

Evaluating the relationship between Social Vulnerability Index and Mobility Ratio during a pandemic

Problem Description

The Social Vulnerability Index (SVI) is a tool used to estimate the risk to lives and livelihoods within a community when faced with external stressors such as manmade or natural disasters, including pandemics (*CDC/ATSDR Social Vulnerability Index (SVI)*, n.d.; Fox et al., 2023; Mah et al., 2023). SVI utilizes 16 community variables described by the American Community Survey, including socioeconomic status, household characteristics, racial and ethnic minority status, housing and transportation characteristics (*CDC/ATSDR Social Vulnerability Index (SVI)*, n.d.; Fox et al., 2023). Fox et al. (2023) showed that the impacts of COVID-19 were disproportionately burdensome on areas of Austin with high SVI scores, which are concentrated in the historically disadvantaged area known as the Eastern Crescent. Utilizing mobility data from 2019 and 2020 provided by SafeGraph, we proposed to evaluate the relationship between SVI and mobility restriction during the COVID-19 pandemic.

Project Plan

- Identify an appropriate timeframe given available data.
- Explore changes in mobility patterns from 2019 to 2020 in Austin.
- Evaluate the relationship between SVI and Mobility during the height of Covid.
- Verify the evaluations to show a general pattern
- Review calculations to improve results

Dataset Description

SafeGraph provides accurate and precise place and mobility global datasets. We were lucky enough to work with mobility data for Travis County, the county in which Austin is located. The data included movements into and out of the Austin area, as well as movement within and between the local zip codes during 2019 and 2020. We focused our efforts on the movements within and between local zip code for the scope of this project. We were also provided a dataset of the calculated SVI index for 45 Austin zip codes. We further defined zip codes in Austin by region, North, East, South, West, and Central.

Analysis

We performed linear regression with social vulnerability scores and mobility data over a 6-month timeframe from January to the end of June in 2020 in the city of Austin. We also investigated the difference between mean movements within a particular zip code in 2019 and 2020, with our data confirming the obvious decline in movements. We also investigated the difference between mean social vulnerability scores in various areas of the city of Austin. We utilized Google Maps to investigate the locations of hospitals within the Austin region and evaluated their distribution compared to areas of vulnerability in Austin.

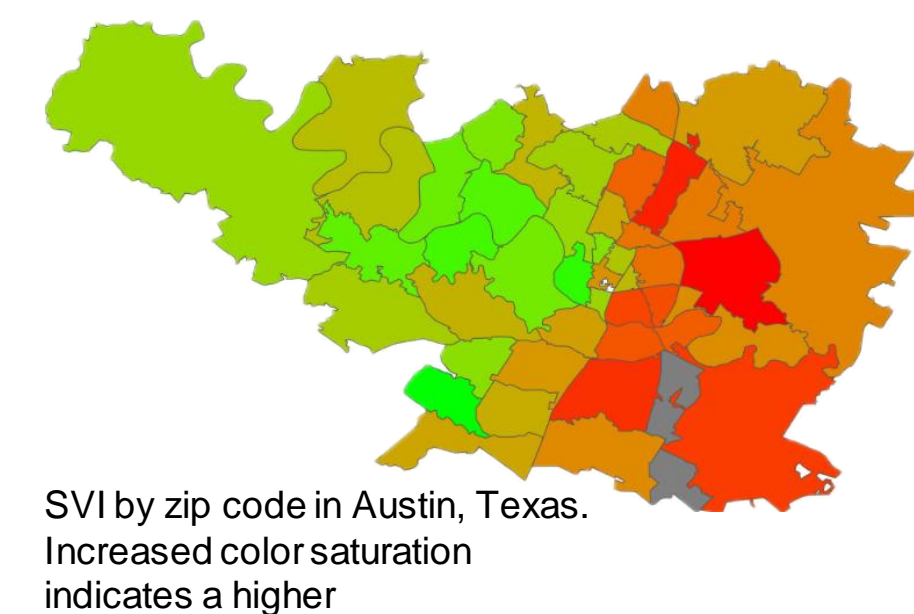


Figure 1: SVI, which is associated with decreased community resilience when exposed to an external stressor.

