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# Effect of Natural Disasters on Coastal Human Populations of the Southeastern U.S.

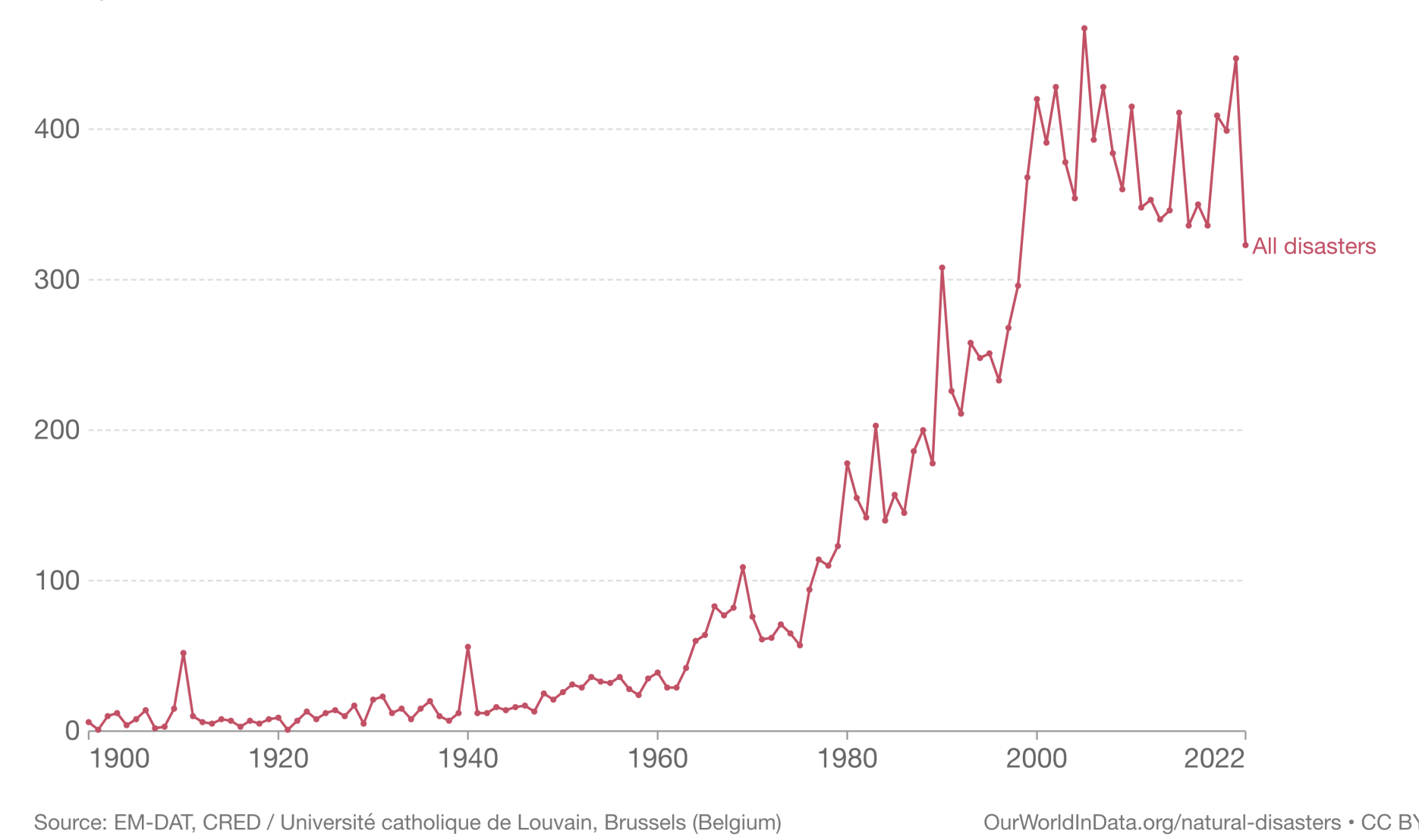


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## Background

Due to climate change, extreme weather events and natural disasters are becoming more prevalent, and the severity of these events is increasing (Sheldon & Zhan, 2022). Over the last 40 years, the number of billion-dollar natural disasters has gone up. The U.S. averaged 3 billion-dollar disasters per year in the 1980s compared to the average 13 per year in the 2010s (USAFacts, 2023). With natural disasters comes loss of life, infrastructure, and resources that can leave a physical and economic toll on communities for many years if not generations. While some global studies have found that natural disasters increase households' propensity to migrate out of their county, studies have not investigated whether this relationship holds within counties of the southeastern U.S. This study seeks to first confirm that the number of natural disasters has increased over time in the southeastern U.S. Second, it seeks to understand if there is a significant relationship between the number of natural disasters that occur within coastal counties of the southeastern U.S and the populations of these counties. I predict that for each additional natural disasters, there will be a decrease in coastal county populations.

Table 1. Number of recorded natural disaster events from 1900 to 2022. This includes those from drought, floods, extreme weather, extreme temperature, landslides, dry mass movements, wildfires, volcanic activity and earthquakes.



