

# Medicare Expenditures Associated With Hospital and Emergency Department Use Among Beneficiaries With Dementia

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## Abstract

Understanding expenditure patterns for hospital and emergency department (ED) use among individuals with dementia is crucial to controlling Medicare spending. We analyzed Health and Retirement Study data and Medicare claims, stratified by beneficiaries' residence and proximity to death, to estimate Medicare expenditures for all-cause and potentially avoidable hospitalizations and ED visits. Analysis was limited to the Medicare fee-for-service population age 65 and older. Compared with people without dementia, community residents with dementia had higher average expenditures for hospital and ED services; nursing home residents with dementia had lower average expenditures for all-cause hospitalizations. Decedents with dementia had lower expenditures than those without dementia in the last year of life. Medicare expenditures for individuals with and without dementia vary by residential setting and proximity to death. Results highlight the importance of addressing the needs specific to the population with dementia. There are many initiatives to reduce hospital admissions, but few focus on people with dementia.

## Keywords

dementia, Medicare expenditures, hospitalization, emergency department, nursing home, Alzheimer's disease

## Introduction

People with long-term care needs and multiple chronic illnesses have high health expenditures compared with people without these characteristics. For example, in 2006, beneficiaries with both chronic conditions and functional impairments had average Medicare expenditures of \$15 833 compared with \$2245 for beneficiaries with neither chronic conditions nor functional impairments.<sup>1</sup> As a result, this population is responsible for a disproportionate share of Medicare and health spending, especially hospital spending. Many studies have documented that a substantial portion of this utilization and its related expenditures are avoidable or preventable.<sup>2-5</sup> Several initiatives are underway to address this problem, including the development of resource use measures (ie, measures that assess potentially preventable utilization or relative spending) for Medicare's public reporting programs<sup>6</sup> and the Centers for Medicare & Medicaid Services (CMS) Initiative to Reduce Avoidable Hospitalizations Among Nursing Facility Residents.<sup>2</sup>

People with dementia are an important subgroup of the population with functional impairments and multiple chronic conditions. Because most people with dementia are Medicare beneficiaries due to age (65 years or older) and many are also Medicaid beneficiaries, the impact on public payers of their hospital and emergency department (ED) use is substantial. These implications are likely to grow as the number of people

older than 65 with Alzheimer's disease (the most common type of dementia) is projected to nearly triple by 2050.<sup>7</sup>

Utilization and expenditures among older people with dementia have generally been found to be significantly higher as a result of their more complicated medical and long-term care needs.<sup>8-12</sup> However, current understanding of expenditure patterns associated with hospital and ED use by people with dementia relative to those without dementia—particularly with potentially avoidable use—remains limited. Many estimates of Medicare expenditures associated with dementia use data prior to 2000 and do not distinguish by place of residence or proximity to death.<sup>9,12-18</sup>

Moreover, although a number of studies have estimated Medicare expenditures associated with dementia among certain Medicare or Medicaid populations,<sup>9,12-19</sup> and some studies

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have assessed potentially avoidable hospitalizations,<sup>20,21</sup> we identified only a few studies that assessed both Medicare expenditures and potentially avoidable hospitalizations among patients with dementia.<sup>9,17,19</sup> One study by Bynum et al<sup>9</sup> analyzed nationally representative data prior to 2000 and found increased Medicare expenditures and odds of hospitalization for people with dementia, both overall and for ambulatory care sensitive conditions. Lin et al<sup>17</sup> found higher Medicare expenditures and increased odds for some but not all types of potentially avoidable hospitalizations among beneficiaries with dementia. The third study, Zhu et al,<sup>19</sup> analyzed data for a prospective cohort of community-based Medicare beneficiaries and found significantly higher Medicare expenditures and inpatient utilization among people with dementia, but results on hospitalizations for ambulatory care sensitive conditions were mixed. None of these studies assessed whether there were differences by residential setting.

