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Racial disparities in hospitalization and neighborhood deprivation among Medicare beneficiaries

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Abstract

Many neighborhoods with concentrated racial and ethnic minority older adult populations experience high neighborhood disadvantage. Yet, to date, no studies have analyzed how neighborhood disadvantage affects the relationship between race and hospitalization among older adults. To fill this gap, we examined if neighborhood disadvantage moderates the relationship between race and hospitalization among older adults in the United States. Medicare claims data from 2018 on 530 962 beneficiary hospitalizations were merged with neighborhood data, and regression models assessed if the Area Deprivation Index (ADI) moderated the association between race and hospitalization. At the highest ADI score, the odds ratio (OR) for hospitalization for Black compared with White beneficiaries was the lowest (OR: 0.96; 95% CI: 0.89-1.04). At the lowest ADI score, the OR for hospitalization for Black compared with White beneficiaries was the highest (OR: 1.19; 95% CI: 1.09-1.29). When Black and White beneficiaries reside in severely deprived areas, the disparity in their outcomes is narrower. However, when they reside in areas with more advantages, White beneficiaries experience better outcomes than Black beneficiaries. Our findings have implications for practice and policy to invest resources in communities to assure health equity.

Key words: primary care; racial disparities; hospitalization; neighborhood; Medicare.

Introduction

In the United States, there are persistent health disparities across racially and ethnically minoritized groups.[1] Black race, in particular, has been linked to higher rates of accumulated disadvantage leading to poor health outcomes in older age.[2] For example, Black adults develop chronic diseases, including heart disease, diabetes, asthma, and cancers, at younger ages compared with White adults.[2,3] Thus, Black adults have often sustained more years of poor health by the time they reach older age, leaving them vulnerable to a higher burden of symptoms and a greater risk of complications.[2] Other minoritized groups experience higher rates of disadvantage as well. For example, Hispanic adults often have limited access to healthcare, leading to later identification of chronic diseases such as hypertension and, therefore, lower rates of treatment when compared with White adults.[4,5] Such accumulated disadvantage, lack of access to regular healthcare services, and poor health can contribute to higher rates of hospitalizations among Black and Hispanic older adults,[6,7] including avoidable hospitalizations.[8,9] Hospitalizations are not only costly, but they also have detrimental effects on older adults, who are at increased risk of adverse events like falls, delirium, and healthcare-associated infections and often experience depressed psycho-physiologic functioning while hospitalized, compared with younger patients.[10,11] Despite persistent disparities in hospitalizations, the underlying mechanisms perpetuating and intensifying these disparities among older adults are poorly understood. Studies show disparities in outcomes are often a function of the healthcare settings where racial and ethnic minority patients receive care.[12-14] Yet, these studies do not fully explain the extent of health disparities.

Where racially and ethnically minoritized groups reside and receive care are key contributors to health disparities.[15,16] Research shows that racially and ethnically minoritized groups often live in neighborhoods with a lack of resources, which affects health and produces disparities.[17-23] For example, social disadvantage in the neighborhoods where Black older adults live may be critical to understanding the development and persistence of racial disparities in health outcomes, including hospitalization.[24] Over the years, housing discrimination and racist lending practices created the racial segregation of neighborhoods in the United States[25,26] The differences between racially segregated neighborhoods were deepened by historical disinvestment in minority communities.[27,28] On average, neighborhoods with more concentrated racial and ethnic minority populations are more likely to have lower-quality educational and employment opportunities,

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unhealthy environmental risks, degraded built environments, and targeted advertising campaigns for health-damaging food and alcohol products.[25,29,30] Moreover, residential segregation tends to give rise to a segregated healthcare system, which is associated with worse access to healthcare services.[31] As a result, many neighborhoods with concentrated racial and ethnic minority populations experience a greater prevalence of health-damaging behaviors and exposures, and higher rates of mortality and poor health outcomes.[25,29,32] For older adults in particular, neighborhood disadvantage has been linked to worsening cognitive function and other health declines.[33-35]

To date, no studies have examined how neighborhood disadvantage affects the relationship between race and hospitalization among older adults. In this study, we build on the current literature by examining if neighborhood disadvantage moderates the relationship between race and hospitalization among older adults in the United States.

