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Authors

Cai, Shubing
Miller, Susan C
Mukamel, Dana B

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Racial Differences In Hospitalizations Among Medicare-Medicaid Dual Eligible Dying Nursing Home Residents

Shubing Cai, PhD¹, Susan C. Miller, PhD², and Dana B. Mukamel, PhD³

¹Department of Public Health Sciences, University of Rochester School of Medicine, Rochester, New York 14642

²Center for Gerontology & Healthcare Research, Brown University School of Public Health, Providence, RI

³Department of Medicine, Division of General Internal Medicine, University of California, Irvine, Irvine, CA

Abstract

Objectives—To examine whether racial differences in end of life (EOL) hospitalizations vary by the presence of advance directives, specifically the Do-Not-Hospitalize (DNH) order and individual cognitive status, among nursing home (NH) residents.

Design—National data, including the Medicare data and the Minimum Data Set (MDS) 2.0, between 01/01/2007 and 09/30/2010 were linked. EOL hospitalizations were hospitalizations in the last 30 days of life. Linear probability models with an interaction term (between race and DNH) and NH fixed-effects were estimated. The analyses were stratified by individual cognitive status.

Setting—NHs in the U.S.

Participants—We included decedents who were Medicare-Medicaid dually eligible, enrolled in Medicare fee-for-service plans and NH long-stayers (i.e., in NHs at least 90 days before their death). In total, 394,948 decedents were identified.

Corresponding author. Shubing Cai, PhD, Department of Public Health Sciences, University of Rochester School of Medicine, 265 Crittenden Blvd., CU 420644, Rochester, New York 14642, Phone: 585-275-6617, Fax: (585) 461-4532, Shubing_cai@urmc.rochester.edu.

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Study concept and design: Cai, Miller, Mukamel

Acquisition of data: Cai

Analysis and interpretation of data: Cai, Miller, Mukamel

Drafting of the manuscript: Cai

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Measurements—The racial difference in EOL hospitalizations from a NH.

Results—EOL hospitalization rate was 31.7% for whites and 42.8% for blacks. Among those without DNH orders, adjusted probabilities of EOL hospitalizations were higher for blacks than for whites: 2.7 percentage points among those moderate cognitive impairment, $P < 0.01$; and 4.7 percentage points among those with severe cognitive impairment, $P < 0.01$. Among those with DNH orders, adjusted racial differences in EOL hospitalizations were not statistically significant among those with moderate or severe cognitive impairment ($P = 0.25$ and 0.93), but blacks had a higher probability of EOL hospitalizations than whites if they had relatively intact cognitive status.

Conclusion—Racial differences in EOL hospitalizations varied with DNH orders and cognitive status among dying residents. Future research is necessary to understand the reasons behind these variations.

INTRODUCTION

Within the last decade, over 25% of decedents aged 65 years and older in the United States died in nursing homes (NHs) each year.¹ Although the main goal of care near the end of life (EOL) is to offer comfort and maintain quality of life, aggressive treatments, such as hospitalizations, are prevalent among these dying NH residents.^{2–4} In fact, between 26% and 44% of NH residents were hospitalized in their last 30 days of life.³ Many of NH originating hospitalizations are unnecessary and costly,^{5–8} and often result in negative health outcomes.^{7–10} This is especially true among dying residents. Reducing unnecessary EOL hospitalizations may improve quality of life for dying residents as well as reduce Medicare expenditures.

Blacks are generally more likely to receive aggressive life-prolonging treatments, including hospitalizations, at the EOL compared to whites.^{11,12} Individual treatment preference has been commonly cited as one of the reasons contributing to this phenomenon, and it is well documented that blacks generally prefer more aggressive treatments than whites at the EOL.^{13,14} Many factors may contribute to racial differences in treatment preferences. For example, blacks are more likely to value life-prolonging treatment at the EOL than whites because of their religious beliefs and cultural background.¹⁵ In addition, blacks are less likely to trust the healthcare system and less likely to have knowledge of disease conditions and EOL care, which may also contribute to the racial difference in EOL treatment preference.^{16–19} Moreover, individual preference is not the only determinant of the type of treatments received at the EOL, and individual preference or documented advance directives may not be consistent with the treatment received at the EOL.^{12,20,21}

