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Health Disparities in Cost of Care in Patients With Alzheimer's Disease: An Analysis Across 4 State Medicaid Populations

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Abstract

Objectives: To investigate health disparities with respect to cost of care across 4 state Medicaid populations. **Methods:** Data were obtained from Centers for Medicare and Medicaid Services (CMS) for this retrospective study. Patients were enrolled in a California, Florida, New Jersey, or New York Medicaid programs during 2004, with a diagnosis of Alzheimer's disease (*International Classification of Diseases, Ninth Revision* 331.0). Outcome of interest was cost of care. Decomposition of cost to calculate disparities was estimated using the Oaxaca-Blinder model. An a priori α level of .01 was used. **Results:** Approximately 158 974 individuals qualified for this study. Disparities were found to exist between blacks and whites (with blacks having higher costs; $P < .0001$), whites and others (with whites having higher costs; $P < .0001$), blacks and Hispanics (with blacks having higher costs; $P < .0001$), blacks and others (with blacks having higher costs; $P < .0001$), and Hispanics and others (with Hispanics having higher costs; $P < .0001$). **Conclusions:** Disparities in cost among minority-to-minority populations were just as prevalent, if not higher, than minority–white disparities.

Keywords

Alzheimer's disease, health disparities, medicaid, costs

Introduction

There are approximately 24 million individuals worldwide, and as many as 5.3 million Americans living with Alzheimer's disease (AD).[1] Currently, AD is the sixth leading cause of death in the United States, and the fifth leading cause of death among those 65 and older worldwide.[1] By 2050, approximately 16 million Americans may have AD.[2]

An issue existing within the realm of AD is racial/ethnic disparities. The incidence and prevalence rates of AD among African Americans have been reported to be more than twice as high compared to whites.[3,4] There is often a delay in the diagnosis and treatment of African Americans despite the prevalence of AD.[5] Studies have demonstrated that African Americans with AD have more severe dementia at the time of diagnosis.[6,7] Similar incidence rates exist in the Hispanic population, with rates almost twice as high compared to whites.[8]

Another crucial aspect of AD and other related dementias is the economic burden of the condition, particularly on payers, such as Medicare and Medicaid. Aggregate payments for health care, long-term care, and hospice for individuals with AD are projected to increase from $200 billion in 2012 to $1.1 trillion in 2015.[1] Currently, a Medicare beneficiary with AD cost approximately 3 times more than those without AD ($43 847 vs $13 879, respectively).[1] Medicare and Medicaid cover about 70% of the costs of care. Private insurance, out-of-pocket, health maintenance organizations (HMOs), and other payer insurance account for the other 30%.

Medicaid covers nursing home care and other long-term care services in the community for individuals who meet program requirements for level of care, income, and assets. The majority of nursing home residents who qualify for Medicaid must spend all of their social security income and other monthly income to pay for nursing home care. Currently, approximately 58% of Medicaid spending is allocated to long-term care. Total Medicaid spending for people with AD is projected to be $35.5 billion in 2012.[9] About half of all Medicaid beneficiaries with AD are nursing home residents. Among nursing home residents with AD, approximately 51% rely on Medicaid to help pay for their long-term care.[10] Approximately 29% of older individuals with

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AD who have Medicare also have Medicaid coverage, compared with the 11% of individuals without AD.[10] In 2008, average Medicaid payments per person of age 65 and older for Medicare beneficiaries with AD were 19 times as great as average Medicaid payments for Medicare beneficiaries without AD ($10 120 per person for individuals with AD compared with $527 for individuals without AD).[10] Much of the difference in these costs is associated with long-term care (ie, nursing homes and assisted living facilities). Medicaid paid $23 953 per person for Medicare beneficiaries with AD living in a long-term care facility compared with $222 for community dwellers nationwide.[10]

Studies using California and Georgia Medicaid administrative claims database studies have demonstrated economic burdens relating to Medicaid.[11,12] In California, out of a sample of 62 450 Medicaid recipients, 2575 were found to have AD or related dementias, with average health expenditures approximately $7700 higher ($P < .01$) than those without AD.[11] These estimates suggest that Medi-Cal spends about $200 million on AD and related dementias annually, which represents nearly 10% of Medicaid expenditures for elderly patients.[11] An analysis of Georgia Medicaid data found a total of 8671 (4.4%) of patients with AD had adjusted annual Medicaid expenditures of $14 492 compared to $8200 for those without AD.[12] Nursing home expenditures accounted for most of the additional cost of treating dementia (>85% of total expenditures).).[12] Early recognition and treatment of AD are essential in order to lower cost of care and maximize patient outcomes.