Data and methods

Study setting and sample

We used data from a large R01 study funded by the National Institute on Minority Health and Health Disparities (removed for peer review). The parent study examined care delivered in primary care practices employing nurse practitioners (NPs) and strategies to enhance these practices to reduce health disparities. We sampled practices from Arizona (AZ), California (CA), New Jersey (NJ), Pennsylvania (PA), Texas (TX), and Washington (WA) for the parent study. These states have racially and ethnically diverse populations and variations in their scope of practice (SOP) regulations, determining the extent to which NPs can practice without physician supervision or collaboration.[36] In AZ and WA, regulations support full SOP (ie, NPs deliver care independently); in NJ and PA, reduced SOP (ie, NPs must collaborate with physicians to provide care); and in CA and TX restricted SOP (ie, NPs must deliver care under physician supervision).

The parent study collected survey data from 1033 primary care practices that employed 1244 NPs. The details of the study design are presented elsewhere and summarized below.[37] We used the IQVIA OneKey database to identify primary care practices employing NPs. IQVIA OneKey is the most comprehensive data source on ambulatory practices and providers, and it includes information on provider and practice names, National Provider Identifiers, network affiliations, practice locations, and contact information.[38] Practices in which 50% or more of the providers reported specialties in internal medicine, geriatrics, general practice, family practice, pediatrics, or preventive medicine were considered primary care; previous studies have also used this approach.[39]

We obtained Medicare claims data on all beneficiaries aged 65 or older with visits billed by NPs and physicians from the practices included in our study. We then used the Centers for Medicare and Medicaid Services Chronic Conditions Data Warehouse to identify beneficiaries with chronic conditions that are the most common among Medicare beneficiaries: asthma, diabetes, hypertension, congestive heart failure (CHF), cardiovascular disease, and chronic obstructive pulmonary disease (COPD).[40] We used primary and secondary diagnoses from inpatient and outpatient claims to identify these conditions based on the International Classification of Diseases, Tenth Revision, Clinical Modification.

Next, we attributed Medicare beneficiaries with chronic conditions to practices where they receive care using a common attribution methodology.[41] First, we attributed beneficiaries to a single provider (NP or physician) based on the billing provider's National Provider Identifier. Using evaluation and management (E&M) visits, we calculated the proportion of primary care paid amounts in the target year (2018) associated with each patient-provider combination. Beneficiaries were then attributed to the provider with the highest proportion of E&M visits, and paid amounts had to represent at least 30% for attribution.[41] In the rare cases of ties (<1%), we used random attribution. Next, using IQVIA OneKey, we attributed each provider's patients to their practice.

We matched these data to a measure of neighborhood deprivation, the Area Deprivation Index (ADI).[42] We obtained ADI data from the Neighborhood Atlas[42] at the University of Wisconsin-Madison School of Medicine and Public Health. The ADI is derived from the American Community Survey 5-year estimates by combining 17 weighted socioeconomic indicators into a single index measure. Using the 2020 9-digit ZIP code ADI files for the 6 states in our study, we identified the national ADI percentile ranking of all 9-digit ZIP codes within each 5-digit ZIP code. Then, we aggregated them by calculating the mean of those rankings. These aggregated 5-digit zip code ADI percentiles were then linked to the 5-digit ZIP codes of the residential addresses of the Medicare beneficiaries included in our study. The 5-digit ZIP is the smallest geographic data available in our Medicare patient dataset.

Key explanatory variables

Race and ethnicity, the main explanatory variable, was measured using the Research Triangle Institute (RTI) coding algorithm, which includes 7 categories: African American or Black (Black), Asian or Pacific Islander (Asian), Hispanic or Latinx (Hispanic), non-Hispanic White (White), American Indian/Native American, Unknown, and Other. We used the RTI algorithm because it is more accurate at identifying race and ethnicity than Medicare race variables.[43]

Neighborhood deprivation, the moderator variable, was measured using the ADI, an ordinal national percentile ranking from 1 to 100, with 1 being least disadvantaged and 100 being most disadvantaged.[44]

