adherence, dietary restrictions) that pose numerous challenges. PLWDs commonly resist or lack understanding about illness management regimens due to impaired cognition and neuropsychiatric symptoms.<sup>9-11</sup> PLWDs' reduced self-management abilities raise the risk of medical nonadherence and heighten responsibility on caregivers, potentially exacerbating caregiver burden.<sup>12</sup> Diabetes,<sup>13,14</sup> heart disease,<sup>15,16</sup> and stroke<sup>14,17</sup> also predict diminished cognitive function that may accelerate dementia progression.

We examined eight major medical comorbidities of dementia (arthritis, cancer, diabetes, heart disease, hypertension, lung disease, osteoporosis, and stroke) and their independent links to emotional caregiving difficulties and caregiving gains. We predicted that PLWDs' diabetes, heart disease, and stroke are associated with greater odds of higher emotional difficulties and lower gains, controlling for caregiver sex, relationship to the PLWD, educational attainment, self-rated health, and care tasks.

## METHODS

### Sample and Procedures

The sample for this cross-sectional study included 356 family caregivers of PLWDs from the 2011 National Health and Aging Trends Study (NHATS) and National Study of Caregiving (NSOC). In accordance with the University of Michigan's policies, ethical approval was not required because we used publicly available secondary data with no individual identifiers.

Participants were eligible for NHATS if they were Medicare enrollees aged 65 and older, lived in the contiguous United States, and received health-related assistance in the last month.<sup>18</sup> NHATS participants were eligible for NSOC if they had at least one unpaid caregiver. Of the 2007 caregivers who participated in NSOC, 739 cared for a person with probable dementia based on PLWD/proxy reported diagnosis,<sup>19</sup> the AD8 criteria for diagnosis,<sup>20</sup> or scores at least 1.5 standard deviations below the mean in two or more cognitive testing domains. We selected 368 co-resident caregivers because of their greater exposure to the daily management and monitoring of medical comorbidities. Twelve were removed due to missing data, resulting in an analytic sample of 356. Most were the sole participating caregiver ( $n = 252$ ), with other households having two ( $n = 92$ ) or three ( $n = 12$ ) participating caregivers.

### Measures

#### Medical Comorbidities of Dementia

PLWDs ( $n = 149$ ) or proxies ( $n = 121$  adult children;  $n = 50$  spouses;  $n = 36$  other relatives) reported whether the PLWD had received a physician diagnosis of eight major chronic health conditions: arthritis (including osteoarthritis or rheumatoid arthritis), cancer, diabetes, heart disease (including angina or congestive heart failure), hypertension or high blood pressure, lung disease (eg, asthma, emphysema, or chronic bronchitis), osteoporosis, and stroke (1 = Yes; 0 = No).

#### Emotional Caregiving Difficulties

Caregivers reported whether helping their PLWDs is emotionally difficult (1 = Yes; 0 = No) and, if yes, the extent of these difficulties from 1 (A little difficult) to 5 (Very difficult). Caregivers with no reported difficulties were assigned a zero, and caregivers reporting difficulties received a score based on their degree (0 = No difficulty to 5 = High difficulty). Caregivers scoring above this sample's weighted median (1.10) were then categorized as having high difficulties (1 = score of 2-5; 0 = score of 0-1).

#### Caregiving Gains

Caregivers reported how much caregiving has made them more confident about their abilities; taught them to deal with difficult situations; brought them closer to the PLWD; and given them satisfaction that the PLWD receives good care from 1 (Not so much) to 3 (Very much). Items were averaged ( $\alpha = .70$ ). Caregivers scoring below this sample's weighted median (2.54) were categorized as having low gains (1 = score of 1.00-2.53; 0 = score of 2.54-3.00).

**Table 1. Caregiver Background Characteristics and Scores on Study Variables**

Variable	Caregivers	
	M	SE
Age, y	59.37	2.00
ADL/IADL assistance	5.32	.22
Medical care activities	5.87	.20
Emotional caregiving difficulties	1.80	.16
Caregiving gains	2.55	.04
		%
Sex, female		62.3
Relationship to PLWD		
Spouse		33.0
Adult child		43.5
Child-in-law		6.0
Grandchild		9.9
Sibling		1.6
Other relative		6.0
Educational attainment		
High school graduate		30.0
Some college		20.5
College graduate		13.7
Postgraduate		7.9
Self-rated health (fair or poor)		23.8
High emotional caregiving difficulties <sup>a</sup>		51.2
Low caregiving gains <sup>b</sup>		47.2

Abbreviations: ADL, activities of daily living; IADL, instrumental activities of daily living; CG, caregiver; M, mean; PLWD, person living with dementia; SE, standard error.

