

## Is Socioeconomic Area Deprivation Index (ADI) Associated with Extended LOS and Non-Home Discharge Following Revision Total Hip and Knee Arthroplasty?

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**INTRODUCTION:** Although research has been conducted on the differences in postoperative outcomes after revision total joint arthroplasty (TJA) based on demographic factors such as race, ethnicity, comorbidities, and insurance status, previous approaches fail to provide insight into the effect of the combination of these socioeconomic factors in determining these outcomes. The area deprivation index (ADI) is a composite index that indicates socioeconomic disadvantage by aggregating indicators of poverty, housing, employment, and education. Identification of socioeconomic determinants influencing postoperative outcomes after TJA may help prevent suboptimal outcomes following surgery while also allowing an opportunity to inform the development of equitable payment models following surgery. Therefore, this study aimed to investigate the potential association between socioeconomic deprivation and extended length of stay and non-home discharge following revision TJA using ADI as a socioeconomic measure.

**METHODS:** Following Institutional Review Board approval, we performed a retrospective review of 558 and 489 patients who underwent revision THA or TKA, respectively. The patient ADI was organized into quartiles: Q<sub>1</sub> (least deprived; < 25th percentile), Q<sub>2</sub> (25th -50th percentile), Q<sub>3</sub> (50th -75th percentile) and Q<sub>4</sub> (most deprived; > 75th percentile). 90-day ED visit, discharge disposition, and extended length of stay (LOS) were analyzed as categorical variables using univariate and multivariate logistic regression. Extended LOS was defined as greater than the 75th percentile of the cohort. Discharge disposition was binarized into home and non-home discharge. Covariates for the multivariate regression model included age, sex, race, ethnicity, body mass index (BMI), insurance status (private vs. public), American Society of Anesthesiologists (ASA) score, Charlson Comorbidity Index (CCI), and additional medical comorbidities such as depression, alcohol, and drug use.

**RESULTS:** Patients were identified from 314 neighborhoods across the country as labeled by zip codes. The mean ADI in patients with revision THA was 23.24±15.45 (range 1.68-76.19). ADI cutoffs for each quartile were Q<sub>1</sub> (<11.34), Q<sub>2</sub> (11.34-21.66), Q<sub>3</sub> (21.67-32.52), and Q<sub>4</sub> (>32.52). In revision TKA, the mean ADI was 24.69 ±15.98 (range 1.00-86.00). ADI thresholds were Q<sub>1</sub> (<12.91), Q<sub>2</sub> (12.91-22.28), Q<sub>3</sub> (22.29-32.52), and Q<sub>4</sub> (>32.52). Multivariate logistic regression demonstrated significantly higher odds of non-home discharge in Q<sub>2</sub> and Q<sub>4</sub> patients compared to Q<sub>1</sub> patients (Q<sub>2</sub>: OR=2.29, p=0.01; Q<sub>4</sub> OR=2.40, p=0.01) following revision THA. In this patient cohort, higher odds of extended LOS were also seen in Q<sub>4</sub> patients compared to Q<sub>1</sub> patients (OR=2.95, p=0.001). However, no significant association was seen between ADI and discharge disposition (Q<sub>1</sub> p=0.39; Q<sub>2</sub> p=0.98; Q<sub>3</sub> p=0.49; Q<sub>4</sub> p=0.14) or extended LOS (Q<sub>1</sub> p= 0.054; Q<sub>2</sub> p=0.78; Q<sub>3</sub> p=0.30; Q<sub>4</sub> p=0.10) in the revision TKA cohort. In both revision TJA cohorts, age, and ASA scores were independently associated with non-home discharge, while ASA score was the only factor associated with an extended length of stay across both surgical procedures.

**DISCUSSION:** This study is one of the first to investigate the relationship between ADI and revision TJA outcomes. Our findings suggest a positive association between ADI scores, non-home discharge, and extended LOS in patients who underwent revision THA; however, this association is less clear when looking at the revision TKA cohort. While ADI has some limitations in offering explanations for the observed disparities in postoperative outcomes, the higher odds of non-home discharge and extended LOS in patients with greater ADI seen in this study could be attributed to the need for additional resources in this patient cohort that may not be available at home during the earlier phases of postoperative recovery.

**SIGNIFICANCE/CLINICAL RELEVANCE:** Area deprivation index (ADI) may be a useful metric of social determinants of health for surgeons and patients in preoperative planning to facilitate optimal recovery, however more comprehensive markers of socioeconomic deprivation in revision TJA patients is warranted.

**Table 1.** Significant multivariate logistic regression analysis to evaluate the association between ADI, non-home discharge, and extended length of stay following revision TJA.

Variables	Revision THA				Revision TKA			
	Non-Home Discharge		Extended Length of Stay		Non-Home Discharge		Extended Length of Stay	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age	1.08*	1.05—1.12	1.03*	1.00—1.06	1.06*	1.02—1.09	—	—
Race (White)	—	—	—	—	3.77*	1.53—9.33	—	—
Sex (Female)	0.67	0.44—1.01	0.60*	0.38—0.93	—	—	—	—
Insurance (Private)								
Public	1.16	0.72—1.87	—	—	1.65	0.93—2.93	—	—
None	0.44	0.06—3.29	—	—	6.23	0.77—50.23	—	—
ASA Score (1 or 2)	3.14*	2.05—4.82	3.53*	2.17—5.77	3.12*	1.88—5.17	4.19*	2.15—8.17
Alcohol	0.57*	0.37—0.89	0.62*	0.38—1.00	—	—	—	—
ADI (Q <sub>1</sub> )								
Q <sub>2</sub>	2.29*	1.26—4.17	1.56	0.80—3.03	0.99	0.49—1.98	0.88	0.38—2.03
Q <sub>3</sub>	1.07	0.61—1.90	1.45	0.76—2.76	1.27	0.63—2.54	0.61	0.24—1.53
Q <sub>4</sub>	2.40*	1.29—4.46	2.95*	1.51—5.76	1.66	0.84—3.28	1.92	0.87—4.22

OR= odds ratio; CI=confidence interval; ASA= American Society of Anesthesiology; ADI= Area Deprivation Index \*p< 0.05