Outcome variables

We analyzed 2 outcomes: all-cause and ambulatory care sensitive condition (ACSC) hospitalizations (ie, preventable with high-quality primary care). The occurrence of these events was coded categorically: 0 hospitalization or at least 1 hospitalization. We defined hospitalization as any record in the Centers for Medicare and Medicaid Services (CMS) inpatient claims file with a length of stay of more than 1 day in 2018. ACSCs are conditions leading to hospitalization that could have been prevented by more accessible ambulatory care or with better quality primary care by preventing the onset of an illness, controlling an acute illness, or managing a chronic disease.[45,46] For each patient, we defined an ACSC hospitalization as a stay for 1 of 9 conditions deemed sensitive to primary care by the Agency for Healthcare Research and Quality.[47]

Covariates

We included patient demographic information (ie, age, sex) and whether the patient's main primary care provider was a

physician or an NP. In addition, we included a count of 15 chronic conditions from the US Department of Health and Human Services list of standard chronic conditions (ie, asthma, COPD, hypertension, CHF, coronary artery disease, cardiac arrhythmias, hyperlipidemia, stroke, arthritis, cancer, chronic kidney disease, dementia, depression, diabetes, and osteoporosis) that are included in the Medicare patient dataset.[48] We assessed multimorbidity by counting the number of chronic conditions, as this predicts total Medicare expenditures.[49] This approach is widely used in research and helps create a more parsimonious model while avoiding overcontrolling for comorbidities.[50]

At the practice level, we controlled for the number of NPs and physicians, practice type (ie, physician office, hospital-based clinic, federally qualified health center, other), location (ie, rural, urban), and structural capability score—measuring practices' infrastructure for delivering care, which measures the presence of specific structural attributes for the delivery of high-quality care (ie, availability of electronic health records, disease registries, weekend hours, performance feedback to clinicians, disease registries and reminder systems, community referrals, and shared communication with patients).[51,52] We also controlled for a global measure of practice-level work environment from the Nurse Practitioner-Primary Care Organizational Climate Questionnaire, a reliable and valid measure of the NP work environment.[53,54] Higher work environment scores indicate a more favorable NP work environment. We included state-fixed effects to account for state-level differences, including NP SOP differences.

Though missing data constituted <5% of the survey data, we assessed patterns of missingness and found that missingness was independent of NPs' demographic attributes. Thus, we used case-wise deletion. There was no missing data in the Master Beneficiary Summary File, from which we obtained patients' demographic information.

Data analysis

We computed descriptive statistics for all patient-level and practice-level characteristics. Bivariate associations between patient-level characteristics (ie, age, dominant primary care provider, number of chronic conditions, and sex) and race and ethnicity (ie, White, Hispanic, Black, Asian, and All Others) were calculated using analysis of variance or χ^2 tests. Frequencies of outcomes (ie, all-cause or ACSC hospitalization) by race and ethnicity were also calculated. Finally, we used multi-level logistic regression models to assess whether the associations of the outcomes with race and ethnicity were moderated by ADI while controlling for the patient- and practice-level characteristics described above. We included interaction terms between race/ethnicity and ADI to assess whether ADI moderated racial and ethnic disparities in all-cause or ACSC hospitalizations. If a significant interaction effect was found, we illustrated the moderation effect to demonstrate how the ordinal national ranking of the ADI was associated with racial/ethnic disparities measured by the odds ratio (OR) of hospitalization. Next, we estimated the OR of hospitalization at 5 illustrative points of the national

Table 1. Patient-level characteristics.

