

# **Socially Vulnerable Patients Wait Longer to Undergo Total Joint Arthroplasty: Evidence from a Multi-State, Multi-Surgeon Collaborative**

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## **INTRODUCTION:**

Prior studies suggest that delays in timely access to total joint arthroplasty (TJA) can lead to slower improvement in quality-of-life after TJA and longer hospital length of stay following TJA. The adverse effects of prolonged wait times for TJA may be even more pronounced among lower income patients. For example, patients with osteoarthritis in 2013 earned \$4,040 less than matched controls without osteoarthritis (OA), and estimates suggest that earning losses attributable to OA exceeded \$160 billion the United States in 2013. Furthermore, TJA may offer a lifeline to low-income patients with OA, as prior studies suggest a 90% return to work rate for total hip arthroplasty patients and a 98% return to work rate for total knee arthroplasty patients.

While prior research describes delays in patient referral for orthopedic evaluation, no prior study has evaluated the association between poverty, social vulnerability, or patient characteristics and wait times for TJA in the United States. In this study, we quantify to what extent **variations in geographic, area deprivation, and patient attributes are associated with prolonged wait times for TJA after evaluation by an orthopaedic surgeon.** We use a novel multi-site cohort that enrolled all new patients referred for evaluation for knee or hip OA to test the hypothesis that patients residing in economically depressed census tracts (using the United States Centers for Disease Control (CDC) Social Vulnerability Indices (SVI)) face prolonged wait times for TJA compared to patients from more affluent areas. **The results of this study provide vital information to population health advocates, health policy experts, and orthopaedic surgeons alike by quantifying the relationship between an important health system issue and access to TJA.**

## **METHODS:**

### *Data Collection*

The PCORI-funded Arthritis care through Shared Knowledge (A.S.K.) study enrolled 5,713 patients with knee or hip osteoarthritis referred for surgical evaluation by one of 36 orthopaedic surgeons practicing in 12 states between 2018 and 2022. All patients completed a pre-visit assessment with demographic (age, sex, race/ethnicity), social (education, living status), clinical (medical and musculoskeletal comorbidities, BMI), and behavioral (cigarette smoking, health literacy) attributes. All patients were tracked for twelve months, and treatment status (TJA or non-operative treatment) and patient-reported outcomes (PROs) included KOOS12 and HOOS12 pain and activities of daily living were recorded at the initial visit and again at 6 and 12 months. TJA surgery date (if any) was recorded at the initial visit, and again at the 6 and 12 month visits. These data were used to calculate the number of days between initial presentation and surgery date.

### *The Relationship Between Social Vulnerability and Wait Times for TJA*

Next, we assessed the relationship between patient-reported (race, ethnicity, and income), and geo-coded economic deprivation (Social Vulnerability Index) and wait times for TJA. Social vulnerability refers to “the potential negative effects on communities caused by external stressors on human health.” The SVI is a census-tract level measurement of a patient’s demographic and socioeconomic factors (such as poverty, lack of access to transportation, and crowded housing) that contribute to human health stressors. We calculated the SVI, and its three associated sub-scores, for each patient based on the patient’s zip code. To assess for possible confounding from geographic surgeon density, we used data from the Area Health Resource File to determine the number of orthopaedic surgeons working in each patient’s home census tract. **Descriptive analyses and multivariable survival analyses were performed to answer our main study question: do patients from socioeconomically disadvantaged areas wait longer to undergo TJA?**

## **RESULTS:**

Among the 5,713 enrolled patients, the mean age was 66.3 years, 62.5% of patients were female, 46.3% were college educated, 87.9% identified as white, and 29.2% were privately insured. Across three groups of surgery dates (within 100 days of initial presentation, between 100-180 days from initial presentation, and more than 180 days from initial presentation), mean age, BMI, college education, and insurance status were similar. Women, Black, and Hispanic patients elected surgery later, and patients with worse OA at initial presentation (as measured by lower hip-and knee-OA PROs) were more likely to undergo surgery earlier.

In a multivariable survival model adjusting for patient comorbidities, orthopedic surgeon density where the patients lived, and PRO symptom severity at initial presentation, one of the four SVI sub scores was statistically significantly associated with prolonged wait time to undergo TJA. This sub score measures the percent of a region that identifies as a non-white minority and had a hazard ratio of 0.68 (95% confidence interval 0.55-0.83,  $p < 0.001$ ) for early TJA. This result suggests

that in our sample, patients living in regions with a greater percentage minority-identifying people face prolonged wait times before undergoing TJA relative to patients from less vulnerable regions.

#### DISCUSSION AND CONCLUSION:

This study is the first to show an association between SVI (a measure of poverty and exogenous stressors) and delay in use of TJA after evaluation by an orthopaedic surgeon. Our findings suggest that efforts to ameliorate disparities in access to TJA must go beyond expanding access to insurance or incentivizing care for marginalized communities because our models adjusted for insurance status and type of insurance. Further research is needed to evaluate the clinician and patient factors (e.g., trust, employment barriers, social factors) and the more generalized manifestations of poverty that may impair use of TJA. As the United States continues to transition toward a value-based health care system, and amid the growing focus on the social determinants of health as drivers of health inequities in the United States, our results can be used by policy makers, surgeons, health systems, and payors to better target reform efforts and expand access to these life changing treatments.