Racial and Ethnic Differences in End-of-Life Medicare Expenditures

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OBJECTIVES: To determine to what extent demographic, social support, socioeconomic, geographic, medical, and End-of-Life (EOL) planning factors explain racial and ethnic variation in Medicare spending during the last 6 months of life.

DESIGN: Retrospective cohort study.

SETTING: Health and Retirement Study (HRS).

PARTICIPANTS: Decedents who participated in HRS between 1998 and 2012 and previously consented to survey linkage with Medicare claims (N = 7,105).

MEASUREMENTS: Total Medicare expenditures in the last 180 days of life according to race and ethnicity, controlling for demographic factors, social supports, geography, illness burden, and EOL planning factors, including presence of advance directives, discussion of EOL treatment preferences, and whether death had been expected.

RESULTS: The analysis included 5,548 (78.1%) non-Hispanic white, 1,030 (14.5%) non-Hispanic black, and 331 (4.7%) Hispanic adults and 196 (2.8%) adults of other race or ethnicity. Unadjusted results suggest that average EOL Medicare expenditures were $13,522 (35%, $P < .001$) more for black decedents and $16,341 (42%, $P < .001$) more for Hispanics than for whites. Controlling for demographic, socioeconomic, geographic, medical, and EOL-specific factors, the Medicare expenditure difference between groups fell to $8,047 (22%, $P < .001$) more for black and $6,855 (19%, $P < .001$) more for Hispanic decedents than expenditures for non-Hispanic whites. The expenditure differences between groups remained statistically significant in all models.

CONCLUSION: Individuals-level factors, including EOL planning factors do not fully explain racial and ethnic differences in Medicare spending in the last 6 months of life. Future research should focus on broader systemic, organizational, and provider-level factors to explain these differences. J Am Geriatr Soc 64:1789–1797, 2016.

Key words: end-of-life; disparities; Medicare; race and ethnicity

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An extensive body of evidence documents racial and ethnic differences in medical care at the end-of-life (EOL).[1–14] These include differences reported in intensity of care, individual preferences, and Medicare spending.[2,3,7,8,15] Medicare spending for black decedents has been found to be between 28% and 37% higher than for white decedents.[5,7,14,16–19]

Despite examining individual and geographic factors that contribute to overall costs, there is unexplained variation between racial and ethnic groups at the EOL. Partial explanatory mechanisms include differences in preferences for more-expensive, life-prolonging care among nonwhite minorities, with quantitative and qualitative evidence of such differences,[5,16] but previous work suggests that these EOL preferences are not necessarily concordant with care received.[3]

This study was designed to explore elements that explain the association between race and EOL spending by examining a more-complete array of individual-level factors, including demographic, socioeconomic, geographic, medical, and EOL planning variables. Guided by a modeling framework developed from prior research on mechanisms for racial health disparities (Figure 1),[5,7,19,20] comprehensive data from the nationally representative Health and Retirement Study (HRS) were used to assess the extent to which these complex factors would explain racial and ethnic differences in EOL spending.
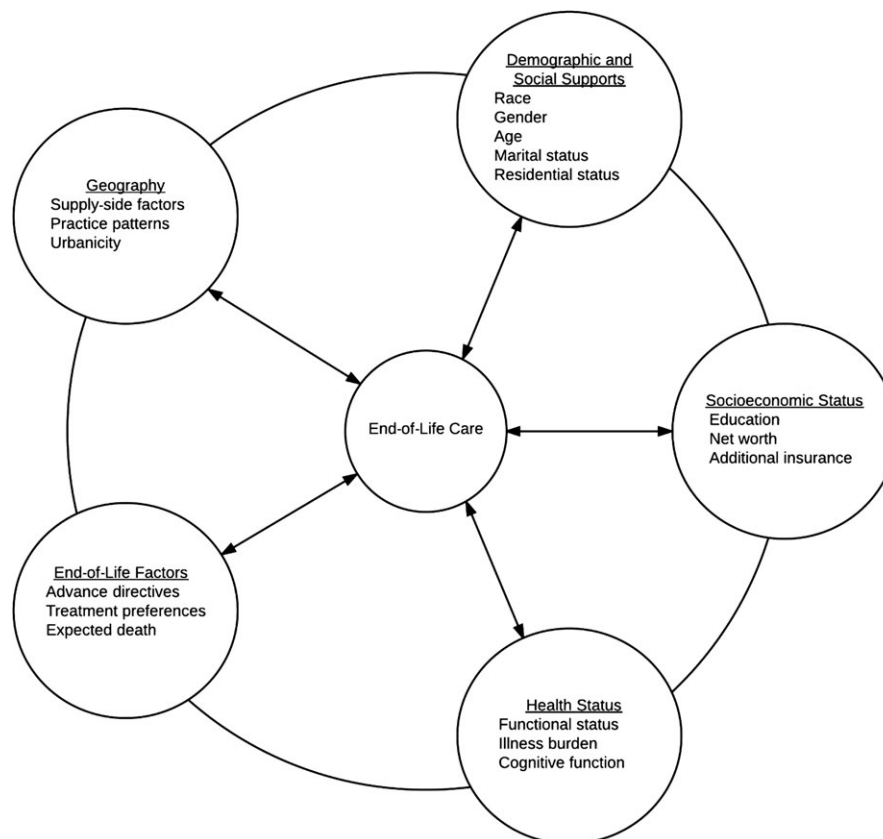
Figure 1. Modeling framework for factors contributing to differences in end-of-life care.