	Race and ethnicity						
	All other[a] ($n = 15\,652$)	Asian ($n = 18\,328$)	Black ($n = 22\,762$)	Hispanic ($n = 40\,173$)	Non-Hispanic White ($n = 434\,047$)	Total ($N = 530\,962$)	*P*-value
Age							
Mean (SD)	72.11 (5.98)	76.14 (7.76)	74.44 (7.50)	74.50 (7.37)	75.86 (7.56)	75.59 (7.54)	<0.001
Number of chronic conditions							
Mean (SD)	2.71 (1.60)	3.08 (1.72)	3.31 (1.84)	3.25 (1.80)	2.95 (1.72)	2.99 (1.73)	<0.001
ADI Rank							
Mean (SD)	36.79 (23.66)	24.19 (18.96)	52.43 (25.88)	50.53 (26.51)	40.64 (21.80)	41.22 (22.87)	<0.001
≤25	5562 (37.15)	11 131 (62.21)	4315 (19.71)	8800 (22.39)	113 471 (27.47)	143 279 (28.25)	
26-50	5300 (35.40)	4640 (25.93)	5494 (25.09)	10 312 (26.24)	159 779 (38.67)	185 525 (36.58)	
51-75	2930 (19.57)	1782 (09.96)	6709 (30.64)	10 578 (26.92)	110 583 (26.77)	132 582 (26.14)	
76-100	1181 (7.89)	341 (1.91)	5379 (24.57)	9606 (24.45)	29 311 (7.09)	45 818 (9.03)	
State							
AZ	2702 (17.26)	923 (05.04)	1229 (5.40)	5044 (12.56)	56 747 (13.07)	66 645 (12.55)	<0.001
CA	3323 (21.23)	9144 (49.89)	3800 (16.69)	13 436 (33.45)	63 021 (14.52)	92 724 (17.46)	
NJ	1463 (9.35)	1732 (9.45)	3418 (15.02)	2780 (6.92)	46 996 (10.83)	56 389 (10.62)	
PA	2779 (17.75)	1480 (8.08)	5115 (22.47)	2263 (5.63)	100 456 (23.14)	112 093 (21.11)	
TX	1797 (11.48)	1550 (8.46)	7455 (32.75)	13 972 (34.78)	82 980 (19.12)	107 754 (20.29)	
WA	3588 (22.92)	3499 (19.09)	1745 (7.67)	2678 (6.67)	83 847 (19.32)	95 357 (17.96)	
Gender—*n*(%)							
Female	7723 (49.34)	11 154 (60.86)	14 693 (64.55)	24 879 (61.93)	251 699 (57.99)	310 148 (58.41)	<0.001
Male	7929 (50.66)	7174 (39.14)	8069 (35.45)	15 294 (38.07)	182 348 (42.01)	220 814 (41.59)	
Primary Care provider— *n*(%)							
Physician	13 523 (86.40)	16 957 (92.52)	19 864 (87.27)	34 482 (85.83)	372 518 (85.82)	457 344 (86.13)	<0.001
Nurse Practitioner	2129 (13.60)	1371 (7.48)	2898 (12.73)	5691 (14.17)	61 529 (14.18)	73 618 (13.87)	
All-Cause hospitalization—*n*(%)							
No	13 471 (86.07)	15 870 (86.59)	18 245 (80.16)	33 052 (82.27)	357 361 (82.33)	437 999 (82.49)	<0.001
Yes	2181 (13.93)	2458 (13.41)	4517 (19.84)	7121 (17.73)	76 686 (17.67)	92 963 (17.51)	
ACSC Hospitalization —*n*(%)							
No	15 438 (98.63)	17 929 (97.82)	21 813 (95.83)	38 958 (96.98)	424 034 (97.69)	518 172 (97.59)	<0.001
Yes	214 (1.37)	399 (2.18)	949 (4.17)	1215 (3.02)	10 013 (2.31)	12 790 (2.41)	

[a]Includes: American Indian/Native American, Unknown Race and Ethnicity, and Other Race and Ethnicity.
Abbreviation: ACSC, ambulatory care sensitive conditions.

ranking of ADI (from a minimum score of 1 to a maximum score of 100, at increments of 25) to give examples of how ADI impacted racial and ethnic disparities in the outcomes. The original ordinal national ranking of ADI scores was re-scaled by dividing it by 10 and centering it around the score of 50 (national median) in the regression models to facilitate the meaningful interpretation of the regression results.[55] We used multi-level regression models to account for the clustering effect of 530 962 patients nested in 1042 practices and adopted a 2-sided α-level of 0.05. Our practice-level sample size of 1042 practices is greater than the recommended sample size of 50 at the second level to run multi-level regression models.[56] All analyses were conducted using SAS version 9.4 (SAS Institute Inc).