Despite the high prevalence of EOL hospitalizations among dying NH residents as well as the extensive literature documenting racial differences in EOL treatment preferences, it is unknown whether racial differences in EOL hospitalizations are modified by the presence of advance directives, or vary with individual medical conditions, among dying NH residents. Advance directives reflect individual treatment preferences, and we expect smaller differences in EOL hospitalization among dying residents who complete advance directives. The detection of racial difference in EOL hospitalization, if any, would suggest a higher level of inconsistency between the presence of advance directives and EOL treatment among

blacks as compared with whites. In addition, understanding the variation in racial differences with medical conditions may provide insights on the population to target the potential intervention at. For example, many hospitalizations occurring in NHs are discretionary – that is, there is no agreement on the necessity of hospitalization. The extent to which hospitalizations are considered discretionary varies with individual medical conditions.^{22,23} Many clinicians and researchers agree that dying NH residents with advanced dementia will benefit more from receiving care in the NH rather than inpatient care for most acute conditions.²⁴ Thus, we expect smaller racial differences in EOL hospitalizations among residents with severe cognitive impairment. If racial differences persist among these residents who are less likely to benefit from EOL hospitalizations, future research may be needed to understand whether these differences are attributable to the difference in residents' well-informed decisions or to other factors that can be modified by the health care delivery system.

Given these gaps in knowledge, the main objectives of this study are to examine whether the racial difference in EOL hospitalizations varies with: 1) the presence of advance directives; and 2) different levels of cognitive impairment, among dying NH residents. As to the advance directives, we specifically focused on the Do-Not-Hospitalize (DNH) order in this study as it is directly related to the preference to hospitalization. We also examined the role of the Do-not-Resuscitate (DNR) order in EOL hospitalizations. Although the DNR order is not specific to hospitalizations per se, it is a marker for a preference for less aggressive care, which may translate into fewer hospitalizations.

METHODS

Data

The study was based on national data spanning Jan 1, 2007 to Sep 30, 2010, and included the Medicare beneficiary summary file, Medicare claims (including inpatient, skilled nursing facility, home health, hospice and outpatient claims) and the Minimum Data Set (MDS) 2.0. The Medicare beneficiary file contains individual Medicare HMO enrollment status and Medicare-Medicaid dual eligibility status. The Medicare claims files provide information on health care utilization for Medicare fee-for-service (FFS) enrollees. The MDS is a federally mandated assessment tool for all residents in Medicare and/or Medicaid certified NHs. It contains detailed information on individual socio-demographic characteristics as well as their health conditions. MDS 2.0 also includes information about advance directives, specifically DNH and DNR orders. These files were linked at the individual level to track each individual through health care locations.²⁵

Cohort

The study included NH decedents who were 65 years and older, who were continuously enrolled in Medicare fee-for-service plans and who were Medicare-Medicaid dually eligible during the last 30 day of life. NH decedents were defined as those who were in NHs within 7 days before death. We focused on Medicare and Medicaid dually eligible residents so that the potential impact of insurance status on hospitalizations would not confound the analyses.²⁶ We further restricted our analyses to those who were NH long-stayers, defined as

those who were in NHs at least 90 days before their death (so that their EOL care were likely to be influenced by the NH). In total, 394,948 decedents were identified between July 1, 2007 and September 30, 2010.

Variables

The outcome variable was defined as dichotomous, indicating whether a resident experienced any hospitalization from a NH within the last 30 days of their life. This variable was constructed based on the Medicare claims and the MDS.

Race was the main independent variable of interest (identified based on the MDS). We focused on white versus black NH residents. The second variable of interest was a documented DNH or DNR order (based on the MDS). We generated the following three mutually exclusive categories to represent residents' EOL treatment preferences: residents who had a documented DNH order (with or without a DNR); residents who did not have a DNH order but had a DNR order; and those who did not have either a DNH or a DNR order. The third variable of interest was the resident's cognitive status. The cognitive performance scale (CPS), constructed from the MDS data, is a scale ranging from 0–6, with 0 as intact cognitive status, 1 as borderline intact, 2 as mild impairment, 3 as moderate impairment, 4 as moderately severe impairment, 5 as severe impairment, and 6 as very severe impairment.²⁷ Based on the definition and distribution of these categories, we categorized residents into 3 groups: residents were considered as having no or mild cognitive impairment if their CPS scores were 0, 1, or 2 (accounting for the lower 25 percentile of the distribution), as having moderate cognitive impairment if their CPS scores were 3 or 4 (accounting for the middle 50 percentile of the distribution), and as having severe cognitive impairment if their CPS scores were 5 or 6 (accounting for the upper 25 percentile of the distribution).

