Social Vulnerability Index as a Predictor of Severe Maternal Morbidity: A Narrative Review

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Abstract

Severe Maternal Morbidity (SMM) is an unexpected, life threatening complication during childbirth that results in poor health to the mother. In NYC, Black women are 2X as likely, and Hispanic women are 3X as likely to experience SMM than are White women. Social Vulnerability Index (SVI) measures the social vulnerability level of U.S. census tracts. Previous studies shown a negative correlation between SVI scores and community health. No studies have been conducted in NYC on the relationship between SMM and SVI. SVI may be used in NYC to predict SMM outcomes in vulnerable census tracts and eliminate this health disparity by addressing geographic inequalities rooted in racial discrimination.

Background

▪ Previous studies focused on individual and hospital factors as determinants of the SMM disparity. Few studies focused on neighborhood-level factors
▪ CDC created SVI to evaluate emergency preparedness of communities. The SVI database allows emergency response planners to allocate resources during natural or human-made disasters.
▪ SVI measures the social vulnerability of census tracts. The index ranks 15 U.S. Census Bureau variables and categorizes them into domains (*SES; household composition and disability; minority and language status; housing and transportation*).
▪ SVI is reported in percentile ranks, from 0.0 to 1.0.
▪ 0.0 = low vulnerability and 1.0 = high vulnerability.
▪ SVI has been used to study many health outcomes.
▪ These studies found a negative correlation between SVI values and health outcomes.

Objectives

1. To investigate the relationship of race on Social Vulnerability Index (SVI) and SMM
2. To explore SVI's applicability in predicting SMM in socially vulnerable areas of NYC

Table 1: SMM Indicators

1. Acute myocardial infarction
2. Aneurysm
3. Acute renal failure
4. Adult respiratory distress syndrome
5. Amniotic fluid embolism
6. Cardiac arrest/ ventricular fibrillation
7. Conversion of cardiac rhythm
8. Disseminated intravascular coagulation
9. Eclampsia
10. Heart failure/ arrest during surgery or procedure
11. Puerperal cerebrovascular disorders
12. Pulmonary edema/ Acute heart failure
13. Severe anesthesia complications
14. Sepsis
15. Shock
16. Sickle cell disease with crisis
17. Air and thrombotic embolism
18. Blood products transfusion
19. Hysterectomy
20. Temporary tracheostomy
21. Ventilation

List of the 21 diagnoses and procedures used by the CDC to identify cases of SMM when a hospital admission occurs due to childbirth. The red boxes indicate the SMM indicators used to investigate the relationship between SVI and SMM in this narrative literature review.

Table 2: Components of SVI

Overall Social Vulnerability

Domain 1: Socio-economic Status	Domain 2: Housing composition & disability	Domain 3: Minority status & language	Domain 4: Housing type & transportation
Variables: ▪Below poverty ▪Income ▪Unemployed ▪No high school diploma	Variables: ▪Age >65 ▪Age <17 ▪Disability ▪Single-parent household	Variables: ▪Minority ▪Limited English proficiency	Variables: ▪Multi-units ▪Overcrowding ▪Group quarters ▪Mobile homes

List of the components of SVI. SVI consists of four main domains that evaluates a total of 15 U.S. Census variables. The variables measure the characteristics of a census tract.

Results

Study and Year	N	City	Study variables	Mediators & Confounders
Mallampati et al. 2021 (19)	50,998	Durham NC	SVI and SMM	Black race, Hispanic ethnicity, maternal age, smoking, chronic HTN, diabetes, BMI, multiple gestation
Robbins et al. 2021 (20)	90	Birmingham AL	SVI and peripartum cardiomyopathy	Maternal age, marital status, payor type, tobacco use, GA at delivery, and mode of delivery
Robbins et al. 2021 (23)	90	Birmingham AL	SVI and peripartum cardiomyopathy by race	Income, Maternal age, marital status, payor type, tobacco use, GA at delivery, and mode of delivery
Goulding et al. 2021 (22)	2,378	Houston TX	COVID-19 in pregnant women and SVI	Medical center of service

▪ SMM health outcomes were associated with census tracts of higher SVI scores
▪ Women with SMM health outcomes had higher composite SVI scores, and higher scores in the *socioeconomic status, housing composition and disability, and housing type and transportation* domains
▪ Black patients with PPCM were more likely to live in census tracts with higher composite SVI scores, and higher scores in the *socioeconomic status, minority status and language, and housing type and transportation* domains, as compared to White patients with PPCM.
▪ Black patients with PPCM were more likely to live in census tracts with higher rates of poverty, unemployment, and single-parent households, as compared to White patients with PPCM.

Methods

▪ Comprehensive search in Google Scholar and SUNY Down state's E-Library for publications on the association between SVI and SMM. Keywords used: social vulnerability index severe maternal morbidity, maternal health, pregnancy
▪ 1 study was located on the association between SVI and SMM. Literature on SVI and health outcomes related to SMM indicators were sought due to limited articles on SVI and SMM.
▪ 2 studies located on the association between SVI and peripartum cardiomyopathy
▪ 1 study located on the association between SVI and COVID-19 positivity
▪ A search for relevant literature of the references section of the articles found resulted in 0 hits.
▪ Total of 4 full-text articles (n=4) published in English from 2021 was used to conduct this narrative literature review.

Discussion/Conclusion

▪ Based on the findings, SVI may be applicable in predicting SMM in NYC, however future research is needed in NYC to validate this theory.
▪ This narrative literature review shows that race is associated with residing in areas that are socially vulnerable, and therefore these communities are more likely to exhibit poor health outcomes, such as SMM due to geographic inequalities rooted in racial discrimination.
▪ SVI has the potential to help local governments in NYC to determine the most vulnerable areas and put into effect programs that aim to improve poverty rates, employment, and family structures, which may ultimately reduce the climbing rates of SMM in underserved women in NYC.

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