Elevated Area Deprivation Index Scores Associated with Increased Cancellation Rates for Patients Scheduled for Total Shoulder Arthroplasty

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INTRODUCTION: Lower socioeconomic status is associated with worse outcomes following primary total shoulder replacements.[1] The area deprivation index (ADI) is a tool created by the University of Wisconsin-Madison that ranks neighborhoods based on socioeconomic disadvantage. The calculation of ADI includes factors for the theoretical domains of income, education, employment, and housing quality with higher levels of ADI being associated with higher levels of deprivation.[2] While numerous studies have examined the effects of socioeconomic status on orthopaedic populations, few have specifically used ADI as a proxy for social deprivation in patients undergoing primary total shoulder arthroplasty (TSA). Therefore, the purpose of this study is to investigate potential differences in demographics and post-operative outcomes in patients undergoing TSA with varying ADI scores.

METHODS: Patients who were >90 days post-op from either a primary anatomic total shoulder arthroplasty (aTSA) or reverse total shoulder arthroplasty (rTSA) procedure between December 2020 and August 2022 were retrospectively recruited for this study from an urban, academic tertiary medical center. Both aTSA and rTSA procedures were combined in the final analysis. Exclusion criteria included prisoners, individuals <18 years of age, TSA secondary to trauma, post-operative infection, and revision surgery. Medical charts were reviewed for patient address, demographics, medical comorbidities, procedure information, and subsequent hospital visits. Patients were grouped according to their state level ADI with 1-3 being low, 4-6 being moderate, and 7-10 being high. The study cohorts were compared using Pearson's Chi-squared test and Fischer's exact test. The Kruskal-Wallis H Test was used to evaluate non-parametric, continuous values. This study was IRB approved by the institution of study.

RESULTS SECTION: A total of 73 patients were identified that fit the inclusion criteria. Patients with higher ADIs were more likely to be female (p=0.043) and Black/African American (p=0.004), have a higher BMI (p=0.032), have Medicaid as their primary insurance (p=0.011), and have a history of diabetes mellitus (p=0.025) (**Table 1**). Additionally, patients with moderate ADIs were more likely to cancel/postpone their surgery compared to low and high ADI groups (p=0.026) (**Table 2**). Patients with moderate and high ADIs were not more likely to be readmitted or present to the ED within 90 days of surgery.

DISCUSSION: One study utilizing state ADI in patients undergoing TSA found that their score did not predict differing outcomes or costs.[3] While our study did not find substantial differences in 90-day ED visits or readmissions, we did find an association with increased cancellation of TSA. Limitations of this study include the use of a single center with a skewed distribution of higher ADI scoring patients and the use of a state instead of national level measure of deprivation. Future studies should be performed across multiple centers to broaden the patient population being analyzed.

SIGNIFICANCE/CLINICAL RELEVANCE: Patients with moderate ADI scores were more likely to postpone their TSA, however, ADI did not impact whether patients presented to the ED or were readmitted within 90 days of surgery.

REFERENCES: **1:** Waldrop LD 2nd, King JJ 3rd, Mayfield J, et al. The effect of lower socioeconomic status insurance on outcomes after primary shoulder arthroplasty. *J Shoulder Elbow Surg*. 2018;27(6S):S35-S42. **2:** Kind AJH, Buckingham W. Making Neighborhood Disadvantage Metrics Accessible: The Neighborhood Atlas. *New England Journal of Medicine*, 2018. 378: 2456-2458. University of Wisconsin School of Medicine Public Health. 2021 Area Deprivation Index. **3:** Moverman MA, Sudah SY, Puzzitiello RN, et al. Neighborhood socioeconomic disadvantage does not predict outcomes or cost after elective shoulder arthroplasty. *J Shoulder Elbow Surg*. 2022;31(12):2465-2472.