Systematically examining multiple individual-level domains that have been associated with disparities in health care will provide a better understanding of the causal pathways underlying the expenditure differences between racial and ethnic groups at the EOL. It was hypothesized that these other factors, not fully measured in past work, would explain the apparent racial and ethnic differences.

METHODS

Study Population

Data were from the HRS, a biennial longitudinal survey of a nationally representative cohort of U.S. adults aged 51 and older that measures a broad range of scientific questions about health and aging.[21] The HRS includes sufficient non-white minorities to examine racial and ethnic differences between older Americans. Telephone or in-person interviews are conducted with HRS participants every 2 years. During each interview cycle, HRS identifies participants who have died since the last core interview using information from family members and the National Death Index. Exit interviews are conducted with surviving family or friends who act as a proxy knowledgeable about the decedent.

Health and Retirement Study decedents aged 65 and older who died between the 1998 and 2012 survey waves and who authorized that their HRS responses could be linked to Medicare claims data were included. Only decedents who had been continuously enrolled in Medicare

Fee-for-Service Parts A and B in the last 6 months of life were included in this analysis.[22–24]

Measures

The primary outcome was total Medicare expenditures in the last 6 months of life. This measure includes all Medicare claims made for inpatient, outpatient, skilled nursing facility, durable medical equipment, home health care, physician supplier, and hospice care. All expenditures were adjusted for inflation (2012 U.S. dollars) using the medical component of the U.S. Bureau of Labor Statistics Consumer Price Index. The primary outcome of interest was the difference in total Medicare Expenditures for white and nonwhite decedents.

Demographic, social support, socioeconomic, geographic, and medical factors that have been shown previously to be associated with Medicare expenditures in the last 6 months of life and to be associated with differences in costs between racial and ethnic groups were included (Figure 1).[5,7,14,19,20,25] Demographic and social support variables included self-reported race (non-Hispanic white, non-Hispanic black, Hispanic, other), age at death, sex, marital status (married, never married, divorced, widowed, other), residential situation (lives at home alone, lives at home with others, lives in nursing home), and birth cohort (grouped years of birth according to predefined generations from the HRS codebook). Birth cohort was included as an independent variable in addition to age to control for

Table 1. Decedent Characteristics According to Race and Ethnicity (N = 7,105)