Results

The patient sample included 530 962 patients (58.41% female), with a mean age of 75.59 years and an average of about 3 chronic conditions. Of these patients, 434 047 (81.75%) were non-Hispanic White, 7.57% were Hispanic, 4.28% were Black, 3.45% were Asian, and 2.95% were All Other race. Demographic characteristics of the sample are reported in Table 1. All patient-level characteristics significantly differed ($P < 0.001$) by race and ethnicity. On average, Asian, Black, and Hispanic patients had significantly more chronic conditions than White patients. Black and Hispanic patients lived in neighborhoods with higher ADI, indicating more disadvantage, compared with White patients, while Asian patients lived in neighborhoods with lower ADI compared with White patients. Black and Asian patients were less likely to have an NP as their primary care provider compared with White patients. Practice-level characteristics are reported in the Appendix (Appendix Table S1). The practices where patients received care were predominantly located in urban areas (85.41%) and employed an average of 2.81 NPs and 5.84 physicians.

Moderation effects of ADI on racial and ethnic disparities in all-cause and ACSC hospitalization

First, we estimated models with only the main effects. Next, we estimated multivariable logistic regression models with interaction terms between race/ethnicity and ADI to assess whether ADI moderated racial and ethnic disparities in all-cause and ACSC hospitalizations. We found that ADI moderated the association of the Black race (compared with the White race) with all-cause (Ratio of OR [ROR]: 0.979; 95% CI: 0.966-0.993; P-value = 0.004) and ACSC (ROR: 0.970; 95% CI: 0.943-0.999; P-value = 0.039) hospitalizations (Table 2). In particular, with a one-point increase in the re-scaled ADI (or 10-point increase in the original ADI), the OR of all-cause hospitalization among Black patients decreased by 2.1% (1-ROR), and the OR of ACSC hospitalization decreased by 3% compared with White patients. Figure 1 shows the negative relationships between the national ranking of the ADI with the ORs of all-cause hospitalization and ACSC hospitalization between Black and White patients. To demonstrate that higher ADI scores were associated with smaller disparities between Black and White patients, we estimated the ORs of hospitalization between Black and White patients at 5 different illustrative points of the national ranking of the ADI (Appendix Table S2). When the national ranking of ADI reached its maximum score of 100 (ie, highest deprivation), the ORs for all-cause and ACSC hospitalization for Black patients compared with White patients were their lowest (all-cause hospitalization OR: 0.96; 95% CI: 0.89-1.04; P-value = 0.35 and ACSC hospitalization OR: 1.42; 95% CI: 1.22-1.67; P-value < 0.0001). Conversely, when ADI reached its minimum score of 1 (ie, the lowest deprivation), the ORs for all-cause and ACSC hospitalization for Black patients compared with White patients were their highest (all-cause hospitalization OR: 1.19; 95% CI: 1.09-1.29; P-value < 0.0001 and ACSC hospitalization OR: 1.93; 95% CI: 1.63-2.28; P-value < 0.0001) (Figure 1 and Appendix Table S2). As shown in Table 3, as ADI increased, all patients had higher odds of experiencing all-cause or ACSC hospitalization (OR = 1.041; 95% CI: 1.035-1.047; P-value < 0.0001).

We found that ADI did not moderate the associations between other racial and ethnic groups (ie, Asian and Hispanic patients, compared with White patients) and all-cause or ACSC hospitalization, based on non-significant interaction terms between ADI and each of those groups. Thus, the interpretation of the relationships between other race and ethnicity categories and the outcomes are based on models with main effects only (Table 3). Overall, Hispanic beneficiaries were less likely to experience all-cause hospitalization (OR: 0.94; 95% CI: 0.91-0.97; P-value < 0.001) but were more likely to experience ACSC hospitalization (OR: 1.13; 95% CI: 1.05-1.21; P-value = 0.001), compared with White beneficiaries. Asian beneficiaries were

Table 2. Multi-level regression models assessing the moderation effect of ADI on racial and ethnic disparities in all-cause and ACSC hospitalization (N = 530 962).