## Results

Year significantly affects the number of natural disasters within coastal counties of the southeastern U.S. The number of natural disasters increases each year (GLM,  $df = 1$ ,  $Chisq = 361.96$ ,  $p < 0.01$ ).

The number of natural disasters, year, and their interaction are all significant predictors of coastal population size (LRT  $df = 4$ ,  $Chisq = 4,459,203$ ,  $p < 0.01$ ). This model showed the population of coastal counties in the southeastern U.S significantly increases with year (ANOVA,  $Chisq = 8.644,047$ ,  $df = 4$ ,  $p < 0.01$ ) (Figure 1), but decreases with natural disasters (ANOVA,  $Chisq = 2,909$ ,  $df = 1$ ,  $p < 0.01$ ) (Figure 2).

Figure 1

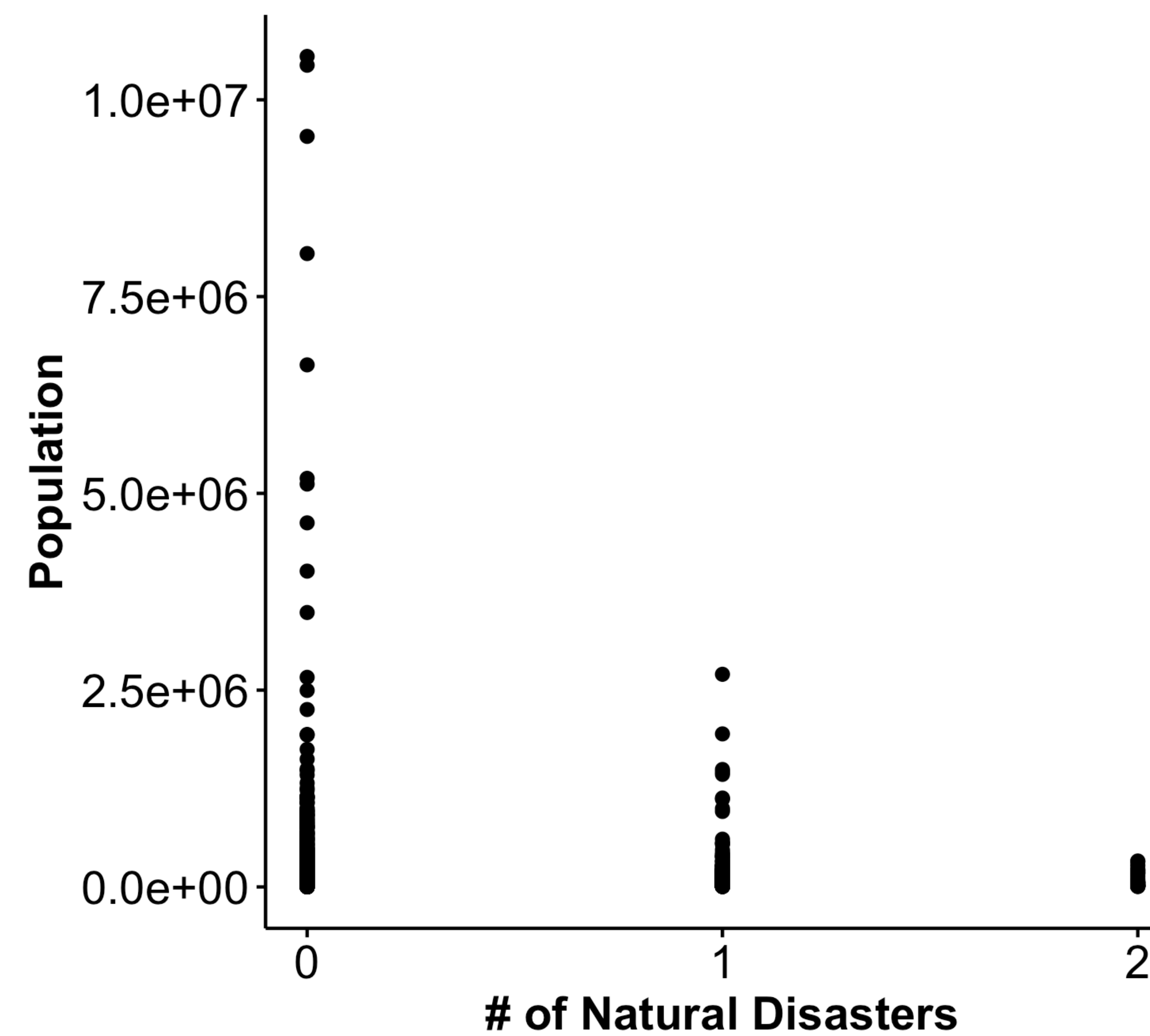
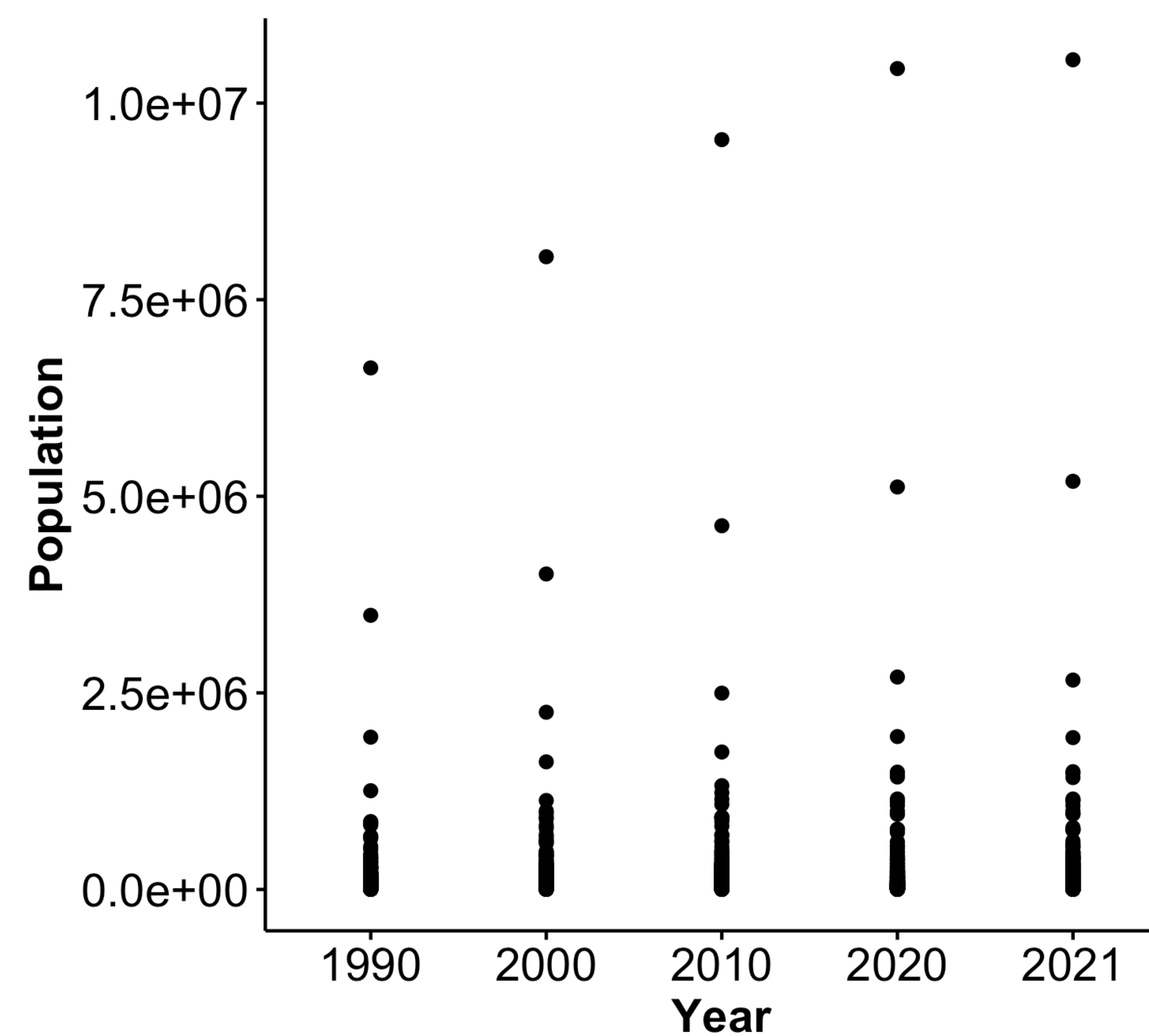


