Beyond the MRI: Social Vulnerability as a Correlate of Pain and Function in Nonsurgical Spine Care

Timothy S. Bullock II, MD, Claire Z. Kalpakjian, PhD, Rishi Bakshi, DO
University of Michigan Physical Medicine & Rehabilitation Department

Introduction

Low back pain is a leading cause of disability and health care utilization. Conventional spine assessments often incorporate clinical presentation, diagnostics, and prior treatments without fully capturing social context. Social determinants of health (SDOH) may influence pain experience, treatment response, and recovery. This pilot study examined whether neighborhood-level social vulnerability, measured by the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI), is associated with Patient-Reported Outcomes Measurement Information System (PROMIS) outcomes; specifically PROMIS scores relating to pain and function.

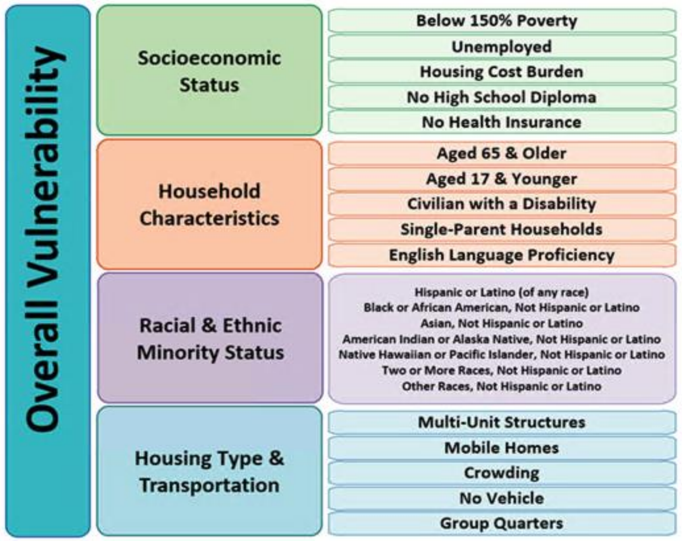
Methods

After institutional IRB approval (Exemption #4), we conducted a retrospective cohort analysis of adult patients with back pain evaluated in a tertiary nonsurgical spine and pain clinic. PROMIS outcomes (Pain Interference, Pain Intensity, Physical Function) and Fibromyalgia/Chronic Widespread Pain (Fibro) scores were obtained from routine clinical assessments. Census tract (FIPS 2020) data were extracted from the medical record and linked to SVI domains: socioeconomic status (SES), household characteristics/disability (HC), racial/ethnic minority status/language (REMS), housing type/transportation (HT&T), and overall SVI. Multivariable regression assessed associations between SVI domains and outcomes, controlling for sex, age, depression, anxiety, and body mass index (BMI).



Results

Across PROMIS outcomes, SVI SES was the most frequently statistically significant neighborhood-level predictor. **Greater** SES vulnerability was associated with **higher** Pain Interference, Pain Intensity, Fibro scores, and **lower** Physical Function (all $p < 0.001$), supporting the hypothesis that neighborhood socioeconomic disadvantage correlates with greater pain burden and worse function in nonsurgical spine care. HC was **not significantly** associated with any PROMIS outcome. HT&T was largely unrelated to outcomes, except for a **modest** inverse association with Pain Intensity ($p = 0.045$). The REMS domain was variable with **significant** associations with Pain Interference ($p < 0.001$), Physical Function ($p < 0.001$), and Fibro score ($p = 0.021$), but not Pain Intensity. Depression, anxiety, and BMI were consistently associated with worse symptom and functional outcomes in each model (all $p < 0.001$), reinforcing the **multifactorial** nature of back pain. Although several SVI associations were statistically significant, all significant PROMIS-related SVI coefficients were less than 1 standard deviation on the PROMIS metric, indicating modest effect sizes and underscoring that SVI should **complement**, not replace, patient-level clinical assessment.



Agency for Toxic Substances and Disease Registry. CDC/ATSDR Social Vulnerability Index (SVI)—Documentation (SVI 2020). August 5, 2022. https://stacks.cdc.gov/view/cdc/125626. Accessed June 5, 2024.

Discussion

Neighborhood socioeconomic vulnerability was associated with worse patient-reported pain and function among patients receiving nonsurgical spine care. These findings extend prior SVI literature from surgical risk prediction to nonsurgical spine pain outcomes; suggesting geospatial SDOH data may help identify patients who could benefit from enhanced support, care coordination, and equity-focused interventions. SVI should be interpreted cautiously, particularly race/language domains, as contextual—not biological—risk markers. Future work should evaluate longitudinal responses and individual-level social risks.

References

- Lucas JW, Connor EM, Bose J. Back, lower limb, and upper limb painamong U.S. adults, 2019. NCHS Data Brief. 2021;(415):1-8.
- Pak SS, Jiang Y, Lituiev DS, De Marchis EH, Peterson TA. Evaluatingassociations between social risks and health care utilization in patientswith chronic low back pain. Pain Rep. 2024;9(6):e1191.doi:10.1097/PR9.0000000000001191.
- Flanagan BE, Gregory EW, Hallisey EJ, Heitgerd JL, Lewis B. A socialvulnerability index for disaster management. J Homel Secur EmergManag. 2011;8(1):Article 3. doi:10.2202/1547-7355.1792.
- Yacoubian V, Cabrera A, Tulcan A, et al. Analyzing the relationshipbetween the Social Vulnerability Index and 90-day elective lumbar fusionoutcomes. Spine J. 2025;25(11):XXX-XXX.doi:10.1016/j.spinee.2025.07.023.
- Cella D, Riley W, Stone A, et al. The Patient-Reported OutcomesMeasurement Information System developed and tested its first wave ofadult self-reported health outcome item banks: 2005-2008. J ClinEpidemiol. 2010;63(11):1179-1194.doi:10.1016/j.jclinepi.2010.04.011.