Note: Values are weighted to produce nationally representative estimates.

$N = 356$  family caregivers.

<sup>a</sup>Scores above the sample weighted median value.

<sup>b</sup>Scores below the sample weighted median value.

**Covariates**

Caregiver background characteristics included sex (1 = Female; 0 = Male), relationship to the PLWD (1 = Spouse; 0 = Non-spouse), and educational attainment (1 = College graduate or postgraduate; 0 = Less than a college education), and self-rated health (1 = Fair or poor; 0 = Good, very good, or excellent).

We also controlled for caregivers' assistance with ADLs, IADLs, and medical care activities. ADLs included bathing, dressing, eating, toileting, getting in/out of bed, and mobility inside and outside the home. IADLs included laundry, shopping, preparing meals, banking, and managing money. Medical care activities included keeping track of medications, giving shots/injections, managing medical tasks (eg, ostomy care, intravenous care, testing blood), assisting with exercises, helping with a special diet, wound/sore care, teeth/denture care, foot care (eg, clipping nails), ordering medication, scheduling medical appointments, speaking to medical providers, helping to change/add a health insurance or prescription drug plan, and other medical insurance matters. Summed scores were created for total ADL/IADL assistance (range = 0-12) and medical care activities (range = 0-13).

In post hoc tests, we controlled for self-reports or proxy reports on whether the PLWD had fallen in the past month (1 = Yes; 0 = No) and had received a physician diagnosis of a fracture in their hip or another bone since age 50 (1 = Yes; 0 = No). Both recent falls (27.7%) and history of fractures (35.2%) were relatively common. We also controlled for three self-rated indicators of caregivers' informal support (having friends or family to talk to about important things, help with daily activities, and help with care tasks) and three self-rated indicators of formal support (caregiver support

group, respite service to take time away from caregiving, and caregiver training) received in the past year (1 = Yes; 0 = No). Frequencies are reported in Supplementary Table S1.

**Statistical Analysis**

We used logistic regressions to evaluate how medical comorbidities were independently linked to caregivers' odds of reporting high emotional difficulties and low gains. We entered PLWDs' eight medical comorbidities as separate predictors, along with the study covariates. Descriptive analyses and logistic regression models were estimated using SAS software v.9.4 with the NSOC analytic weight and statistical procedures to account for the complex survey design.<sup>21</sup>

**RESULTS**

Table 1 presents caregiver background characteristics and scores on study variables. Caregivers most often cared for a PLWD with arthritis (65.5%), followed by hypertension (64.9%), diabetes (30.1%), stroke (28.8%), osteoporosis (27.1%), heart disease (23.3%), cancer (21.5%), and lung disease (17.2%).

As shown in Table 2, caregivers' odds of high emotional caregiving difficulties were 2.63 times higher when the PLWD had diabetes compared with no diabetes. Caregivers had 2.32 times the odds of reporting high emotional caregiving difficulties and 2.10 times the odds of reporting low caregiving gains when the PLWD had osteoporosis compared with no osteoporosis.

Post hoc tests evaluated whether the effect of osteoporosis was confounded by recent falling or history of fractures. The negative effect of osteoporosis was independent of these

**Table 2. Logistic Regressions with Medical Comorbidities Predicting High Emotional Caregiving Difficulties and Low Caregiving Gains**

Estimate	High emotional caregiving difficulties <sup>a</sup>			Low caregiving gains <sup>b</sup>		
	OR	95% CI	P value	OR	95% CI	P value
<b>PLWD medical comorbidities</b>						
Arthritis	.55	.28-1.09	.085	.63	.30-1.34	.225
Cancer	.87	.42-1.80	.705	1.33	.65-2.72	.429
Diabetes	2.63	1.14-6.11	<b>.025</b>	1.34	.55-3.23	.516
Heart disease	.59	.30-1.19	.139	.78	.43-1.39	.389
Hypertension	.84	.46-1.50	.543	1.39	.76-2.53	.284
Lung disease	1.64	.73-3.66	.223	.82	.36-1.84	.618
Osteoporosis	2.32	1.23-4.36	<b>.010</b>	2.10	1.06-4.18	<b>.035</b>
Stroke	1.12	.48-2.61	.793	.97	.51-1.86	.928
<b>CG covariates</b>						
Sex, female	2.13	1.14-4.00	<b>.019</b>	.84	.43-1.63	.596
Relationship, spouse	.87	.48-1.57	.644	.89	.48-1.66	.705
Education, college or higher	1.91	1.16-3.14	<b>.013</b>	1.97	1.06-3.69	<b>.033</b>
Self-rated health, fair or poor	1.44	.76-2.71	.258	1.31	.65-2.64	.444
ADL/IADL assistance	1.09	1.00-1.19	<b>.047</b>	.98	.88-1.10	.728
Medical care activities	1.06	.96-1.17	.223	.97	.86-1.10	.671

