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Community-level social vulnerability and hip and knee joint replacement surgery receipt among Medicare enrollees with arthritis

Sarah H. Yi, PhD, MS, RD,
Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia.

Renee M. Calanan, PhD, MS,
National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia.

Commissioned Corps, US Public Health Service, Rockville, Maryland.

Michael J. A. Reid, MD, MPH,
Department of Medicine, University of California San Francisco, San Francisco, California.
Institute for Global Health Sciences, University of California San Francisco, San Francisco, California

Sophia V. Kazakova, MD, PhD, MPH,
Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia.

James Baggs, PhD,
Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia.

Anita W. McLees, MA, MPH
Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia.

Structured abstract

Background: Expanded understanding of relevant social determinants of health is essential to inform policies and practices that promote equitable access to hip and knee total joint replacement (TJR).

Objectives: (1) Explore associations between county Minority Health Social Vulnerability Index (MH-SVI) and TJR; (2) assess associations by individual-level race/ethnicity.

Corresponding author: Sarah H. Yi, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, MS H16-3, Atlanta, GA 30329-4027, sarahyi@cdc.gov.

Disclosure of potential conflicts of interest
No potential conflicts exist

Research Design: Retrospective cohort study of Medicare enrollees. CMS claims data were linked with MH-SVI. Multivariable logistic regression models were used to evaluate the odds of TJR according to the MH-SVI quartile in which enrollees resided.

Subjects: 10,471,413 traditional Medicare enrollees in 2018 ages ≥67 years with arthritis.

Measures: Main outcome: enrollee primary TJR during hospitalization. Main exposure: Minority-Health Social Vulnerability Index (composite and six themes) for county of enrollee residence. Results were stratified by enrollee race/ethnicity.

Results: Asian American, Native Hawaiian, or Pacific Islander (AANHPI), Black or African American (Black), and Hispanic enrollees comparatively had 26–41% lower odds of receiving TJR than White enrollees. Residing in counties within the highest quartile of composite and socioeconomic status vulnerability measures was associated with lower TJR overall and by race/ethnicity. Residing in counties with increased medical vulnerability for Black and White enrollees; housing type and transportation vulnerability for AANHPI and Hispanic enrollees; minority status and language theme for AANHPI enrollees; and household composition vulnerability for White enrollees were also associated with lower TJR.

Conclusions: Higher levels of social vulnerability were associated with lower TJR. However, the association varied by individual race/ethnicity. Implementing multi-sectoral strategies is crucial for ensuring equitable access to care.

Keywords

access to care; arthritis; Medicare; social inequality; total joint replacement

Introduction

Arthritis is projected to grow to a prevalence of 78 million adults in the United States by 2040.[1] With disease progression, pain can limit quality of life[2] with activity limitations seen in 44% of adults with arthritis.[3] To manage symptoms, treatment guidelines promote strategies such as weight control, patient education, medical devices and aids, and anti-inflammatory and pharmacologic agents.[4] When symptoms can no longer be managed through these approaches, total joint replacement (TJR) surgery may be needed to improve pain and mobility.[5]

While hip and knee TJR are among the most frequently performed surgical operations[6], receipt differs in relative frequency by race and ethnicity. Non-Hispanic (NH) Black, NH multiple race, and Hispanic adults are less likely to receive TJR than NH White adults.[7–9] In contrast, increased pain severity, disability, and arthritis-attributable activity limitations have been reported at higher proportions by those same population groups compared with NH White adults with arthritis.[3,10,11] Despite national prioritization by the orthopedic community[12] and the federal government[13] to eliminate racial and ethnic disparities in hip and knee TJR, documented differences in receipt by race and ethnicity have continued for decades.[7,9,12–14]

Health disparities across racial and ethnic groups highlight systemic racism and adverse social conditions.[15] Addressing these inequities requires focusing on underlying social

and structural causes. Social determinants of health (SDOH) are the nonmedical factors influencing health and conditions in which people live and receive healthcare. Studies indicate patients in communities with higher vulnerability scores, like those on the CDC/ATSDR's Social Vulnerability Index (SVI), tend to have lower TJR receipt and poorer outcomes compared with those in communities with lower vulnerability.[16]

The SVI was originally developed to identify communities most vulnerable to natural disasters but has also shown utility in identifying communities vulnerable to healthcare disparities. The SVI combines 15 variables into four themes: socioeconomic status; household composition and disability, characterized by household member age, disability status, and parental support; minority status and language; and housing type and transportation.[17] During the COVID-19 pandemic, the Minority-Health Social Vulnerability Index (MH-SVI)[18] was created by CDC/ATSDR and the U.S. Department of Health and Human Services Office of Minority Health to identify populations at highest risk for disproportionate impact. The MH-SVI adds healthcare infrastructure and access, medical vulnerability, racial and ethnic minority status, and community language data to the original SVI's four themes, as detailed in Supplemental Digital Content 1. This inclusion allows for enhanced assessment of community-level factors and SDOH beyond prior studies.

Objectives

In this study, we explored associations between the six community-level MH-SVI themes and receipt of hip and knee TJR in a cohort of Medicare enrollees with arthritis. Because of the long-standing disparities in surgery receipt, we assessed whether associations varied by individual-level race/ethnicity. A better understanding of the community factors associated with TJR is critical to ensure that policies and practices lead to equitable access to restorative procedures for population groups that have disproportionate risk of outcomes and activity limitations from arthritis.

Methods

Study design

We used a retrospective cohort design. The cohort was drawn from Medicare enrollees in the Chronic Conditions Data Warehouse's (CCW) 2018 100% Medicare Beneficiary Annual Summary File (MBSF). To ensure availability of all medical claims, we limited the cohort to enrollees with Medicare fee-for-service (FFS) Parts A and B (also known as original or traditional) coverage for the two years before and one year after a randomly selected start date in 2018. We selected those aged 67–99 years and residing within the 50 US states or the District of Columbia. Enrollees were limited to those with rheumatoid arthritis or osteoarthritis (arthritis), two indications for TJR. The MBSF Chronic Condition file was used to identify enrollees with arthritis[19] as detailed in Supplemental Digital Content 2. Identification criteria had to be met as of the randomly selected start date and without evidence of fracture or joint replacement surgery in the prior two years. To avoid underestimating the odds of TJR receipt we excluded enrollees with end-stage renal disease[20] and those who died without receiving TJR in the year following the start date.