Variable	Category	Odds ratio[b]	95% CI		P-value
Outcome: all-cause hospitalization					
Race	All Other[a]	0.842	0.798	0.889	<0.0001
Race	Asian	0.726	0.674	0.782	<0.0001
Race	Black	1.069	1.030	1.110	0.001
Race	Hispanic	0.941	0.912	0.972	0.000
Race	Non-Hispanic White				
ADI		1.043	1.037	1.049	<0.0001
ADI × Race	All Other[a]	1.025	1.004	1.046	0.0178
ADI × Race	Asian	0.979	0.956	1.003	0.090
ADI × Race	Black	0.979	0.966	0.993	0.004
ADI × Race	Hispanic	0.992	0.980	1.004	0.192
ADI × Race	Non-Hispanic White	1.000			.
Outcome: ACSC hospitalization					
Race	All Other[a]	0.763	0.657	0.887	0.000
Race	Asian	0.886	0.744	1.055	0.173
Race	Black	1.657	1.533	1.791	<0.0001
Race	Hispanic	1.124	1.046	1.208	0.001
Race	Non-Hispanic White	1.000			
ADI		1.088	1.073	1.103	<0.0001
ADI × Race	All Other[a]	1.027	0.971	1.086	0.351
ADI × Race	Asian	0.958	0.906	1.013	0.129
ADI × Race	Black	0.970	0.943	0.999	0.039
ADI × Race	Hispanic	1.005	0.979	1.032	0.693
ADI × Race	Non-Hispanic White	1.000			

Full regression models include an interaction term of race and ADI and control for all beneficiaries' demographic characteristics, number of chronic conditions, dominant primary care provider type, practice-level work environment and structural capability scores, practice size and type, state, and urbanicity. The ordinal national ranking of the ADI score was rescaled by dividing it by 10 and centering it at 50, representing the national median, for meaningful interpretation.
[a]Includes: American Indian/Native American, Unknown Race and Ethnicity, and Other Race and Ethnicity.
[b]Exponentiated regression coefficient of the interaction term (eg, the ADI × Race term) of a logit model is the ROR.
Abbreviations: ACSC, ambulatory care sensitive conditions; ADI, Area Deprivation Index; ROR, ratio of odds ratio.