In addition to direct payments related to AD, substantial informal costs also exist. Over 15 million Americans provide unpaid care for a person with AD. Family members provide approximately 80% of informal care.[1] In 2011, unpaid caregivers provided an estimated 17.4 billion hours of unpaid care, a contribution valued at over $210 billion.[1] Combining direct and indirect costs places current estimates at over $400 billion annually for AD.

An increasing interest exists in measuring disparities in health and health care delivery among various minority groups.[13] Despite rising knowledge of the significance of disparities, efforts to eradicate them in health care for blacks and Hispanics have yet to be seen.[14] Regardless of the scientific and clinical innovations, many deficiencies remain in the quality of health care in the United States.[15-17] Examining whether or not racial disparities exist in vulnerable populations (ie, Medicaid populations) who are diagnosed with AD is an important health policy issue, so that attempts can be made to improve access and potentially help reduce costs. Therefore, the purpose of this study was to determine whether differences exist with respect to the cost of AD health care by race/ethnicity.

Methods

This was an observational retrospective study using data from 4 state Medicaid programs. The data were extracted from the Medicaid analytic extract file (MAX) from the Centers for Medicare and Medicaid services. MAX is a person-level data file on Medicaid eligibility, service utilization, and payment information for all individuals. MAX consists of 1 personal summary file and 4 claims files, which include inpatient; long-term care; other services (ie, outpatient); and prescription medications. Because of the high potential for dual Medicaid/Medicare eligibility, institutional, outpatient, and beneficiary summary files from Medicare (MedPAR) were used to capture additional health expenditures among patients. Dual eligible are individuals who are entitled to Medicare Part A and/or Part B and are eligible for some form of Medicaid. The primary outcome of interest was total cost of care for patients with AD during the 1-year time period. Total cost of care consisted of costs derived from the inpatient, long-term care, outpatient, and prescription claims from the MAX data set in addition to the costs derived from the MedPAR institutional, outpatient, and beneficiary summary claims.

To be eligible for this study, persons with AD had to be enrolled in a California, Florida, New Jersey, or New York Medicaid program on January 1, 2004, and remain in that Medicaid program through December 31, 2004. These states were selected due to their large populations, diverse racial/ethnic groups, and the fewest restrictions regarding Medicaid prescription benefits (ie, quantity supplied allowed per month and cost of medications). This particular date range was chosen because it was before the implementation of Medicare Part D and the number of individuals with a reported race/ethnicity was higher than subsequent years. In the MAX data set, inpatient claims files include a total of 10 diagnosis sections, long-term care 5 diagnosis sections, and outpatient includes 2 sections. Alzheimer's disease was identified based on the *International Classification of Diseases, Ninth Revision* (*ICD-9*) code 331.0. This is the only *ICD-9* code that provides a diagnosis for AD. If patients had a diagnosis of 331.0 in any section of the inpatient, long-term care, or outpatient Medicaid claim files, then they were considered to have AD. Since this study was specifically interested in AD, patients with an *ICD-9* code relating to dementia, which include all 290 codes (senile dementia), 291.2 (other alcoholic dementia), 292.82 (drug-induced dementia), 294.10-294.11 (dementia in condition classified elsewhere), 294.8 (dialysis dementia), 295.0-298.8, 293.0-293.9, 310.10, 331.1 (Pick's disease), 331.2 (senile degeneration), and 797 (senile) were excluded.

Age was restricted from 50 to 99 years. Due to the very limited sample size of individuals under 50 and over 99 years (ie, less than 10 patients), these individuals were excluded to prevent the possibility of identification.

Independent variables of interest included demographic characteristics and resource utilization factors. Patient comorbidities were identified through the *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) diagnosis codes provided in the MAX medical claim's data. Eight independent variables were included for the total cost of care outcome variable and included race; age; at least 1 stay in a long-term care facility (scored as a dichotomous variable); at least 1 stay in an inpatient care facility (scored as a dichotomous variable); Charlson comorbidity score[18]; state (each scored as a dichotomous variable with California as the referent group); gender; and number of AD medications prescribed in a year (ie, amount of exposure). Non-Hispanic White was the referent group for race. In the MAX database, race and ethnicity are combined under one variable. Non-Hispanic other individuals were identified as those who affiliated with any of the following: "Alaskan Native," "Asian or Pacific Islander," or "Native Hawaiian or Other Pacific Islander" and not of Hispanic origin.

