Developing a Societal Vulnerability Map of San Francisco Area

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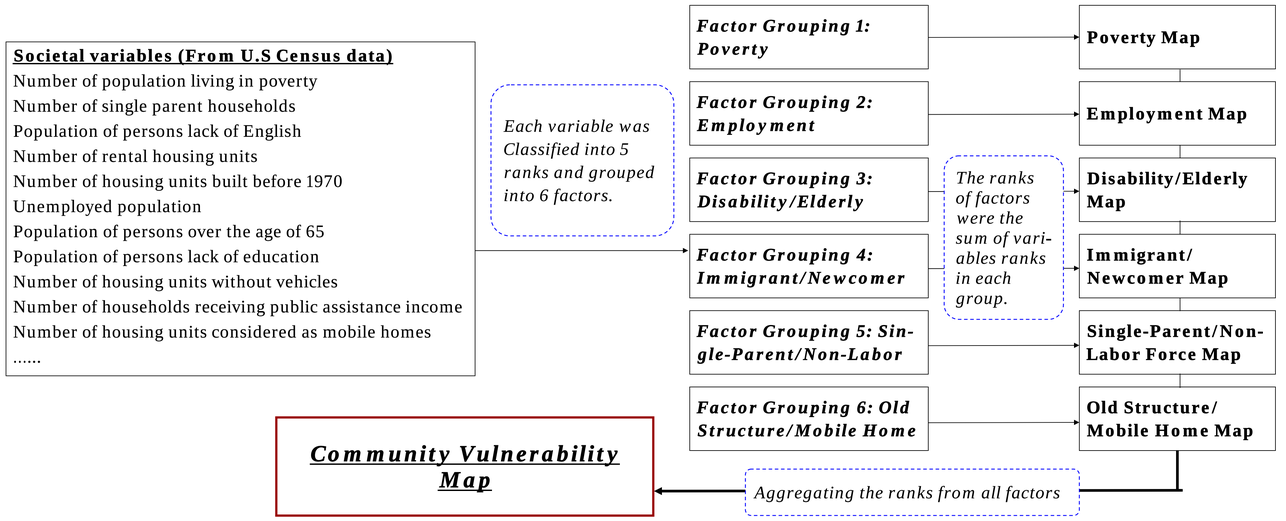
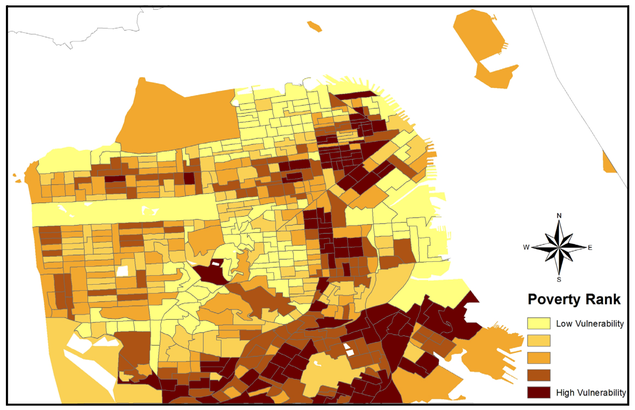
The objective of this project is to assess community vulnerability in San Francisco area by using the U.S. Census data. Through looking beyond community vulnerability, planners can understand how unique socio-demographic patterns in their community. Developing a community vulnerability inventory is the first step of risk assessment, and the results can accentuate risk for some categories of people. This project focuses primarily on socio-demographic variables from the Census data. Literature reviews reveal that poverty status, income and income resources, housing types and year built, occupation, transportation, and races and ethnicity are frequently identified as elements in the vulnerability assessment. Therefore, those variables were used here and grouped into six factors to present different societal characteristics. The output was an aggregation of all factors to identify the most vulnerable area in the community. Such an inventory or assessment could then be used in response to some disaster, or more pro-actively, to strengthen a community to be more resilient in the face risk.