Some estimates of Medicare expenditures for nursing home residents with dementia have shown higher costs as the disease progresses,<sup>22</sup> and other work has documented substantial variation in costs.<sup>23</sup> In both studies, expenditures for hospitalizations and hospice were major drivers of total spending.

This study aims to address these research gaps with recent and nationally representative data. The objective is to provide estimates of Medicare expenditures for hospitalization and ED use, both overall and potentially avoidable, among fee-for-service (FFS) Medicare beneficiaries with dementia across residential settings (community vs nursing home) and at end-of-life (EOL) compared with beneficiaries without dementia.

## Methods

### *Data and Study Population*

We analyzed 5 waves of survey data from the Health and Retirement Study (HRS) merged with Medicare claims for 2000-2008. The HRS is a biennial survey that collects information on a nationally representative sample of older adults aged 50 years and above. It contains data about respondents' health status including cognitive status, physical functioning, and chronic conditions, along with a broad set of sociodemographic, economic, and other characteristics.<sup>24</sup>

Medicare enrollment and claims data from CMS are linked for consenting HRS respondents. The claims provide detailed information on health care utilization and expenditures, which is more reliable than the self-reported data in the HRS. Given our focus on Medicare expenditures, the study population includes HRS respondents aged 65 years or older enrolled in FFS Medicare.

We conducted stratified analyses on 4 subsamples: (1) community residents (n = 11 921 persons with 37 127 observations), (2) nursing home residents (n = 1081 persons with 1604 observations), (3) community decedents (n = 2630

persons), and (4) nursing home decedents (n = 615 persons). Nursing home residence was defined as residing in a nursing home at the time of the HRS interview at each wave.

### *Measure of Dementia*

Previous research has shown that using 1 source for classifying dementia leads to underreporting of prevalence<sup>25,26</sup> and expenditures.<sup>27</sup> To address this problem, we measured dementia by combining diagnostic information from the Medicare claims and a cognitive impairment measure from the HRS; the latter incorporates information on cognitive functioning from respondent and proxy reports. The HRS-based cognitive measure was developed and validated with diagnostic data from the Aging, Demographics, and Memory Study, a subsample of HRS respondents aged 70 and older.<sup>28,29</sup> For self-respondents, cognitive performance was assessed using a modified Telephone Interview for Cognitive Status, a 27-point index based on items for short-term memory, working memory, and speed of processing; scores of 0 to 6 on this index are considered dementia. For respondents assessed by proxies, cognitive status was measured on an 11-point index based on reports of memory deficiencies, instrumental activities of daily living (ADL) limitations, and an interviewer assessment, with scores of 6 to 11 indicating dementia. From the linked Medicare claims, we used the Chronic Condition Data Warehouse indicator for a diagnosis of Alzheimer disease and related dementias (ADRD) or senile dementia. We created a dichotomous variable to flag beneficiaries who either met the HRS definition of dementia or had an ADRD diagnosis from Medicare claims.

### *Expenditure Outcomes*

Two sets of Medicare expenditure outcomes were defined for hospitalizations and ED visits, respectively: expenditures for overall utilization and expenditures for potentially avoidable utilization. For beneficiaries alive at the HRS interview, each outcome was defined annually over a calendar-year period during the year of the HRS survey. For decedents, the outcome was for the last year of life.

**Hospitalization expenditures.** We identified all hospitalizations from the linked Medicare inpatient claims and further distinguished those hospitalizations that were potentially avoidable. For each beneficiary, we calculated yearly Medicare expenditures (ie, program payments) for all-cause and potentially avoidable hospitalizations. Following the definition developed by Walsh and colleagues<sup>3</sup> and refined by Feng and colleagues,<sup>20</sup> we identified potentially avoidable hospitalizations using a list of conditions and diagnosis-related groups judged by an expert panel as either preventable or manageable outside of the acute care setting.

Consistent with these studies, we used one set of potentially avoidable conditions—those deemed preventable or

manageable in the community—to define potentially avoidable hospitalizations in both the nursing home and community setting.<sup>3,20</sup> The community list does not include all of the conditions in the nursing home list because fewer medical resources are available in the community, which means that some conditions that are preventable in a nursing home may not be preventable in the community; thus, our estimated expenditures among the nursing home sample are likely conservative.

