

# A Novel Socioeconomic Status Metric as a Predictor of Access to Rehabilitation Services

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**INTRODUCTION:** Physical and occupational therapy (PT/OT) play a vital role in improving patient outcomes throughout the practice of orthopaedic surgery. Not only is PT/OT heavily utilized during the perioperative period, but it also offers therapeutic benefits as a first-line treatment for multiple orthopaedic pathologies. Although PT/OT leads to improved function and quality of life, access to these services varies.<sup>1</sup> Patients of lower socioeconomic status (SES) have historically had less access to healthcare services including PT/OT.<sup>2</sup> The area deprivation index (ADI) is a useful measure of SES that represents the socioeconomic disadvantages present in a specified geographic region. To our knowledge, no studies have examined the relationship between SES and geographic distribution of PT/OT services. We hypothesize that areas of greater socioeconomic disadvantage (higher ADI) have a lower density of PT/OT practices.

**METHODS:** We compiled county-level population, land area, and business data from 2020 United States (US) Census Bureau Reports. SES data was collected from the 2020 Centers for Disease Control Social Vulnerability Index (SVI) and ADI (population weighted to create a county-level measure). Four SVI Domains were included for analysis: SES, Household Characteristics, Race and Ethnicity, and House/Transportation Types. Each SES domain was converted into a percentile bin from 1-20, with the higher the percentile bin corresponding to lower SES. The mean of each density measure for each percentile bin was calculated and plotted against SES percentile. PT/OT businesses were identified using the North American Industry Classification System code 621340. Density of business by county population and land area were calculated and regression analyses performed to evaluate a correlation between SES and these measurements.

**RESULTS SECTION:** For counties of all sizes, there was a strong inverse relationship between county-level ADI and PT/OT density, for both per person and per person per square mile measures ( $R^2 = 0.97$  and  $0.94$ ) (**Figures 1 & 2**). Overall SVI showed minimal correlation with PT/OT density ( $R^2 = 0.04$  and  $0.15$ ). Household characteristics displayed a negative correlation ( $R^2 = 0.49$  and  $0.56$ ) while House/Transportation Types showed a positive correlation with PT/OT density ( $R^2 = 0.26$  and  $0.45$ ) (**Figures 1 & 2**). In larger counties (population > 500k), the SVI domains with the most significant inverse relationship to PT/OT density were household characteristics ( $R^2 = 0.68$ ) and SES ( $R^2 = 0.59$ ) (**Figure 3**). For counties of all sizes, race and ethnicity displayed an inverse parabolic relationship with PT/OT density based on population alone ( $R^2 = 0.83$  and  $0.57$ ) (**Figures 1 & 3**). However, a positive correlation between race and ethnicity was seen when considering both population density and land area ( $R^2 = 0.39$  and  $0.52$ ) (**Figure 2**).

**DISCUSSION:** We report a significant correlation between socioeconomic status and access to PT/OT services. Areas of higher socioeconomic disadvantage, based on ADI, correlate with lower density of PT/OT services. One limitation of this study includes the use of the NAICS code 621340 to find the number of PT/OT businesses as this also captures speech therapy/audiology practices. Furthermore, the reliance on the US Census data may lead to undercounting, which would provide an inaccurate representation of the population. Despite these limitations, we discovered significant relationships between various measures of SES and density of PT/OT practices. Although SES plays an important role in patient outcomes, other factors influencing patients' ability to access PT/OT must be further explored.

**SIGNIFICANCE/CLINICAL RELEVANCE:** Our study provides orthopaedic surgeons with a useful, predictive tool, ADI, to assess their patients' ability to access PT/OT, a critical modulator of patient outcomes. Orthopaedic surgeons may use this data to develop specific mitigation strategies to ensure their patients receive the appropriate rehabilitation services.

**REFERENCES:** [1] Sarpong NO, Lakra A, Jennings E, Cooper HJ, Shah RP, Geller JA. Same-Day Physical Therapy Following Total Knee Arthroplasty Leads to Improved Inpatient Physical Therapy Performance and Decreased Inpatient Opioid Consumption. J Arthroplasty. 2019;34(12):2931-2936. [2] Mandalia K, Ames A, Parzick JC, Ives K, Ross G, Shah S. Social determinants of health influence clinical outcomes of patients undergoing rotator cuff repair: a systematic review. J Shoulder Elbow Surg. 2023;32(2):419-434.

## IMAGES AND TABLES:

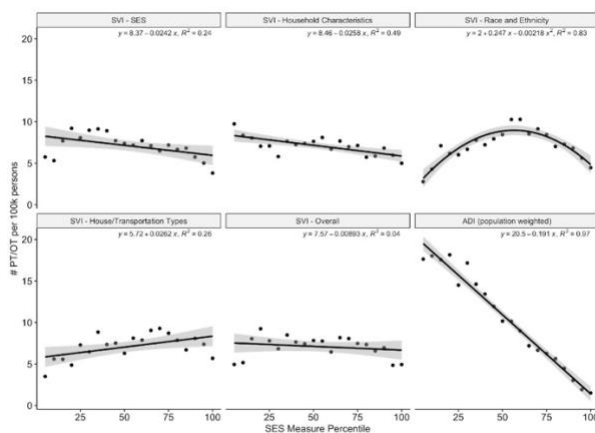


Figure 1. PT/OT Density by Population vs. SES Percentile

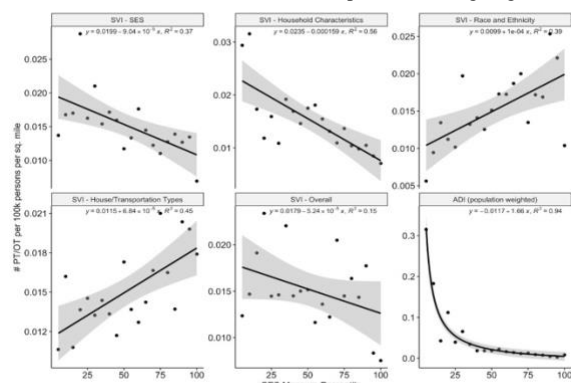


Figure 2. PT/OT Density by Land Area and Population vs. SES Percentile

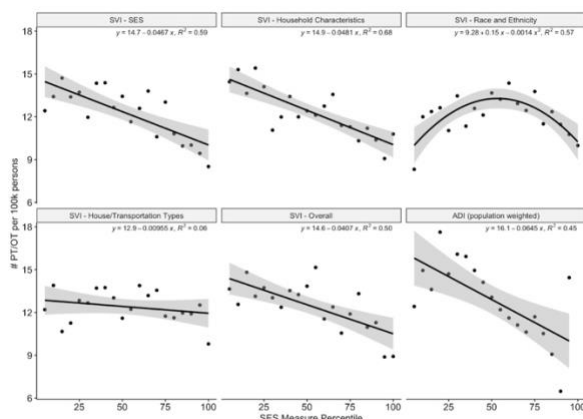


Figure 3. PT/OT Density by Population vs. SES Percentile for Counties >500K Residents