Report on Social Vulnerability in Ingham County

Introduction

This report applies a provided subset of the Social Vulnerability Index data to census tracts in Ingham County in order to identify areas high in social vulnerability.

Scope & limitations

- This report was prepared as a hiring exercise.
- Analysis was limited to the data provided and as specified, to tracts in a single county, Ingham County
- Outlying tracts were low on the social vulnerability indices provided; therefore, analysis was focused on the upper left (northwest) quadrant of Ingham County.
- Statements are based on the data provided. We assume for the exercise that the data are correct and complete.
- Analysis is limited to the level of census tracts. Conclusions about households or individuals cannot be drawn from this analysis.
- Although the dataset is rich and many complex statistical analyses are possible, I have limited myself here to what I think would be most useful to policymakers considering social vulnerability from an emergency preparedness perspective.

Social Vulnerability

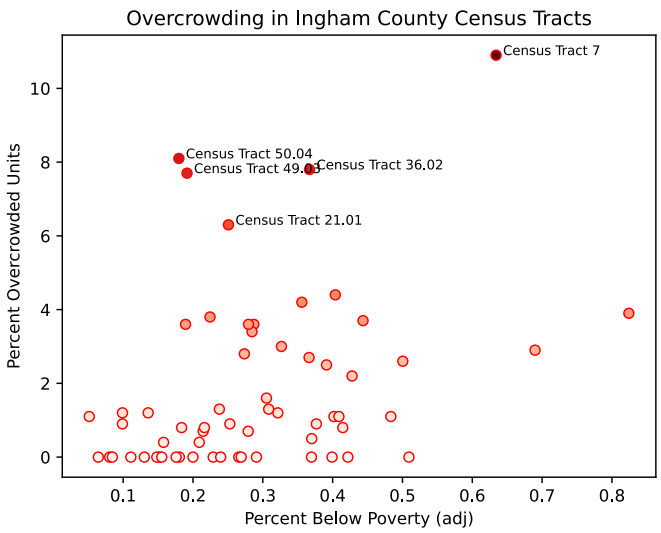
Social vulnerability refers to a community's exposure to human suffering and financial loss in the event of a disaster. Indicators of social vulnerability, such as overcrowding, lack of vehicles, and poverty, can be used to identify communities that are most vulnerable. This information can be used to plan for emergency preparedness and response.

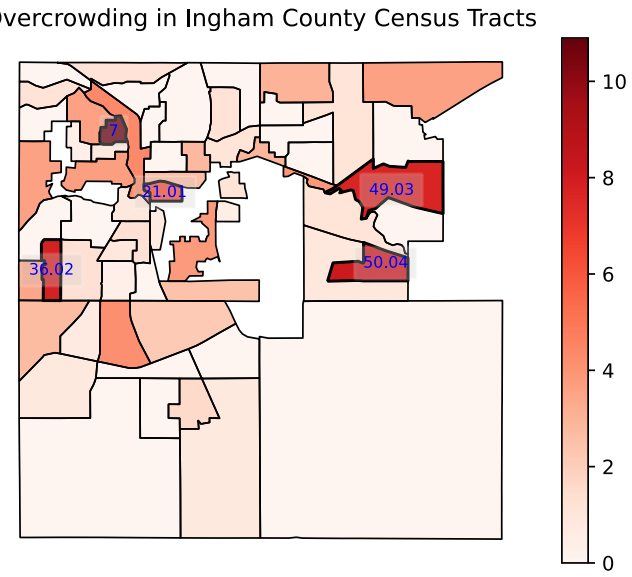
Given the geographic location of Lansing and Ingham County, certain types of disasters, such as wildfires, flooding, or earthquakes are less likely (though not impossible). The types of disasters that may be more likely include building fires and outbreaks of communicable diseases. Therefore, the analysis that follows will use these disasters are motivating factors.

Indices of Social Vulnerability in Ingham County

Overcrowding

In the CDC/ATSDR dataset (based in part on the American Communities Survey, ACS), a housing unit is considered to be overcrowded if there are more people in the unit than there are rooms. Relative to other metropolitan areas, overcrowding is not as marked an area of social vulnerability in Ingham County. The maximum percent of crowded units per tract in Ingham County is about 10%. For comparison, the tract with the highest rate of overcrowding in Chicago has about 23% overcrowded units; in New York the maximum is 60%. However, even relatively low levels of overcrowding can be risk factors for disease spread and building fires.





The scatterplot above on the left shows the relationship between poverty and overcrowding in Ingham County. Overcrowding is not evenly spread out: the most overcrowded tracts are much more overcrowded than other tracts. There is also an association between overcrowding and poverty: in general, tracts with more overcrowding are also higher in the % of residents in that tract below 1.5 times the poverty line, although there are exceptions.

