USING SOCIAL VULNERABILITY INDICES IN HAZARDS AND DISASTER RESEARCH

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This check sheet is written for those who are considering using social vulnerability indices in hazard and disaster research. It briefly reviews key concepts and provides a primer on the use of social vulnerability indices for research and practical application.

SOCIAL VULNERABILITY

Social vulnerability is a concept that broadly refers to the increased susceptibility of individuals and communities to disproportionate impacts of hazards due to a combination of social, economic, political, and historical factors. Social vulnerability in disasters is associated with hazard exposure and population characteristics, such as socioeconomic status, age, race, gender, and disability status. By exploring these characteristics, researchers and practitioners can begin to address disparities and enhance disaster mitigation, preparedness, response, and recovery efforts for socially vulnerable populations.

SOCIAL VULNERABILITY INDICES

Social vulnerability indices illustrate geographic variability and range in underlying causes of risk that contribute to susceptibility to harm (Cutter et al., 2003). In general, *indices* refer to quantitative or categorical composite measures of a concept, allowing for easier analysis or comparison. *Indicators* are single qualitative or quantitative measures of a subject or topic, such as poverty rate or populations without shelter, that can serve as a proxy for social vulnerability. Indicators are aggregated to form indices. Social vulnerability indices vary in geographic scale, ranging from U.S. Census tracts to counties, but are often used to assess a specific hazard or place (Painter et al., 2024).

In the hazards and disaster field, commonly used social vulnerability indices include the Hazards Vulnerability and Resilience Institute's Social Vulnerability Index (SoVI) and the Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry's Social Vulnerability Index, or CDC/ATSDR SVI. Other vulnerability indices exist for the United States at the national level, including the National Resiliency Index, Community Disaster Resilience Zones, and the Climate and Economic Justice Screening Tool.
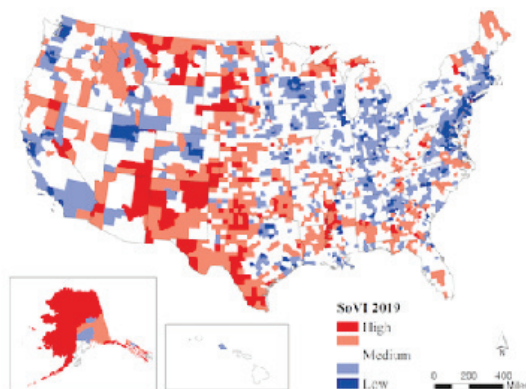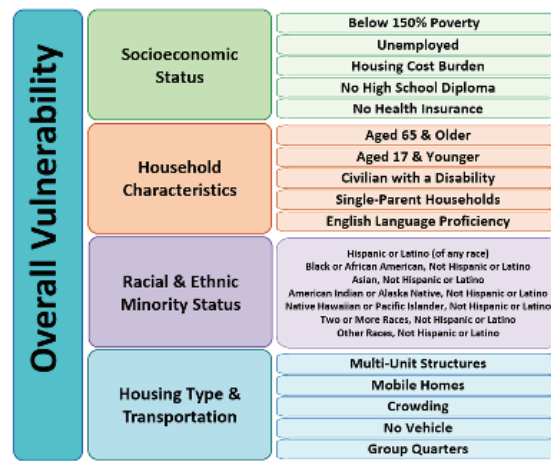

Figure 1. Map of the Social Vulnerability Index (SoVI) of the United States from the Hazards Vulnerability & Resilience Institute at the University of South Carolina, 2019: https://sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/data_and_resources/sovi/index.php

Figure 2. Variables Used in the Centers for Disease Control and Agency for Toxic Substances Disease Registry Social Vulnerability Index (CDC/ATSDR SVI), 2020: https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/SVI_documentation_2020.html

Overall Vulnerability

Socioeconomic Status
- Below 150% Poverty
- Unemployed
- Housing Cost Burden
- No High School Diploma
- No Health Insurance

Household Characteristics
- Aged 65 & Older
- Aged 17 & Younger
- Civilian with a Disability
- Single-Parent Households
- English Language Proficiency

Racial & Ethnic Minority Status
- Hispanic or Latino (of any race)
- Black or African American, Not Hispanic or Latino
- Asian, Not Hispanic or Latino
- American Indian or Alaska Native, Not Hispanic or Latino
- Native Hawaiian or Pacific Islander, Not Hispanic or Latino
- Two or More Races, Not Hispanic or Latino
- Other Races, Not Hispanic or Latino

Housing Type & Transportation
- Multi-Unit Structures
- Mobile Homes
- Crowding
- No Vehicle
- Group Quarters

KEY CONSIDERATIONS

If you are planning to use a social vulnerability index in your work, it is important to consider the following:

» **How was the social vulnerability index constructed?** Social vulnerability indices vary greatly in how they are constructed (Painter et al., 2024). As such, it is critical to understand why they were developed, which data sources they draw upon, and their intended use before applying them in hazard and disaster research.