### *ED Visit Expenditures*

Yearly expenditures for ED visits included total Medicare payments for outpatient ED visits that did not result in inpatient admissions, which were identified from hospital outpatient claims using either the Healthcare Common Procedure Coding System classification codes (99281-99285) or Revenue Center Codes (045x or 0981). There is no widely used method to identify potentially avoidable ED visits specific to the elderly population. Therefore, we utilized the same definition for potentially avoidable ED visits as that used for potentially avoidable hospitalizations. In addition, we distinguished potentially avoidable ED utilization only among outpatient ED visits not resulting in inpatient admissions given these are more likely unavoidable despite the fact that the associated hospitalization may be classified as potentially avoidable. In these instances, a physician determined whether to admit the patient. Therefore, our potentially avoidable ED utilization results may also be somewhat underestimated.

### *Other Variables*

In multivariate models predicting annualized expenditures, we controlled for a range of risk factors for hospital and ED use, including beneficiary age, gender, race and ethnicity, education, marital status, types of insurance coverage, number of limitations in ADL, chronic conditions, self-reported health status, income, urban residence, and geographic regions.

### *Statistical Analysis*

We calculated Medicare expenditures for each beneficiary per year for (1) all-cause hospitalizations, (2) potentially avoidable hospitalizations, (3) all-cause outpatient ED visits, and (4) potentially avoidable outpatient ED visits. These expenditure measures were annualized by adjusting for time “at risk” for service use during each year. We also inflation-adjusted expenditures in terms of 2008 dollars based on the Consumer Price Index (CPI) for medical care services developed by the Bureau of Labor Statistics.

To address the fact that Medicare expenditures often are skewed and not normally distributed—in this case as a result of beneficiaries with no utilization—we used a 2-part

generalized linear model (GLM) which is a common approach used in health care expenditure studies.<sup>30-33</sup>

In the first part of the model, we estimated the probability of having any positive expenditure using generalized estimating equation (GEE) logistic regression for the subsamples, to account for repeated observations, and regular logistic regression for the subsamples of decedents. The second part of the model predicts expenditures conditional on the probability of having any positive expenditure. Next, using predicted values from these models, we calculated the predicted expenditures per person by multiplying the probability of having any positive expenditure (from the first part) by the expected expenditures (from the second part).

Similar to estimating the counterfactual, we recalculated the predicted expenditures by recoding the dementia variable to 0 for the sample while holding constant their values for all other risk factors meaning that individuals with dementia were modeled as if they did not have dementia. Finally, we calculated the differential between the 2 sets of predicted expenditures for each person, which can be considered the marginal dollar amount of expenditures attributable to dementia, independent of all other risk factors. We report results on the adjusted mean annual expenditures per beneficiary by dementia status in each subsample.

All multivariate regression models adjusted for each person’s exposure time or count of months survived and enrolled in FFS Medicare during the outcome measurement period. The HRS survey year or year of death was also included to account for time trends, which would pick up any unobserved changes in Medicare policy or payment changes over the time period. All analyses were further adjusted for sampling weights. This study was approved by the institutional review board (IRB) at RTI International. The Medicare claims data analyzed in this research were authorized under a data use agreement (DUA #24379) with CMS.

## **Results**

Table 1 summarizes the characteristics of all 4 subsamples. In all, 12% of community residents had dementia, compared with 84% of nursing home residents. In contrast, 34% of community decedents and 87% of nursing home decedents had dementia. The community and nursing home subsamples, both overall and for decedents, were significantly different across most characteristics.

