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Utility of the Social Vulnerability Index in Risk Stratification of Critically Ill Neonates with Surgical Conditions

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References

BACKGROUND

- Pediatric surgical conditions in critically ill neonates are associated with significant morbidity and mortality.
- Factors including minority race, public health insurance, and lower socioeconomic status are individually associated with worse surgical outcomes
- Social vulnerability index (SVI) is a composite measure of 16 census variables calculated based on home address, which increases with higher risk of social vulnerability

HYPOTHESIS

We hypothesize that SVI may predict critically ill neonates at risk for adverse outcomes following index pediatric surgical intervention.

METHODS

- IRB-approved, multicenter retrospective review including patients who underwent surgical intervention and were admitted to the neonatal intensive care unit (NICU) between January 2016-December 2022
- Associations between SVI as a continuous variable and clinical outcomes including mortality, 30-day readmission, unplanned reoperation, hospital length of stay (LOS), and transfusion requirements were evaluated
- Patient home address was used to calculate SVI and patients were divided into quintiles by SVI percentile.
- Binary and continuous outcomes were fit using logistic and Poisson regression models respectively

RESULTS

Figure 1: Patient Selection Criteria

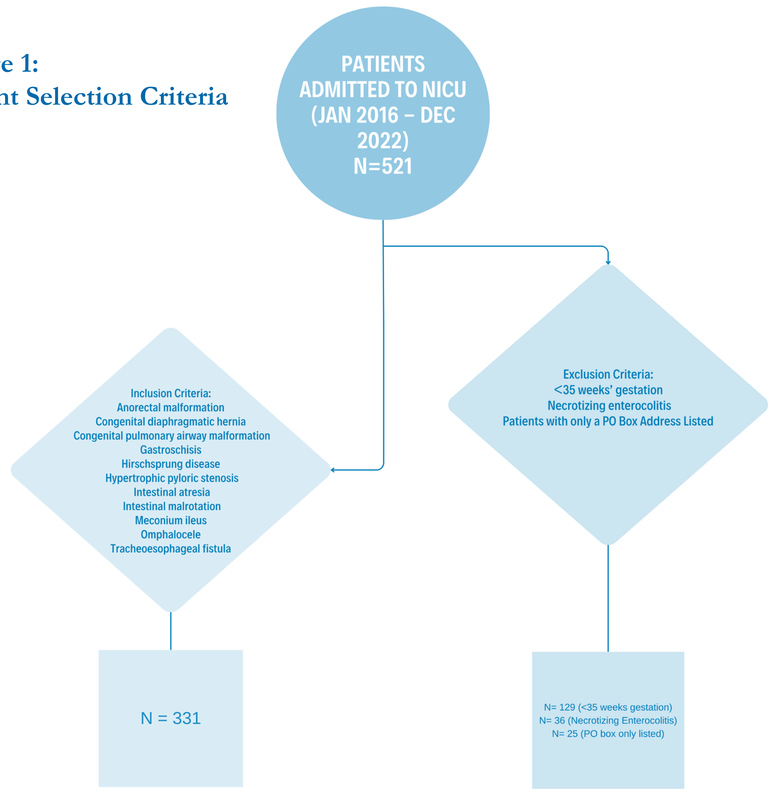


Table 1: Patient Demographics and Surgical Factors

	CHCO (N=320)	DH (N=11)	Overall (N=331)
Age at admission in days, mean (SD)	7.32 (14.4)	0 (0)	7.08 (14.2)
Female, N (%)	106 (33.1%)	4 (36.4%)	110 (33.2%)
Male	214 (66.9%)	7 (63.6%)	221 (66.8%)
Race, N (%)			
American Indian/Alaska Native	3 (0.9%)	0 (0%)	3 (0.9%)
Asian	3 (0.9%)	1 (9.1%)	4 (1.2%)
Black/African American	15 (4.7%)	2 (18.2%)	17 (5.1%)
More than one race	12 (3.8%)	0 (0%)	12 (3.6%)
Native Hawaiian/Pacific Islander	4 (1.3%)	0 (0%)	4 (1.2%)
Other	40 (12.5%)	1 (9.1%)	41 (12.4%)
Unknown	31 (9.7%)	0 (0%)	31 (9.4%)
White/Caucasian	212 (66.3%)	7 (63.6%)	219 (66.2%)
Ethnicity , N (%)			
Hispanic or Latino	95 (29.7%)	7 (63.6%)	102 (30.8%)
Not Hispanic or Latino	196 (61.3%)	4 (36.4%)	200 (60.4%)
Unknown	29 (9.1%)	0 (0%)	29 (8.8%)
SVI, Mean (SD)	0.531 (0.313)	0.863 (0.158)	0.542 (0.314)
Gestational age in weeks, mean (SD)	38.2 (1.57)	38.1 (0.875)	38.2 (1.55)
Birth weight in grams, mean (SD)	2990 (531)	2830 (430)	2990 (528)
Laparoscopic surgery	85 (26.6%)	0 (0%)	85 (25.7%)
Open surgery	235 (73.4%)	11 (100%)	246 (74.3%)
Pressors required	95 (29.7%)	0 (0%)	95 (28.7%)