Characteristic	Non-Hispanic White, n = 5,548	Black, n = 1,030	Hispanic, n = 331	Other Minority, n = 196
Age, mean±SD	83.0 ± 8.5	81.2 ± 9.3	82.5 ± 9.1	79.5 ± 8.7
Female, n (%)	3,016 (54.4)	592 (57.5)	174 (52.6)	94 (48.0)
Marital status, n (%)				
Married	2,477 (44.7)	336 (32.7)	143 (43.3)	80 (41.0)
Never married	157 (2.83)	45 (4.37)	13 (3.94)	10 (5.13)
Widowed	2,529 (45.6)	515 (50.1)	137 (41.5)	43.1
Separated, divorced	384 (6.92)	133 (12.9)	37 (11.2)	21 (10.8)
Living situation, n (%)				
Alone	1,497 (27.0)	273 (26.5)	82 (24.8)	50 (25.5)
With others	2,989 (53.9)	560 (54.4)	204 (61.6)	112 (57.1)
Nursing home	1,062 (19.1)	197 (19.1)	45 (13.6)	34 (17.4)
Educational attainment, years, n (%)				
<12	1,963 (35.4)	676 (65.6)	260 (78.6)	138 (70.4)
12	1,901 (34.3)	204 (19.8)	34 (10.3)	26 (13.3)
13–15	932 (16.8)	81 (7.86)	23 (6.95)	15 (7.65)
≥16	750 (13.5)	69 (6.70)	14 (4.23)	17 (8.67)
Birth year cohort, n (%)				
<1923	3,259 (58.7)	544 (52.8)	189 (57.1)	80 (40.8)
1923–30	1,181 (21.3)	161 (15.6)	59 (17.8)	53 (27.0)
1931–41	1,061 (19.1)	307 (29.8)	79 (23.9)	57 (29.1)
1942–47	47 (0.85)	18 (1.75)	4 (1.21)	6 (3.06)
Net wealth, 2012 US$, median±SD	141,796 ± 1,205,068	17,469 ± 189,637	16,610 ± 244,258	10,141 ± 544,775
Urban residence, n (%)	2,116 (38.2)	508 (49.4)	137 (41.5)	75 (38.5)
Additional insurance coverage, n (%)				
Medicaid	823 (15.1)	388 (39.4)	181 (55.9)	85 (44.3)
Veterans administration	263 (4.78)	34 (3.38)	7 (2.12)	8 (4.17)
Medigap (private)	3,524 (66.0)	300 (30.4)	59 (18.2)	50 (26.2)
End-of-Life Expenditure Index quintile, n (%)				
1	800 (14.5)	140 (13.7)	14 (4.29)	18 (9.18)
2	1,006 (18.2)	200 (19.6)	6 (1.84)	19 (9.69)
3	1,327 (24.0)	114 (11.2)	39 (12.0)	27 (13.8)
4	974 (17.6)	203 (19.9)	54 (16.6)	52 (26.5)
5	1,420 (25.7)	362 (35.5)	213 (65.3)	80 (40.8)
Functional status (number of activity of daily living deficiencies), n (%)				
Independent (0)	2,152 (38.9)	338 (33.0)	104 (31.6)	73 (37.8)
Moderate impairment (1–3)	1,890 (34.2)	335 (32.7)	111 (33.7)	61 (31.6)
Severe impairment (≥4)	1,489 (26.9)	351 (34.3)	114 (34.7)	59 (30.6)
Chronic medical conditions, n (%)				
Congestive heart failure	1,666 (30.0)	310 (30.1)	105 (31.7)	63 (32.1)
Chronic pulmonary disease	1,565 (28.2)	243 (23.6)	106 (32.0)	66 (33.7)
Hypertension (complicated + uncomplicated)	3,594 (50.6)	898 (12.6)	273 (3.84)	136 (1.91)
Diabetes mellitus (complicated + uncomplicated)	1,761 (24.8)	517 (7.28)	206 (2.90)	99 (1.39)
Renal failure	662 (11.9)	208 (20.2)	62 (18.7)	33 (16.8)
Liver disease	150 (2.7)	30 (2.91)	15 (4.53)	11 (5.61)
Lymphoma	114 (2.05)	14 (1.36)	3 (0.91)	2 (1.02)
Metastatic cancer	317 (5.71)	58 (5.63)	14 (4.23)	8 (4.08)
Solid tumor	951 (17.1)	172 (16.7)	45 (13.6)	20 (10.2)
Depression	729 (13.1)	82 (7.96)	49 (14.8)	23 (11.7)
≥2 comorbidities	3,195 (57.6)	648 (62.9)	213 (64.4)	124 (63.3)
Cognitive function				
Normal	2,270 (41.7)	209 (20.9)	80 (24.6)	39 (20.3)
Mild cognitive impairment	1,465 (26.9)	295 (29.5)	86 (26.5)	65 (33.9)
Severe cognitive impairment, dementia	1,706 (31.4)	496 (49.6)	159 (48.9)	88 (45.8)
Number of days in hospital, median (IQR)	7 (0–16)	11 (0–25)	12 (0–25)	10 (0–20)
Advance directive, n (%)	3,468 (71.9)	332 (37.6)	89 (31.2)	74 (42.1)
Discussed treatment preferences				
Yes	2,937 (58.7)	373 (38.4)	114 (37.5)	95 (48.7)
No	2,016 (40.3)	588 (60.6)	186 (61.2)	95 (48.7)
Unsure	47 (0.94)	10 (1.03)	4 (1.32)	5 (2.56)
Died in hospital, n (%)	1,605 (29.3)	387 (38.7)	129 (39.9)	72 (36.9)
Any hospice use in last 6 months, n (%)	2,070 (37.3)	258 (25.1)	95 (28.7)	57 (20.1)

(Continued)

Table 1 (Contd.)