The unadjusted and adjusted results of expenditures for the overall HRS sample, separately for community and nursing home residents and by dementia status, are reported in Table 2. Unadjusted expenditures were significantly higher for community residents with dementia than for community residents without dementia; the average annual unadjusted expenditures were \$3489 higher for all-cause hospitalizations, \$960 higher for potentially avoidable hospitalizations, \$97 higher for all-cause ED visits, and \$20 higher for potentially avoidable ED visits. However, among nursing home

**Table 1.** Sample Description of FFS Medicare Beneficiaries and Decedents in the HRS, 2000-2008.

	Residents		Decedents	
	Community	Nursing home	Community	Nursing home
	% or Mean (SD)	% or Mean (SD)	% or Mean (SD)	% or Mean (SD)
Dementia	11.7	84.4***	33.8	87.3***
Age				
65-74	51.1	10.4***	25.7	7.6***
75-84	36.9	31.8***	44.2	28.5***
85+	12.0	57.8***	30.1	63.9***
Female	58.0	74.3***	51.3	71.4***
Race/ethnicity				
White	86.6	86.8	86.2	86.4
Black	7.4	8.5	8.2	8.2
Hispanic	4.2	3.3*	4.2	3.5
Other	1.8	1.5	1.5	1.9
Low education (<12 years)	27.5	41.7***	37.8	47.3***
Unmarried	45.4	83.6***	55.4	81.8***
Insurance coverage				
Medicare only	74.4	44.3***	73.4	43.9***
Medicare-Medicaid dual eligible	11.6	50.9***	17.4	51.7***
Other/supplemental insurance	13.9	4.8***	9.2	4.4***
Number of ADL limitations (range, 0-5)	0.4 (0.9)	3.1 (1.8)***	1.1 (1.6)	3.5 (1.6)***
Health conditions				
Number of conditions (range, 0-8)	2.3 (1.4)	3.2 (1.6)***	3.0 (1.5)	3.4 (1.6)***
Diabetes	18.7	21.5**	25.4	25.2
Cancer	17.8	17.2	27.6	18.2***
Lung disease	11.3	14.1**	23.5	16.1***
Heart problems	31.9	46.0***	51.7	53.9
Stroke	10.9	38.9***	21.5	39.6***
Psychiatric problems	13.2	38.7***	19.8	39.7***
Arthritis or rheumatism	65.8	75.6***	71.4	74.9
Poor self-rated health	30.9	64.5***	59.6	71.1***
Income			0.0	0.0
Quartile 1	23.1	52.5***	34.0	53.0***
Quartile 2	25.3	27.5	28.7	26.4
Quartile 3	25.5	12.8***	22.2	12.2***
Quartile 4	26.2	7.2***	15.1	8.4***
Urban	63.4	62.5	64.5	56.9***
Number of observations (unweighted)	11 921	1081	2630	615

Source. Authors' analysis of HRS data linked with Medicare claims, 2000-2008.

Note. There were no significant differences in survey year/year of death or census region; descriptives not shown. FFS = fee-for-service; HRS = Health and Retirement Study; ADL = activities of daily living; SD = standard deviation.

\* $P < .05$ . \*\* $P < .01$ . \*\*\* $P < .001$ .

residents, the unadjusted mean expenditures did not differ by dementia status.

Multivariate regression adjusted expenditure estimates showed that among community residents, beneficiaries with dementia had adjusted expenditures that were \$2121 higher, on average, than those without dementia for all-cause hospitalizations (\$6709 vs \$4588); for potentially avoidable hospitalizations, the marginal difference was \$606 (\$1465 vs \$859). Community residents with dementia also had higher adjusted expenditures for all-cause and potentially avoidable

outpatient ED visits than those without dementia. Although statistically significant, both the absolute amounts and marginal differences in expenditures for both types of ED visits were much smaller, compared with hospitalization-associated expenditures.

Among community residents, the differences in adjusted expenditures by dementia were similar with those found in unadjusted expenditures: Average adjusted expenditures were higher compared with unadjusted expenditures for all utilization categories regardless of dementia status. In addition, the

**Table 2.** Unadjusted and Adjusted Annual Medicare Expenditures for Hospitalizations and ED Visits Among FFS Medicare Beneficiaries in the HRS, 2000-2008.

