Economic Impact of COVID-19

Raviteja Aechan
North Carolina State University
Kavin M. Govindarajan
North Carolina State University
Myles Gregor
North Carolina State University
Joydeep Mukherjee
University of Illinois at Urbana-Champaign

November 1, 2020

Abstract

Using Community Resilience Estimates from the United States Census Bureau, a Risk Severity Assessment value can be determined and used to estimate the COVID-19 effects on American cities and their economies for years to come. Our analysis concludes that counties with high RSA values tend to have higher percentiles of deaths and predicted to have slower economic recoveries. Also, counties with high RSA values are predicted to have a net loss in population as residents with teleworking opportunities will tend to move to counties with lower population density and lower RSA values.

I. Introduction

COVID-19 has affected every aspect of human life, especially the economies and systems that many rely on. It has led to increases in unemployment, created lockdowns, decreased spending, and changed many more factors that affect the economy of a city. Each city was also affected differently, with varied response, some enforcing many safety and quaratining procedures with long lockdowns, while others took a more lenient approach, with the intention of easing their economy. It is difficult to predict exactly how each city's economy will continue to be affected since there are many unquantifiable factors, but predictions can be made on which cities will be affected the most and which cities will recover the quickest by comparing measurable factors across cities. Some of these factors are how a city has recovered historically, type of economy, unemployment rate, infection rate, and population density.

II. Methods

The United States Census Bureau (USCB) provides Community Resilience Estimates[1] for each county in the United States. For each county, there are a total of 11 Risk Factors (RF) that have been defined that may introduce vulnerabilities within a community. Each county is grouped into one of three categories based upon the number of Risk Factors present within the community. These groups are:

- 0RF (0 Risk Factors)
- 1-2RF (1-2 Risk Factors)
- 3PLRF (3 or more Risk Factors)

Each county in the United States is also designated with a 5-digit FIPS[2] code, where the first two digits indicate the state the county is located in, and the remaining three digits designate the county itself. The USCB dataset includes the following information:

- FIPS code

[1] More information at: https://www2.census.gov/data/experimental-data-products/community-resilience-estimates/2020/technical-document.pdf

[2] Federal Information Processing Standard

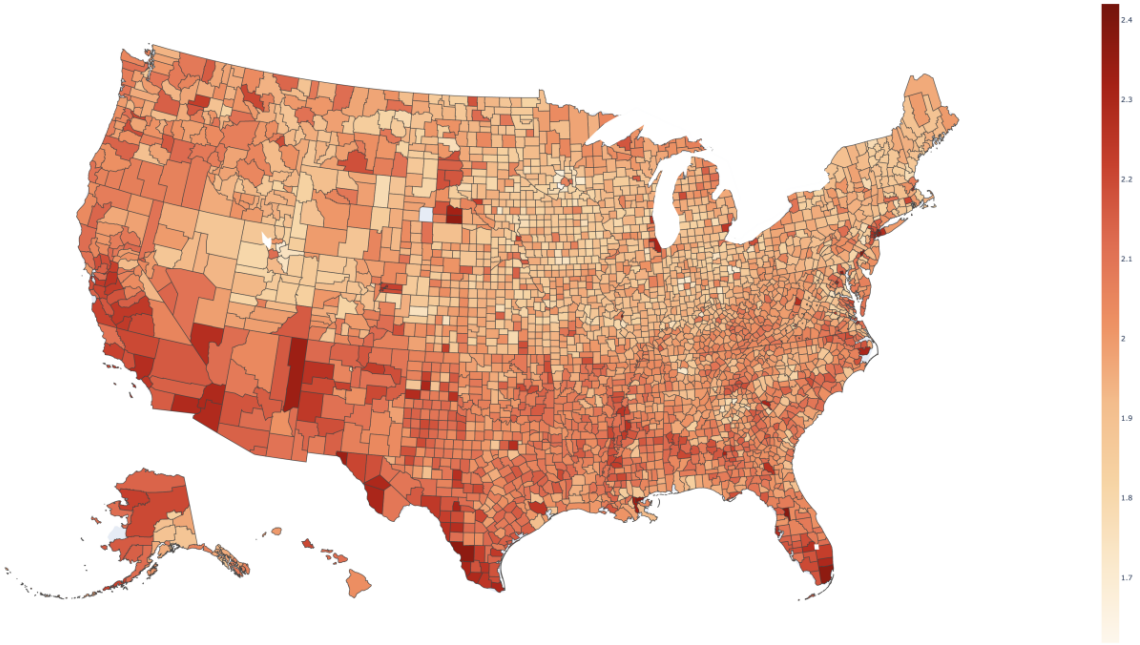

Figure 1: *RSA by county in the United States*

- County Name
- Total Population
- Risk Factor Grouping
- Population in each Risk Factor Grouping

We created a scale called the Risk Severity Assesment Index (RSA™)[3]. The RSA is a weighted average of the proportion of the population that falls under each Risk Factor grouping. The weights for each Risk Factor grouping were assigned as follows:

- 0RF was given a weight of 1
- 1-2RF was given a weight of 2
- 3PLRF was given a weight of 3

The calculation of RSA is as follows:

$$\frac{pop_{0RF}}{pop_{total}} * 1 + \frac{pop_{1-2RF}}{pop_{total}} * 2 + \frac{pop_{3PLRF}}{pop_{total}} * 3 \quad (1)$$

This calculation results in a value between 1 and 3, where a lower value represents a lower average number of Risk Factors within a county. Therefore, lower values suggest a county is more resilient to disaster circumstances, such as COVID-19.