Characteristic	Non-Hispanic White, n = 5,548	Black, n = 1,030	Hispanic, n = 331	Other Minority, n = 196
Death expected				
Yes	3,150 (62.3)	492 (52.5)	181 (60.1)	99 (53.5)
No	1,897 (37.5)	441 (47.0)	117 (38.9)	84 (45.4)
Unsure	13 (0.26)	5 (0.53)	3 (1.00)	2 (1.08)
Number of months between last core interview and death, median (IQR)	14.9 (7.6–22.2)	14.4 (7.4–21.8)	13.9 (6.8–22.3)	15.2 (8.3–21.6)

SD = standard deviation; IQR = interquartile range.

generation-specific associations with healthcare knowledge and preferences.

Socioeconomic variables included educational attainment (<12, 12, 13–15, ≥16 years), net worth according to quartile, and non-Medicare insurance coverage (Medicaid, Veterans Affairs insurance, private insurance or Medigap). Geographic factors were included as urban residency determined according to ZIP code, and the End-of-Life Expenditure Index (EOL-EI) according to quintile. Using the Dartmouth Atlas of Health Care, each participant was linked to a hospital referral region. The Dartmouth Atlas calculates the EOL-EI, a measure of physician practice patterns based on usage patterns of Medicare beneficiaries in the last 6 months of life, for each hospital referral region. The EOL-EI takes into account regional variation and expenditure patterns that contribute to spending differences at the EOL.[26,27]

Thirty Elixhauser comorbidities were included as individual factor variables for each decedent to control for the contribution of illness burden to expenditure differences in the last 6 months of life.[28] The HRS cognitive functioning measures collected at the decedent's last survey interview were included. Cognitive function was categorized as normal, mild cognitive impairment, or dementia based on HRS-validated definitions.[29,30] Functional status, based on number of activity of daily living (ADL) deficiencies identified during the last core interview, were also included. Functional status was categorized as no impairment (no ADL deficiencies), moderate impairment (1–3 ADL deficiencies), or severe impairment (≥4 ADL deficiencies).

End-of-life planning factors include presence of an advance directive, having discussed EOL treatment preferences before death, and having an "expected death." Proxy informants were asked in the exit interview, "Was the death expected at about the time it occurred, or was it unexpected?"

Data Analyses

Multivariable generalized linear regression was used to model the extent to which all known factors could account for the association between race and ethnicity and EOL spending. Because of the positively skewed distribution of Medicare expenditure data, the models used a gamma distribution with a log link.[31] Model coefficients generated using the regression models were exponentiated to transform the data into rate ratios (RRs). Five multivariable models were constructed, with total Medicare expenditures as the outcome variable, adding sequentially the clusters of variables hypothesized to contribute to racial and ethnic differences in EOL Medicare expenditures. The clusters were added to the bivariate model with race and ethnicity (Model 1) in the following order: (Model 2) demographic and social support variables, (Model 3) socioeconomic and geographic indicators, (Model 4) illness burden variables, and (Model 5) EOL planning variables. Differential effects of all independent variables on total Medicare expenditures were tested for by calculating the marginal effects according to race or ethnicity.

Covariates for which any data were missing were imputed using multiple imputation (5 cycles).[32] Missing data values were most frequent in presence of an advance directive (11%), expected death (9%), discussion of EOL treatment preferences (8%), and having private or Medigap insurance (4%). There were no significant differences in results of multivariable analyses using imputed or non-imputed variables. All analyses were performed using Stata version 13 (StataCorp, College Station, TX).