	Dementia	No dementia	Difference
	Mean (SD)	Mean (SD)	
<b>Unadjusted</b>			
Community residents			
Hospitalizations, total	\$6166 (\$15 969)	\$2677 (\$9774)	\$3489***
Hospitalizations, potentially avoidable	\$1310 (\$6181)	\$350 (\$2608)	\$960***
Outpatient ED visits, total	\$169 (\$415)	\$73 (\$293)	\$97***
Outpatient ED visits, potentially avoidable	\$30 (\$170)	\$10 (\$88)	\$20***
Nursing home residents			
Hospitalizations, total	\$8268 (\$17 964)	\$12 676 (\$38 176)	-\$4409
Hospitalizations, potentially avoidable	\$2642 (\$8586)	\$2956 (\$18 951)	-\$314
Outpatient ED visits, total	\$183 (\$472)	\$184 (\$470)	-\$1
Outpatient ED visits, potentially avoidable	\$33 (\$163)	\$27 (\$176)	\$5
	Mean (SD)	Mean (SD)	Difference <sup>a</sup>
<b>Adjusted</b>			
Community residents			
Hospitalizations, total	\$6709 (\$4504)	\$4588 (\$3477)	\$2121***
Hospitalizations, potentially avoidable	\$1465 (\$1635)	\$859 (\$1057)	\$606***
Outpatient ED visits, total	\$173 (\$114)	\$117 (\$84)	\$56***
Outpatient ED visits, potentially avoidable	\$31 (\$33)	\$19 (\$22)	\$12***
Nursing home residents			
Hospitalizations, total	\$9118 (\$6873)	\$11 154 (\$8800)	-\$2035***
Hospitalizations, potentially avoidable	\$2994 (\$2632)	\$3075 (\$2742)	-\$81
Outpatient ED visits, total	\$191 (\$124)	\$194 (\$130)	-\$3
Outpatient ED visits, potentially avoidable	\$37 (\$47)	\$32 (\$41)	\$5**

Source. Authors' analysis of HRS data linked with Medicare claims, 2000-2008.

Note. The adjusted expenditures reported are in constant 2008 dollars, estimated from multivariate 2-part models controlling for dementia, age, gender, race/ethnicity, education, marital status, types of health insurance coverage, activities of daily living limitations, chronic conditions (total count and specific conditions), self-rated health status, income, urban location, census region, and survey year. The unweighted number of observations was 4578 and 32 549 for community residents with and without dementia, respectively, and 1378 and 226 for nursing home residents with and without dementia, respectively. ED = emergency department; FFS = fee-for-service; HRS = Health and Retirement Study.

<sup>a</sup>Estimated net amount of expenditures that is attributable to dementia, independent of the effects of all other risk factors included in the models.

\* $P < .05$ . \*\* $P < .01$ . \*\*\* $P < .001$ .

marginal difference in adjusted expenditures between those with and without dementia was lower, relative to unadjusted expenditures, but remains substantial for hospitalization expenditures.

However, for nursing home residents, the pattern is somewhat less consistent, where the adjusted estimates were higher for all utilization categories except for all-cause hospitalizations for residents without dementia for which the adjusted estimates were lower than unadjusted. Moreover, unadjusted marginal differences by dementia status were not significant for any type of utilization, whereas the adjusted expenditures for all-cause hospitalizations were significantly lower (\$2035 less) for those with dementia.

Results of the unadjusted and multivariate regression adjusted expenditures for HRS decedents are reported in Table 3. Among decedents, only the unadjusted expenditures associated with all-cause hospitalizations were significantly lower for beneficiaries with dementia compared with those

without dementia, regardless of residence. The adjusted results show that among community decedents, the adjusted expenditures for all-cause hospitalizations in the last year of life were \$3320 lower for decedents with dementia (\$19 817) than for those without dementia (\$23 138). Among nursing home decedents, the adjusted expenditures for all-cause hospitalizations were \$8808 lower, on average, for individuals with dementia (\$13 688) than for those without dementia (\$22 496). Similarly, the adjusted expenditures for potentially avoidable hospitalizations were lower for decedents with dementia than for those without dementia, by \$366 for community decedents and \$2497 for nursing home decedents.