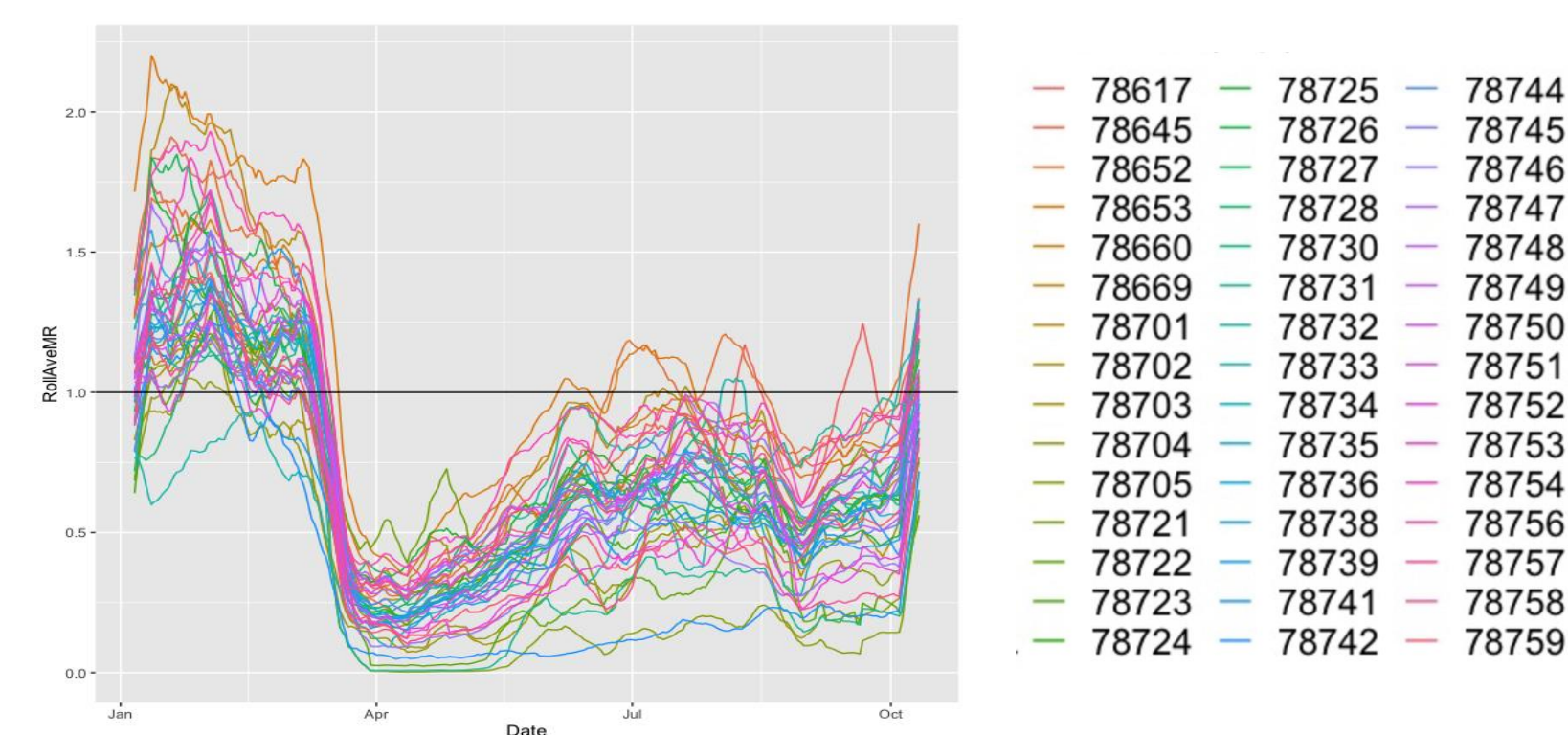