RESULTS

The study sample included 7,105 fee-for-service Medicare beneficiaries aged 65 and older who died between the 1998 and 2012 survey waves and whose proxies responded to subsequent HRS exit surveys (72% of all Medicare-linked decedents). The characteristics of the study population are summarized in Table 1. The respondents included 5,548 (78.1%) non-Hispanic whites, 1,030 (14.5%) non-Hispanic blacks, 331 (4.7%) Hispanics, and 196 (2.8%) persons of other race or ethnicity. Mean total Medicare expenditures across the study population in the last 6 months of life, adjusted to 2012 U.S. dollars were $41,712 (range $0–754,124).

Table 2 reports RR estimates derived from the sequential models to explain racial and ethnic differences in EOL expenditures. The final model shows that despite controlling for previously hypothesized explanatory variables that contribute to differences in racial and ethnic spending at the EOL, there was still a significant difference in spending for non-Hispanic white, black, and Hispanic decedents.

The unadjusted results of Model 1 show that Medicare expenditures for black decedents were 35% more than for whites (RR = 1.35, 95% confidence interval (CI) = 1.26–1.44), and Medicare expenditures for Hispanics were 42% more than for whites (RR = 1.42, 95% CI = 1.27–1.59). Model 2 accounted for demographic and

Table 2. Models Examining Explanatory Factors Contributing to Racial and Ethnic Differences in Medicare Spending in the Last 6 Months of Life

	Rate Ratio (95% Confidence Interval)				
Factor	Model 1[a]	Model 2[b]	Model 3[c]	Model 4[d]	Model 5[e]
Race and ethnicity (reference non-Hispanic white)					
Black	1.35 (1.26–1.44)	1.31 (1.22–1.40)	1.25 (1.16–1.34)	1.20 (1.12–1.29)	1.22 (1.13–1.31)
Hispanic	1.42 (1.27–1.59)	1.41 (1.26–1.58)	1.27 (1.13–1.42)	1.21 (1.08–1.36)	1.19 (1.06–1.34)
Demographic and social support characteristics					
Female		1.03 (0.98–1.08)	1.02 (0.97–1.07)	1.02 (0.96–1.07)	1.00 (0.95–1.06)
Age		1.06 (1.00–1.12)	1.06 (1.01–1.12)	1.02 (0.97–1.07)	1.02 (0.97–1.08)
Marital status (reference married)					
Never married		0.99 (0.86–1.14)	0.96 (0.83–1.10)	0.99 (0.86–1.14)	0.99 (0.86–1.14)
Widowed		1.03 (0.96–1.10)	1.02 (0.95–1.09)	1.05 (0.98–1.12)	1.05 (0.86–1.13)
Divorced, separated		1.02 (0.92–1.13)	0.98 (0.89–1.09)	0.98 (0.89–1.08)	0.98 (0.89–1.08)
Residential status (reference home alone)					
Home with others		1.08 (1.01–1.16)	1.07 (1.00–1.14)	1.09 (1.02–1.17)	1.09 (1.02–1.17)
Nursing home		0.83 (0.77–0.89)	0.82 (0.76–0.88)	0.89 (0.82–0.97)	0.87 (0.81–0.95)
Birth year cohort (reference <1923)					
1923–1930		0.96 (0.89–1.03)	0.98 (0.92–1.06)	0.94 (0.87–1.01)	0.93 (0.87–1.00)
1931–1941		1.07 (0.97–1.19)	1.13 (1.02–1.25)	0.99 (0.89–1.09)	0.99 (0.88–1.10)
1942–1947		0.95 (0.73–1.23)	1.06 (0.83–1.37)	0.88 (0.68–1.13)	0.88 (0.68–1.13)
Socioeconomic and geographic indicators					
Educational attainment, years (reference <12)					
12			1.01 (0.96–1.07)	0.99 (0.93–1.04)	0.98 (0.92–1.04)
13–15			0.96 (0.90–1.03)	0.94 (0.87–1.01)	0.94 (0.87–1.01)
≥16			1.04 (0.96–1.12)	1.00 (0.93–1.09)	0.99 (0.91–1.07)
Net worth, quartile (reference 1)					
2			0.98 (0.91–1.05)	0.98 (0.92–1.06)	0.99 (0.92–1.06)
3			0.99 (0.92–1.07)	1.02 (0.95–1.10)	1.02 (0.95–1.10)
4			1.01 (0.93–1.10)	1.07 (0.98–1.16)	1.07 (0.98–1.17)
Urban residence			1.14 (1.07–1.20)	1.12 (1.06–1.18)	1.12 (1.06–1.19)
EOL-EI, quintile (reference 1[t])					
2			1.19 (1.09–1.29)	1.19 (1.10–1.30)	1.19 (1.09–1.29)
3			1.21 (1.12–1.31)	1.19 (1.10–1.29)	1.19 (1.09–1.28)
4			1.25 (1.15–1.36)	1.22 (1.12–1.32)	1.23 (1.13–1.34)
5			1.50 (1.38–1.63)	1.43 (1.32–1.56)	1.43 (1.32–1.56)
Additional insurance					
Medicaid			1.08 (1.01–1.16)	1.03 (0.96–1.11)	1.04 (0.97–1.12)
Veterans Affairs			0.90 (0.81–1.01)	0.84 (0.75–0.95)	0.84 (0.75–0.94)
Medigap (private)			1.07 (1.01–1.13)	1.02 (0.97–1.08)	1.02 (0.97–1.08)
Illness burden					
Functional impairment (reference none)					
Moderate				1.02 (0.97–1.08)	1.01 (0.96–1.07)
Severe				0.95 (0.89–1.02)	0.94 (0.87–1.01)
Elixhauser Comorbidities (30 indices)				See Table S1	
Cognitive function (reference normal)					
Mild cognitive impairment				0.98 (0.93–1.04)	0.98 (0.92–1.04)
Dementia				0.87 (0.81–0.93)	0.86 (0.81–0.92)
EOL planning					
Discussed preferences (reference no)					
Yes					0.98 (0.92–1.04)
Unsure, don't know					1.08 (0.83–1.39)
Had advance directive (reference no)					
Yes					1.01 (0.95–1.06)
Unsure, don't know					1.09 (0.73–1.56)
Expected death					1.24 (1.18–1.30)