## Discussion

Our results indicate that Medicare expenditures associated with hospital and ED use for people with and without

**Table 3.** Unadjusted and Adjusted Medicare Expenditures for Hospitalizations and ED Visits in the Last Year of Life Among FFS Medicare Beneficiaries in the HRS Who Died, 2000-2008.

	Dementia	No dementia	Difference
	Mean (SD)	Mean (SD)	
<b>Unadjusted</b>			
Community decedents			
Hospitalizations, total	\$20 321 (\$33 842)	\$23 953 (\$34 049)	-\$3631**
Hospitalizations, potentially avoidable	\$5788 (\$16 260)	\$5250 (\$13 032)	\$538
Outpatient ED visits, total	\$330 (\$583)	\$295 (\$560)	\$34
Outpatient ED visits, potentially avoidable	\$79 (\$314)	\$59 (\$229)	\$20
Nursing home decedents			
Hospitalizations, total	\$13 534 (\$20 819)	\$23 907 (\$40 352)	-\$10 373*
Hospitalizations, potentially avoidable	\$5253 (\$10 682)	\$9507 (\$23 151)	-\$4254
Outpatient ED visits, total	\$253 (\$547)	\$331 (\$625)	-\$78
Outpatient ED visits, potentially avoidable	\$52 (\$186)	\$41 (\$129)	\$11
	Mean (SD)	Mean (SD)	Difference <sup>a</sup>
<b>Adjusted</b>			
Community decedents			
Hospitalizations, total	\$19 817 (\$63 10)	\$23 138 (\$7364)	-\$3320***
Hospitalizations, potentially avoidable	\$5442 (\$23 15)	\$5808 (\$2493)	-\$366**
Outpatient ED visits, total	\$327 (\$142)	\$285 (\$133)	\$42***
Outpatient ED visits, potentially avoidable	\$76 (\$62)	\$68 (\$57)	\$9**
Nursing home decedents			
Hospitalizations, total	\$13 688 (\$9398)	\$22 496 (\$14 237)	-\$8808***
Hospitalizations, potentially avoidable	\$5369 (\$4009)	\$7866 (\$5943)	-\$2497***
Outpatient ED visits, total	\$261 (\$193)	\$300 (\$218)	-\$39**
Outpatient ED visits, potentially avoidable	\$59 (\$85)	\$22 (\$32)	\$37***

Source. Authors' analysis of HRS data linked with Medicare claims, 2000-2008.

Note. The adjusted expenditures reported are in constant 2008 dollars, estimated from multivariate 2-part models controlling for dementia, age, gender, race/ethnicity, education, marital status, types of health insurance coverage, activities of daily living limitations, chronic conditions (total count and specific conditions), self-rated health status, income, urban location, census region, and year of death. The unweighted number of observations was 918 and 1712 for community decedents with and without dementia, respectively, and 545 and 70 for nursing home decedents with and without dementia, respectively. ED = emergency department; HRS = Health and Retirement Study; FFS = fee-for-service.

<sup>a</sup>Estimated net amount of expenditures that is attributable to dementia, independent of the effects of all other risk factors included in the models.

\* $P < .05$ . \*\* $P < .01$ . \*\*\* $P < .001$ .

dementia vary by residential setting and proximity to death. Specifically, community-residing people with dementia incurred greater average Medicare expenditures for all-cause hospitalizations and potentially avoidable hospitalizations than those without dementia. Among nursing home residents, the average Medicare expenditures were lower for residents with dementia.