A set of individual covariates were included in the analyses, as listed in Table 1. Individual social-demographic characteristics (e.g. age, gender, and education) were obtained from the Medicare beneficiary summary file and the MDS data. Individual health status (e.g. activities of daily living [ADL], comorbidities, number of medications etc.) was obtained from the MDS assessments. We derived the Changes in Health, End-Stage Disease and Symptoms and Signs (CHESS) scores based on the MDS. The CHESS score is a measure of instability in health reflecting individual's frailty level.²⁸ The CHESS score ranges from 0–5, with higher score indicating a higher probability of death. We also accounted for the hospice enrollment during the last 30 day of life as hospice enrollment could affect the risk of EOL hospitalizations.³ Lastly, we accounted for secular trends (i.e. 2007–2010) by including indicator variables for the year in which the resident died.

Statistical analysis

We first examined the overall prevalence of EOL hospitalizations, DNH or DNR orders, as well as other individual characteristics between white and black dying residents, stratified by their cognitive status. Multivariate analyses were then used to explore the association between race and EOL hospitalizations. We stratified residents by their cognitive status so that the relationship between independent variables (e.g. race) and EOL hospitalizations could vary with cognitive status.

For each of the subgroups with the different level of cognitive impairment, a linear probability model with facility fixed-effects and robust standard errors was estimated to test the racial differences in EOL hospitalizations, controlling for individual covariates and secular trends. We chose to use a linear probability model because of its computational efficiency, its approximation to the logistic regression,²⁹ and more importantly, because of its easy interpretation (e.g. the direct effect of race on the probability of EOL hospitalization), especially for the interaction terms (discussed below) – the coefficient of the interaction term can be directly interpreted in a linear probability model but not in a non-linear model (e.g. logistic regression).^{29,30} As the site of NH care may contribute to racial differences in quality of care (e.g. blacks may be more likely to stay in NHs with lower quality), we used a fixed-effects model to account for the overall facility effect that can affect the care received by black and white residents in the same facility (thus the racial difference estimated from the model reflects the within-facility difference).^{18,31–33} Lastly, we added an interaction term between race (i.e. the variable “black”) and the DNH order as well as an interaction term between “black” and the category of “no DNH but with DNR” (i.e. the variable “DNR”) in the model to test whether racial differences varied with the documented DNH or DNR orders. As the interaction between “black” and “DNR” was not statistically significant for all three subgroups, we did not include this interaction term in our final analyses.

In the model with the interaction term between “black” and “DNH”, the main effect of “black” represents the racial differences in EOL hospitalizations among residents without DNH. The interaction term between “black” and “DNH” represents the change in racial differences due to the presence of DNH orders. To evaluate the overall racial differences among dying residents with DNH, the joint effect of “black” and the interaction term between “black” and “DNH” was estimated.

RESULTS

Descriptive analyses

Among 394,948 NH decedents, 11.39% were blacks and 88.61% were whites. The overall EOL hospitalization rate was 31.69% among whites and 42.84% among blacks. As presented in Table 1, the prevalence of EOL hospitalizations decreased with the severity of cognitive impairment, but the unadjusted racial differences in EOL hospitalizations increased with the severity of cognitive impairment. For example, the unadjusted EOL hospitalization rates for blacks were 7.95, 12.68, 15.19 percentage points higher than the rates for whites among those with no/mild, moderate, and severe cognitive impairment, respectively.

The prevalence of DNH or DNR orders was lower among blacks than among whites; and, as the overall prevalence of DNH or DNR orders increased with the severity of cognitive impairment, the racial differences in the presence of DNH or DNR orders increased as well. For example, the prevalence of DNH or DNR orders was 2.7 percentage points lower among blacks than whites if they had no or mild cognitive impairment; and this difference increased to 5.6 percentage points among those with severe cognitive impairment.

There was also a gender difference between blacks and whites – the prevalence of male was 35.2% among blacks and 27.5% among whites. Table 1 lists the distribution of males and females by race and cognitive status. Females were more likely to have DNH or DNR orders than males – the prevalence of advance directives (DNH or DNR orders) was 73.7% among females and 65.5% among males.

Regression analyses

Table 2 presents the results of the linear probability models with facility fixed-effects, stratified by cognitive status. The racial differences in EOL hospitalizations varied with the presence of DNH orders as well as with individual cognitive status. To ease the interpretation, we calculated the adjusted racial differences in EOL hospitalization for those with and without DNH orders separately, as illustrated in Figure 1.