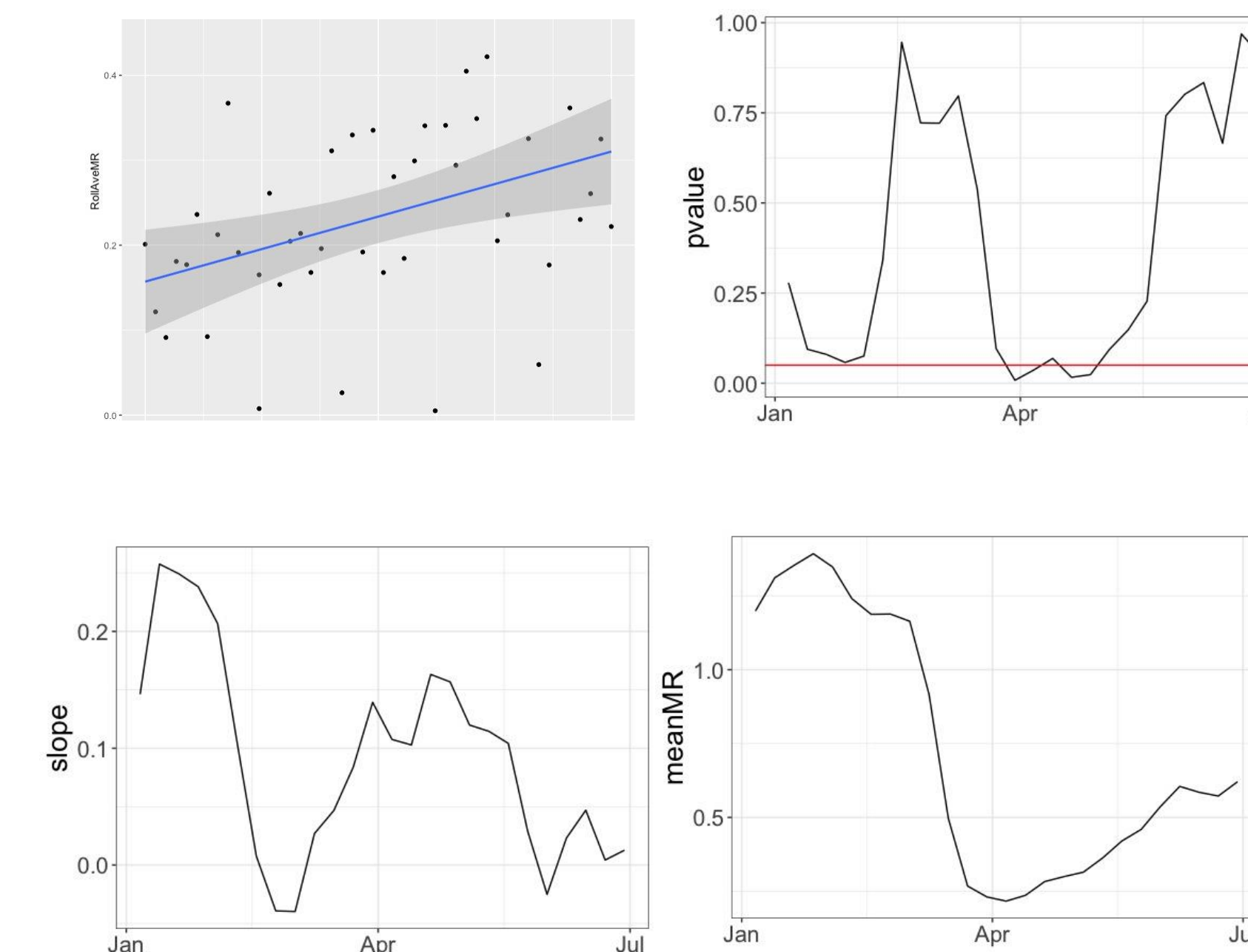
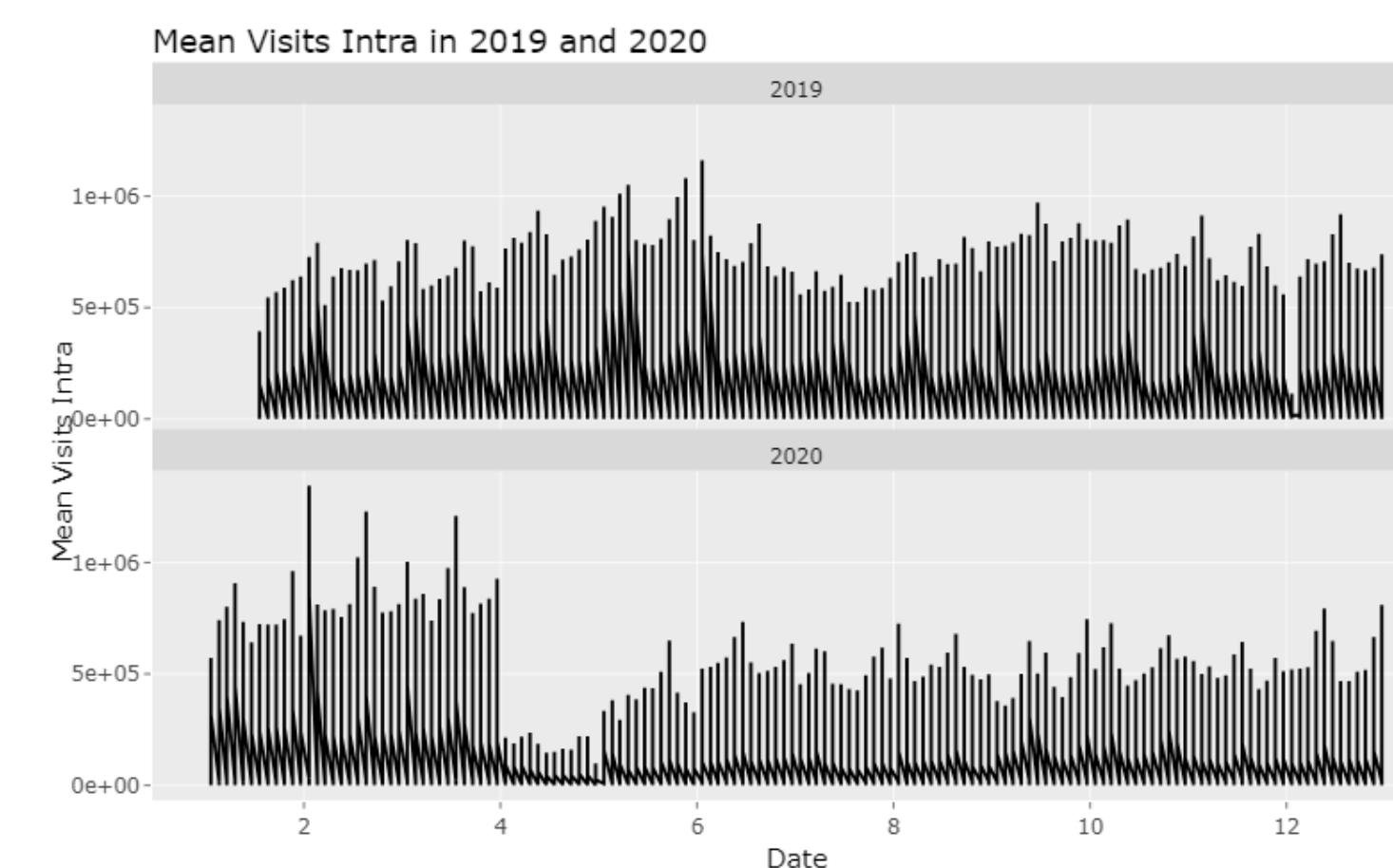