Amount of exposure was defined by patients having at least one pharmacy claim for a cholinesterase inhibitor (ChEI) or memantine, regardless of the duration of this treatment for the 1-year time period. Number of unique AD medications was selected as the exposure variable to assess cost. Memantine was the last drug to be approved by the FDA in 2003. All cholinesterase inhibitors and memantine were available during 2004. However, there were no generic versions of these medications available at this time.

The Charlson comorbidity index (CCI) measures the risk of 1-year mortality for longitudinal studies for 22 comorbid conditions.[19] Assigned weights for each condition can equal 1, 2, 3, or 6 depending on severity. Because the CCI was not designed for retrospective studies, this study used an Enhanced *ICD-9* modification that links the comorbid conditions to *ICD-9* codes in administrative databases and modifies the amount of comorbid conditions to 17. The Enhanced *ICD-9* coding algorithm was selected for this study because it has demonstrated better performance in calculating comorbidities compared to the Deyo/Elixhauser algorithms.[18] Dementia was removed from the comorbidity calculation in order to avoid overestimating the mean score.

Multivariate analyses were conducted in order to determine the association between total cost of care when demographic characteristics and resource utilization factors were included in the model. In addition, further analyses were conducted to stratify long-term care residents and community-dwelling individuals to assess differences in cost and utlization. A generalized linear model (GLM) using a log link function was conducted to test the associations between race and the total cost of care. The GLM is widely regarded as the preferred method to model the total cost of care, as opposed to using log transformations in an ordinary least squares (OLS) regression model. Using a multiple linear regression model would have violated several OLS assumptions including (1) residuals and dependent variables being normally distributed and (2) constant variance of the dependent variable. Due to multiple patients incurring zero costs, a gamma distribution was used to help control for the skewness of data.To decompose the effects of race/ethnicity, the Oaxaca-Blinder decomposition technique was used. The Oaxaca-Blinder decomposition method is a technique for identifying and quantifying the separate contributions of group differences in measurable characteristics to detect health disparities. This method decomposes the differences in expenditures and utilization into two components: (1) the portion (ie percentage) due to the distribution of the demographic characteristics and resource utilization factors across racial/ethnic groups; and (2) the portion due to differences in the coefficients of those demographic characteristics and resource utilization factors that were associated with race/ethnicity.[20,21] The Oaxaca-Blinder method only allows for 2 racial/ethnic groups to be compared simultaneously. In this study, 6 different racial/ethnic groups were compared: (1) non-Hispanic white and non-Hispanic black; (2) non-Hispanic white and Hispanic; (3) non-Hispanic white and non-Hispanic other; (4) non-Hispanic black and Hispanic; (5) non-Hispanic black and non-Hispanic other; and (6) Hispanic and non-Hispanic other.

All statistical analyses were conducted in SAS version 9.2 for Windows 7 and Intercooled STATA 11.0 for Windows 7. An a priori α level of .01 was selected for all analyses due to the large sample size.

Results

A total of 158 974 patients qualified for this study (Table 1). All individuals in this study were dually eligible for both Medicare and Medicaid. Females were the majority across all states (greater than 65%). The average age ranged from 78 to 80 years. Charlson scores ranged from 3.1 to 3.4 across all states. The majority of non-Hispanic whites resided in New Jersey (approximately 64.4%). Hispanics had the highest frequency of individuals in Florida (approximately 25.5%), non-Hispanic blacks mostly resided in New Jersey (approximately 11.0%), and the majority of non-Hispanic others resided in California (approximately 16.0%).

New York had the highest percentage of inpatient visits (approximately 14.3%), with residents of California having the lowest (approximately 1.0%). New York also had the greatest percentage of individuals residing in a long-term care facility (approximately 16.4%), while Florida had the lowest percentage of patients (approximately 3.2%). Across all states, over half of individuals were taking at least 1 unique AD medication. California had the lowest average total cost of care for 2004 (approximately \$933, SD = \$4784), with New Jersey having the highest annual total cost of care per individual (\$3070, SD = \$11 339).

Results from the overall GLM are shown in Table 2. Several factors investigated were associated with significantly higher total cost of care ($P < .0001$). These included inpatient care (exp $\beta = 19.95$), long-term care (exp $\beta = 5.28$), CCI (exp $\beta = 1.15$), and age (exp $\beta = 1.01$). However, when compared to non-Hispanic whites, non-Hispanic others had significantly ($P < .0001$) lower costs of care (exp $\beta = 0.79$). Concerning states, when compared to California, Florida (exp $\beta = 1.69$), New Jersey (exp $\beta = 1.61$), and New York (exp $\beta = 1.21$) were associated with significantly higher costs of care.