[a]Unadjusted analysis.

[b]Model 1 plus demographic and social support variables (sex, age, marital status, residential status, birth cohort).

[c]Model 2 plus socioeconomic and geographic variables (educational attainment, net worth, urban residence, End-of-Life Expenditure Index (EOL-EI), additional insurance (Medicaid, Veterans Affairs, private or Medigap)).

[d]Model 3 plus illness burden (Elixhauser comorbidities, functional status, cognitive function).

[e]Model 4 plus end-of-life (EOL)-specific factors (discussed EOL treatment preferences, presence of advance directive, death expected).

social support by including model covariates for sex, age, marital status, residential status, and birth cohort. Only age and residential status had a statistically significant independent association with EOL Medicare expenditures. Living with others in the decedent's home was associated with greater spending at the EOL (RR = 1.08, 95%

CI = 1.01–1.16), whereas living in a nursing home was associated with lower EOL Medicare spending (RR = 0.83, 95% CI = 0.77–0.89). Controlling for demographic covariates reduced the difference in expenditures to 31% more (RR = 1.31, 95% CI = 1.22–1.40) for black decedents than for whites, whereas expenditures for Hispanic decedents remained stable at 41% more than for whites (RR = 1.41, 95% CI = 1.26–1.58).

Model 3 added socioeconomic and geographic indicators to the demographic and social support variables of Model 2, which further reduced discrepancies in EOL Medicare expenditures. Included in this model were educational attainment, net worth (according to quartile), urban residence, regional EOL-EI (according to quintile), and additional insurance (Medicaid, VA insurance, and private or Medigap were included). Of those, urban residence (RR = 1.14, 95% CI = 1.07–1.20), Medicaid (RR = 1.08, 95% CI = 1.01–1.16) and private or Medigap insurance (RR = 1.07, 95% CI = 1.01–1.13) were statistically significantly associated with greater EOL expenditures for all races and ethnicities. Each EOL-EI quintile contributed an increasing proportion of expenditures. Adjusting for demographic, socioeconomic, and geographic indicators in this model reduced the difference between black and white EOL expenditures to 25% (RR = 1.25, 95% CI = 1.16–1.34) and between Hispanic and white expenditures to 27% (RR = 1.27, 95% CI = 1.13–1.42).

Model 4 considered illness burden in addition to demographic, socioeconomic, and geographic factors in evaluating expenditures. Factors included in this model were individual Elixhauser comorbidities, cognitive function, and functional status based on number of ADL limitations. Only 11 of the 30 Elixhauser comorbidities included in the model had a statistically significant association with EOL Medicare expenditures (Table S1). Dementia was associated with statistically significant lower EOL Medicare spending (RR = 0.87, 95% CI = 0.81–0.93). Model 4 further decreased the difference in EOL spending between blacks and whites to 20% (RR = 1.20, 95%

CI = 1.12–1.29) and between Hispanics and whites to 21% (RR = 1.21, 95% CI = 1.08–1.31).