Abbreviations: ADL, activity of daily living; CG, caregiver; CI, confidence interval; IADL, instrumental activity of daily living; M, mean; OR, odds ratio; PLWD, person living with dementia.

Note: Degrees of freedom (df = 55) accounted for the complex survey design.

N = 356 family caregivers.

<sup>a</sup>Scores above the sample weighted median value.

<sup>b</sup>Scores below the sample weighted median value. Values in boldface designate P values < .05.

variables. We also tested the main models controlling for informal and formal caregiver support in a reduced sample of 354 caregivers with complete data. The findings did not change in these models, suggesting the associations in this study are independent of levels of caregiver support.

## DISCUSSION

This study shows that medical comorbidities of dementia have distinct implications for caregiving outcomes. In line with our hypothesis, caregivers were more likely to report high emotional difficulties if the PLWD had diabetes. Unexpectedly, caregivers also had greater odds of high emotional difficulties and low gains from caregiving when the PLWD had osteoporosis that was independent of falls and fractures. Overall, these findings suggest that clinical care and interventions to promote caregiver well-being should explicitly support the management of comorbid diabetes and osteoporosis.

Diabetes requires high daily management demands that are likely to be problematic in the context of dementia. PLWDs' compromised ability to self-manage results in a growing need for caregivers to assume responsibility that can be stressful for both parties.<sup>11,22</sup> PLWDs might view caregivers' involvement as a threat to their own autonomy and competence, whereas caregivers may feel overwhelmed. Additionally, diabetes complications such as severe hypoglycemia are more frequent among PLWDs,<sup>13,23</sup> partly due to their lower capacity for recognizing and responding to symptoms.<sup>9,11,12</sup> Family members caring for a PLWD with diabetes also perceive inadequate support from healthcare providers.<sup>9</sup> Thus many caregivers may constantly monitor and worry, leading to hypervigilance that intensifies distress. Notably, however, these caregivers were not more likely to report low gains, suggesting that PLWDs' diabetes does not hinder positive caregiving experiences.

Although diagnosis and treatment of osteoporosis is seemingly straightforward (ie, once-weekly bisphosphonates), several factors might explain its association with high emotional difficulties and low gains from caregiving. Relative to older adults without dementia, PLWDs are more likely to be hospitalized for fractures.<sup>5</sup> Fractures are common among people with osteoporosis and can lead to increased morbidity, mortality, and subsequent falls.<sup>24,25</sup> PLWDs have a heightened risk of falls resulting from cognitive impairment, and past month falls are linked to caregivers' greater emotional difficulties beyond background characteristics and care-related stressors.<sup>26</sup> PLWDs are also at higher risk of rehospitalization following fragility fractures,<sup>27</sup> indicating poorer recovery.

Of note, the associations between PLWDs' osteoporosis and caregiving outcomes remained even after controlling for available information regarding recent falls and history of fractures. Hence other unmeasured characteristics associated with osteoporosis that are complex to treat (eg, malnutrition, low muscle mass, frailty) or unmeasured factors related to osteoporosis caregiving (eg, caregivers' worries about future falls and fractures, complex medication administration) may play a key role in explaining the associations in this study. Another reason osteoporosis may be stressful for caregivers is that multiple geriatric conditions (eg, dementia and comorbid osteoporosis) lead to more complex overall care and poorer quality of ambulatory care, likely resulting from more time and effort to treat these conditions.<sup>28</sup> This greater care complexity may both

amplify caregivers' emotional strain and minimize gains from caregiving. Finally, bone loss is predictive of faster cognitive decline,<sup>29,30</sup> and so osteoporosis may contribute to a worse trajectory of dementia that further complicates care.