Among individuals who received 1 AD medication, total health care expenditures decreased significantly (exp $\beta = 0.56$) compared to those receiving no pharmacotherapy ($P < .0001$). When the level of exposure increased to 2 ($P = .02$) or 3 or more drugs ($P = .19$), there was no difference between individuals who received medication therapy as compared to those who received none.

Table 1. Demographics for Medicaid Patients With Alzheimer's Disease in California, Florida, New Jersey, and New York (n = 158 974).

State	Race N (%)	Gender (% female)	Age, mean (SD)	Charlson score, mean (SD)	Inpatient (% who had 1 visit or more)	Long-term care (% who had 1 claim or more)	Number of unique AD medications, N (%)	Total cost of care, mean (SD)
California (n = 53 013)	White: 25 935 (48.9) Black: 4006 (7.6) Hispanic: 7574 (14.3) Other: 8503 (16.0) Unknown: 6995 (13.2)	68.9	78.6 (9.2)	3.1 (2.8)	1.0	10.9	0: 7938 (14.9) 1: 40 384 (76.2) 2+: 4691 (8.9)	932.59 (4784.16)
Florida (n = 41 292)	White: 21 830 (52.9) Black: 4 542 (11.0) Hispanic: 10526 (25.5) Other: 182 (0.4) Unknown: 4212 (10.2)	72.6	79.1 (9.6)	3.2 (2.7)	10.4	3.2	0: 4555 (11.0) 1: 30 233 (73.2) 2+: 6504 (15.8)	3070.19 (11 338.39)
New Jersey (n = 20 910)	White: 13 458 (64.4) Black: 2930 (14.0) Hispanic: 1457 (7.0) Other: 167 (0.8) Unknown: 2898 (13.8)	76.3	80.4 (9.4)	3.4 (2.8)	7.3	14.7	0: 3579 (17.1) 1: 13 880 (66.4) 2+: 3451 (16.5)	4565.11 (16 561.46)
New York (n = 43 759)	White: 27 306 (62.4) Black: 4702 (10.7) Hispanic: 1926 (4.4) Other: 1797 (4.1) Unknown: 8028 (18.4)	73.5	78.3 (10.1)	3.2 (2.8)	14.3	16.4	0: 16 602 (37.9) 1: 21 329 (48.7) 2+: 5828 (13.4)	1757.79 (12 257.97)

Table 2. Association of Demographics and Resource Utilization Factors on Total Cost of Care.

Full model	Exp β (99% CI)	SE	*P* value
Race			
White	Reference		
Black	1.00 (0.83, 1.21)	0.07	.98
Hispanic	1.09 (0.91, 1.29)	0.07	.22
Other	0.79 (0.63, 0.98)	0.08	.01
Age	1.01 (1.00, 1.02)	0.01	.002
Long-term care	5.28 (4.32, 6.45)	0.41	<.0001
Inpatient care	19.95 (16.14, 24.67)	1.64	<.0001
Charlson score	1.15 (1.12, 1.17)	0.01	<.0001
Gender	1.12 (0.98, 1.26)	0.05	.02
State			
California	Reference		
Florida	1.69 (1.44, 1.98)	0.10	<.0001
New Jersey	1.61 (1.33, 1.93)	0.12	<.0001
New York	1.21 (1.04, 1.41)	0.07	.001
Number of AD medications			
0	Reference		
1	0.56 (0.48, 0.65)	0.03	<.0001
2	0.82 (0.67, 1.01)	0.07	.02
3 or more	1.34 (0.75, 2.37)	0.30	.19

Abbreviations: AD, Alzheimer's disease; CI, confidence interval.

Table 3 stratifies patients who were institutionalized in 2004 compared to patients who did not reside in a long-term care facility. Inpatient care and CCI were associated with significantly higher costs of care across both groups ($P < .0001$). Concerning the number of AD medications (specifically being exposed to 1 or 2 medications), significantly lower costs of care were associated with community-dwelling residents ($P < .0001$).

When examining cost of care by state, lower costs were significantly associated ($P < .0001$) with long-term care individuals residing in Florida (exp $\beta = 0.14$) and New York (exp $\beta = 0.25$) compared to long-term care residents in California. However, costs of care were significantly higher ($P < .0001$) for long-term care residents in New Jersey (exp $\beta = 1.54$). Community-dwelling residents had significantly higher costs of care in Florida (exp $\beta = 1.88$), New Jersey (exp $\beta = 1.52$), and New York (exp $\beta = 1.49$) compared to California ($P < .0001$).

