# Comparing Social Vulnerability to COVID-19 and Hospital Access in Tarrant County

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#### Abstract

This project uses GIS to take a look at multiple layers of spatial data to identify possible relationships between COVID-19 and a variety of social vulnerability in Tarrant County, Texas in the year 2020. The purpose of this research is to better understand trends of widespread public health events and factors that may contribute their severity. A variety of techniques are used to map COVID-19 rates for each city and to visualize differences in social vulnerability across the county. Furthermore, GIS is used to analyze social vulnerability and access to hospitals in order to identify areas underserved by medical care. From there, recommendations for new hospital locations are established.

## Background

COVID-19, caused by the SARS-CoV-2 virus, is a novel viral infection that originated in Wuhan China in 2019. From its first appearance, corona virus rapidly spread around the world and infected millions of people. It is important to understand the relationship between public health and socioeconomic status, household characteristics, racial and ethnicity minority status, and housing type and transportation. These factors comprise the Social Vulnerability Index, which is used to identify socially vulnerable populations who are more at risk to hazardous events, such as natural disasters or disease outbreaks. The Social Vulnerability Index can help government officials identify potentially underserved communities and make preparations for future disaster preparedness and resource allocation. In this project, the spread of Tarrant County COVID-19 rates is compared to the area's social vulnerability to identify potential relationships. Social vulnerability is then used to assess hospital access among underserved populations. This can help pinpoint areas in need of more medical care facilities to combat future public health events.

## **Objective**

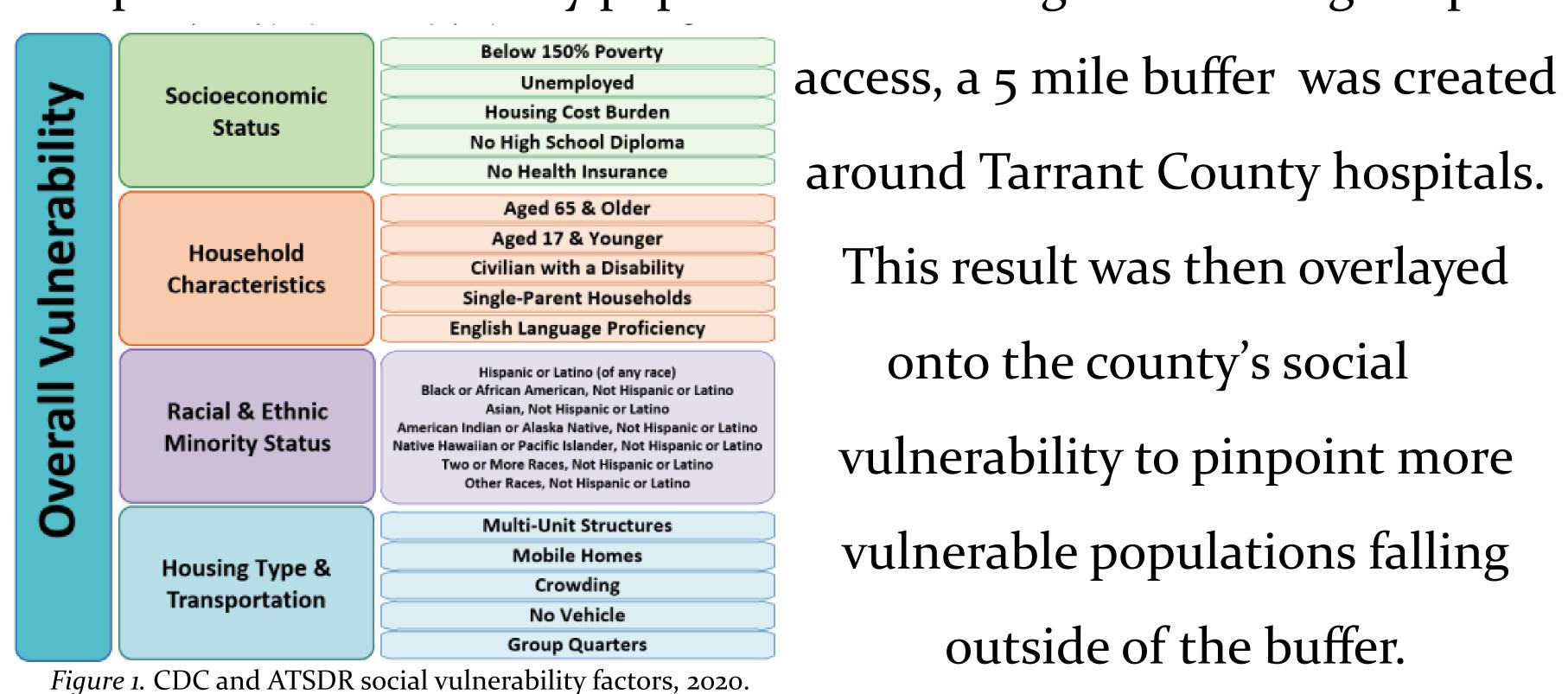
The objective of this research is to identify possible relationships between COVID-19 and social vulnerability factors. Furthermore, access to hospitals across the county will be assessed to identify areas with underserved populations lacking hospital access.