Main outcome

The main outcome examined was enrollee receipt of primary hip or knee TJR surgery within one year of the start date according to inpatient hospitalization records in CCW Medicare Provider Analysis and Review (MedPAR) files. ICD-10 procedure codes based on Centers for Medicare & Medicaid Services (CMS) Inpatient Quality Reporting criteria[21] were used to identify TJR.

Exposures and other data elements

Overall and theme-specific county-level MH-SVI were the main exposures. The MH-SVI data were obtained as a publicly available dataset containing one row per county-state Federal Information Processing Series (FIPS) code. To maximize the ability to link enrollee data with MH-SVI, enrollee county was based on Social Security Administration, FIPS, or zip code from the MBSF as detailed in Supplemental Digital Content 2. We linked the county-level MH-SVI dataset to the enrollee cohort file by enrollee state-county FIPS code. Overall MH-SVI and each of the six themes are ranked across the fifty US states plus DC, with values ranging between 0 and 1; lower values indicate lower level of vulnerability relative to other counties. We then categorized the rankings into quartiles for descriptive and comparison purposes. For each MH-SVI measure, one set of quartiles was developed based on distribution of the enrollee-level data for the study cohort.

To identify disparities by race/ethnicity, we used the Research Triangle Institute (RTI) race variable from the MBSF. We reference “race/ethnicity” because the data source provides either race or ethnicity information for each enrollee but not both. The RTI race variable is constructed through an imputation algorithm using the CMS’s enrollment database original race variable. This algorithm was developed to reduce missingness and improve accuracy, particularly in identifying Hispanic and Asian/Pacific Islander enrollees[22]. The race/ethnicity information is not self-reported. The data source had five named race/ethnicity categories: American Indian or Alaska Native (abbreviated henceforth as AIAN); Asian American, Native Hawaiian, or Pacific Islander (AANHPI); Black or African American (Black); Hispanic or Latino (Hispanic); non-Hispanic White (White).[23] The two unnamed categories were another race or ethnicity (Other race) and unknown race or ethnicity (Unknown). Because White patients historically have the highest receipt of TJR when stratified by race/ethnicity[8,9], non-Hispanic White race/ethnicity served as the reference category. In this study, differences in outcomes by race/ethnicity were used as markers and not causes of inequity. Causes include structural racism and other adverse social determinants of health[15]

Potential confounding factors at the enrollee level included age, sex, dual Medicare-Medicaid enrollment, chronic conditions, and time from initial diagnosis until the start of the index period and obtained from the MBSF. County-level 2013 National Center for Health Statistics (NCHS) urban/rural classification data[24] were linked to the cohort file by enrollee state-county FIPS code.

Statistical analysis

Descriptive statistics stratified by enrollee race/ethnicity were used to characterize the sample. We used bivariable logistic regression to provide unadjusted odds ratios and 95% confidence intervals (95% CI) of TJR for each exposure, stratifying variable, and potential confounding factors.

Multivariable logistic regression models were used to evaluate the odds of TJR according to the MH-SVI quartile in which enrollees resided. Enrollees living in counties ranking in the least vulnerable quartile served as reference. For the first two models, the overall MH-SVI and the group of six themes served as exposures, respectively. Both models included enrollee race/ethnicity and accounted for potential confounding factors at the enrollee and county levels. Seven additional sets of models were used for each MH-SVI measure (i.e., overall and the six themes) individually as an independent exposure and stratified by race/ethnicity. The logistic regression models produced effect and variability estimates in the form of odds ratios (OR) and 95% confidence intervals (CI).

Data management, analysis, and figures were completed using SAS version 9.4 (SAS Institute Inc., Cary, NC). We set a minimum effect size criterion of 10% to identify meaningful difference in enrollee TJR. This criterion translated to an OR and corresponding 95% CI ≤0.90 or ≥1.10. A *P*-value <0.05 indicated statistical significance. Meeting both sets of criteria was required to be considered a significant result. In addition to identifying more meaningful differences, these criteria were used to account for the large study population which exceeded ten million enrollees overall. With an expected rate of <1 TJR per 100 enrollees[9], these criteria still allow for effects smaller than Cohen's *d* "small" effect size.[25]

Ethical considerations

This work was conducted under a data use agreement with CMS. This activity was reviewed and approved by the CDC as exempt human subjects research under 45 CFR 46.104.[26]

Results

Of the 12,661,734 Medicare enrollees with arthritis in 2018 with eligible coverage, 7% were excluded because they died without receiving TJR in the year following the start date (n=927,567). A total of 10,471,413 enrollees met all restriction criteria, including no TJR or fracture in the prior two years. This group is referred to hereafter as members of the study cohort or enrollees (Figure 1).

Distribution of the cohort by race/ethnicity groups in order of prevalence was White (84% or 8,841,088 enrollees), Black (7%), Hispanic (4%), AANHPI (2%) and AIAN (0.5% or 47,915 enrollees; Table 1). Less than 1% of patients were another race; race/ethnicity information was unknown for 1% of the cohort. Thirteen percent of enrollees had dual Medicare and Medicaid coverage. Dual enrollment varied widely by race/ethnicity (9% - 50%), with AANHPI (50%) and Hispanic (46%) enrollees having the highest proportions of dual enrollment.

The cohort resided in 3,139 of 3,143 counties across 50 states and the District of Columbia. Large fringe metropolitan areas were the most common residential locations (25%). Twenty-one percent of enrollees lived in non-metropolitan locations (i.e., micropolitan or non-core). Location type varied by race/ethnicity: 59% of AANHPI enrollees lived in large central metropolitan counties and 54% of AIAN enrollees lived in micropolitan or non-core counties. The median overall MH-SVI score was 0.64 (interquartile range: 0.42–0.84), with race/ethnicity-specific medians ranging between 0.60–0.84 (details shown in Table 1). Theme-specific medians ranged from a median of 0.23 (range of medians by race/ethnicity: 0.08, AANHPI - 0.56, AIAN; Medical Vulnerability) to 0.90 (range of medians by race/ethnicity: 0.73, AIAN - 0.98, AANHPI; Minority Status and Language).