Oaxaca-Blinder Decomposition Results

While race/ethnicity was not statistically significant for non-Hispanic blacks and Hispanics in the overall GLM, the model compared all races simultaneously. However, the Oaxaca-Blinder method allows for decomposition of cost of care in order to assess whether health disparities exist across 2 specified racial/ethnic groups. Table 4 stratifies the raw differential and the portion of the differential attributable to health disparities between racial groups from the Oaxaca-Blinder decomposition. No significant differences existed in the total cost of care between non-Hispanic whites and Hispanics ($P = .13$).

There was a significant difference ($P < .0001$) in the raw differential between non-Hispanic whites and non-Hispanic blacks; with non-Hispanic blacks having a higher cost of care by approximately \$598. The proportion of the differential that was attributable to the disparity between whites versus blacks was approximately \$480 (80.3%). Variables significantly contributing to the health disparity were inpatient care and higher costs of care by co-morbidity.

A statistically significant difference ($P < .0001$) of \$1579 was observed in the total cost of care between non-Hispanic Whites and non-Hispanic others. Of that difference, approximately \$875 (55.4%) was attributable to the health disparity between these 2

Table 3. Association of Demographics and Resource Utilization Factors on Cost of Care Stratified by Long-Term Care Residents and Community Dwellers.

	Long-term care (n = 17 351)			Non long-term care (n = 141 623)		
Full model	Exp β (99% CI)	SE	*P* value	Exp β (99% CI)	SE	*P* value
Race						
White	Reference			Reference		
Black	0.89 (0.66, 1.18)	0.10	.28	1.01 (0.82, 1.23)	0.07	.94
Hispanic	0.73 (0.50, 1.10)	0.11	.03	1.12 (0.93, 1.34)	0.08	.11
Other	0.71 (0.41, 1.24)	0.15	.12	0.84 (0.66, 1.07)	0.08	.06
Age	1.01 (0.99, 1.02)	0.01	.24	1.01 (1.00, 1.01)	0.01	.01
Inpatient care	9.09 (6.40, 12.91)	1.24	<.0001	21.75 (17.29, 27.34)	1.93	<.0001
Charlson score	1.06 (1.03, 1.10)	0.01	<.0001	1.16 (1.14, 1.19)	0.01	<.0001
Gender	1.03 (0.84, 1.25)	0.08	.74	1.11 (0.97, 1.26)	0.06	.05
State						
California	Reference			Reference		
Florida	0.14 (0.10, 0.21)	0.02	<.0001	1.88 (1.60, 2.21)	0.12	<.0001
New Jersey	1.54 (1.21, 1.98)	0.15	<.0001	1.52 (1.24, 1.87)	0.12	<.0001
New York	0.25 (0.20, 0.31)	0.02	<.0001	1.49 (1.27, 1.75)	0.09	<.0001
Number of AD medications						
0	Reference			Reference		
1	0.86 (0.69, 1.08)	0.08	.09	0.49 (0.41, 0.59)	0.03	<.0001
2	0.91 (0.62, 1.33)	0.13	.52	0.73 (0.58, 0.92)	0.07	<.0001
3 or more	0.70 (0.17, 2.82)	0.38	.50	1.25 (0.68, 2.28)	0.29	.35

Abbreviations: AD, Alzheimer's disease; CI, confidence interval.

Table 4. Oaxaca-Blinder Decomposition Results for Total Cost of Care (TCC).

Racial groups	Raw differential	Portion of differential attributable to the health disparity (%)	*P* value	Variables contributing to differential attributable to the health disparity[a]
White versus black[b]	$597.17	$479.49 (80.3)	<.0001	Inpatient care, Charlson score
White[b] versus other	$1578.82	$874.53 (55.4)	<.0001	Long-term care, inpatient care, Charlson score
Black[b] versus Hispanic	$717.00	$680.61 (94.9)	<.0001	Long-term care, inpatient care, Charlson score
Black[b] versus other	$2175.96	$1089.93 (50.1)	<.0001	Long term care, inpatient care, Charlson score
Hispanic[b] versus other	$1458.95	$41 9.31 (28.7)	<.0001	Inpatient care, Charlson score

[a] All variables significant ($P \leq .001$).
[b] TCC higher for this race/ethnicity.

racial/ethnic groups. The use of inpatient care and long-term care services ($P < .0001$) was the largest contributors to the disparity between non-Hispanic whites and non-Hispanic others. In addition, chronic conditions were a significant predictor of cost of care for non-Hispanic whites ($P = .001$).