In this project, all data were from the 2000 U.S. Census data. Depending on different societal characteristics, variable were grouped into six important factors: *Poverty*, *Employment*, *Disability*, *Immigrant*, *Single-Parent and Building*. Variables were calculated by numbers instead of percentages, and each variable had its rank classified by the Quantile method. Rank was generated using the following criteria: High = 5, Moderately-high = 4, Moderate = 3, Moderately-low = 2, Low = 1. These numerical values are totaled for each record and classified into 5 classes.



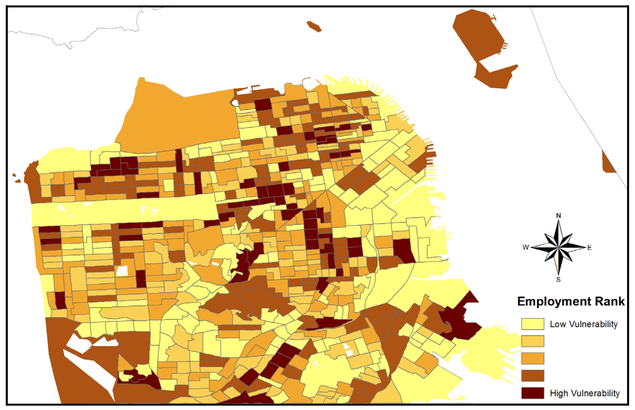
Factor 1 — Poverty

Variables:
- # of total population below the poverty
- Median household income distribution
- Per capita income distribution
- # of total households receiving public assistance
- # of Hispanic population
- # of Black population
- # of Asian population
- # of population aged 25 and over less than high school diploma
- # of population aged 5 and over lack English ability



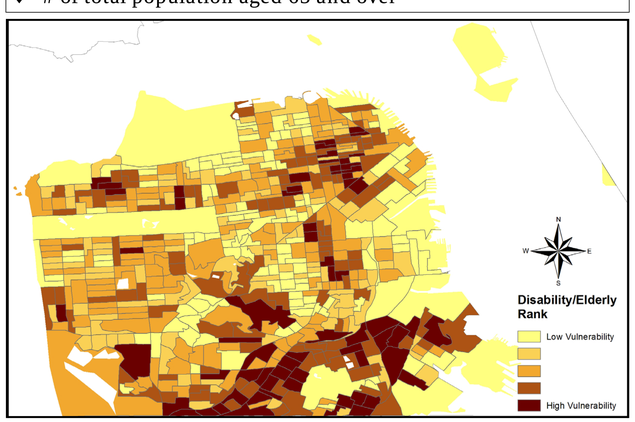
Factor 2 — Employment

Variables:
- # of unemployed population aged 16 and over
- # of occupied housing units without vehicle available
- Average time to work
- # of self-employed population aged 16 and over
- # of employed carpooled population
- # of employed population by public transportation



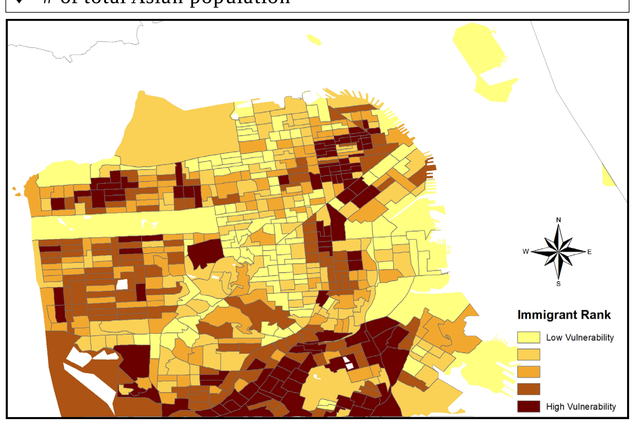
Factor 3 — Disability and Elderly

Variables:
- # of disable population
- # of disable population with low self-care
- # of unemployed disable population
- # of total population aged 65 and over