In the year following the randomly selected start date, 2.1% (225,476) of enrollees received TJR. Characteristics of Medicare enrollees who did and did not receive TJR surgery are presented in Supplemental Digital Content 3. AANHPI, Black, and Hispanic enrollees had 41%, 29%, and 26% lower TJR, respectively, compared with White enrollees in adjusted multivariable regression models (adjusted $P<0.05$; Figure 2a). Enrollees living in the counties with the highest levels of overall vulnerability (adjusted odds ratio, 95% CI: 0.87, 0.86–0.88) and socioeconomic status vulnerability (adjusted odds ratio, 95% CI: 0.86, 0.84–0.88; Figure 2b) also had lower odds of TJR (hereafter, lower TJR) compared with enrollees living in counties with the lowest levels of the respective measures in adjusted multivariable regression models.

Supplemental Digital Content 4 shows the distribution of the cohort across MH-SVI quartiles by race/ethnicity. These stratified results had a similar pattern for overall MH-SVI (Figure 3a, Supplemental Digital Content 5) and socioeconomic status theme (Figure 3b, Supplemental Digital Content 5) as unstratified results. Enrollees living in counties ranked in the highest MH-SVI quartile had lower TJR than those living in counties ranked in the lowest quartile among AANHPI (adjusted odds ratio, 95% CI for overall MH-SVI: 0.76, 0.67–0.88), Black (adjusted odds ratio, 95% CI: 0.77, 0.72–0.83), Hispanic (adjusted odds ratio, 95% CI: 0.80, 0.72–0.87), and White (adjusted odds ratio, 95% CI: 0.88, 0.86–0.89) enrollees. AANHPI and Hispanic enrollees living in counties ranked in the highest MH-SVI quartile of the housing type and transportation theme had less TJR than those living in the lowest quartile. Black and White enrollees living in counties in the highest quartile for medical vulnerability had less TJR than those living in the lowest quartile. AANHPI enrollees living in counties ranked in the highest quartile of the minority status and language theme had less TJR than those in the lowest quartile. Finally, White enrollees living in counties ranked in the highest quartile for the household composition theme had less TJR than those in the lowest quartile. Little differentiation in TJR receipt by MH-SVI quartile was observed among AIAN enrollees.

Discussion

This study investigated the relationship between community social vulnerability, race/ethnicity, and TJR receipt among Medicare enrollees with arthritis. We identified racial/ethnic disparities in TJR, with enrollees living in counties with the highest vulnerability receiving fewer surgeries than those in counties with the lowest. These findings were

observed across the entire cohort and AANHPI, Black, Hispanic, and White groups. Associations between TJR and domains like housing type and transportation varied by race/ethnicity, underscoring how community social context may affect TJR access. Understanding these dynamics is critical to promoting equitable healthcare.

We observed an independent association between race/ethnicity and TJR in multivariable analysis (Figure 2a). AANHPI, Black, and Hispanic enrollees had comparatively 26–41% lower odds of receiving TJR than White enrollees. These findings align with prior studies between the 1970s through 2021.[7,9,12–14] Because racial and ethnic inequities in healthcare are often multifactorial, there may be other mediators of the relationship between race, ethnicity, and TJR. One potential driver of inequities is structural racism, which operates through interpersonal bias and discrimination in the healthcare setting towards patients who have been minoritized.[15] Language, cultural, and provider time barriers during clinical encounters can also lead to explicitly or implicitly biased care; such bias can erode patient trust in providers.[27] Moreover, due to the complexity of the TJR decision-making process, bias could impact whether or not providers discuss, refer, or offer TJR as a treatment option.[28]

We also observed that patients with dual Medicare-Medicaid enrollment had 60% less TJR receipt, which is consistent with prior studies.[9,29] Payment policies can be strong drivers of healthcare receipt with lower reimbursement and payment delays impacting patient access to care.[30–32] Medicaid providers may receive lower reimbursement for treatment of patients with dual Medicare-Medicaid enrollment compared with Medicare only.[33] A 2019 poll revealed 81% of responding hip and knee surgeons felt pressured by current payment systems to limit the number of patients covered by Medicaid.[34]

Socioeconomic vulnerability at the community level was independently associated with lower TJR. This domain combines county-level measures of poverty, employment, per capita income, and persons without a high school diploma. Previous studies show consistent associations of economic disadvantage at a community level[29,35] for specific domain elements (e.g., average residential income) and composite measures (e.g., SVI or Area Deprivation Index). Furthermore, lower availability of surgeons has been described in the areas of high concentration of enrollees with dual Medicare-Medicaid coverage, another indicator of socioeconomic vulnerability.[9]

AANHPI enrollees living in counties ranked in the highest compared with the lowest quartile of vulnerability based on minority status and language had lower odds of TJR. This theme comprised of six Minority Status elements (i.e., percent of population identifying as Hispanic or Latino, Black or African American, Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, and Some Other Race) and five language elements. The language elements reflected the proportion of residents whose preferred language is Spanish, Chinese, Vietnamese, Korean, or Russian and speak English “Less than Very Well.” Patients speaking a language other than English (LOE) have had barriers to general and surgical health care access and poor outcomes.[36] Even when referred for orthopedic surgery consultation, people who spoke a language other than English or Spanish may be less likely to proceed to surgery.[37] In 2014, 8.7 million enrollees in Medicare and/or Medicaid were

estimated to speak a LOE.[38] Among Medicare and/or Medicaid enrollees with LOE, 60% speak Spanish, 4% Chinese, and the remaining spoke one of over 20 different languages.