Results indicated a statistically significant difference between non-Hispanic blacks and Hispanics in the total cost of care ($P < .0001$). A $717 unadjusted differential existed between non-Hispanic blacks and Hispanics, with approximately $681 (94.9%) of the differential attributed to disparities between non-Hispanic blacks and Hispanics. Inpatient care ($P < .0001$) was a significant contributor to the disparity between non-Hispanic blacks and Hispanics. In addition, non-Hispanic blacks had higher expenditures for long-term care facilities ($P < .0001$) and chronic conditions also were related to cost of care ($P < .0001$).

Between non-Hispanic blacks and Non-hispanic others, there was a statistically significant difference in the unadjusted differential in the total cost of care ($P < .0001$) by approximately $2176, with non-Hispanic blacks having the higher cost of care. Approximately $1090 (50.1%) of the differential was related to the disparities between these 2 groups. Non-Hispanic blacks consumed more on inpatient care than non-Hispanic others ($P < .0001$). In addition, non-Hispanic Blacks incurred more expenses relating to long-term care ($P < .0001$). The Charlson score was also a significant predictor of costs ($P < .0001$).

Finally, the Oaxaca-Blinder method indicated significant differences in the cost of care between Hispanics compared to non-Hispanic others ($P < .0001$). Hispanics had an approximately $1459 higher cost of care than non-Hispanic others. However, of this differential, only $419 (28.7%) could be contributed to the disparity between Hispanics and non-Hispanic others. Hispanics consumed more on inpatient care ($P < .0001$) and had higher cost of care for comorbidities than non-Hispanic others.

Discussion

There are no known previous evaluations of health disparities among AD Medicaid patients with respect to cost of care and medication use. Health disparities in AD are important, because these individuals are often unable to care for themselves, unable to seek medical care on their own, unable to make decisions regarding their access/type of medical care, and because there is currently no cure. This disease not only affects the patients but also affects family and loved ones physically, financially, and emotionally. Identifying health disparities may reduce the total cost of care and provide states with the financial ability to treat more AD Medicaid patients.

Demographic characteristics and resource utilization factors attributed significantly to the total cost of care. Age, admittance to a long-term care facility, inpatient care, Charlson comorbidity score, state of residence, and the number of AD medications exposed to were all statistically significant predictors of health care expenditures ($P < .0001$). Gender was the only variable that did not influence total cost of care ($P = .21$). These results are consistent with those reported by Yang et al, where age, gender, race, education, chronic conditions, and geographic location were significant predictors of Medicaid expenditures from 1997 to 2005 using the Medicare Current Beneficiary Survey (MCBS).[22] Results from this study are comparable to the overall Alzheimer's population. Currently, the majority of patients in the overall Alzheimer's population are more than 75 years old (90%), with 65% being female.[1] Prevalence rates are anticipated to increase between 49% and 81% in California and Florida and 0% and 24% in New Jersey and New York.[1]

While the majority of patients did not have an inpatient care admission (approximately 92.2%), it is important to note that, by law, Medicaid programs are the payers of last resort. If another insurer or program has the responsibility to pay for medical costs incurred by a Medicaid-eligible patient, that program is generally required to pay all or part of the cost of the claim prior to Medicaid making any payment (ie, third-party liability). Since all of the patients in this study were dual eligible, it is likely that Medicare paid for the majority of expenses prior to Medicaid being billed for services, which explains the low percentage of individuals having an inpatient care claim. Research has shown that by the time a diagnosis of AD appears on a claim, it is usually in the more advanced stages (ie moderate to severe).[22] While severity cannot be determined through claims, patients in this study may be more likely to be in the moderate to severe stages of AD, given that the a reasonable portion of this study's sample (approximately 11%) was institutionalized.