CHCO = Children's Hospital Colorado; DH = Denver Health

Table 2: Adjusted Regression Model Comparing SVI as a Continuous Variable with Clinical Outcomes

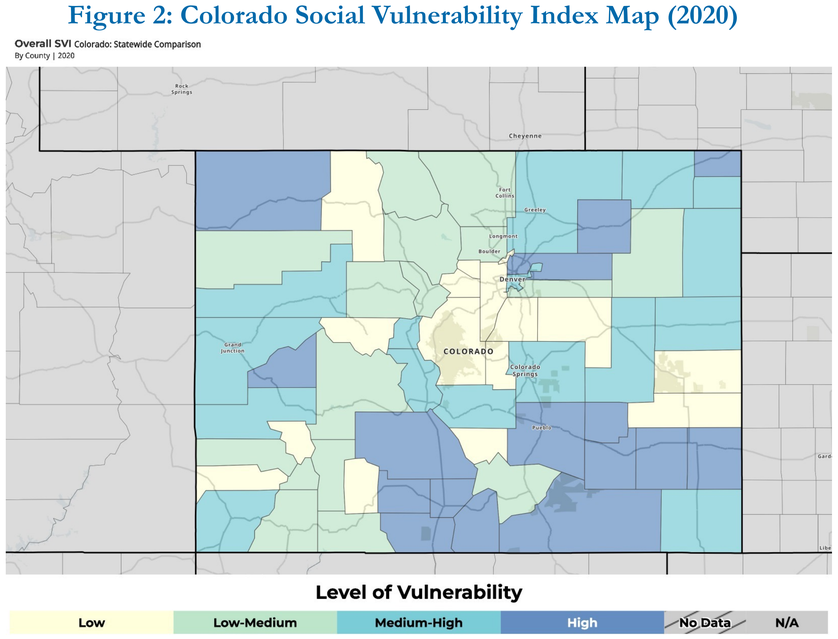
Outcome	N=331	SVI, Median (Q1, Q3)	Odds Ratio (95% CI)	P-Value
Mortality, N (%)	23 (6.9%)	0.31 (0.12, 0.77)	0.88 (0.76-1.02)	0.107
30-day readmission, N (%)	29 (9.4%)	0.68 (0.40, 0.91)	1.09 (0.96-1.25)	0.189
Unplanned reoperation, N (%)	47 (14%)	0.53 (0.26, 0.85)	1.01 (0.91-1.12)	0.890
Hospital length of stay in days, mean (SD)	40.6 (67.9)	0.54 (0.26, 0.84)	1.04 (1.01-1.07)	**0.011**
Need for blood transfusion, N (%)	111 (33.6%)	0.63 (0.29, 0.91)	1.13 (1.02-1.25)	**0.020**

SVI = social vulnerability index; CI = confidence interval

CONCLUSIONS

Critically ill neonates with surgical diagnoses that are more socially vulnerable as determined by SVI are more likely to experience poor outcomes, including need for blood transfusion and increased hospital LOS.

Figure 2: Colorado Social Vulnerability Index Map (2020)



Source: Centers for Disease Control and Prevention. (2022, December 1). CDC/ATSDR Social Vulnerability Index (SVI). Retrieved from www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.

FUTURE DIRECTIONS

- Given that SVI can be simply measured from a patient's home address, this may pose a more feasible option to preemptively screen families that may require additional resources during hospital admission or at time of discharge.
- Further studies should be performed utilizing data from a widespread group of pediatric hospitals nationwide to identify other disparities in neonatal surgical outcomes.

DISCLOSURES

Authors have no financial relationships to disclose.