Increased Socioeconomic Deprivation is Associated with Worse Baseline Orthopaedic Function

Samir Kaveeshwar, Sania Malaika Hasan, Daniel J Polsky, Nathan N O'Hara[1], Samuel Q Li, Craig Shul[2], Julio J Jauregui[3], R Frank Henn, Christopher Langhammer[4]
[1]University of Maryland, [2]UMMC, [3]University of Maryland School of Medicine, [4]University of Maryland - Department of Orthopaedic

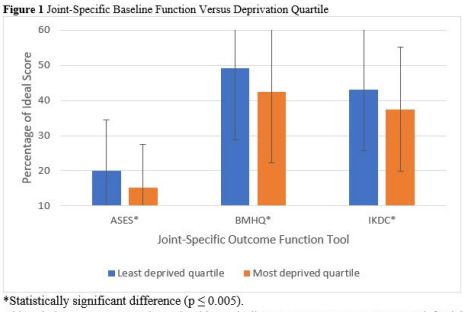
INTRODUCTION: Socioeconomic deprivation has shown an association with poorer baseline levels of health and function. Limited data exist validating this finding in orthopaedic patients. The purpose of this study was to identify whether there is an association between level of deprivation and baseline orthopaedic function, preoperative expectations, and joint-specific outcome measures in a population of patients presenting for outpatient surgery.

METHODS: 3207 patients undergoing orthopaedic elective surgery from June 2015 to May 2021 at a single urban tertiary referral center were enrolled in an orthopaedic registry. Area Deprivation Index (ADI) was computed from according to home address. Patients were administered Patient-Reported Outcome Metric Information System (PROMIS) computer-adaptive testing, Musculoskeletal Outcomes Data Evaluation and Management System (MODEMS) preoperative expectations questionnaires, and an appropriate joint-specific survey instrument. Bivariate analyses were run to analyze for associations with deprivation. Regression models were run to analyze for confounding interaction effects among deprivation, operative site location, and history of injury leading to pending operation.

RESULTS: Higher levels of deprivation were associated with numerous sociodemographic factors including female gender, African-American race, legal claim, lower level of education, and lower income (all with $p < 0.001$). Higher levels of deprivation were also associated with poorer baseline health status as measured by smoking status, Charlson Comorbidity Index, American Anesthesiologist Association score, and BMI ($p < 0.001$). Upper extremity patients had higher levels of deprivation than lower extremity patients ($p < 0.001$). Those with a history of injury leading to surgery had lower levels of deprivation than those without a history of injury ($p < 0.001$). Deprivation quartile analysis showed that more deprived individuals had worse joint-specific function as measured via ASES, BMHQ, and IKDC ($p \leq 0.005$). Separate interaction effect models demonstrated heterogeneity based on the patient's injury history for the association between ADI and Pain Interference, Social Satisfaction, Pain at the operative site (NPS), and Marx Shoulder Activity Rating Scale scores. Injury history did not demonstrate interaction effects in the ASES, BMHQ, or IKDC models. Operative site location demonstrated interaction effects between ADI and Fatigue when analyzed in upper versus lower extremity patients.

DISCUSSION AND CONCLUSION: Higher levels of socioeconomic deprivation as measured by neighborhood ADI score is associated with poorer presenting baseline function. However, effect differences overall were small. Multiple factors including operative site location and history of prior injury may play a confounding role in the relationship between socioeconomics and baseline function. This information is important for contextualizing outcomes and preoperative patient counseling in the outpatient orthopaedic surgery population. Future studies are necessary to clarify if deprivation is an independent predictor of postoperative outcomes

Figure 1 Joint-Specific Baseline Function Versus Deprivation Quartile



*Statistically significant difference ($p \leq 0.005$).
Abbreviations: ASES, American Shoulder and Elbow Surgeons Score; BMHQ, Brief Michigan Hand Questionnaire; IKDC, International Knee Documentation Committee.

Table I Relationship between baseline orthopaedic function and area deprivation index quartile

	National ADI		
	Quartile 1 Mean (SD)	Quartile 4 Mean (SD)	P-value
PROMIS Physical Function	42.8 (9.4)	40.8 (9.2)	**<0.001***
PROMIS Pain Interference	59.5 (7.6)	62.8 (7.3)	**<0.001***
PROMIS Fatigue	50.0 (10.4)	54.1 (10.2)	**<0.001***
PROMIS Social Satisfaction	43.5 (9.7)	40.6 (9.4)	**<0.001***
PROMIS Anxiety	53.9 (9.0)	56.2 (9.5)	**<0.001***
PROMIS Depression	48.2 (9.2)	49.9 (10.1)	**0.001***
NPS op site	44.2 (28.0)	58.8 (29.2)	**<0.001***
NPS whole body	13.4 (21.3)	22.1 (28.1)	**<0.001***
MODEMS Preoperative Expectations	86.5 (17.6)	82.5 (20.6)	**<0.001***
Tegner Activity Scale	25.7 (21.5)	18.3 (19.7)	**<0.001***
MARS Upper	59.7 (27.8)	45.6 (31.7)	**<0.001***
MARS Lower	57.2 (36.9)	40.3 (38.4)	**<0.001***
IKDC	43.0 (17.2)	37.5 (17.7)	**<0.001***
ASES	20.0 (14.4)	15.3 (12.3)	**<0.001***
BMHQ	49.2 (20.3)	42.4 (20.2)	**0.005***

***Statistically significant difference ($p < 0.05$) between ADI quartile 1 and 4 in baseline outcome function scores.**
Abbreviations: National ADI, National Area deprivation Index (1-100 scale); PROMIS, Patient-Reported Outcome Measurement Information System; NPS, Numeric Pain Scale; MODEMS, Musculoskeletal Outcomes Data Evaluation and Management System; MARS, Marx Activity Rating Scale; IKDC, International Knee Documentation Committee; ASES, American Shoulder and Elbow Surgeons; BMHQ, Brief Michigan Hand Questionnaire