These expenditure patterns for beneficiaries with dementia relative to those without dementia largely mirror their hospitalization and ED utilization profiles. Previous research using the same data shows that in the community, individuals with dementia are more likely to be hospitalized than those without dementia.<sup>20</sup> That same research found no significant difference in hospitalization rates by dementia status among nursing home residents or among decedents in the last year of life. Yet in the current study, our estimates of hospitalization-associated Medicare expenditures for hospitalizations are significantly *lower* for nursing home residents and

decedents with dementia than those without dementia. It is possible that when people with dementia are hospitalized, they may be treated with less aggressive or less costly care relative to others without dementia.

The finding of higher Medicare expenditures among beneficiaries with dementia in the community is consistent with other studies.<sup>9,13</sup> However, our study provides more current estimates and distinguishes potentially avoidable utilization and expenditure patterns by residential setting. Our results suggest that the growing numbers of Medicare beneficiaries with dementia will likely increase hospital expenditures, more so than what may be expected among beneficiaries without dementia.

Limitations of this work relate to study measures and data. First, people were identified as having dementia through survey responses and Medicare claims rather than through individual physician diagnosis. We used a hybrid definition of dementia, taking advantage of both Medicare

claims-based dementia diagnosis and HRS survey-based data to identify dementia. Given evidence that relying on 1 source for classifying Alzheimer's disease leads to underreporting of prevalence<sup>25,26</sup> and expenditure estimates,<sup>27</sup> this hybrid approach likely represents an improvement over studies that only use survey or claims data. However, the possibility of under- or overidentification or misclassifications remains. Furthermore, our dichotomous dementia measure is not sensitive to disease severity or progression.

In addition, our definition of potentially avoidable hospitalization and ED visits is the product of expert opinion rather than an assessment of whether specific hospitalizations actually are avoidable.<sup>3,34-36</sup> Moreover, there is limited research on potentially avoidable ED visits and no standard definitions, especially for older people and nursing home residents; however, our approach is consistent with other work.<sup>37</sup>

Finally, the generalizability of our results is limited to elderly FFS Medicare beneficiaries who responded to the HRS and consented to provide access to their Medicare records. Thus, our results are not necessarily generalizable to the general elderly population. This study focused only on expenditures for hospital and ED use, and did not estimate total health care expenditures.

The major study finding that Medicare expenditures associated with hospital and ED use vary by dementia status, residential setting, and proximity to death points to several areas for further investigation. In light of the policy attention to hospitalizations, including readmissions and potentially avoidable hospitalizations among Medicare beneficiaries, assessing the impact of ongoing initiatives or developing new ones to reduce hospitalizations and readmissions among community and nursing home residents with dementia is an important area for future research. In addition, as suggested by Clevenger and colleagues,<sup>38</sup> further research is needed to inform evidence-based practice for treating people with dementia who present in the ED. Although some research has examined the prevalence of dementia and associated costs in the Medicare managed care population,<sup>12,39-41</sup> much of it is quite old. Thus, another important policy question pertains to understanding the Medicare managed care population with dementia, especially given that roughly one-quarter of elderly Medicare beneficiaries are enrolled in managed care organizations.<sup>42</sup> Finally, considering the known variation in EOL expenditures,<sup>43</sup> more in-depth study is needed to shed light on EOL expenditures for beneficiaries with dementia, including those associated with hospice use.

Our results on hospital and ED-associated Medicare expenditures highlight the importance of addressing the needs specific to the population with dementia. There are many Medicare and Medicaid initiatives to reduce hospital admissions, but none focus on people with dementia, who account for a large share of expenditures for potentially avoidable hospitalizations and ED use. However, it is not obvious what strategies would be effective in reducing these

inappropriate expenditures. A recent systematic review of 10 interventions designed to reduce hospitalizations among community-dwelling individuals with dementia found only 1 to be effective.<sup>44</sup> The high hospitalization and ED-related expenditures by people with dementia in the community strongly suggest the need to strengthen primary care for people with dementia in the community. Future policy and research efforts should focus on specific initiatives to address people with dementia that have the potential to reduce unnecessary Medicare expenditures and improve the quality of life of people with these conditions.

### Authors' Note

The statements contained in this article are those of the authors and do not necessarily reflect the policies and views of ASPE or RTI International.

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