The map above shows census tracts in the upper right quadrant of Ingham County; overcrowding is indicated by the color red; the darker the shade of red, the more overcrowding (from white=0% to darkest red=10%). The top five most overcrowded tracts are outlined in bold and their tract numbers are overlaid in blue. Interestingly, the most overcrowded tracts are distributed throughout the quadrant, rather than being geographically concentrated in one or a few areas.

The table below gives more information about these most vulnerable tracts: for example, these most overcrowded tracts tend to have high rates of poverty (% below 1.5 Poverty) and tend to be home to more Black, Indigenous, and People of Color (BIPOC) residents than many less crowded tracts.

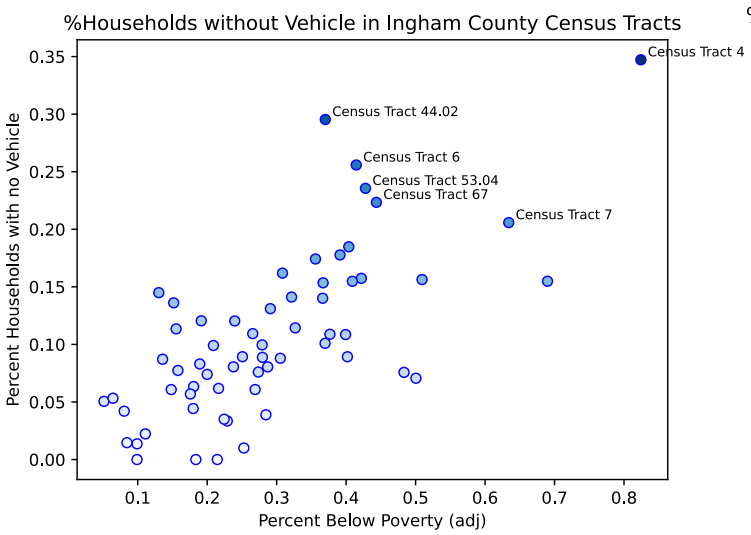
Census Tract	*Area (sq mi)*	*Population*	*Housing Units*	*Households*	*Number Below 1.5 Poverty*	*% below 1.5 Poverty*	*Number BIPOC Residents*	*% BIPOC Residents*	***% Overcrowded Units***
7	0.352	3192	1392	1278	2024	63.4%	2122	66.5%	**10.9%**
21.01	0.390	2173	778	683	545	25.1%	1611	74.1%	**6.3%**
36.02	0.710	3639	1440	1329	1335	36.7%	2135	58.7%	**7.8%**
49.03	2.512	2768	1226	1137	530	19.1%	1596	57.7%	**7.7%**
50.04	1.265	4193	1824	1716	754	18.0%	1554	37.1%	**8.1%**

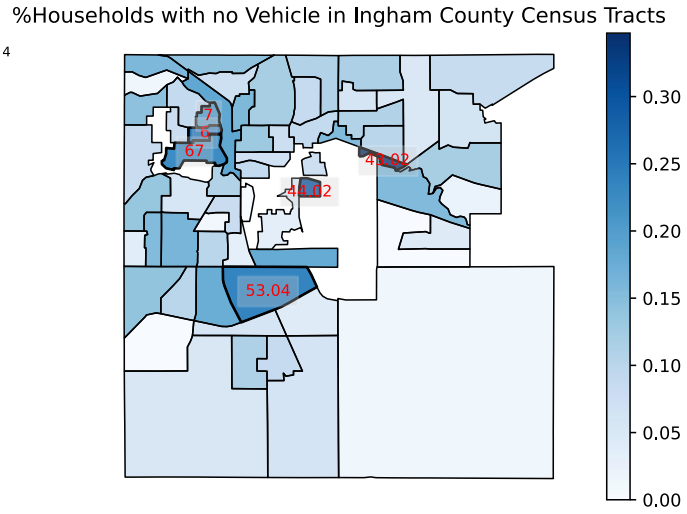
Policy Insight: Focus prevention and responses efforts on these tracts

- Units in the most overcrowded tracts could be targeted for fire safety and prevention inspections & interventions
- Likewise, perhaps a program for distribution of fire extinguishers (and demonstrations on use) and smoke detectors could focus on these tracts
- Have a distribution point for PPE in these tracts in case of outbreak
- Any planned interventions need to been screened for cultural competence and may need to be available in multiple languages. For example, due to historical mistreatment, Black/African-American residents may be suspicious of vaccine efforts in the case of disease outbreak.

Lack of Vehicle Access

While lack of vehicle access has many implications for daily life (e.g., ability to seek employment), in terms of emergency preparedness, lack of vehicle access is primarily seen as a barrier to evacuation efforts.