Racial differences among dying residents without a DNH order—The racial differences among dying residents without DNH orders were captured by the main effect of “black” presented in Table 2. We also illustrated this difference in Figure 1. Specifically, among dying residents without DNH orders and with no or mild cognitive impairment, blacks had a slightly higher risk of EOL hospitalizations than whites after accounting for individual characteristics and facility effects (i.e. the racial difference in the probability of EOL hospitalization was 1.3 percentage points with $P=0.06$). However, although the overall prevalence of EOL hospitalizations decreased with the level of cognitive impairment (as presented in Table 1), racial differences did not. For example, the adjusted probability of EOL hospitalization was 2.7 and 4.7 percentage points higher ($P<0.01$) for blacks than for whites among those with moderate cognitive impairment and those with severe cognitive impairment, respectively.

Racial differences among dying residents with a DNH order

The racial differences in EOL hospitalizations were modified by the presence of DNH orders, but the modification effect varied with cognitive status, as indicated by the interaction term between “DNH” and “black” in Table 2. For example, the presence of a DNH order increased the racial differences in EOL hospitalization by 6.1 percentage points among those with no or mild cognitive impairment, but reduced the racial differences by 4.6 percentage points among those with severe cognitive impairment.

The adjusted overall racial difference among dying residents with DNH orders was calculated by adding the main effect of “black” and the interaction effect between “black” and “DNH”. The adjusted overall difference is illustrated in Figure 1 as well. For instance, among residents with DNH orders, the probability of EOL hospitalizations was 7.4 percentage points (i.e. by adding the main effect of “black” [0.013,] and the interaction effect [0.061]; $P=0.025$) higher for black residents with relatively intact cognitive status compared with their white counterparts. However, this racial difference was not observed among those with moderate or severe cognitive impairment – the racial differences in these two groups were not statistically significant ($P=0.25$ and 0.93 respectively).

Racial differences and DNR—The presence of DNR orders was also significantly associated with a lower likelihood of EOL hospitalizations for all dying NH residents. Specifically, for those who did not have a documented DNH order, the presence of a DNR order was associated with 10–12 percentage points decrease in the overall EOL hospitalizations ($P < 0.01$, Table 2). However, we did not observe any significant interaction effects between “DNR” and “black” across the three subgroups with different level of cognitive impairment (we did not include this interaction in the final model).

DISCUSSION

Racial differences in EOL care are of great concern considering the persistent high prevalence of aggressive care at the EOL among dying black patients and associated negative outcomes.^{34–38} This study examined the racial difference in EOL hospitalizations among Medicare-Medicaid dually eligible residents who resided within the same NH. We found that the overall racial differences were higher among dying residents with severe cognitive impairment, and the racial differences in EOL hospitalizations varied with the presence of advance directives and the level of cognitive impairment. Specifically, among those who did not have DNH orders, the racial differences in EOL hospitalizations persisted among all subgroups and were higher among those with severe cognitive impairment, even though the overall hospitalization rates decreased with the severity of cognitive impairment. Such racial difference was eliminated by the presence of DNH orders among those with moderate or severe cognitive impairment, but not among those with no or mild cognitive impairment.

Our findings suggest the importance of advance directives, which are not only associated with an overall reduction in EOL hospitalizations, but also a reduction in racial differences among cognitively impaired dying NH residents who are least likely to benefit from hospitalizations. However, one should recall that black residents are less likely to have advance directives than white residents. We, as well as prior studies,^{39,40} found a lower prevalence of DNH orders among blacks than whites, and this difference was larger among those with severe cognitive impairment. Many reasons may account for this racial difference. For example, blacks’ preferences towards aggressive EOL treatment may originate from their religious and culture background,¹⁵ and it is important to respect their beliefs and values of life.⁴¹ On the other hand, research has suggested that patients’ preferences may be shaped by patients’ knowledge of advance directives, their prognoses and of the options for EOL treatments.^{38,40,42–45}