**Data** 

The Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) created the Social Vulnerability Index. These two organizations provided several datasets that indicate the level of social vulnerability for each U.S. census tract based on a variety of social and economic factors in 2020. COVID-19 rates for each city and hospital locations came from Tarrant County's online database. The county provides a variety of datasets on demographics and public health across the county.

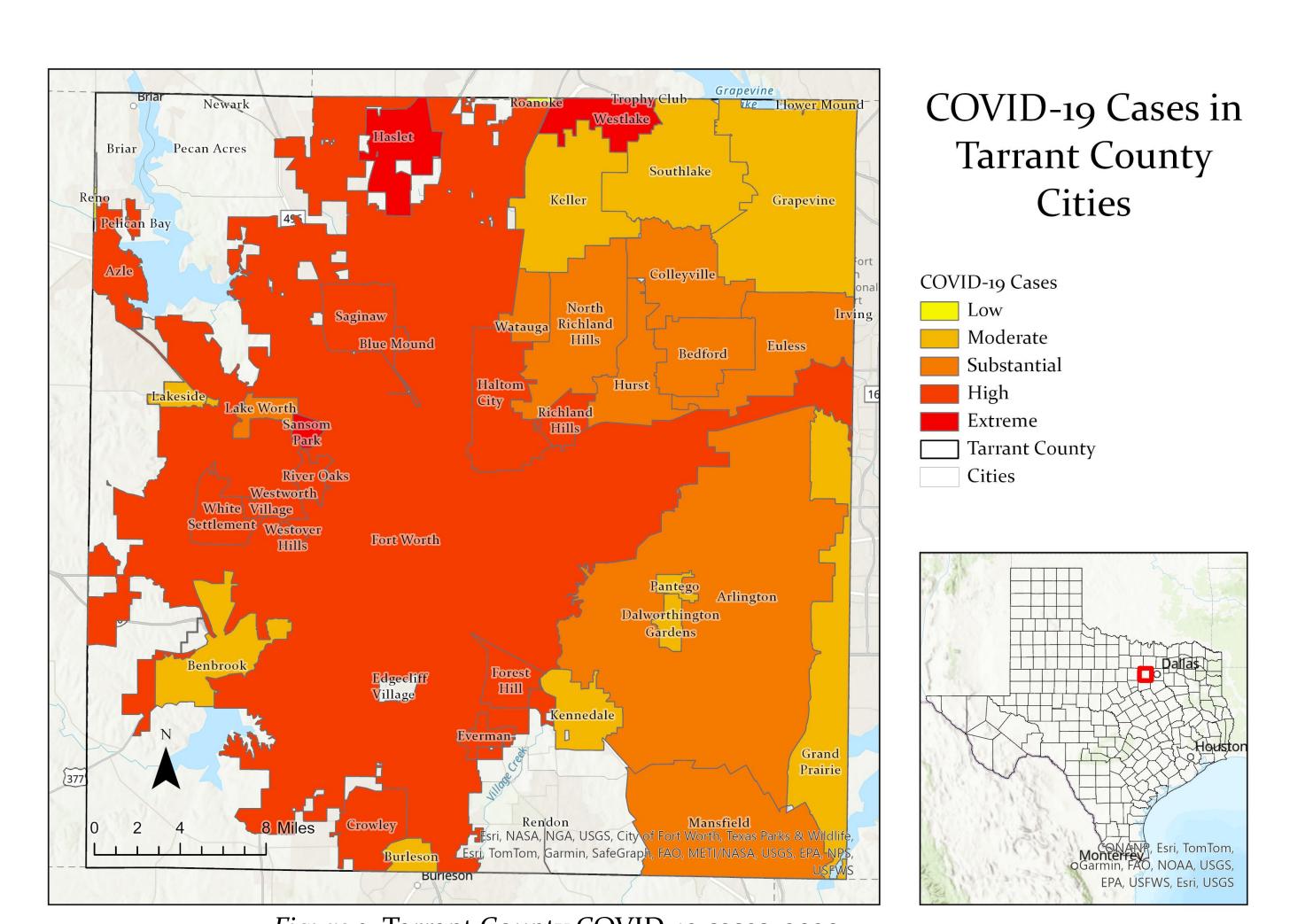
#### Method

COVID-19 data was transferred to a data table in ArcGIS Pro. The data was the joined to a Tarrant County boundary shapefile based on city information. The COVID-19 cases were then normalized by population and visualized as a choropleth map using 5 classes under Jenks natural breaks. Then, social vulnerability census tract data sets were clipped to Tarrant county to isolate the area of interest. The overall level of social vulnerability, calculated based on a variety of demographic factors by the CDC and ATSDR, was also classified into 5 classes using Jenks natural breaks and displayed on a choropleth map. In order to identify populations that might be lacking hospital



around Tarrant County hospitals. This result was then overlayed onto the county's social vulnerability to pinpoint more vulnerable populations falling outside of the buffer.