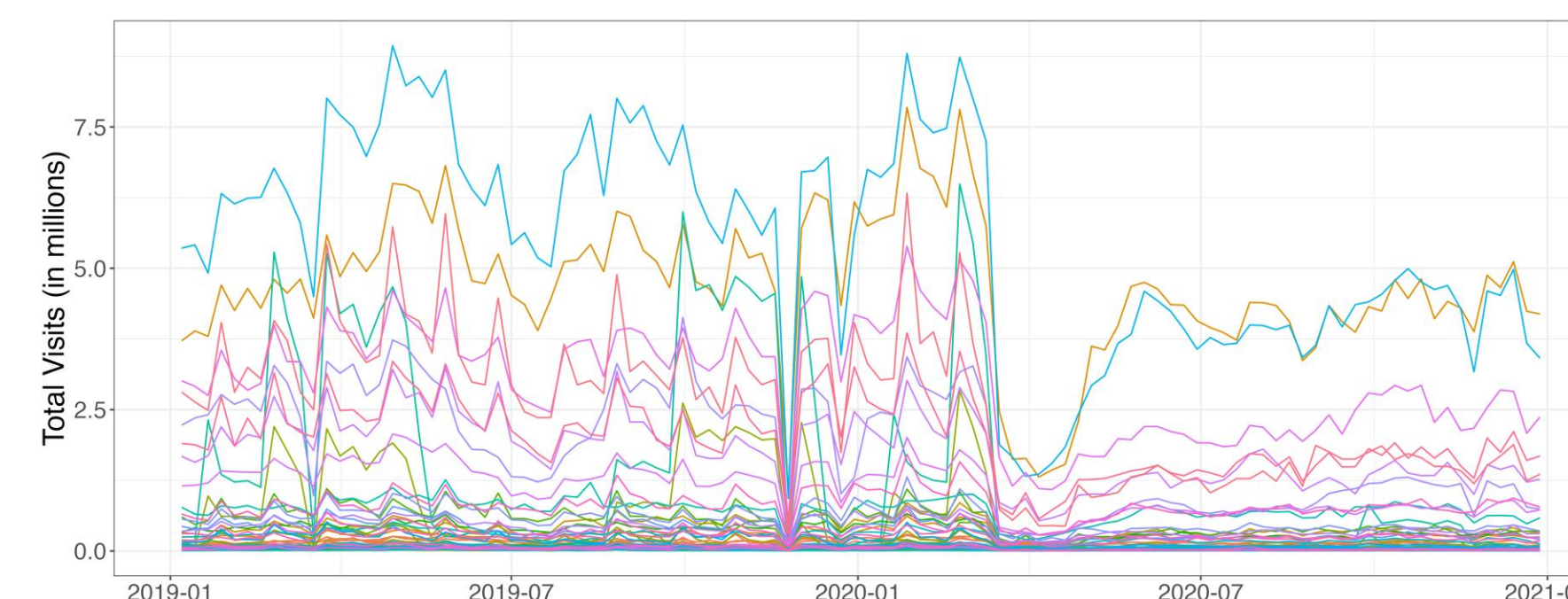