Although NHs are required to educate residents and their families on advance directives (e.g. DNH or DNR orders) under the Patient Self Determination Act (1991), education and discussions on advance directives and EOL choices may not guarantee the delivery of relevant knowledge to patients. Blacks generally have less formal education than whites. While some studies indicated that racial differences in patients’ EOL preferences remained after accounting for individual education level,^{16,46} others argued that health literacy was strongly associated with the variation in EOL preferences.^{47,48} It has been suggested that health literacy may affect the effectiveness of patient-clinician communication and discussion on EOL choices,^{39,43} and thus the same education or discussion on EOL

treatment options may not be equally effective for blacks and whites who have different levels of health literacy. The empirical research on intervention to improve health literacy among blacks regarding EOL choices is limited.⁴⁵ One study found that a verbal explanation of EOL conditions did not eliminate the racial difference in EOL treatment preferences, but the racial difference was mitigated after blacks had a visualized understanding of the disease.⁴⁷ A randomized trial, although not specifically focused on black patients, found that patients were more likely to engage in the EOL planning and complete advance directives if advance directives were designed in a form that meets individual literacy level.⁴⁸ These studies suggest that it may be important to tailor the education and discussion on EOL care towards the individual (or his/her family) literacy level so that the communication between patients or their families and clinicians can be more effective.

Our study found a relatively high level of racial difference in EOL hospitalizations among residents who did not have DNH orders but had severe cognitive impairment. This calls the need for future research as residents with severe cognitive impairment are less likely to benefit from EOL hospitalizations. It will be important to understand the reasons for these differences as the care and policy implications are likely to be different. For example, if the difference is due to blacks' lack of knowledge on EOL care or their mistrust with the physician, promoting efficient communication strategy between physicians and blacks may be necessary. Thus, blacks' EOL treatment choices will be based on informed decisions. On the other hand, if blacks' preference towards aggressive EOL treatment are based on well-informed decisions and reflect their culture background or religious belief, it will be important to respect their preference and offer goal-concordant EOL care.

We also observed racial differences among those with relatively intact cognitive status even though they all had documented DNH orders. The reasons behind this observed phenomenon is not clear. It is possible that black residents (or their families) with relatively intact cognitive status were more likely to change their EOL treatment preferences during the course of their disease and these changes were not documented in a timely manner.^{42,49} Black dying residents or their families may be less likely to recognize their conditions as terminal,²¹ especially when their cognitive status is relatively intact, and thus change their decisions on EOL treatments. On the other hand, individual patients or their families are not the only parties involved in the decision making process for EOL care. Physicians play a critical role in deciding EOL treatments as well. Physicians' decisions are not necessarily based on advance directives alone,⁵⁰⁻⁵² but on other factors such as their own perception of the disease prognosis and patients' or their families' preferences.⁵³⁻⁵⁵ It is possible that physicians' perception towards blacks' preferences is different from the documented advance directives. Studies suggest that communication of EOL preferences between patients and physicians is crucial to ensure the delivery of goal-concordant care and patients are more likely to receive goal-concordant EOL care if they are able to discuss their preferences with physicians.^{56,57} It has been reported that blacks are less likely to have the opportunity to discuss EOL treatments with their care providers, even though they would appreciate the opportunity to do so.⁴⁰ Thus, Effective communication may not only facilitate patients and their families to make informed EOL decisions but may also help clinicians to better recognize patients' wishes and make treatment decisions that are consistent with patients' informed preferences.⁵⁵

LIMITATIONS

We were reliant on the secondary data available in Medicare claims and MDS assessments and thus could not control for confounders not captured in these data sources. However, given the large number of variables in the MDS, which describe the individual's health status and socio-demographics, it is unlikely that we were missing important confounders. Furthermore, our study did not explore potential underlying reasons for racial differences in EOL hospitalizations, but rather provided evidence on the variation of racial differences in EOL hospitalizations. Future research is needed to understand the reasons leading to the variation of these racial differences.

These limitations notwithstanding, this study offers new contributions to the literature. First, this is the first national study, to our knowledge, to examine the variation of racial differences in EOL hospitalizations with advance directives and cognitive impairment. Second, this study explored the racial differences in EOL hospitalizations within a facility (recall that our models included facility fixed effects) – thus, we accounted for the possibility that site of care can contribute to the racial differences in quality of care. Third, this study was focused on Medicaid-Medicare dually eligible population. This is the largest NH population, and suboptimal care received by this population will not only impair their quality of care and life, but also have significant financial implications on the Medicare and Medicaid programs.

CONCLUSION

We found racial differences in EOL hospitalizations among Medicare-Medicaid dually eligible dying residents within the same NH, and these differences varied with the presence of DNH orders and individual cognitive status. Additional efforts are needed to more fully understand the reasons behind these variations. Goal-concordant care should be provided to all patients. This includes equal opportunities for patients and families to gain an understanding of their medical conditions and their EOL treatment options.