State of residence was a significant factor in predicting total cost of care. Florida, New Jersey, and New York all had significantly higher costs of care compared to California ($P \leq .0001$). Medicaid benefits and services (ie, programs for patient advocacy) provided by different states could be a factor in the health disparities found in this study. Florida and New Jersey have implemented Cash and Counseling Demonstration and Evaluation (CCDE) programs.[23] The CCDE program is an extended model of consumer-directed care and provides consumers a monthly budget to hire preferred workers, including family members, and to purchase care-related services and goods permitted by states. It allows consumers to designate representatives, such as relatives or friends, to help make decisions regarding their care and offers counseling on hiring and managing caregivers and fiscal management services to help participants handle their program responsibilities. Research has demonstrated large, positive effects on the well-being of beneficiaries in both states.[24-27] However, while positive effects have been demonstrated, it has also significantly increased Medicaid expenditures in both states by several hundred thousand.[23] In addition, the Florida Legislature created the AD waiver program in 2003 to test the effectiveness of specific interventions to delay or avoid institutional placement.[28] This program offers 11 services (including caregiver training, respite care, and adult day health care) designed to allow participants to remain in the community and to support their caregivers.[28] Unfortunately, this program did not delay nursing home placement (NHP) more effectively than other programs, and it costs the state more, on average, than other waiver programs.

The Charlson comorbidity score was also a significant predictor of health disparities in total cost of care. Patients with AD often have more than 1 chronic condition.[1] Kuo et al examined the implications of comorbidities on medical expenditures for patients with AD and found that patients with AD have higher non-AD chronic conditions and are more expensive (average \$13 936, SD = \$25 214, annually) than demographically matched controls (average \$10 369, SD = \$33 561, annually).[29] Inpatient care, outpatient pharmacy, and the total cost were statistically different between the groups ($P < .001$).[29]

Medicaid plays a particularly important role in financing long-term care. Yet despite the fact that Medicaid is one program, states show tremendous variation in their coverage and spending. Results from this study demonstrated that, for long-term care residents, cost of care was statistically significant across all states ($P < .0001$), with the most expensive costs incurred in New Jersey, followed by California, New York, and finally Florida being the least expensive. Multiple factors can be contributed to differences in state Medicaid spending, including coverage and reimbursement policies, participation rates (ie, the proportion of eligible residents who are actually enrolled in Medicaid), and waiver programs offered by each state. A study conducted by Fossett and Burke calculated a long-term care population and service generosity scored based upon the following services: home health, hospice, personal care, private duty nurse, intermediate care, inpatient psychiatric care, and nursing home to rank each state.[30] Results demonstrated that New Jersey was ranked among the least generous state as measured by this standard, while New York was the most generous.[30]

A potential solution to reduce Medicaid expenditures across states for persons with AD was proposed by Pande et al who studied the use of a Medicaid waiver in South Carolina; a program where patients are allowed to use the waiver for home-and community-based program to frail older patients in lieu of institutionalization called community long-term care (CLTC).[31] Results demonstrated that patients in 2005 utilizing CLTCs were more fragile than elderly patients in 1995, and clients were significantly more likely to receive specific services including physical therapy, dialysis, and oxygen.[31] Utilization of these services may reflect a successful effort to help individuals age in the community, delaying institutionalization. Waivers are available in several states and future research should be conducted to determine whether this cost-saving benefit can occur in states with substantial Medicaid expenses (ie, California and Florida).

There was a difference between health care costs among individuals exposed to medication therapy for AD as compared to those who have not been exposed to medication therapy. Individuals exposed to medication therapy and who did not reside in a long-term care facility had lower total cost of care expenses ($P < .0001$). Results from Mucha et al found that while it would be logical to assume that patients who are on medication therapy would incur more health care expenditures due to greater medication expenditures, the opposite was true; patients who had more exposure (ie, refilled their prescriptions on a monthly basis) to medication therapy had lower health care expenditures.[32] A potential reason for this is that patients who are on AD pharmacotherapy are at lower risk of being institutionalized. Studies have evaluated the predictors of nursing home placement, while focusing on the effects of cholinesterase inhibitor use on NHP.[33] Two studies conducted in the United States found an inverse relationship between ChEI exposure and NHP; one study found that treatment decreased the risk of NHP,[34] and the second study found that treatment with tacrine at doses greater than 80 mg/d was associated with a reduced likelihood of NHP.[35] Beusterien et al found that after controlling for known predictors of NHP such as age, number of comorbidities and behavioral disturbances, control participants were almost 3-fold as likely to be admitted to a nursing home than those taking rivastigmine.[33]