IMAGES/TABLES:

State ADI Decile	1-3, N = 14[1]	4-6, N = 27[1]	7-10, N = 32[1]	p-value[2]
Sex				0.043
Male	9 (64%)	14 (52%)	9 (28%)	
Female	5 (36%)	13 (48%)	23 (72%)	
Age at Surgery	62.3 ± 11.6	61.1 ± 16.0	61.4 ± 9.9	0.577
BMI	28.5 ± 5.2	32.0 ± 6.5	33.5 ± 6.8	0.032
Race/Ethnicity				0.004
White/Caucasian	8 (57%)	6 (22%)	6 (19%)	
Black/African American	1 (7.1%)	12 (44%)	20 (63%)	
Hispanic/Latinx	3 (21%)	7 (26%)	6 (19%)	
Asian	1 (7.1%)	0 (0%)	0 (0%)	
Other	1 (2.7%)	2 (7.4%)	0 (0%)	
Insurance type				0.011
Medicare	5 (36%)	20 (74%)	12 (38%)	
Medicaid	5 (36%)	3 (11%)	15 (47%)	
Private/Commercial	4 (29%)	2 (7.4%)	3 (9.4%)	
Workers Comp	0 (0%)	2 (7.4%)	2 (6.3%)	
Other	0 (0%)	0 (0%)	0 (0%)	
Cardiovascular Disease	1 (7.1%)	6 (22%)	11 (34%)	0.093
Chronic Obstructive Pulmonary Disease	1 (7.1%)	6 (22%)	4 (13%)	0.516
Diabetes Mellitus	4 (29%)	17 (63%)	10 (31%)	0.025
History of Anxiety or Depression	2 (14%)	8 (30%)	11 (34%)	0.418
Smoking Status				0.662
Active	2 (14%)	9 (33%)	7 (22%)	
Former	5 (36%)	6 (22%)	11 (34%)	
Never	7 (50%)	12 (44%)	14 (44%)	

[1] n (%) Mean ± SD
[2] Pearson's Chi-Squared Test; Fisher's Exact Test; Kruskal-Wallis Rank Sum Test

Table 1: Demographic features of primary TSA patients grouped by low, moderate, and high ADI scores.

State ADI Decile	1-3, N = 14[1]	4-6, N = 27[1]	7-10, N = 32[1]	p-value[2]
Reason for Surgery				0.298
Osteoarthritis	9 (64%)	10 (37%)	19 (59%)	
Rheumatoid Arthritis	0 (0%)	0 (0%)	1 (3.1%)	
Osteonecrosis	0 (0%)	1 (3.7%)	1 (3.1%)	
Instability	0 (0%)	0 (0%)	2 (6.3%)	
Chronic Pain	2 (14%)	3 (11%)	3 (9.4%)	
Chronic Rotator Cuff Tear	3 (21%)	13 (48%)	6 (19%)	
Other	0 (0%)	0 (0%)	0 (0%)	
Laterality				0.400
Left	6 (43%)	14 (52%)	11 (34%)	
Right	8 (57%)	13 (48%)	21 (66%)	
Surgery Cancelled / Postponed	0 (0%)	6 (22%)	1 (3.1%)	0.026
Patient Readmitted Within 90 Days	2 (14%)	0 (0%)	3 (9.4%)	0.128
ED Visit Within 90 Days	1 (7.1%)	2 (7.4%)	7 (22%)	0.324
Discharge Disposition				0.306
Home With Home Care	0 (0%)	2 (7.4%)	4 (13%)	
Home Without Home Care	13 (93%)	24 (89%)	28 (88%)	
Institutional Rehab Facility	1 (7.1%)	0 (0%)	0 (0%)	
Skilled Nursing Facility	0 (0%)	1 (3.7%)	0 (0%)	
Other	0 (0%)	0 (0%)	0 (0%)	

[1] n (%) Mean ± SD
[2] Pearson's Chi-Squared Test; Fisher's Exact Test; Kruskal-Wallis Rank Sum Test

Table 2: Perioperative data of primary TSA patients grouped by low, moderate, and high ADI scores.