AANHPI and Hispanic enrollees living in counties ranked in the highest quartile of housing and transportation vulnerability had lower odds of TJR compared with the lowest quartile. This domain consists of measures of households with no vehicle available, housing in multi-unit structures, mobile homes, or group quarters, and household crowding, (i.e., more people than rooms in occupied housing units). Identifying transportation solutions may aid patients in communities with limited transport and dense housing. Previous research shows people living in the US aged 65 years and older who identify as Hispanic or Asian were more likely to live in crowded residences than non-Hispanic White people.[39,40] Factors driving household crowding, like cultural values, financial status, and immigration background may not all be modifiable and could be protective if culturally normative.[41]

Black and White enrollees living in counties ranked higher in medical vulnerability had lower TJR, compared to those living in counties ranked lowest. In the MH-SVI, medical vulnerability is defined by county levels of cardiovascular disease, chronic respiratory disease, obesity, and diabetes as well as internet access. Given overlap of risk factors for severe arthritis such as obesity, which is part of the medical vulnerability MH-SVI theme, counties ranked higher in medical vulnerability could have more surgical need than capacity. Alternatively, limiting surgical procedures to patients meeting certain factors including body mass index (BMI), diabetes control, and smoking status[34] may drive some of the disparity. To reduce inequities and support patients in meeting guideline-specified eligibility criteria for TJR, practices, policies, and systems within and beyond the healthcare setting are needed. Such support in the healthcare setting could include ensuring affordable access to quality primary care focused on primary, secondary, and tertiary prevention.

This study had several limitations. First, while 96% of US residents aged ≥65 years were enrolled in a Medicare plan in 2018, the findings are generalizable mainly to the 53% enrolled in Parts A and B FFS Medicare (Supplemental Digital Content 2). Generalizability may be limited for those enrolled in partial (i.e., part A or B) FFS or a Medicare Advantage plan. Second, our analysis did not include surgical appropriateness data. This information is typically found in medical records but absent from Medicare claims. While such data could enhance precision in identifying patients indicated for TJR, their use might lead to an overly narrow cohort selection due to disparities in healthcare access and consequent under-documentation of condition severity.[42] Third, county-level data may be insufficiently granular for characterizing the social conditions most proximal to an enrollee's life.[43] Even so, some national studies have consistent findings when comparing county and census tract resolutions.[44] Also, because the enrollee county is based on mailing address, actual county of residence may be different. The extent to which this occurs and implications for the results are unclear. Fourth, we limited TJRs to inpatient procedures and therefore may incompletely capture TJR receipt by enrollees. While earlier projections estimated 25% of procedures would be performed in the outpatient setting, National Surgical Quality Improvement Program evidence shows the proportion to be under 14% for total knee replacements before 2020.[45,46] Fifth, the retrospective period to exclude enrollees with prior TJR or fracture was two years; patients with earlier TJR or fracture

may inadvertently be included. Sixth, there may be misclassification bias for race/ethnicity because the information was not self-reported. In addition, race/ethnicity could not be further disaggregated to determine which population sub-groups experienced the greatest inequities. The AANHPI group is diverse and sub-groups have known differences in social and structural factors that influence health. Using the RTI race variable helped mitigate this limitation as it improves sensitivity of identifying Hispanic and AANHPI enrollees with continued high specificity compared to self-reported race and ethnicity through first and last name algorithms.[47] Despite improvements, however, the sensitivity for AIAN enrollees remains low. While unavailable for the current study, future research may consider using the new Medicare Bayesian Improved Surname Geocoding which has shown improved prediction to include AIAN enrollees.[48] Finally, we lacked statistical precision to draw conclusions for AIAN enrollees. This limited precision stemmed in part from the relatively small number of AIAN enrollees and the inability to disaggregate this diverse group. Despite these limitations, this large national study expands understanding of underlying contributors to inequities in TJR receipt among population groups identified by race/ethnicity.

Implications

To address the social and structural factors influencing who receives TJR, a comprehensive, multi-sectoral approach is needed to ensure equitable care. Healthcare providers, professional and community organizations, healthcare insurance companies and other payers, government at all levels, and patients themselves are key players in this approach (Supplemental Digital Content 2). Their collaborative efforts should aim to create healthy communities; ensure early diagnosis and effective management of arthritis; equitable access to and provision of TJR; and screen for patient social needs and coordinate support before and after surgery.[49] Achieving equitable health care is contingent on understanding each patient's unique situation and ensuring the community infrastructure promotes access to resources and quality care for the best possible health outcomes.

Conclusions

In this cohort of Medicare enrollees with arthritis, we used measures of county-level social vulnerability to examine social determinants of racial/ethnic inequities in receiving hip and knee total joint replacement surgery. This approach allowed for an expanded understanding of TJR variability for enrollees with different social contexts. Such understanding provides context for addressing drivers of healthcare inequities and is critical to promoting equitable quality healthcare.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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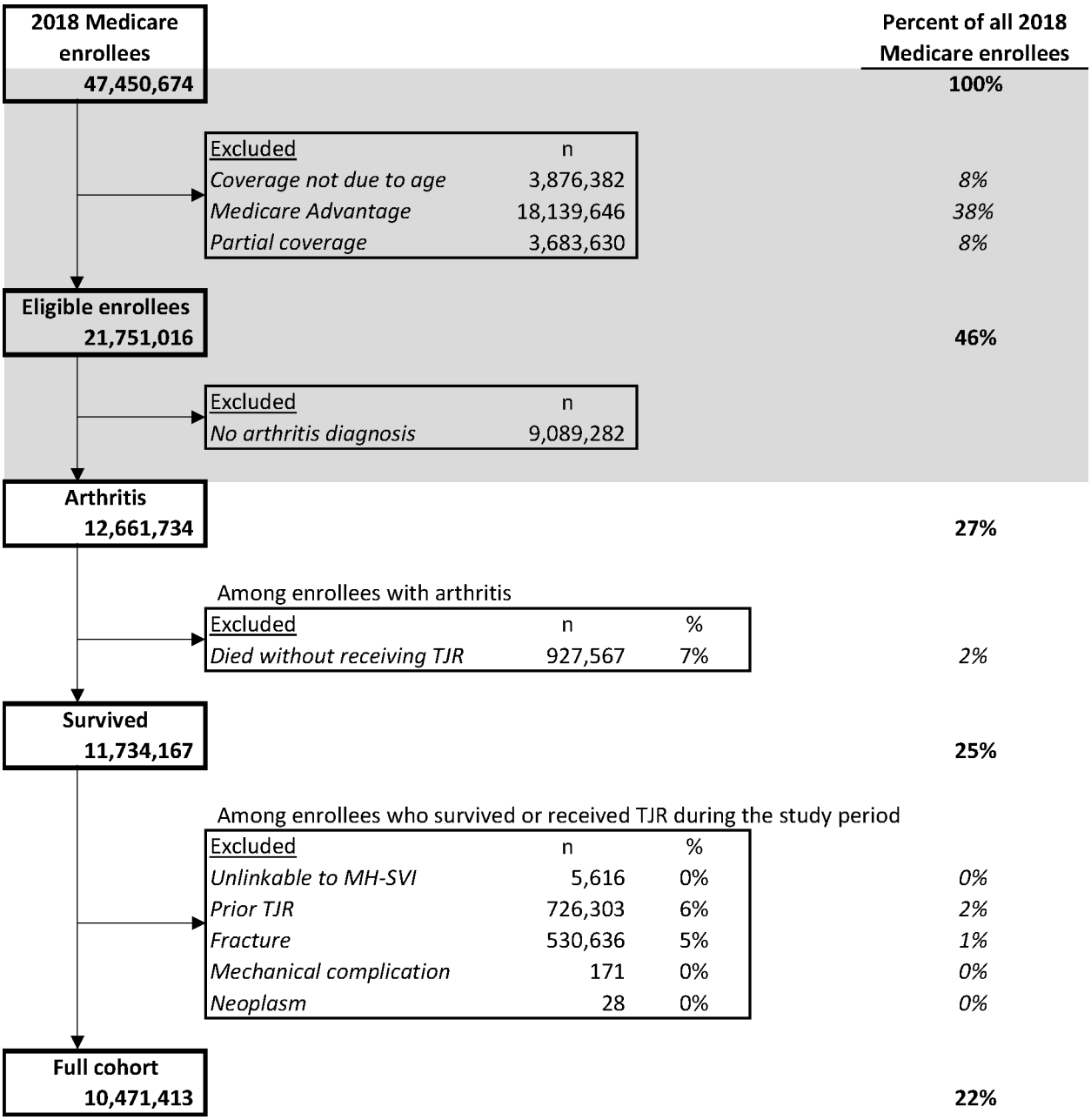


