Socioeconomic and Geographic Barriers to Postoperative Follow-up in Adolescent Idiopathic Scoliosis

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INTRODUCTION: Surgical correction for Adolescent Idiopathic Scoliosis (AIS) has high success rates, yet postoperative care is often disrupted by missed or cancelled follow-up visits. Understanding the drivers of these lapses is critical, as consistent follow-up is central to monitoring recovery and long-term outcomes. This study leverages natural language processing (NLP) to systematically identify AIS surgical cases and examines patient- and neighborhood-level predictors of visit cancellations and discontinuation.

METHODS: Following IRB approval, a custom validated NLP model (Accuracy 99%, Sensitivity 99%, Specificity 99%) was used to extract operative notes from a large tertiary pediatric hospital, identifying AIS surgical corrections performed between 2011 and 2019. For each case, all related postoperative visits—completed, cancelled, or missed—were extracted, along with demographic, clinical, and census-tract–level neighborhood data. The study cohort was restricted to patients with at least two years of postoperative follow-up records. Visit characteristics were summarized and stratified by driving distance to the clinic. Generalized estimating equations were applied to evaluate predictors of visit cancellation, while Kruskal-Wallis, chi-squared, or Fisher's exact tests compared patient characteristics across groups completing, cancelling, or discontinuing follow-up.

RESULTS: The dataset included 3,459 postoperative visits from 647 patients (median age at surgery 15 years; 82% female; 71% White). Fifty-seven percent resided within 50 km of the clinic, while 13% lived more than 150 km away. Cancellation risk was elevated for patients 50–100 km versus <50 km from clinic (p=0.04), over 18 versus younger (p=0.03), and those with public versus private insurance (p=0.01). Risk also rose with follow-up duration—1.3-fold higher at 6 months and 2.3-fold higher at 5 years compared with 1-month visits (p=0.002)—and during winter compared with summer visits (p=0.008). Neighborhood factors were strong predictors: patients from census tracts with lower Child Opportunity Index had 20–22% higher cancellation risk, while those from areas with ≥50% of households lacking a vehicle had 54% higher risk (p=0.041). At the 2-year mark, only 40% of patients completed follow-up; 9% cancelled, and 51% dropped out. Those who did not complete were older (17–18 vs. 16 years, p<0.001), more likely to have public insurance (31% vs. 18%, p=0.045), lived farther away (43–48 km vs. 41 km, p=0.006), and came from neighborhoods with lower COI and fewer vehicles.

DISCUSSION: By combining automated case identification with longitudinal visit tracking, this study demonstrates that postoperative follow-up in AIS is strongly influenced by socioeconomic and geographic barriers. Distance from clinic, older age, public insurance, seasonal variation, and neighborhood disadvantage—including limited transportation access—were all significant predictors of cancellations and discontinuation.

SIGNIFICANCE: Integrating NLP-driven data collection with socioeconomic analysis highlights critical, often overlooked barriers to continuity of care in AIS patients. Targeted strategies addressing transportation and neighborhood-level inequities are essential to reduce cancellations and improve long-term surgical outcomes.

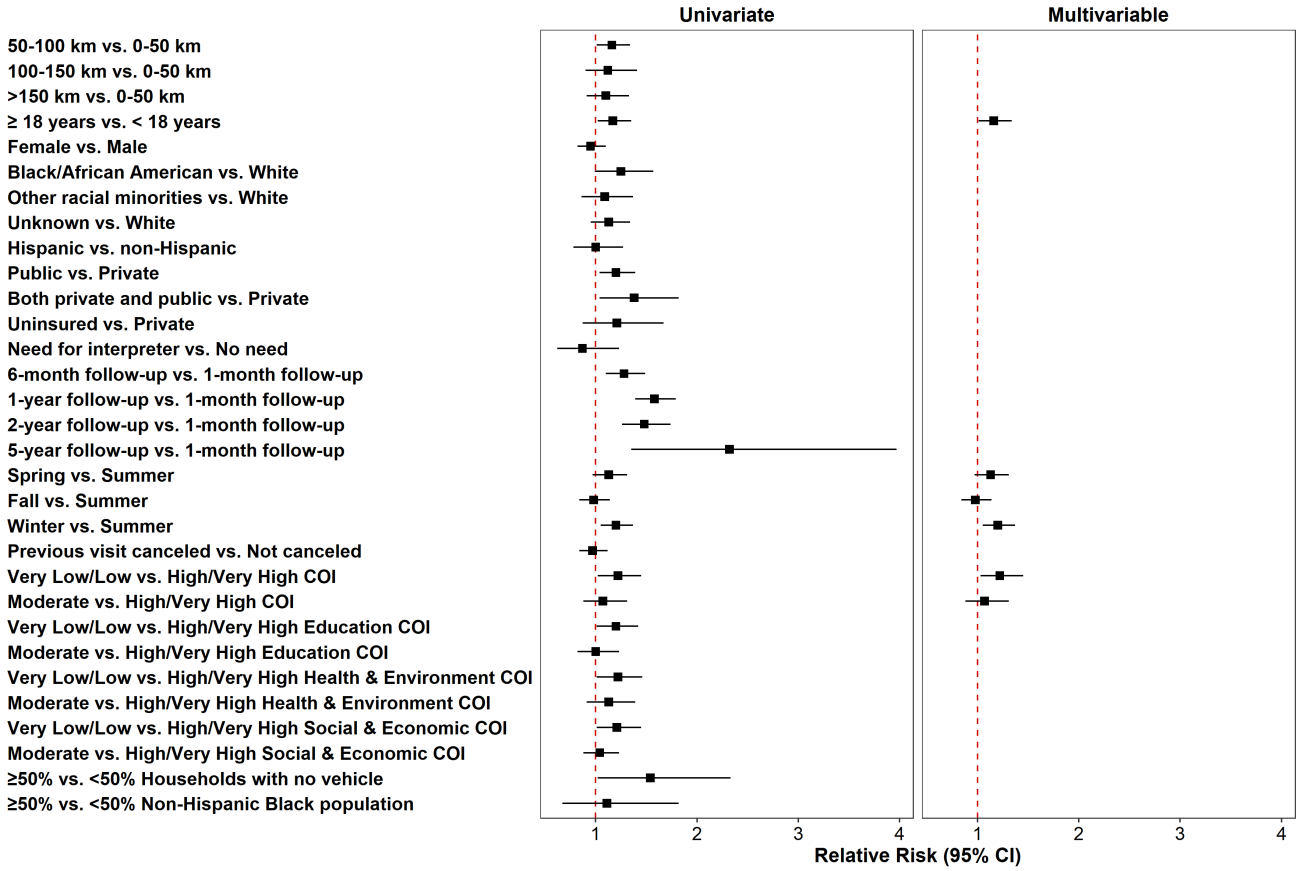

Figure 1: Forest plot of unadjusted and adjusted relative risks of visit cancellation.