Finally, Model 5 included EOL planning factors. These variables include presence of an advance directive, discussion of EOL treatment preferences, and whether death was expected. Having an expected death was associated with greater Medicare expenditures in the last 6 months of life. Neither the presence of an advance directive nor discussion of treatment preferences for the final days of life was significantly associated with average EOL Medicare expenditures. An expected death was associated with 24% greater EOL expenditures (RR = 1.24, 95% CI = 1.18–1.30) than unexpected death. Models adjusting for the endogeneity of location of death or enrollment of hospice did not alter the final results (Table S2, Model 6a, b). Controlling for demographic, socioeconomic, geographic, medical, and EOL-specific factors in this model showed that expenditures for black decedents were 22% (RR = 1.22, 95% CI = 1.13–1.31) higher and expenditures for Hispanic decedents were 19% (RR = 1.19, 95% CI = 1.06–1.33) higher than for non-Hispanic whites.

Figure 2 illustrates the mean differences in EOL expenditures according to race between unadjusted Model 1 and fully adjusted Model 5. In unadjusted analyses, Medicare expenditures were on average $13,522 more for black decedents than for non-Hispanic whites and was $16,341 more for Hispanic decedents than for non-Hispanic whites. Accounting for all measured demographic, socioeconomic, geographic, medical, and EOL-specific factors, Medicare expenditures were on average $7,185 more for black decedents than for non-Hispanic whites and $6,164 more for Hispanic decedents than for non-Hispanic whites.

DISCUSSION

In this national sample of decedents, an extensive array of individual characteristics did not fully explain significantly higher Medicare expenditures for non-Hispanic black and Hispanic decedents. Tested variables included demographic
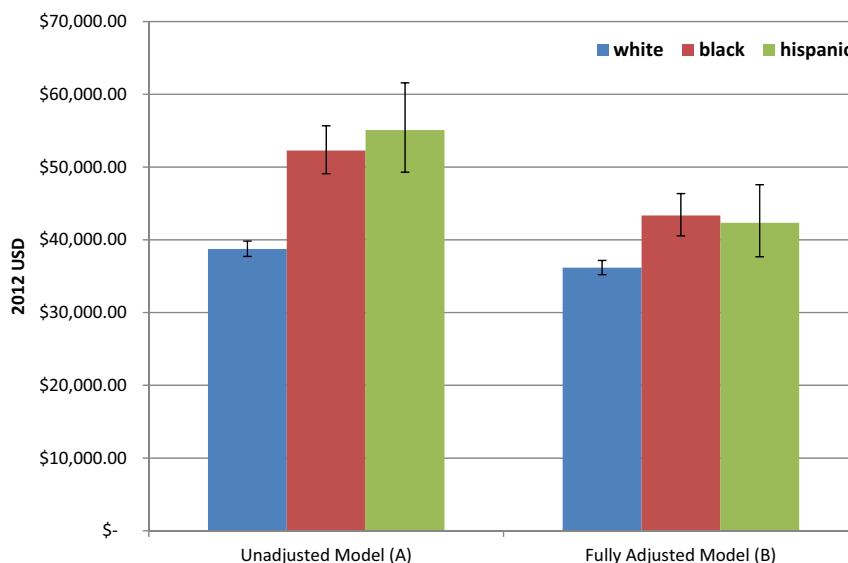

Figure 2. Predicted mean Medicare expenditures in the last 6 months of life according to race and ethnicity. Model 1: Unadjusted analysis of race and total Medicare expenditures. Model 5: Multivariable analysis including all demographic and social support characteristics, socioeconomic factors, geographic factors, illness burden, and end-of-life planning variables.

and social supports, socioeconomic status, geography, medical, and EOL planning factors. As prior studies examining a more-limited range of factors found, these variables explained some of the variation in EOL spending between racial and ethnic groups,[5,8,9,12,13,33,34] but even in the fully adjusted models, approximately half of the variation remained unaccounted for.