Figure 1.

Flow diagram of selection of a cohort of Medicare enrollees with arthritis in 2018.

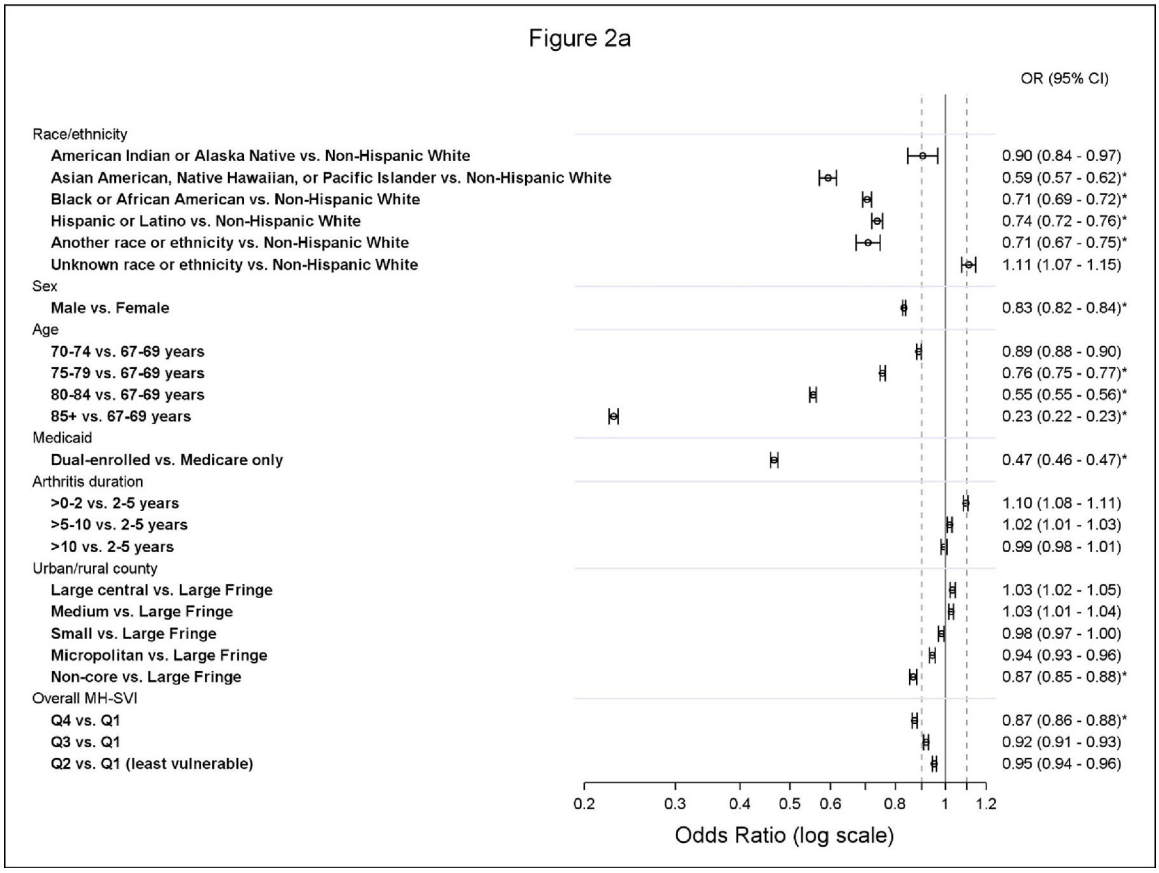
Abbreviations: MH-SVI, minority-health social vulnerability index; TJR, total joint replacement.

Notes:

- Arthritis refers to osteoarthritis or rheumatoid arthritis.
- Rolling counts of enrollees excluded are provided and are therefore mutually exclusive.