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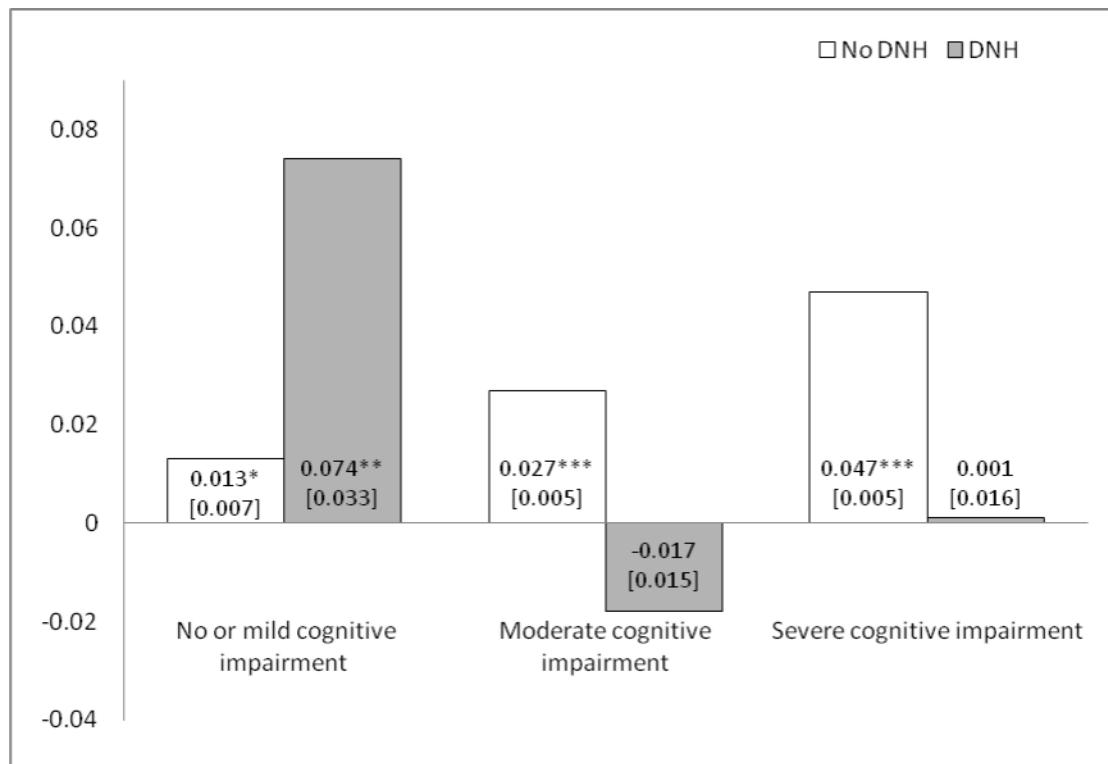


Figure 1.

Adjusted overall racial differences (black-white) in the probabilities of EOL hospitalizations by cognitive status and the presence of DNH (based on the regression results presented in table 2)

Numbers in parentheses represent standard errors. The vertical axis indicates the differences in the adjusted probabilities of EOL hospitalizations between black and white residents. The positive difference indicates that the adjusted probability of EOL hospitalization is higher for blacks than for whites.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

For each subgroup, the statistical differences between “No DNH” bar and “DNH” bar were captured by the significance level of the interaction term in Table 2.

Table 1

Characteristics of nursing home decedents, stratified by cognitive status and race