Overall, non-Hispanic blacks had the highest total cost of care, followed by non-Hispanic whites, Hispanics, and persons with ethnicity classified as other. The most significant contributors to the disparity on the cost of care were inpatient care and long-term care admittance. A study conducted by Joyce et al reported that the average total costs for patients with AD were more than 5-fold higher compared with those without AD ($28 263 vs $5880; $P < .001$), driven primarily by inpatient cost, and the adjusted annual costs per patient were also 5-fold higher ($21 150 vs $4053 for AD vs control, respectively) during the follow-up period.[36] Results from this study, while not comparing AD versus non-AD individuals, indicate (not surprisingly) that inpatient care expenses are extremely high, regardless of race. Higher long-term costs of care are most likely the result of cultural and familial factors. Research consistently shows that non-Hispanic blacks, Hispanics, and persons with ethnicity classified as other caregivers were less likely than non-Hispanic whites to place their relative with AD in long-term care.[37] A potential reason for these racial/ethnic differences is caregiver coping style or amount of involvement in care giving.[38] Minorities have less access to long-term care facilities, have different family structures, and have different attitudes toward institutionalization.[39] Determining the underlying factors behind these reasons for placement of patients with AD in long-term care remain an important question for future research when examining total cost of care and health disparities.

The disparity between non-Hispanic blacks and Hispanics in this study could be attributed to the differences in response to patient advocacy programs. Florida has implemented a disease management (DM) program for Medicaid beneficiaries. Kominski et al found that the Florida DM program was effective in significantly reducing utilization of inpatient stays and emergency department visits for Hispanics, Asian Americans ($P < .01$ for both groups), and African Americans ($P < .05$) and significantly reduced outpatient visits for Hispanics and Asian Americans ($P < .04$) but not for African Americans.[40]

Overall, there has been debate over whether patients (of all races) with AD over- or underutilize appropriate health care services.[41] Elderly Medicare and Medicaid beneficiaries with AD have difficulty recognizing and self-managing their comorbid conditions as the disease progresses, which could lead to underutilization; in contrast, medication nonadherence could drive overutilization of other health care services.[41] Results from MCBS data show that inpatient care was the major expenditure driver among high spenders with AD, whereas prescription medication expenditures were the largest component among low spenders.[41] Results from this study are consistent with these findings. Future research exploring racial/ethnic disparities and over-/underutilization of care should be conducted.

Several limitations exist within this study. First, missing information on race was an issue. Approximately 22 133 (13.9%) out of 158 974 identified participants had unknown race/ethnicity status. Second, while this study used the Charlson comorbidity index to measure disease burden, there were no data elements present to evaluate the severity of AD. Differences observed may reflect duration of disease and/or severity of disease. These factors cannot be easily controlled for using administrative data. In addition, persons that received medication therapy may have unobserved characteristics that contribute to the use of AD-related medications for other conditions (ie, Parkinson's disease). The majority of diagnoses of AD came from outpatient claim files; while this is not necessarily a limitation, this should be considered when interpreting these results.

An additional limitation is the time line of the study. This study only observed individuals during the year 2004 because of significant changes in the proportion of individuals who had missing race information in 2005. The 1-year limitation inhibits determining long-term costs, assessing costs at different stages of the disease and changes to Medicaid eligibility status (ie, was the patient continuously on Medicaid or did they rotate on and off during subsequent years). Since this analysis was based on cross-sectional data, causal inferences cannot be made. When examining long-term care claims, it was unable to be determined whether a patient had a confirmatory claim throughout the study time frame (ie, whether the patient resided solely in a facility throughout the year). Since state Medicaid policies change annually, a 1-year time period was deemed appropriate to avoid reimbursement and eligibility concerns. Furthermore, this study evaluated medication use before 2006, when Medicare Part D was implemented. Until recently, it was not possible to track medication use among individuals in both Medicaid and Medicare programs and prescription drug use. Because of the short time frame of this study, future evaluations should observe the total cost of care over multiple years since AD is a chronic progressive condition. Gaps in clinical information and the billing context often compromise the ability to create valid appraisals from administrative data.

Numerous unobservable determinants (ie, variables not used in the above models) may play a role in health disparities, whether it be care-seeking behavior, selection criteria into Medicaid programs, treatment of Medicaid enrollees, physician practice styles, or the incentives to seek care also affect health disparities in the total cost of care.

Conclusion

Disparities in total cost of care among minority to minority populations were just as prevalent, if not higher than minority–white disparities in the cost of care. Non-Hispanic blacks had significantly higher costs of care followed by Hispanics, non-Hispanic whites, and finally persons with ethnicity classified as other. Inpatient utilization, long-term care institutionalization, and chronic conditions were the significant drivers of health disparities across racial groups. Patients who were exposed to AD pharmacotherapy had significantly lower total costs of care than those who were not exposed. Furthermore, geographical location proved to be an important predictor of health disparities. Future research should examine these relationships more closely.

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