The scatterplot on the left shows the strong relationship between poverty and lack of vehicle access: tracts with a greater percent of residents below poverty have higher percents of households without a vehicle. The map above shows census tracts in the the upper right quadrant of Ingham County and % of households without a vehicle is indicated by the color blue; the darker the shade of blue, the smaller the proportion of households with access to a vehicle. The top five tracts with the highest percentage of households without vehicles are outlined in bold and their tract numbers are overlaid in red.

The table below gives more information about these tracts: again, the tracts with the highest rates of householdes without vehicles are also high in poverty and home to many BIPOC residents.

Census Tract	*Area (sq mi)*	*Population*	*Housing Units*	*Households*	*Number Below 1.5 Poverty*	*% below 1.5 Poverty*	*Number BIPOC Residents*	*% BIPOC Residents*	*Households with no vehicle*	***%Households no vehicle***
7	0.35	3192	1392	1278	2024	63.4%	2122	66.5%	263	**20.6%**
67	1.05	4737	2520	2337	2101	44.4%	2334	49.3%	522	**22.3%**
53.04	2.83	3001	1525	1367	1284	42.8%	1929	64.3%	322	**23.6%**
6	0.30	1785	1244	1075	740	41.5%	685	38.4%	275	**25.6%**
44.02	0.28	327	693	193	121	37.0%	248	75.8%	57	**29.5%**
43.02	0.22	2225	1467	1273	1834	82.4%	887	39.9%	442	**34.7%**

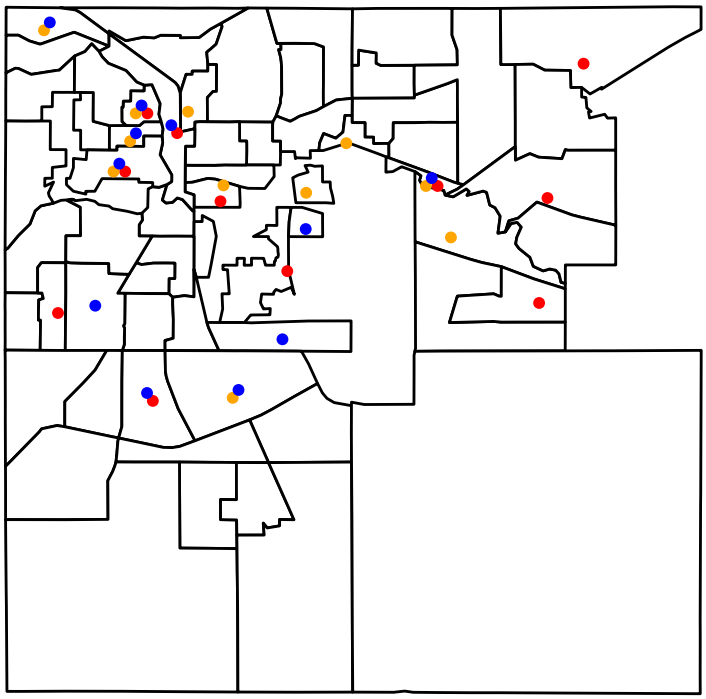
Policy Insights: Transportation and Shelters

- In cases of extreme temperatures, consider locating heating/cooling centers in these tracts as residents will have difficulty traveling to other areas
- Consider adding transit options, such as a shuttle from tract 53.04 to a transit hub, or additional bus lines servicing tracts 6,7, and 67
- Have transportation options in place for residents of these tracts in case evacuation is needed

Compound Vulnerability

Unsurprisingly, the indicators of social vulnerability are interrelated. Tracts with more people in poverty tend to have fewer households with vehicles. The most overcrowded tracts have high rates of poverty.

Tracts with Compound Vulnerability



In this map, tracts with a red dot are among the top ten most overcrowded. Tracts with a blue dot are among the top ten with the lowest percentage of households having vehicles. Tracts with orange dots are among the top ten with the highest rates of poverty.