Future research should consider mechanisms that explain the current findings to pinpoint intervention targets. Guidance in the management of comorbid diabetes, for example, is likely to benefit caregiver well-being. Strategies to maximize PLWDs' involvement may also help ensure that both parties' care preferences are understood and honored. Similarly, strategies to manage risks and conditions that co-occur with osteoporosis might improve caregiver well-being. Healthcare providers may not always recognize the particular challenges faced by caregivers managing dementia with medical comorbidities.<sup>9,12,22</sup> Consequently, integrative care models that enlist caregivers and PLWDs as active partners offer considerable promise.

Several limitations warrant comment. First, unmeasured aspects of comorbidities that were not directly associated with caregiving outcomes (eg, complications, severity) may be consequential. Second, other medical comorbidities not assessed in the NHATS may have important implications for caregiver outcomes. Third, PLWDs (or proxies) reported on their diagnosed chronic health conditions that may introduce bias. Fourth, the single-item measure of emotional caregiving difficulties is not ideal. Fifth, we lacked data on behavioral and psychological symptoms of dementia that complicate the management of comorbidities.<sup>9</sup> Sixth, aligned with US trends, most caregivers were women and spouses or adult children, but the findings may not generalize to more diverse samples. Nevertheless, this study provides a foundation for subsequent research and underscores the importance of supporting family caregivers in the complex long-term medical care of PLWDs.

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**Author Contributions:** Courtney A. Polenick conceptualized and planned the study, conducted the analyses, and wrote the article. Lillian Min and Helen C. Kales assisted with the study design and interpretation of the findings. All authors critically revised the article for important intellectual content.

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## REFERENCES

1. Claque F, Mercer SW, McLean G, Reynish E, Guthrie B. Comorbidity and polypharmacy in people with dementia: insights from a large, population-based cross-sectional analysis of primary care data. *Age Ageing*. 2017;46:33-39.
2. Zhao Y, Kuo TC, Weir S, Kramer MS, Ash AS. Healthcare costs and utilization for Medicare beneficiaries with Alzheimer's. *BMC Health Serv Res*. 2008;8:108.
3. Andersen F, Viitanen M, Halvorsen DS, Straume B, Engstad TA. Comorbidity and drug treatment in Alzheimer's disease. A cross sectional study

