

Elevated Area of Deprivation Index Scores Associated with Multiple Demographic and Comorbid Conditions in Patients Undergoing Primary Total Hip Arthroplasty

Benjamin T. Johnson¹, Rana Ahmad¹, Apurva Choubey M.D.¹, Brett Drake¹, Mark Gonzalez M.D. P.h.D.¹

¹University of Illinois College of Medicine at Chicago, Chicago, IL, ²University of Illinois Hospital, Department of Orthopaedics

Email of Presenting Author: ranaa2@uic.edu

Disclosures: Benjamin T. Johnson (N), Rana Ahmad (N), Apurva Choubey (N), Brett Drake (N), Mark Gonzalez (N)

INTRODUCTION: Lower socioeconomic status in patients undergoing total hip arthroplasty (THA) has been associated with poor outcomes and preoperative presentation. The area deprivation index (ADI) is a tool created by the University of Wisconsin-Madison that ranks neighborhoods by socioeconomic disadvantage in a region of interest.¹ 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. While numerous studies have examined the relationship between socioeconomic status (SES) and outcomes of primary THA, few have utilized state level ADI as representation of socioeconomic disadvantage in this patient population.

METHODS: Patients who were >1-year post-op from a primary THA procedure between December 2020 and August 2022 were retrospectively recruited for this study from an urban, academic tertiary medical center. Prisoners, individuals <18 years of age, trauma, infection, and revision surgeries were excluded from the study. 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 as has been reported in other studies. 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 is IRB approved by the institution of study.

RESULTS SECTION: Patients who underwent primary THA with higher ADIs were more likely to be Black / African American (p<0.001), be an active smoker (p=0.012), and have diabetes (p=0.048) (**Table 1**). Patients with lower ADIs were more likely to be diagnosed with chronic obstructive pulmonary disease (COPD) (p=0.013). No significant differences were found between ADI groups with regards to sex, BMI, insurance type, postponing surgery, age, discharge disposition, illicit drug use, presence of cardiovascular disease, anxiety, or depression, 90 day rates of readmission, 90 day emergency department (ED) visits, or requiring additional surgery within 1 year of the primary operation (**Table 2**).

DISCUSSION: One systematic review found that lower SES patients undergoing THA were more likely to be readmitted to the hospital, however, we did not find a substantial difference in 90 day readmission or ED visit rates.³ Various types of SES proxies exist and could account for variations in studies. These proxies should be compared in order to establish a standardized method for approximating socioeconomic disadvantage in orthopaedic patient populations. 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.

SIGNIFICANCE/CLINICAL RELEVANCE: Patients undergoing primary total hip arthroplasty may have different demographic features based on ADI scores, however, cancellations, 90-day readmission and ED visit rates, and requiring revision surgery within 1 year were not substantially different.

REFERENCES:

1: Clement ND, Muzammil A, Macdonald D, Howie CR, Biant LC. Socioeconomic status affects the early outcome of total hip replacement. *J Bone Joint Surg Br.* 2011;93(4):464-469.
2: Kind AJH, Buckingham W. [Making Neighborhood Disadvantage Metrics Accessible: The Neighborhood Atlas](#). *New England Journal of Medicine*, 2018. 378: 2456-2458. DOI: 10.1056/NEJMp1802313. University of Wisconsin School of Medicine Public Health. 2021 Area Deprivation Index.
3: Alvarez PM, McKeon JF, Spitzer AI, et al. Socioeconomic factors affecting outcomes in total knee and hip arthroplasty: a systematic review on healthcare disparities. *Arthroplasty*. 2022;4(1):36. Published 2022 Oct 3.

Table 1: Demographic factors of THA patients, grouped by ADI.

State ADI Decile	1-3, N = 23 ¹	4-6, N = 55 ¹	7-10, N = 61 ¹	p-value ²
Sex				0.256
Male	15 (65%)	25 (45%)	29 (48%)	
Female	8 (35%)	30 (55%)	32 (52%)	
Age at Surgery	63.7 ± 14.2	60.0 ± 11.3	61.2 ± 10.7	0.554
BMI	30.4 ± 4.7	32.0 ± 5.8	32.0 ± 4.9	0.354
Race/Ethnicity				<0.001
White/Caucasian	14 (61%)	6 (11%)	4 (6.6%)	
Black/African American	6 (26%)	39 (71%)	48 (79%)	
Hispanic/Latinx	3 (13%)	6 (11%)	7 (11%)	
Asian	0 (0%)	0 (0%)	0 (0%)	
Other	0 (0%)	4 (7.3%)	2 (3.3%)	
Insurance type				0.517
Medicare	12 (52%)	22 (40%)	27 (44%)	
Medicaid	5 (22%)	20 (36%)	24 (39%)	
Private/Commercial	6 (26%)	13 (24%)	10 (16%)	
Workers Comp	0 (0%)	0 (0%)	0 (0%)	
Other	0 (0%)	0 (0%)	0 (0%)	
Cardiovascular Disease	7 (30%)	12 (22%)	14 (23%)	0.704
Chronic Obstructive Pulmonary Disease	5 (22%)	1 (1.8%)	6 (9.8%)	0.013
Diabetes Mellitus	2 (8.7%)	11 (20%)	20 (33%)	0.048
History of Anxiety or Depression	4 (17%)	13 (24%)	16 (26%)	0.697
Smoking Status				0.012
Active	0 (0%)	15 (27%)	7 (11%)	
Former	14 (61%)	18 (33%)	25 (41%)	
Never	9 (39%)	22 (40%)	29 (48%)	

¹ n (%) Mean ± SD

² Pearson's Chi-Squared Test; Fisher's Exact Test; Kruskal-Wallis Rank Sum Test

Table 2: Perioperative information of THA patients grouped by ADI

State ADI Decile	1-3, N = 23 ¹	4-6, N = 55 ¹	7-10, N = 61 ¹	p-value ²
Reason for Surgery				0.559
Osteoarthritis	21 (95%)	50 (98%)	47 (96%)	
Rheumatoid Arthritis	1 (4.5%)	0 (0%)	1 (2.0%)	
Other	0 (0%)	1 (2.0%)	1 (2.0%)	
Laterality				0.207
Left	7 (30%)	27 (49%)	22 (36%)	
Right	16 (70%)	28 (51%)	39 (64%)	
Surgery Cancelled / Postponed	1 (4.3%)	7 (13%)	7 (12%)	0.666
Patient Readmitted Within 90 Days	1 (4.3%)	5 (9.1%)	13 (21%)	0.079
ED Visit Within 90 Days	3 (13%)	14 (25%)	16 (26%)	0.417
Additional / Revision Surgery <1 Year	1 (4.3%)	3 (5.5%)	3 (4.9%)	>0.999
Discharge Disposition				0.271
Home With Home Care	8 (35%)	17 (31%)	21 (34%)	
Home Without Home Care	7 (30%)	28 (51%)	32 (52%)	
Institutional Rehab Facility	1 (4.3%)	3 (5.5%)	1 (1.6%)	
Skilled Nursing Facility	7 (30%)	7 (13%)	7 (11%)	
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