Differences between racial and ethnic groups in Medicare spending in the last 6 months of life are frequently attributed to differences in preferences.[2,3,5,14,33,35] Qualitative survey work supports the conclusion that nonwhite individuals are more likely to prefer life-sustaining treatments and more likely to prefer to die in the hospital than whites,[2,3,16,35–40] but inferring that unexplained variation in expenditures is due largely to these differences in preferences risks minimizing the extent to which other systemic or organizational factors contribute to this difference. Questions have been raised as to whether preferences—of any individuals of any race—have any substantial effect on EOL care.[7,10,13,36,41] Therefore, the current analysis systematically examined several mechanisms that might contribute to racial and ethnic differences in EOL Medicare expenditures, including some aspects of preferences. This analysis suggests that EOL expenditure variation remains after controlling for many individual-oriented factors.

In this way, EOL expenditures are unlike many other health outcomes that have been evaluated for the effects of race and ethnicity. Prior studies have demonstrated that other mechanisms, such as socioeconomic status, health literacy, clinical factors, hospital- or neighborhood-level effects, or insurance status, can explain what often appears to be a race effect on health outcomes.[3,4,9,11,42–45] Although the current study included these factors, all of which somewhat attenuated the measured association between EOL Medicare expenditures and racial and ethnic groups, they failed to explain the total difference. This highlights how complexities surrounding care and decision-making at the EOL can be difficult to capture.

These results suggest that factors that were not measured in the analysis—or in prior analyses—may be important to consider. Following the modeling framework, it was possible to systematically eliminate several explanatory mechanisms for racial and ethnic variation in EOL Medicare expenditures. It is unlikely that the residual expenditure differentials were due solely to remaining individual-level factors, specifically preferences for life-prolonging treatment. Rather, it may be that larger system-level or network-based factors are contributing to this unexplained difference. Important unexplored mechanisms potentially include interactions with the healthcare system, such as patient–family communication, patient–provider factors, and provider–provider interactions. Because the literature in this area frequently focuses on individual-level characteristics, insufficient attention has been paid to caregiver, provider, and health system contributions to EOL expenditures. Disagreements between family or other surrogates and individual preferences are well documented,[35] yet little information exists as to how family or surrogate characteristics may be associated with EOL expenditures. Additionally, providers make assumptions based on presumed EOL preference differences

according to race and thereby contribute to overall Medicare expenditures by providing unwanted life-sustaining care.[8,41,46,47] Further research is needed to determine whether including family- or caregiver- and provider-level factors explains more of the variation in EOL expenditures between racial and ethnic groups. Much of the work in this domain has included evaluating additional individual-level variables to understand EOL expenditure differences between racial and ethnic groups. There are many stakeholders involved at the EOL, and there are opportunities for these parties to influence decisions regarding high-cost care.

This study has a number of potential limitations. Medicare expenditures do not account for all healthcare costs that decedents incurred. Nursing home costs and expenditures that other insurance providers cover are not captured using these data and probably contribute significantly to total overall spending at the EOL. Out-of-pocket costs for decedents and families were also not included in this analysis and can be substantial at the EOL.[48] Despite adjusting for hospital referral regions, facilities may vary within regions. It was not possible to adjust for physician- or facility-level factors that may influence EOL care and usage.[49] The HRS for this time period lacks the sample size to study other racial and ethnic groups, so the analysis was limited to white, black, and Hispanic decedents. Because decedents were identified after death, and the data were examined retrospectively, the study was subject to selection bias because those who survived in the same cohort despite a high risk of death cannot be accounted for. Finally, data from proxy respondents in exit interviews were collected retrospectively and could be subject to recall bias.

This study found that known and previously unexamined mechanisms do not fully explain racial and ethnic differences in EOL Medicare expenditures. Having individual respondent and proxy data over 14 years of survey collection provided a more-detailed understanding of specific EOL planning factors that could not be examined on a national level in previous studies,[5] but much of the variation in expenditures remains unexplained. Future research should focus on broader systemic, organizational, or social network factors that might underlie racial and ethnic differences in EOL spending. Such information is essential to developing policies and programs to understand and improve these factors that contribute to differences in care and spending at the EOL.

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SUPPORTING INFORMATION

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

Table S1. Models Examining Explanatory Factors Contributing to Racial and Ethnic Differences in Medicare Spending in the Last 6 Months of Life, Including All Elixhauser Comorbidities.

Table S2. Sensitivity Analysis of Fully Adjusted Model with Additional End-of-Life Planning Variables

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