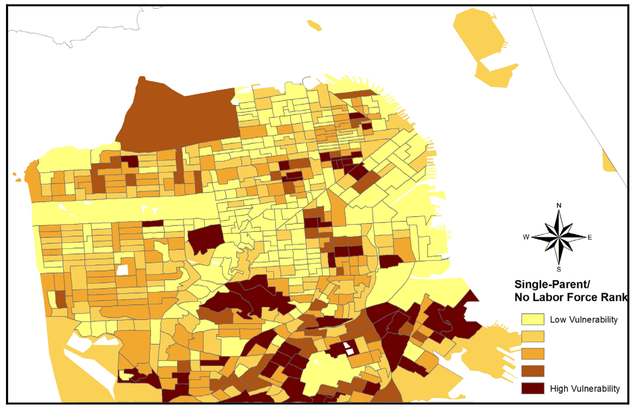
Factor 4 — Immigrant/Newcomer

Variables:
- # of foreign-born population
- # of foreign-born population enter after 1990
- # of foreign-born and non-citizen population
- # of total Asian population



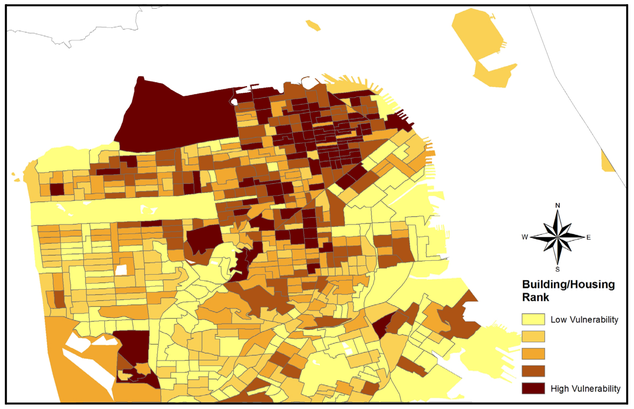
Factor 5 — Single-Parent/ Non- Labor Force Family

Variables:
- # of single-parent with children
- # of either father or mother is not in labor force

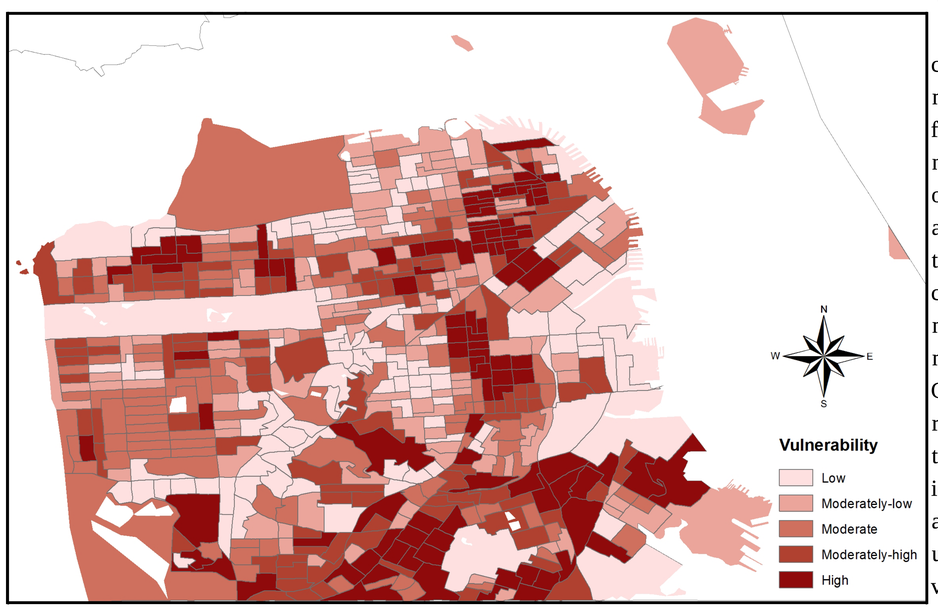


Factor 6 — Building/Housing

Variables:
- # of rental housing units
- # of structure built before 1970
- # of mobile homes



Community Vulnerability Map



When an emergency or a disaster occurs, the most common question asked is "How many people injured?" Therefore, this project used the actual numbers of each variable instead of normalizing values. Vulnerability map can help determine the most vulnerable areas in a community, and help the governments to respond to disasters and minimize the risks. The U.S. Census data are good and accurate sources for social indicators to identify community vulnerability. In addition, grouping variables into different factors can understand the characteristics of vulnerability in each area.