We also used the Johns Hopkins COVID-19 deaths dataset[4], which updates daily and provides deaths per county. The Johns Hopkins dataset includes the following information:

- FIPS
- Population
- Date
- Cumulative deaths

We extracted the cumulative deaths for each of the counties that we wanted to further analyze from the date 10/30/2020.

III. Results

Figure 1 demonstrates the results of the RSA calculations for each county in the United States. From this map, we find notable counties, which we shall explore in the following case studies:

[3]For legal reasons, it is important to note that we have not trademarked RSA

[4]More information at:https://github.com/CSSEGISandData/COVID-19

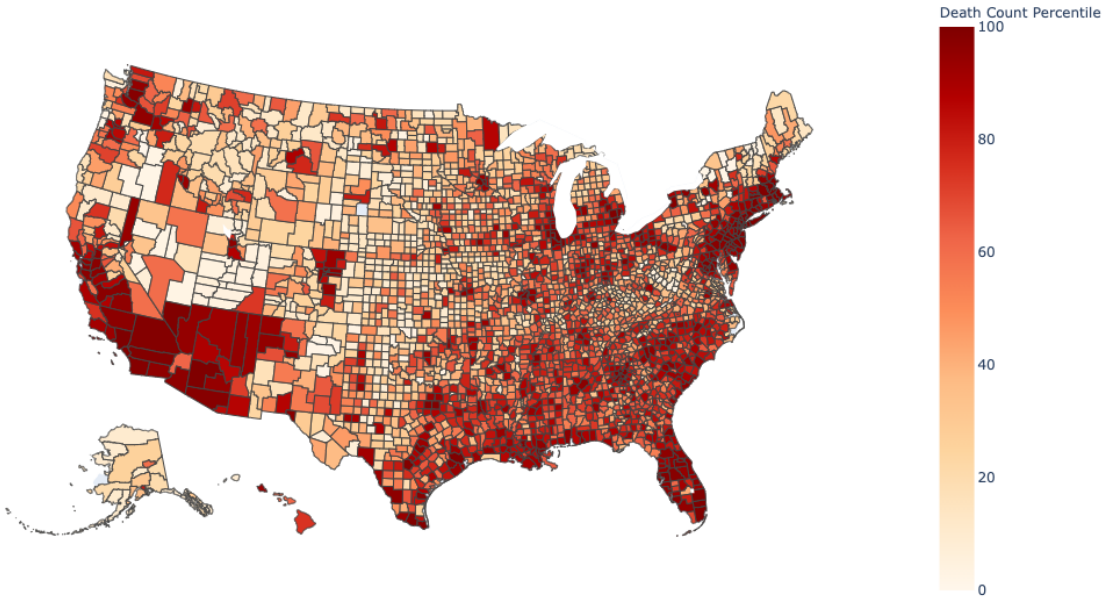

Figure 2: *Deaths by county in the United States*

i. Case Studies

i.1 Bronx County, New York (FIPS: 36005)

One significant finding of our analysis was the RSA score attributed to Bronx County, New York (FIPS code 36005). In fact, this county attained the highest RSA score of any counties we analyzed, scoring an RSA of 2.41. The nearby Kings County has reported the most deaths out of any US county at a total 7400, scoring an RSA of 2.35. Bronx County ranks fifth, with 4992 deaths. We conclude that the response in New York City and supporting data imply that the city is highly susceptible to disasters and will take much longer to recover economically from the effects of a pandemic.

i.2 Ada County, Idaho (FIPS Code: 16001)

One finding of our analysis was the RSA score attributed to Ada County, Idaho (FIPS code 16001). As a small to midsize city, Meridian, Idaho, many citizens are likely to immigrate from densely packed, urban environments.[5] Meridian, located in nearby Ada County, scored an RSA of 1.93. This city will likely have significant economic prospects in the future, as the influx of population will bring capital and other resources to the local economy.

Figure 2 maps the deaths per county in the United States as a percentile, sourced from the Johns Hopkins Dataset. From this map, we can see that it is similar in comparison to Figure 1. This supports our initial observation that locations with a higher RSA value are more susceptible to disaster situations such as COVID-19. Particular instances to note include Bronx County, New York (FIPS: 36005) and Cook County, Illinois (FIPS: 17031). Both locations have some of the highest RSA values, and accordingly, they have some of the highest death rates as well. This further boldens our observation that a high RSA value corresponds to reduced resilience within a community.

[5] More information at:https://www.mymove.com/moving/covid-19/coronavirus-moving-trends/

IV. Conclusion

We recognize the fact that Bronx County, New York has a significant population advantage as compared to more rural areas such as Ada County, Idaho. From this, we can conclude that the disruption caused by COVID-19 and other pandemics to American cities will be felt for the most part by large urban and densely populated areas. Using our case studies, we have also deduced that counties with a higher RSA values' will have higher population, deaths percentile, and slower economic recovery. These facts incentivize people living in high RSA counties to move to low RSA counties as telework opportunities increase and importance of physical location decreases.

For additional analysis, we believe a beneficial dataset that would help increase the accuracy of the prediction of the economy of cities would be one that tracks different areas of GDP of each county over time, such as percent of GDP that the tourism industry contributes. Having additional GDP breakdown data would enable us to determine the specific industries that are suffering from COVID-19. Since certain cities rely upon certain industries (such as tourism), we can identify with greater accuracy which cities will suffer from the impacts to those industries. We can also compare this to our RSA values in order for better analysis of the resilience of various industries as well. Further, a dataset that tracks unemployment per county over time would also help track the percent of workforce available to keep the economy running and predict the resilience of the economy.

References

[US Census Bureau, 2020] US Census Bureau Community Resilience Estimates

[Johns Hopkins, 2020] Johns Hopkins COVID-19 Deaths