- The following exclusions were applied during the index period before receipt of TJR: death, CCW hip fracture, or diagnosis of mechanical complication, neoplasm, or fractures. Mechanical complication, neoplasm, and fractures were based on ICD-based codes from Centers for Medicare & Medicaid Services (CMS) Inpatient Quality Reporting criteria[21].

a. Figure 2a. Overall MH-SVI



b. Revised Figure 2b. MH-SVI themes

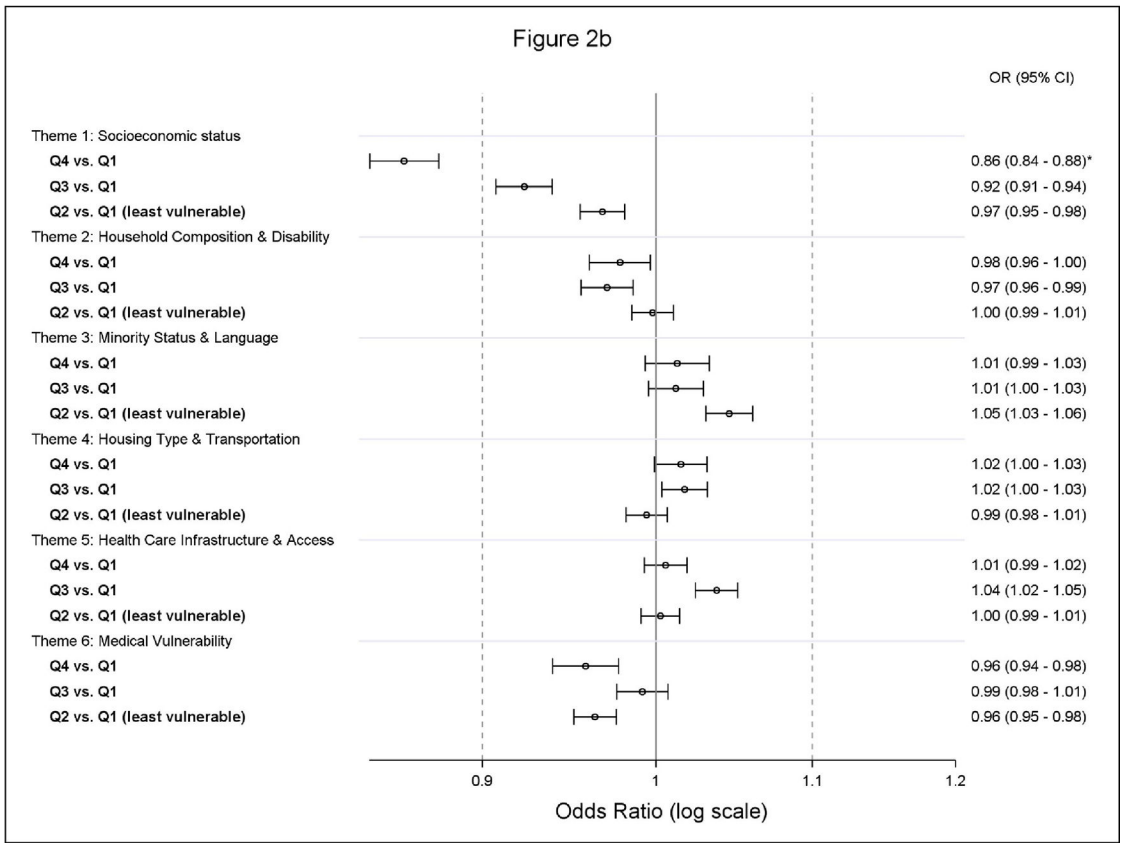


Figure 2.

Relationship between MH-SVI measures and total joint replacement surgery receipt in a cohort of Medicare enrollees with arthritis in 2018: multivariable logistic regression.