Figure 2: Mean mobility by zip code from January to October 2020. Austin declared a state of emergency on March 6, 2020, and a stay-at-home order was issued on March 24, 2020. This is demonstrated in the above figure as the sharp decline in mobility across all zip codes, noting that some zip codes experienced increased mobility restriction compared to others.

Figure 5: Linear regression of mean Mobility Ratio by SVI score for the week of April 6, 2020. This indicates that more vulnerable zip codes (high SVI) had higher mobility than less vulnerable zip codes (low SVI) during this week.

Project Findings



Conclusions

Based on our calculations, for the month of April 2020, there is statically significant correlation between mobility and SVI, which is dependent on mobility restrictions. Further analysis is needed to determine if this correlation was consistent during the entire timeframe impacted by COVID-19. We also showed areas of high vulnerability index are regional in Austin, with highest vulnerability noted in regions that are historically disadvantaged. Hospital facilities are almost exclusively located in areas of low vulnerability.

References and Resources

- <https://www.safegraph.com/>
- <https://github.com/LaJoshua/Mobility-and-Social-Vulnerability-Index>
- <https://posit.co/products/open-source/rstudio-server/>
- CDC/ATSDR Social Vulnerability Index (SVI)*. (n.d.). <https://www.atsdr.cdc.gov/placeandhealth/svi/index.html>
- Fox, S. J., Javan, E., Pasco, R., Gibson, G. C., Betke, B., Herrera-Diestra, J. L., Woody, S., Pierce, K., Johnson, K. E., Johnson-León, M., Lachmann, M., & Meyers, L. A. (2023). Disproportionate impacts of COVID-19 in a large US city. *PLoS Computational Biology*, 19(6), 1–22. <https://doi.org.libproxy.txstate.edu/10.1371/journal.pcbi.1011149>
- Mah, J. C., Penwarden, J. L., Pott, H., Theou, O., & Andrew, M. K. (2023). Social vulnerability indices: a scoping review. *BMC Public Health*, 23(1), 1–11. <https://doi-org.libproxy.txstate.edu/10.1186/s12889-023-16097-6>

Future Work

After catching up on sleep, Team Render Mages would like to further this investigation by including key infrastructure data, such as the locations of emergency room and outpatient clinicals to evaluate the relationship between mobility and increased hospitalization rate in areas of low SVI (Fox et al. (2023). It would also be beneficial to compare data from this event to other disaster events in the same region.

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