Figure 2



## Conclusion

These data support the hypotheses that natural disasters have become more frequent over time and that that higher counts of natural disasters decrease county populations within the coastal southeastern U.S. Future directions of this research may include analysis of more years, including those prior to 1990, as well as analysis of different regions outside the southeastern U.S to determine if the relationship between these variables persist further north or west. Additionally, this investigation does not consider the socioeconomic effects that may also impact migration patterns and consequent coastal county populations. Therefore, further analysis including variables representative of these factors may enhance understanding on the relationship and model accuracy.

## Acknowledgement

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## Methods

This study merges the FEMA Disaster Declarations, 1953–2023 dataset and USDA, Economic Research Service, Population counts and estimates for the U.S., States, and counties, 1990–2021 dataset. The FEMA dataset was collected to determine all the federally declared natural disasters that have occurred across the U.S. over time. The USDA dataset was collected to determine the total estimated population across U.S. counties in 1990, 2000, 2010, 2020, and 2021. I only used counties within Florida, Georgia, South Carolina, North Carolina, and Virginia for this analysis of the southeastern U.S. Natural disasters were filtered down to include floods, coastal storms, hurricanes, and tropical storms as these are typically the natural disasters that affect coastal communities. These datasets were then combined, filtered, and analyzed to test the significance of the models below using R Studio.

- no.ND ~ 1 + Year
- population ~ 1 + no.ND
- population ~ 1 + no.ND + Year
- population ~ 1 + no.ND + Year + no.ND \* Year

Year: Year that coastal natural disaster occurred (1990, 2000, 2010, 2020, 2021)

no.ND: The number of coastal natural disasters total that occurred in corresponding region and time