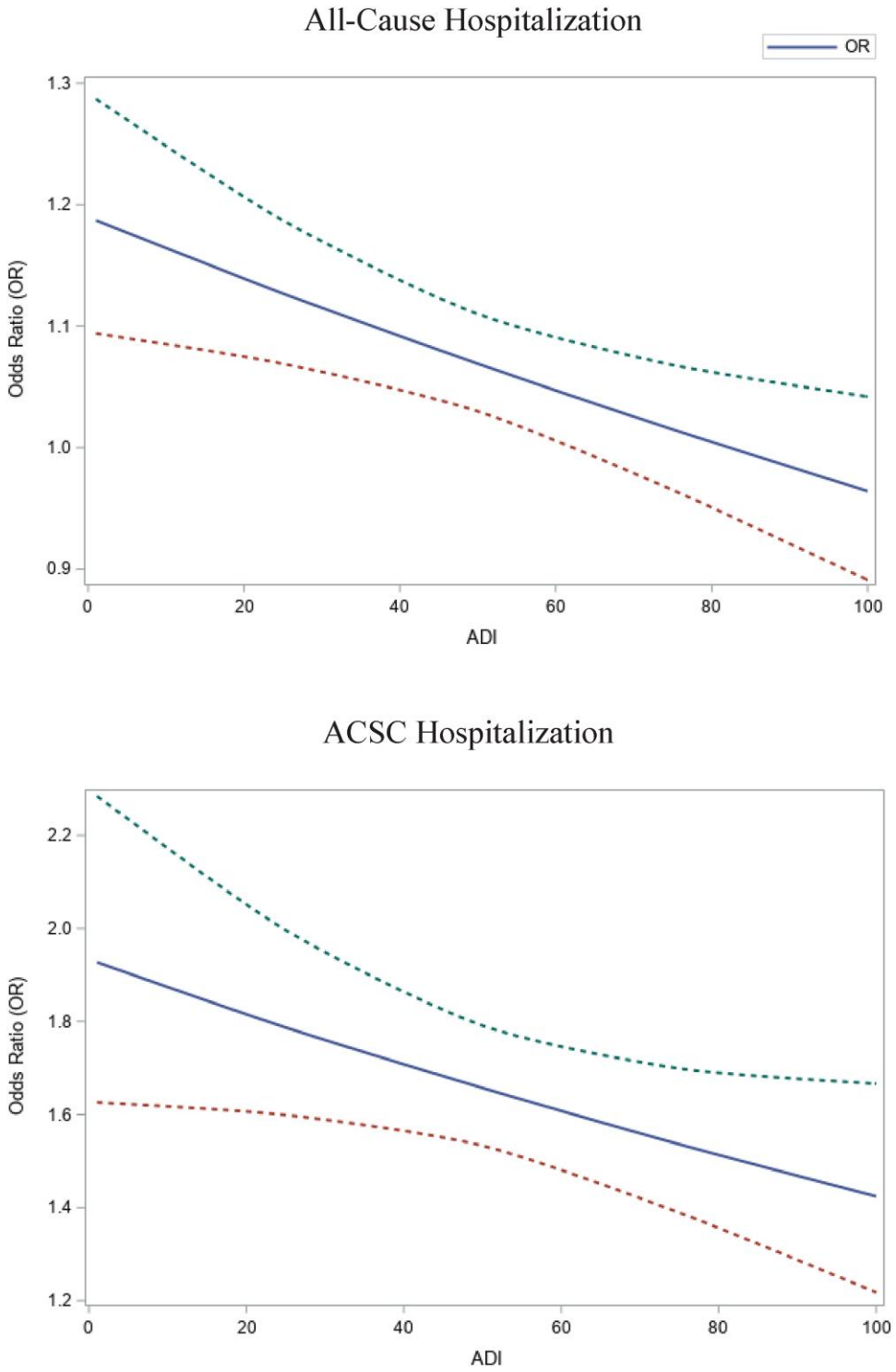

Figure 1. Relationship of national ranking of the ADI with OR of all-cause hospitalization and ACSC hospitalization between Black and White patients.

less likely to experience all-cause hospitalization (OR: 0.76; 95% CI: 0.72-0.80; *P*-value < 0.0001) but were equally likely to experience ACSC hospitalization (OR = 0.98; 95% CI: 0.87-1.09; *P*-value = 0.68), compared with White beneficiaries.

Discussion

In this study, we investigated racial and ethnic disparities in hospitalization among older adult Medicare beneficiaries receiving care in primary care practices employing NPs and how neighborhood disadvantage moderated the relationship between race and hospitalization outcomes. We found that older adults from Black and Hispanic backgrounds had more chronic conditions, lived in more deprived areas, and had higher hospitalization rates than their White counterparts. Yet, the disparity in hospitalization rates between Black and White older adults narrowed in the most deprived areas, with the lowest disparity in hospitalization rates

Table 3. Main effect of race and ethnicity and ADI on all-cause ACSC hospitalization.

Variable	Category	Odds ratio	95% CI		*P*-value
			Lower	Upper	
	Outcome: all-cause hospitalization				
Race	All Other	0.817	0.778	0.858	<0.0001
Race	Asian	0.759	0.723	0.797	<0.0001
Race	Black	1.067	1.027	1.107	0.001
Race	Hispanic	0.943	0.914	0.973	<0.001
Race	Non-Hispanic White	1.000			
ADI		1.041	1.035	1.047	<0.0001
	Outcome: ACSC hospitalization				
Race	All Other	0.745	0.646	0.859	<0.0001
Race	Asian	0.976	0.872	1.093	0.678
Race	Black	1.639	1.516	1.771	<0.0001
Race	Hispanic	1.128	1.050	1.212	0.001
Race	Non-Hispanic White	1.000			
ADI		1.085	1.071	1.099	<0.0001

Full regression models control for all beneficiaries' demographic characteristics, number of chronic conditions, type of dominant primary care provider, practice-level work environment and structural capability scores, practice size and type, state, and urbanicity. The ordinal national ranking of the ADI score was rescaled by dividing it by 10 and centering it at 50, representing the national median, for meaningful interpretation.
Abbreviations: ACSC, ambulatory care sensitive conditions hospitalization; ADI, Area Deprivation Index.

occurring in the areas with the highest deprivation. Conversely, when the ADI indicated the least deprivation, disparities in hospitalization rates between Black and White beneficiaries were the widest. We did not observe similar relationships between other racial groups.