☐ Check the methods used to calculate index values and review the scale type:

* There are different approaches to creating index values (Painter et al., 2024). These methodological choices can affect how vulnerability is measured in different places or at a specific time. As such, it is important to understand how an index was calculated and what it represents.
* Common scale types for social vulnerability indices are 0-1 scales and percentile rank. The 0-1 scale goes from least vulnerable (0) to most vulnerable (1). Percentile rank compares social vulnerability across different geographic areas, "ranking" different areas as a comparison.

☐ Review the data sources and indicators used to create the index:

* There are different approaches to creating index values. These methodological choices can Though some consensus exists on the factors that contribute to social vulnerability, the metrics, data sources, variables used, and resulting indicators vary (Painter et al., 2024), impacting interpretation of the index.
* Datasets have limitations that may impact the ability of an indicator to accurately measure specific groups of people. For example, the 2020 Census undercounted Black, Native American, and Hispanic people in several states (Cohn & Passel, 2022). Inaccurate or incomplete data will influence social vulnerability measures, so it is important to investigate and report data limitations.

» **What can an index identify about a community or population?** Social vulnerability indices should be used as a starting point to generate ideas and questions about hazard and disaster risk. However, they do not provide the full community context. Additional investigation is needed to understand factors that contribute to social vulnerability in a community and associated outcomes.

☐ Check the geographic context of the index:

* The most widely used vulnerability indices are designed at scales that increase their generalizability (Cutter et al., 2003; Flanagan et al., 2011). For example, the CDC/ATSDR SVI primarily shows data at census tract or the county scale across the entire United States (Flanagan et al., 2011). In some cases, more granular geographic units, such as Census blocks, capture the variation in vulnerability better and should be used.
* National indices cannot account for context-specific factors that can contribute to vulnerability in an area. For example, the CDC/ATSDR SVI uses the percentage of minority populations as an indicator of vulnerability. However, in places like Puerto Rico where racial and ethnic identity categories vary from the contiguous United States, this index would be less accurate (Tormos-Aponte et al., 2021). It is vital to understand the representativeness of the index for your study area.
* National indices may miss important indicators that accurately capture risk, such as historically embedded variables including environmental injustices, access to infrastructure, or systemic exclusion of Tribal Nations

(Yellow Horse et al., 2020). Local context shapes risk, exposure, and vulnerability and should be accounted for where possible.

☐ Acknowledge that social vulnerability is a complex term that encompasses more than just numbers:

* Understand that terms like "marginalized" and "vulnerable" are not meant to diminish or essentialize people's capabilities but rather to capture inequitable access to resources or unequal levels of hazards exposure.
* Areas measured as socially vulnerable represent individuals and communities—not just statistics. Every community has their own unique strengths and agency that help mitigate harm (Marino & Faas, 2020; Ogie & Pradhan, 2019), which should be considered in the context of social vulnerability measures.

CONCLUSION

Social vulnerability indices are tools that can help to bridge the gap between abstract societal dynamics and quantifiable metrics. They offer researchers, decision-makers, and emergency managers an important snapshot of the social dimensions of risk. The use of indices should be viewed as an initial step to uncover deeper insights about a specific community. Depending on the research or program goal, a holistic understanding of the community is needed to capture the local and cultural context of the community and its dynamics (Becker et al., 2005).

Social vulnerability indices, while powerful, should be used with care. These indices do not capture historical injustices, local nuances, cultural intricacies, community strengths, or individual stories. Collaboration with community members, local organizations and decision-makers, or research partners familiar with the community, such as through community-based participatory research, can offer invaluable insights (Roque et al., 2023). While these indices offer valuable information, their full potential is realized when complemented with a deep understanding of the communities in focus. The ultimate power of social vulnerability indices rests in the hands of the user.

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