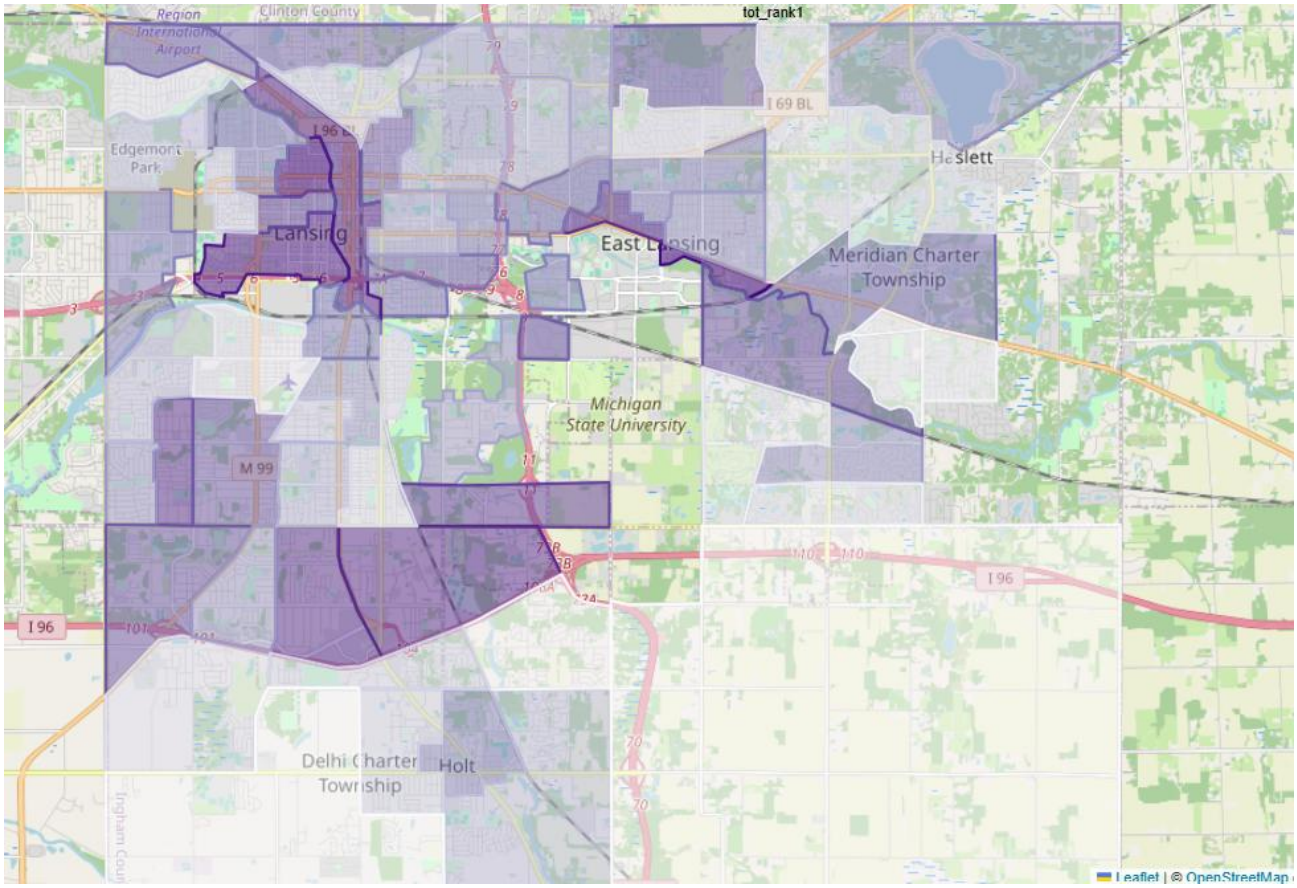
Tracts with any dots in this map should be considered socially vulnerable; however, those with multiple dots should be considered the most socially vulnerable and wherever possible, intervention efforts should be targeted to these areas.

There is a cluster of high-vulnerability tracts in the northwest corner of the map that includes tracts 6,7, 67, and adjacent areas. Notably, tracts adjacent to the MSU campus have various types of social vulnerability, but one tract just to the north of the campus has a high rank on all three indicators analyzed here. Some of these are most likely home to many students, as indicated by the high rates of high school completion seen in these tracts (unusual in other high poverty tracts).

While university students may face different challenges from other types of socially vulnerable residents, it should be noted that in terms of emergency planning, many of them live in crowded or overcrowded conditions and lack vehicles. Any emergency preparedness plan should take the vulnerability of MSU students into account and coordinate with the university.

To put all of this in context, it may be helpful to see the tracts overlaid on a conventional map with landmarks, etc.

This map shows the tracts with the greatest vulnerability (high rank on one or more indicators) in darker purple. Clusters of highly vulnerable tracts can be seen along I-96 to the South, along the northern border of the MSU campus, and adjacent to both North Cedar/North Larch Street and Ransom-E. Olds Freeway. (interactive version available here: https://pbkalra.github.io/ingham_SVI.html)



Conclusion/summary:

- Poverty, in addition to being a predictor of both overcrowding and lack of vehicle access, is itself an indicator of social vulnerability
- Areas (census tracts) that are vulnerable on one index are often vulnerable in multiple ways
- Highly vulnerable tracts tend to be home to high proportions of BIPOC residents
- Several clusters of highly vulnerable tracts can identified: intensive interventions may be necessary in these areas

More detailed analysis and explanation can be provided on request!