- of participants in the dementia study in northern Norway. *BMC Geriatr.* 2011;11:58.
4. Lin P, Fillit HM, Cohen JT, Neumann PJ. Potentially avoidable hospitalizations among Medicare beneficiaries with Alzheimer's disease and related disorders. *Alzheimers Dement.* 2013;9(1):30-38.
  5. Rudolph JL, Zanin NM, Jones RN, et al. Hospitalization in community-dwelling persons with Alzheimer's disease: frequency and causes. *J Am Geriatr Soc.* 2010;58:1542-1548.
  6. Melis RJF, Marengoni A, Rizzuto D, et al. The influence of multimorbidity on clinical progression of dementia in a population-based cohort. *PLoS One.* 2013;8(12):e84014.
  7. Solomon A, Dobranici L, Kareholt I, Tudose C, Lazarescu M. Comorbidity and the rate of cognitive decline in patients with Alzheimer's dementia. *Int J Geriatr Psychiatry.* 2011;26:1244-1251.
  8. Pinquart M, Sörensen S. Associations of stressors and uplifts of caregiving with caregiver burden and depressive mood: a meta-analysis. *J Gerontol Psychol Sci Soc Sci.* 2003;58:112-128.
  9. Feil DG, Lukman R, Simon B, Walston A, Vickrey B. Impact of dementia on caring for patients' diabetes. *Aging Ment Health.* 2011;15:894-903.
  10. Gillespie RJ, Harrison L, Mullan J. Mediation management concerns of ethnic minority family caregivers of people living with dementia. *Dementia.* 2015;14:47-62.
  11. While C, Duane F, Beanland C, Koch S. Medication management: the perspectives of people with dementia and family carers. *Dementia.* 2012;12:734-750.
  12. Aston L, Hinton A, Moutela T, Shaw R, Maidment I. Exploring the evidence base for how people with dementia and their informal carers manage their medication in the community: a mixed studies review. *BMC Geriatr.* 2017;17:242.
  13. Abdelhafiz AH, McNicholas E, Sinclair AJ. Hypoglycemia, frailty and dementia in older people with diabetes: reciprocal relations and clinical implications. *J Diabetes Complications.* 2016;30:1548-1554.
  14. Bakouni H, Guerra SG, Chudzinski V, Berbiche D, Vasiliadis H. One-year prospective study on the presence of chronic diseases and subsequent cognitive decline in older adults. *J Public Health.* 2017;39:e170-e178.
  15. Deckers K, Schievink SHJ, Rodriguez MMF, et al. Coronary heart disease and risk for cognitive impairment or dementia: systematic review and meta-analysis. *PLoS One.* 2017;12:e0184244.
  16. Hajduk AM, Kiefe CI, Person SD, Gore JG, Saczynski JS. Cognitive change in heart failure: a systematic review. *Circ Cardiovasc Qual Outcomes.* 2013;6:451-460.
  17. Saposnik G, Cote R, Rochon PA, et al. Care and outcomes in patients with ischemic stroke with and without preexisting dementia. *Neurology.* 2011;77:1664-1673.
  18. Montaquila J, Freedman VA, Edwards B, Kasper JD. National Health and Aging Trends Study Round 1 Sample Design and Selection. NHATS Technical Paper 1. Baltimore, MD: Johns Hopkins University School of Public Health; 2012. [https://www.nhats.org/scripts/sampling/NHATS%20Round%201%20Sample%20Design%2005\\_10\\_12.pdf](https://www.nhats.org/scripts/sampling/NHATS%20Round%201%20Sample%20Design%2005_10_12.pdf). Accessed August 29, 2018.
  19. Kasper JD, Freedman VA, Spillman BC. Classification of Persons by Dementia Status in the National Health and Aging Trends Study. Technical Paper 5. Baltimore, MD: Johns Hopkins University School of Public Health; 2013. [https://www.nhats.org/scripts/documents/NHATS\\_Dementia\\_Technical\\_Paper\\_5\\_Jul2013.pdf](https://www.nhats.org/scripts/documents/NHATS_Dementia_Technical_Paper_5_Jul2013.pdf). Accessed August 29, 2018.
  20. Galvin JE, Roe CM, Xiong MJC. Validity and reliability of the AD8 informant interview in dementia. *Neurology.* 2006;67:1942-1948.
  21. Kasper JD, Freedman VA, Spillman B. National Study of Caregiving User Guide. Baltimore, MD: Johns Hopkins University School of Public Health; 2013. [https://www.nhats.org/scripts/documents%5CNSOC\\_Round\\_1\\_User\\_Guide.pdf](https://www.nhats.org/scripts/documents%5CNSOC_Round_1_User_Guide.pdf). Accessed August 29, 2018.
  22. Maidment ID, Aston L, Moutela T, Fox CG, Hilton A. A qualitative study exploring medication management in people with dementia living in the community and the potential role of the community pharmacist. *Health Expect.* 2017;20:929-942.
  23. Meneilly GS, Tessier DM. Diabetes, dementia and hypoglycemia. *Can J Diabetes.* 2016;40:73-76.
  24. Dempster DW. Osteoporosis and the burden of osteoporosis-related fractures. *Am J Manag Care.* 2011;17:S164-S169.
  25. Nazrun AS, Tzar MN, Mokhtar SA, Mohamed IN. A systematic review of the outcomes of osteoporotic fracture patients after hospital discharge: morbidity, subsequent fractures, and mortality. *Ther Clin Risk Manag.* 2014;10:937-948.
  26. Leggett AN, Polenick CA, Maust DT, Kales HC. Falls and hospitalizations among persons with dementia and associated emotional difficulties. *Gerontologist.* 2018;58:e78-e86.
  27. Mathew SA, Gane E, Heesch KC, McPhail SM. Risk factors for hospital representation among older adults following fragility fractures: a systematic review and meta-analysis. *BMC Med.* 2016;14:136.
  28. Min L, Kerr EA, Blaum C, Reuben D, Cigolle C, Wenger N. Contrasting effects of geriatric versus general medical multimorbidity on quality of ambulatory care. *J Am Geriatr Soc.* 2014;62:1714-1721.
  29. Lui L, Stone K, Cauley JA, Hillier T, Yaffe K. Bone loss predicts subsequent cognitive decline in older women: the study of osteoporotic fractures. *J Am Geriatr Soc.* 2003;51:38-43.
  30. Yaffe K, Browner W, Cauley J, Launer L, Harris T. Association between bone mineral density and cognitive decline in older women. *J Am Geriatr Soc.* 1999;47:1176-1182.

## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

**Supplementary Table S1: Caregiver Scores on Informal and Formal Support Variables**