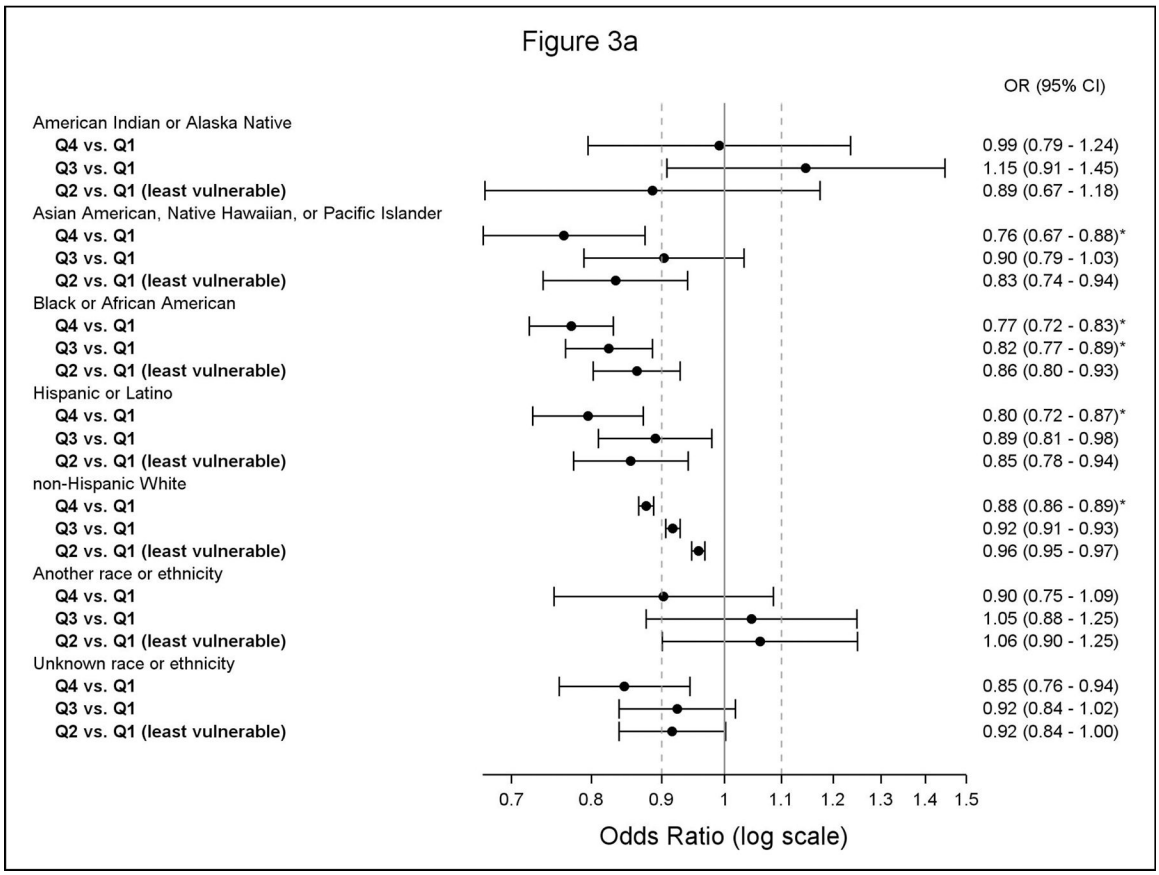
- a. Overall MH-SVI
- b. MH-SVI themes

Abbreviations: AIAN, American Indian or Alaskan Native (AIAN); AANHPI, Asian American, Hawaiian Native, or other Pacific Islander; CI, confidence interval; Q, quartile; MH-SVI, Minority Health Social Vulnerability Index; OR, Odds Ratio; SES, socioeconomic status; TJR, total joint replacement.

Notes

- Models control for enrollee age group, sex, dual Medicare-Medicaid enrollment, time from initial diagnosis, and county NCHS urban/rural classification. Multiple chronic conditions category was removed from the multivariable model due to collinearity with age group.
- An odds ratio and corresponding 95% confidence interval ≤0.90 or ≥1.10 with a *P*-value <0.05 was required to be considered a significant result. Results meeting these criteria are noted with an asterisk (*).

a. Figure 3a. Overall MH-SVI



b. Revised Figure 3b. MH-SVI themes

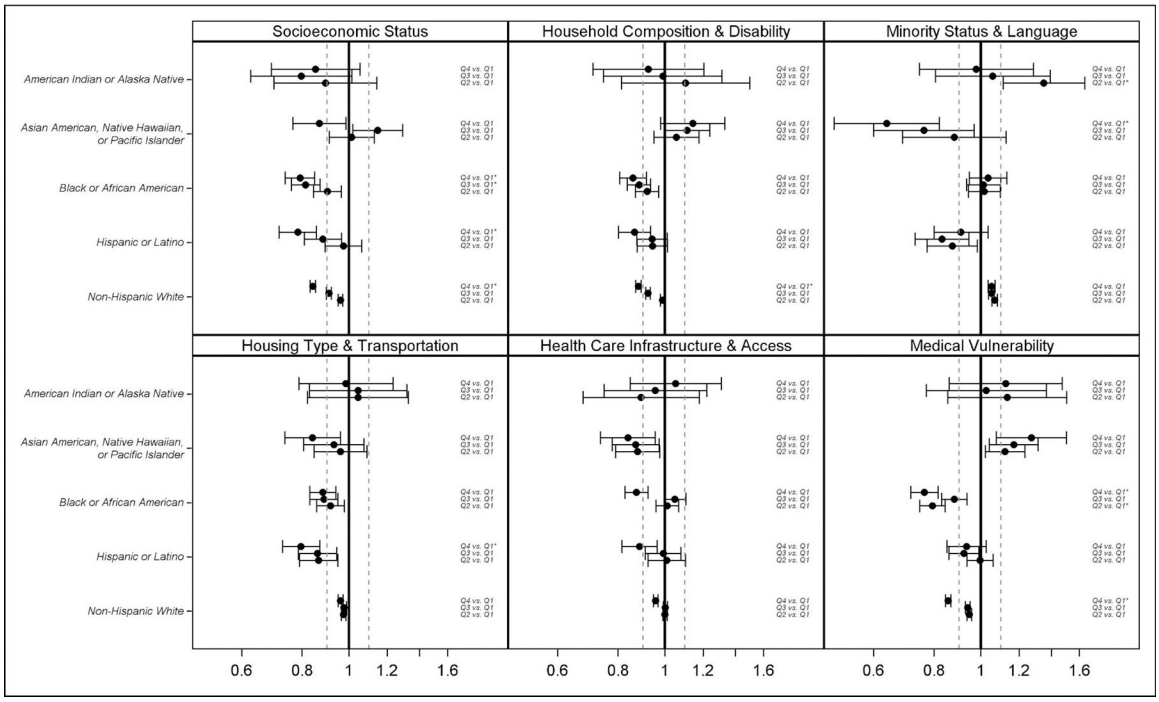


Figure 3.

Relationship between MH-SVI measures and total joint replacement surgery receipt in a cohort of Medicare enrollees with arthritis in 2018: multivariable logistic regression stratified by race/ethnicity.

- a. Overall MH-SVI
- b. MH-SVI themes

Abbreviations: Q, quartile; MH-SVI, Minority Health Social Vulnerability Index; OR, Odds Ratio; TJR, total joint replacement.

Notes

- Each cluster of three horizontal bars represents the odds of quartiles 2–4 compared with the odds of quartile 1 for a given theme. Figure 3a represents overall MH-SVI, stratified by race/ethnicity. Figure 3b has a box for each theme, stratified by race/ethnicity.
- Each model controls for enrollee age group, sex, dual Medicare-Medicaid enrollment, time from initial diagnosis, and county NCHS urban/rural classification. Multiple chronic conditions category was removed from the multivariable model due to collinearity with age group.
- An odds ratio and corresponding 95% confidence interval ≤0.90 or ≥1.10 with a *P*-value <0.05 was required to be considered a significant result. Results meeting these criteria are noted with an asterisk (*).

Table 1.

Characteristics of enrollees of fee-for-service Medicare with arthritis stratified by race/ethnicity (full cohort) in 2018.