Individual level Variables	No or mild cognitive impairment (CPS=0,1,2)		Moderate cognitive impairment (CPS=3,4)		Severe cognitive impairment (CPS=5,6)	
	White (91,689)	Black (9,292)	White (169,039)	Black (20,180)	White (89,239)	Black (15,509)
Any EOL hospitalizations	42.1%	50.1%	31.2%	43.8%	22.0%	37.2%
DNH	4.6%	1.9%	6.5%	2.7%	9.1%	3.5%
No DNH but with DNR	63.3%	32.3%	69.0%	38.7%	72.3%	48.2%
No DNH and no DNR	32.1%	65.7%	24.6%	58.6%	18.7%	48.3%
Age	84.3 (± 8.4)	80.9 (±9.1)	86.2 (±7.8)	83.8 (±8.8)	86.0 (±7.7)	84.2 (±8.5)
ADLs	15.3 (±7.1)	17.2 (±7.2)	19.8 (±5.8)	21.3 (±6.1)	24.6 (±4.1)	26.2 (±3.4)
Female	70.6%	58.5%	71.1%	62.1%	77.0%	72.0%
Male	29.4%	41.5%	28.9%	37.9%	23.0%	28.0%
Married	16.5%	13.9%	18.9%	14.9%	22.3%	16.2%
Any hospice use in the last 30 days of life	41.5%	36.2%	47.2%	41.5%	51.7%	44.4%
Education: Below high school	27.1%	38.0%	25.9%	37.6%	22.1%	32.6%
Education: Above college	10.6%	7.2%	9.3%	5.4%	8.4%	5.4%
Education: missing	26.6%	27.8%	32.2%	33.8%	40.4%	41.5%
CHES score=0	42.6%	48.3%	42.3%	47.3%	45.6%	52.6%
CHES score=1	30.3%	30.5%	29.5%	29.8%	30.0%	29.0%
CHES score>=2	27.1%	21.2%	28.1%	22.9%	24.4%	18.4%
Hip Fracture	3.2%	1.5%	4.0%	1.9%	3.6%	1.6%
Infection	15.4%	13.5%	12.9%	13.0% ⁺⁺	12.5%	16.8%
Renal Failure	13.1%	23.7%	9.9%	19.0%	7.1%	14.2%
End stage disease	6.8%	5.1%	9.3%	6.5%	14.4%	9.4%
Pressure Ulcers	17.7%	23.5%	18.0%	26.8%	22.1%	39.2%
Chronic obstructive pulmonary disease	42.0%	34.3%	30.6%	25.8%	20.9%	19.9%
Stroke	22.2%	33.0%	26.2%	39.5%	26.1%	46.5%
Diabetes	40.0%	55.3%	33.6%	49.1%	28.8%	50.4%
Congestive heart failure	49.6%	44.1%	38.1%	36.3%	26.3%	27.4%
Other heart conditions	64.8%	60.9%	60.5%	57.6%	52.1%	53.1%

Individual level Variables	No or mild cognitive impairment (CPS=0,1,2)		Moderate cognitive impairment (CPS=3,4)		Severe cognitive impairment (CPS=5,6)	
	White (91,689)	Black (9,292)	White (169,039)	Black (20,180)	White (89,239)	Black (15,509)
Cancer	16.3%	21.0%	11.8%	14.8%	8.2%	9.3%
Dementia	32.5%	35.6%	72.9%	71.5%	85.8%	80.5%
Anxiety	28.1%	12.4%	28.5%	13.8%	26.3%	12.7%
Depression	62.7%	46.9%	66.8%	49.3%	60.7%	41.0%
Any use of antipsychotics	13.9%	13.5% ⁺⁺	31.7%	26.6%	30.7%	18.7%
Use at least 10 medications	77.8%	70.4%	66.1%	60.7%	48.8%	50.8%

We included nursing home decedents between July 1, 2007 and September 30, 2010.

CPS denotes Cognitive Performance Score. It is a scale ranging 0 to 6, with 0 indicating no cognitive impairment and 6 indicating very severe cognitive impairment. DNR denotes Do-Not-Resuscitate order; DNH denotes Do-Not-Hospitalize order; ADL denotes Activities of Daily Living (ranging 0–28, with higher score indicating worse functioning); CHES denotes Changes in Health, End-Stage Disease and Symptoms and Signs(ranging 0–5, with higher score indicating a higher probability of death).

⁺⁺ indicates that the difference is not statistically significant

Numbers in the cell indicate percentage for categorical variables or mean (±SD) for continuous variables. The differences in the list variables between blacks and whites are all statistically significant (P<0.05) except for two variables, denoted as⁺⁺.

Table 2

Racial differences in End-of-life hospitalizations by cognitive status: results from multivariate regression analysis, adjusting for individual characteristics and facility effects