Our results suggest a complex relationship between race/ethnicity, socioeconomic conditions, and health outcomes. Specifically, we found that disparities between White and Black beneficiaries are lowest in the most deprived communities. Previous studies have found that low socioeconomic status at the *individual level* likely impacts the health of Black and White Americans similarly. For example, other studies have demonstrated that life expectancy is nearly identical for White and Black non-college-educated Americans.[57] Our study finds a similar relationship when considering socioeconomic status at the community level. Namely, that living in low-income and disadvantaged neighborhoods leads to poor health outcomes both for Black and White patients, but Black patients still experience worse outcomes.

At the same time, we found that disparities in hospitalization outcomes between White and Black beneficiaries are largest in the least deprived communities. This is consistent with arguments suggesting that upper-class Black Americans cannot access the benefits of higher socioeconomic status.[58,59] Likewise, at the individual level, higher levels of education have been associated with improvements in life expectancy, though the returns are less dramatic for Black Americans.[60] Our study shows that this individual-level phenomenon may also operate at a community level. It appears that Black older adults do not have the same health returns on living in wealthy and advantaged communities compared with White Americans. One potential explanation for Black older adults' struggle to access the benefits of more advantaged communities is that they may be overtly or implicitly unwelcome in these communities, possibly contributing to lower levels of health attainment through experiences of discrimination.[58] For example, there is evidence that wealthy Black women experience higher levels of discrimination-induced hypertension than lower-income Black women.[61] This could explain why we see larger disparities in hospitalization outcomes between White and Black beneficiaries in the least deprived communities.

Lastly, while investing in disadvantaged neighborhoods may benefit all residents, our findings suggest that older Black patients remain marginalized and experience poor outcomes even when residing in better-resourced communities, and this must be carefully considered when developing initiatives to reduce disparities in hospital utilization. Given their effectiveness in reducing the risk of hospitalization, investments in preventive measures, including more proactive outpatient care,[62] treating or preventing frailty,[63] and creating meaningful relationships with communities,[64,65] should be prioritized for marginalized populations. Our findings also suggest that programs and interventions that facilitate access to high-quality healthcare support and services are needed for older Black Americans, regardless of where they live. Research has shown that diversifying the healthcare workforce, outreach to marginalized populations, and targeted outbound patient communication are essential to engagement and promoting health equity.[66-68] Future research should further explore barriers and facilitators to broader implementation and uptake of these programs.

Limitations

Our study has several limitations. First, we collected data from 6 states with different healthcare markets and geographic characteristics, and our findings may not be generalizable nationwide. Future studies with nationally representative samples are needed. Second, the beneficiaries included in our sample received care in primary care practices employing NPs. Even though patients in our sample received care from both NPs and physicians in the practices employing NPs, our findings will not be generalizable to the practices that do not employ NPs. Although, in 2023, more than half of primary care practices employ NPs.[38] Future research should focus on practices that do not employ NPs, as it may be possible that practices that hire and employ NPs may be located in different geographic areas than practices that employ NPs. Third, our study used a cross-sectional, observational design, and establishing causation is not possible. Fourth, while our findings provide important insights, more research is needed to understand whether targeted improvements to specific aspects of neighborhoods can more effectively address health disparities. Lastly, the 5-digit ZIP code of each patient's residential address was used to compute the ADI. While this was the smallest geographic data available in our Medicare patient dataset, we acknowledge that using an aggregated 5-digit ZIP code ADI reduced precision in the study.

Conclusion

In this study, we found that when Black and White Medicare beneficiaries reside in severely disadvantaged neighborhoods, Black beneficiaries experience smaller disparities in hospitalizations. Black beneficiaries face large disparities in well-resourced communities. Our findings have important implications for developing policies, programs, and strategies to advance health equity through targeted investments in community support and healthcare delivery infrastructure to serve historically marginalized groups better.

Supplementary material

Supplementary material is available at *Health Affairs Scholar* online.

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Conflicts of interest

Please see ICMJE form(s) for author conflicts of interest. These have been provided as supplementary materials.

Notes

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