Result



Social Vulnerability

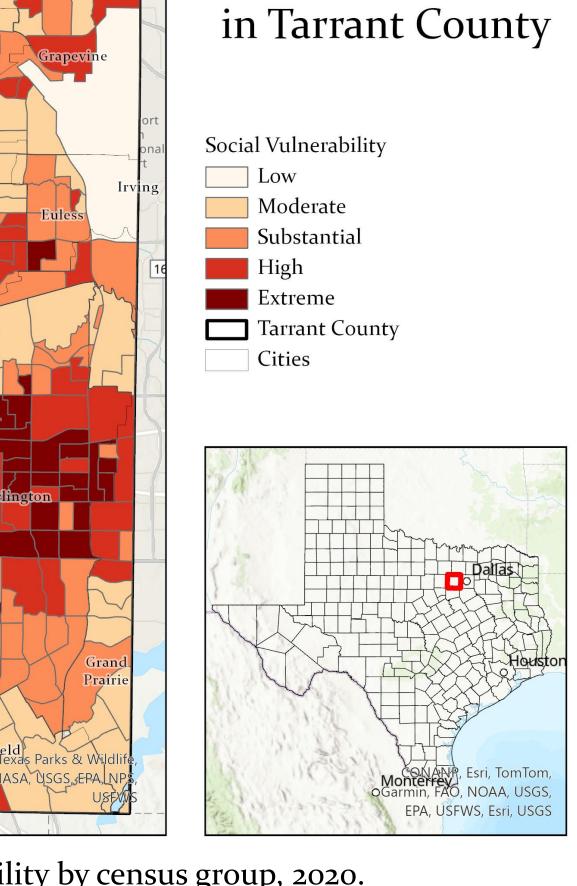
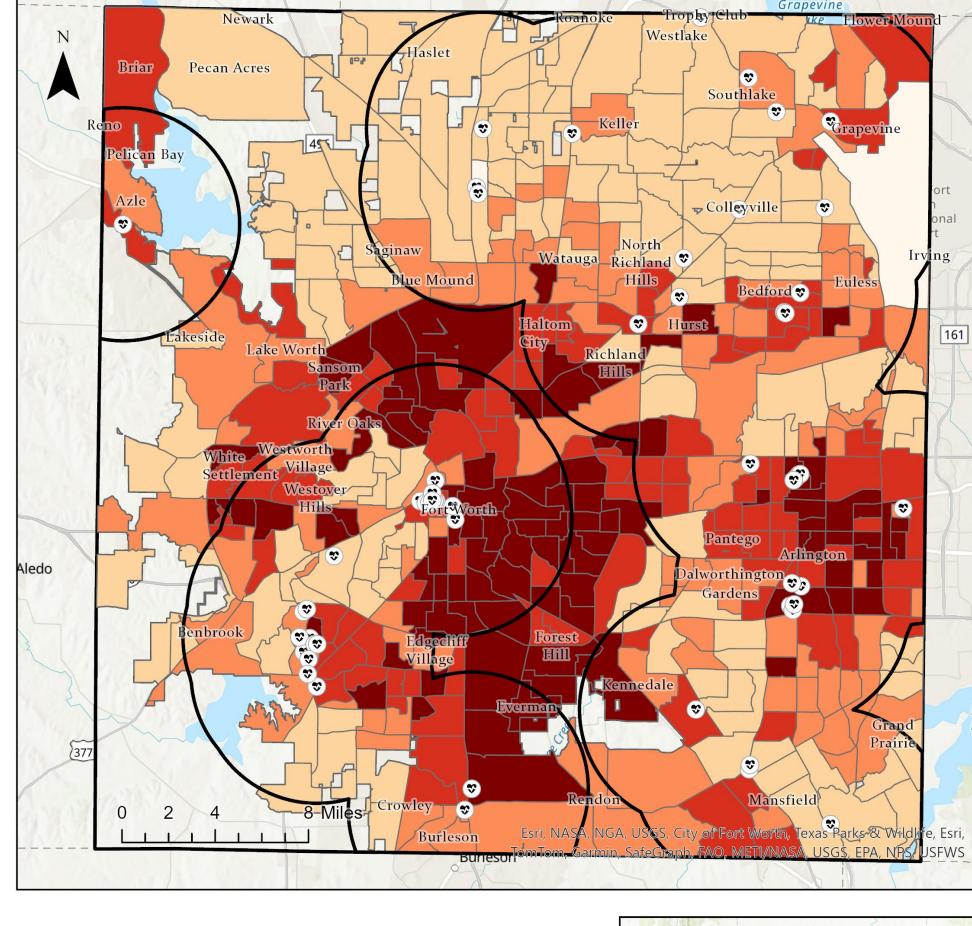


Figure 2. Tarrant County COVID-19 cases, 2020.

Hospital Access Among Socially Vulnerable



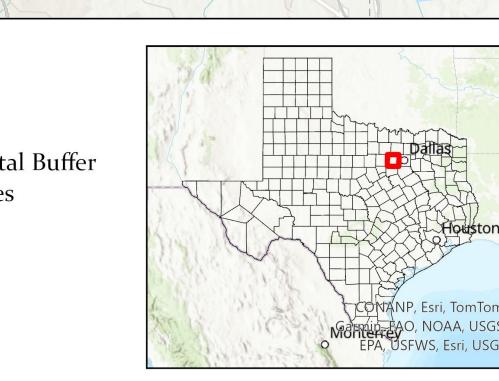


Figure 4. Tarrant County hospitals and social vulnerability

Social Vulnerability

Figure 3. Tarrant County social vulnerability by census group, 2020.

Based on the data, Tarrant County cities with higher rates of COVID-19 cases also had greater distributions of socially vulnerable populations. Fort Worth, Texas and the surrounding cities generally had the most extreme social vulnerability and the highest occurrence of COVID-19 cases during the global pandemic. These maps indicate that social, economic, and other demographic factors are related to the intensity of public health events. Based on the location of hospitals and vulnerability levels, the Forest Park and Sansom Hill areas are potential locations for future Tarrant County hospitals. These two locations are farther away from the current hospitals and have high and extremely vulnerable populations.

#### Conclusion

Using GIS, visual similarities between the spread of COVID-19 cases and socially vulnerable populations in Tarrant County were established. This indicates that more vulnerable populations also experienced more intense impacts from the pandemic. Furthermore, two potential locations for future hospitals were identified by analyzing social vulnerability.