Variables	(1) CPS=0,1,2 N=100,981	(2) CPS=3,4 N=189,219	(3) CPS=5,6 N=104,748
Black	0.013 [*] (0.007)	0.027 ^{***} (0.005)	0.047 ^{***} (0.005)
DNH × Black	0.061 [*] (0.033)	-0.045 ^{***} (0.016)	-0.046 ^{***} (0.016)
DNH	-0.270 ^{***} (0.008)	-0.262 ^{***} (0.005)	-0.233 ^{***} (0.006)
No DNH but with DNR	-0.097 ^{***} (0.004)	-0.117 ^{***} (0.003)	-0.112 ^{***} (0.004)
No DNH and no DNR	Reference		
Age	-0.002 ^{***} (0.000)	-0.003 ^{***} (0.000)	-0.002 ^{***} (0.000)
Female	0.022 ^{***} (0.004)	-0.014 ^{***} (0.003)	-0.034 ^{***} (0.004)
Married	0.025 ^{***} (0.005)	0.018 ^{***} (0.003)	0.009 ^{***} (0.004)
Hospice enrollment in the last 30 day of life	-0.121 ^{***} (0.004)	-0.094 ^{***} (0.003)	-0.082 ^{***} (0.004)
Education: Below high school	0.004 (0.004)	0.006 ^{**} (0.003)	0.009 ^{**} (0.004)
Education: Above college	-0.006 (0.006)	0.002 (0.004)	0.003 (0.005)
Education: Missing	-0.006 (0.004)	-0.013 ^{***} (0.003)	-0.012 ^{***} (0.004)
Education: High school	Reference		
ADL	-0.006 ^{***} (0.000)	-0.008 ^{***} (0.000)	-0.008 ^{***} (0.000)
CHES score=1	-0.035 ^{***} (0.004)	-0.027 ^{***} (0.003)	-0.029 ^{***} (0.003)
CHES score>=2	-0.077 ^{***} (0.004)	-0.069 ^{***} (0.003)	-0.062 ^{***} (0.004)
CHES score=0	Reference		
Hip fracture	0.004 (0.009)	0.007 (0.005)	-0.003 (0.007)
Infection	0.023 ^{***} (0.005)	0.022 ^{***} (0.003)	0.035 ^{***} (0.004)
Renal failure	0.014 ^{***} (0.005)	0.012 ^{***} (0.004)	0.014 ^{***} (0.005)
End stage disease	-0.217 ^{***} (0.005)	-0.169 ^{***} (0.003)	-0.128 ^{***} (0.004)
Pressure Ulcers	-0.016 ^{***} (0.004)	-0.020 ^{***} (0.003)	-0.015 ^{***} (0.003)

Variables	(1) CPS=0,1,2 N=100,981	(2) CPS=3,4 N=189,219	(3) CPS=5,6 N=104,748
Chronic obstructive pulmonary disease	0.024 *** (0.003)	0.026 *** (0.002)	0.020 *** (0.003)
Stroke	0.034 *** (0.004)	0.039 *** (0.002)	0.030 *** (0.003)
Diabetes	0.038 *** (0.003)	0.027 *** (0.002)	0.030 *** (0.003)
Congestive heart failure	0.049 *** (0.003)	0.046 *** (0.002)	0.036 *** (0.003)
Other heart conditions	0.023 *** (0.004)	0.017 *** (0.002)	0.014 *** (0.003)
Cancer	-0.068 *** (0.004)	-0.042 *** (0.003)	-0.027 *** (0.005)
Dementia	0.008 ** (0.004)	0.013 *** (0.003)	0.012 *** (0.004)
Anxiety	-0.002 (0.004)	-0.001 (0.003)	-0.003 (0.003)
Depression	0.011 *** (0.003)	0.002 (0.002)	-0.003 (0.003)
Any use of antipsychotics	-0.024 *** (0.005)	-0.011 *** (0.002)	-0.005 * (0.003)
Use at least 10 medications	0.026 *** (0.004)	0.032 *** (0.002)	0.025 *** (0.003)
Interval between MDS assessment and death (days)	-0.001 *** (0.000)	-0.000 *** (0.000)	-0.000 *** (0.000)
Year 2008	0.011 * (0.005)	0.007 * (0.004)	-0.002 (0.005)
Year 2009	0.008 (0.006)	0.001 (0.004)	-0.011 ** (0.005)
Year 2010	0.024 *** (0.006)	0.008 * (0.004)	-0.000 (0.005)
Year 2007	Reference		
Constant	0.774 *** (0.020)	0.852 *** (0.015)	0.797 *** (0.020)

The numbers are the coefficients estimated from a linear probability model with facility fixed-effects (which accounts for the overall NH effects that may affect the care received by black and white residents in the same facility). Robust standard errors in parentheses

p<0.01,

**
p<0.05,

*
p<0.1

CPS denotes Cognitive Performance Score. DNR denotes Do-Not-Resuscitate order; DNH denotes Do-Not-Hospitalize order; ADL denotes Activities of Daily Living; CHESS denotes Changes in Health, End-Stage Disease and Symptoms and Signs.