VARIABLE	VALUE	TOTAL		AMERICAN INDIAN OR ALASKAN NATIVE		ASIAN AMERICAN, NATIVE HAWAIIAN, OR PACIFIC ISLANDER		BLACK		HISPANIC		WHITE		OTHER RACE		UNKNOWN	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Arthritis diagnosis		10,471,413	100	47,915	0.5	248,437	2.4	690,037	6.6	456,305	4.4	8,841,088	84.4	78,263	0.75	109,368	1.0
Sex	*Female*	6,433,850	61	30,699	64	165,097	66	470,935	68	294,871	65	5,382,434	61	46,017	59	43,797	40
	Male	4,037,563	39	17,216	36	83,340	34	219,102	32	161,434	35	3,458,654	39	32,246	41	65,571	60
Age, years	*67–69*	1,385,246	13	8,151	17	27,257	11	113,630	16	65,611	14	1,112,195	13	9,235	12	49,167	45
	70–74	2,821,156	27	13,558	28	58,545	24	187,991	27	121,073	27	2,365,505	27	20,690	26	53,794	49
	75–79	2,505,623	24	11,659	24	59,150	24	155,763	23	106,599	23	2,146,436	24	23,253	30	2,763	3
	80–84	1,866,555	18	8,134	17	49,433	20	115,452	17	82,401	18	1,594,753	18	14,811	19	1,571	1
	85+	1,892,833	18	6,413	13	54,052	22	117,201	17	80,621	18	1,622,199	18	10,274	13	2,073	2
Dual coverage		1,382,909	13	15,616	33	124,831	50	202,734	29	208,801	46	805,271	9	14,230	18	11,426	10
# Chronic conditions	*0–1*	2,540,282	24	11,232	23	59,772	24	160,520	23	106,414	23	2,124,596	24	18,378	23	59,370	54
	2–3	2,277,154	22	10,109	21	53,639	22	142,349	21	96,475	21	1,918,530	22	16,967	22	39,085	36
	4–5	2,738,524	26	12,318	26	65,920	27	177,702	26	120,084	26	2,329,855	26	23,449	30	9,196	8
	6+	2,915,453	28	14,256	30	69,106	28	209,466	30	133,332	29	2,468,107	28	19,469	25	1,717	2
Arthritis duration, years	*0–2*	253,803	2	1,372	3	4,576	2	12,105	2	10,418	2	215,249	2	1,691	2	8,392	8
	>2	10,217,610	98	46,543	97	243,861	98	677,932	97	445,887	98	8,625,839	98	76,572	98	100,976	92
<u>County-level</u>																	
Counties		3,139		1,898		2,333		2,505		2,786		3,137		2,711		2,895	
Urban/rural	*Large central*	2,151,877	21	3,504	7	134,393	54	244,675	35	173,968	38	1,541,717	17	27,020	35	26,600	24
	Large Fringe	2,579,271	25	2,981	6	57,434	23	163,491	24	82,731	18	2,220,106	25	20,467	26	32,061	29
	Medium	2,290,455	22	8,554	18	39,255	16	125,047	18	111,726	24	1,966,765	22	15,830	20	23,278	21
	Small	1,223,563	12	6,500	14	8,520	3	59,455	9	37,438	8	1,095,275	12	5,890	8	10,485	10
	Micropolitan	1,232,407	12	12,875	27	6,855	3	51,465	7	33,174	7	1,112,165	13	5,849	7	10,024	9
	Non-core	993,840	9	13,501	28	1,980	1	45,904	7	17,268	4	905,060	10	3,207	4	6,920	6

VARIABLE	VALUE	TOTAL		AMERICAN INDIAN OR ALASKAN NATIVE		ASIAN AMERICAN, NATIVE HAWAIIAN, OR PACIFIC ISLANDER		BLACK		HISPANIC		WHITE		OTHER RACE		UNKNOWN	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
MH-SVI																	
*Overall*Median (Q1-Q3)*		0.64 (0.42–0.84)		0.84 (0.64–0.95)		0.69 (0.55–0.91)		0.81 (0.62–0.91)		0.83 (0.63–0.94)		0.62 (0.40–0.83)		0.67 (0.48–0.86)		0.60 (0.38–0.81)	
*Socioeconomic Status**		0.41 (0.22–0.61)		0.63 (0.39–0.84)		0.34 (0.18–0.60)		0.52 (0.34–0.71)		0.55 (0.34–0.69)		0.39 (0.21–0.59)		0.38 (0.17–0.57)		0.34 (0.16–0.53)	
Household Composition & Disability		0.31 (0.11–0.58)		0.65 (0.34–0.86)		0.10 (0.05–0.25)		0.34 (0.14–0.63)		0.31 (0.10–0.62)		0.31 (0.11–0.58)		0.17 (0.06–0.39)		0.20 (0.08–0.43)	
Minority Status & Language		0.90 (0.73–0.96)		0.79 (0.58–0.95)		0.98 (0.95–1.00)		0.92 (0.82–0.97)		0.96 (0.90–0.99)		0.89 (0.71–0.96)		0.95 (0.88–0.99)		0.92 (0.81–0.97)	
Housing Type & Transportation		0.64 (0.40–0.81)		0.75 (0.58–0.90)		0.79 (0.57–0.90)		0.74 (0.57–0.88)		0.80 (0.60–0.90)		0.62 (0.38–0.79)		0.71 (0.50–0.88)		0.63 (0.38–0.81)	
Health Care Infrastructure & Access		0.33 (0.17–0.49)		0.51 (0.33–0.67)		0.31 (0.21–0.47)		0.32 (0.14–0.50)		0.41 (0.29–0.54)		0.32 (0.17–0.49)		0.31 (0.20–0.47)		0.29 (0.16–0.45)	
Medical Vulnerability		0.23 (0.08–0.52)		0.56 (0.22–0.76)		0.06 (0.03–0.15)		0.34 (0.14–0.62)		0.15 (0.06–0.36)		0.24 (0.08–0.53)		0.12 (0.05–0.32)		0.15 (0.05–0.38)	

Abbreviations: AIAN, American Indian or Alaskan Native; AANHPI, Asian American, Native Hawaiian, or Pacific Islander; MH-SVI, Minority Health Social Vulnerability Index; Q, quartile; TJR, total joint replacement.

Notes

Arthritis refers to osteoarthritis or rheumatoid arthritis.

Dual coverage refers to dual Medicare-Medicaid coverage or enrollment.

* All 1405 enrollees living in the Rio Arriba County, NM have missing values for MH-SVI Overall and Socioeconomic Status due to a data collection error for income and earnings for that county in the American Community Survey (ACS) during the data period. Source: https://www.census.gov/programs-surveys/acs/technical-documentation/errata/125.html. These enrollees are dropped from all estimates that include Overall and Socioeconomic Status.

Description of MH-SVI Themes are provided in Supplemental Digital Content 1.