

# What Populations are Vulnerable to Significant Heat Events in NYC?

Jason Cruz<sup>1,2</sup>, Rosanna Duran<sup>1,2</sup>, Rocky Garcia<sup>2,3</sup>, Jimmy Booth<sup>2,3</sup>

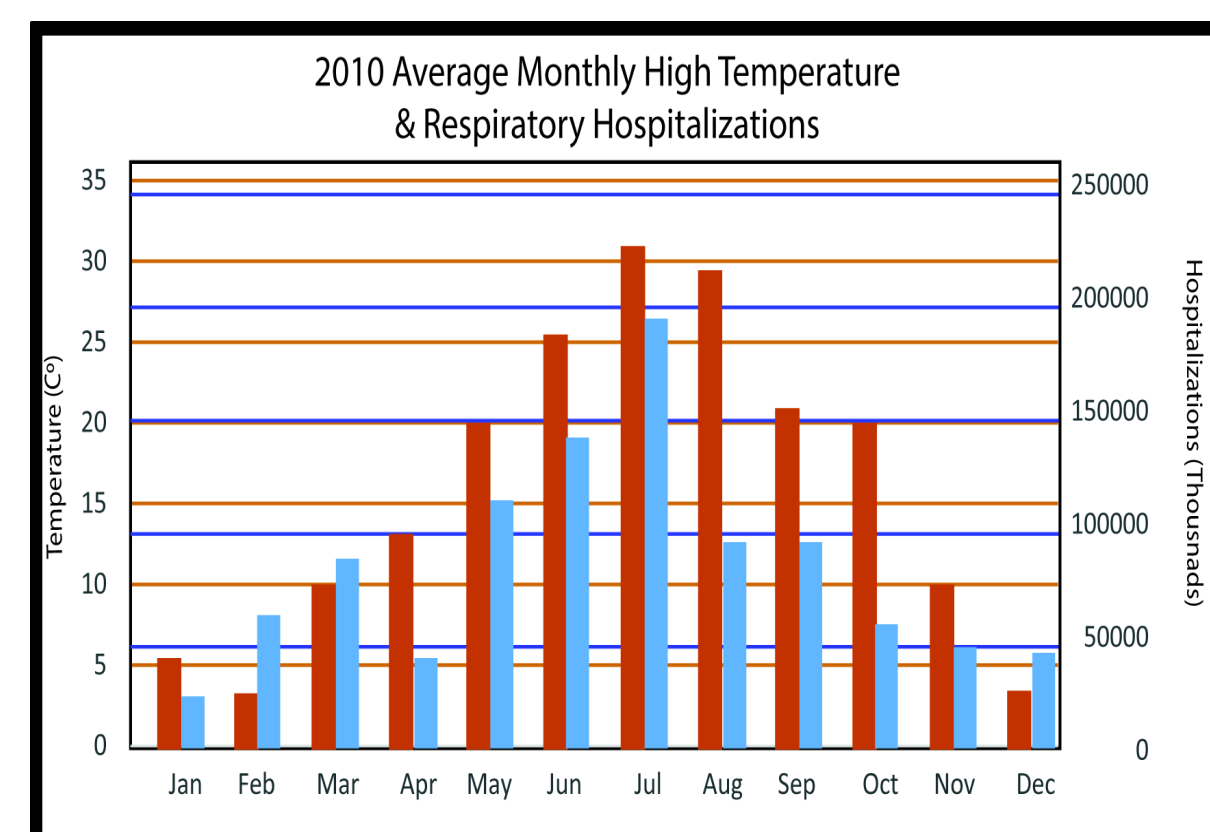
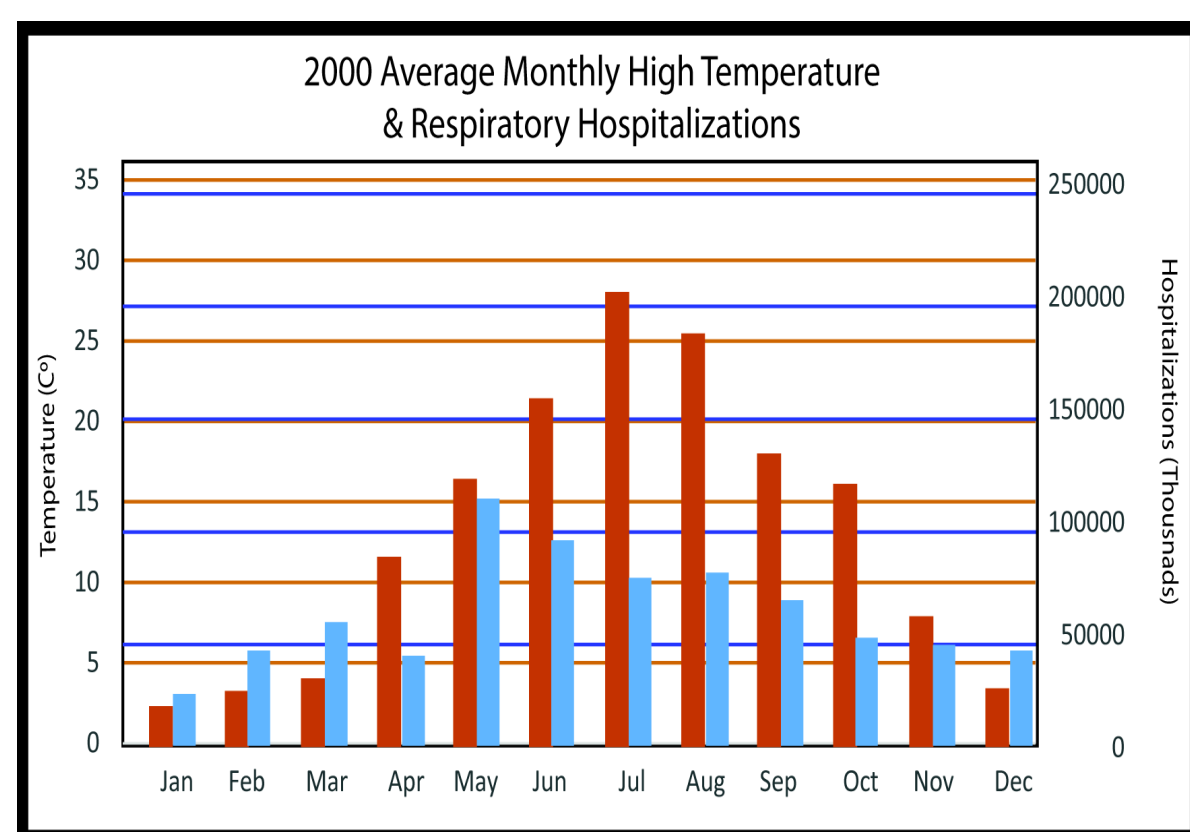
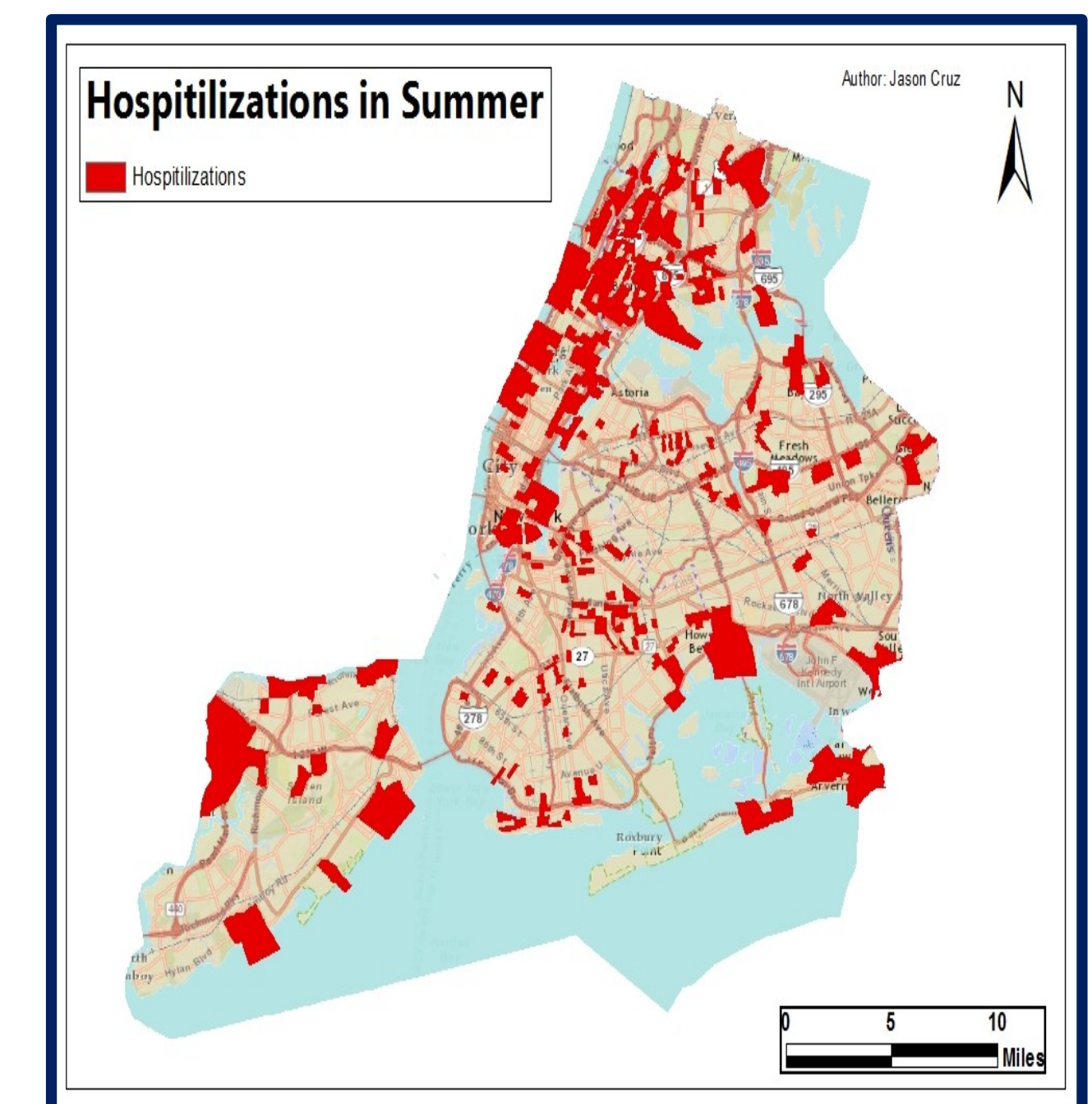
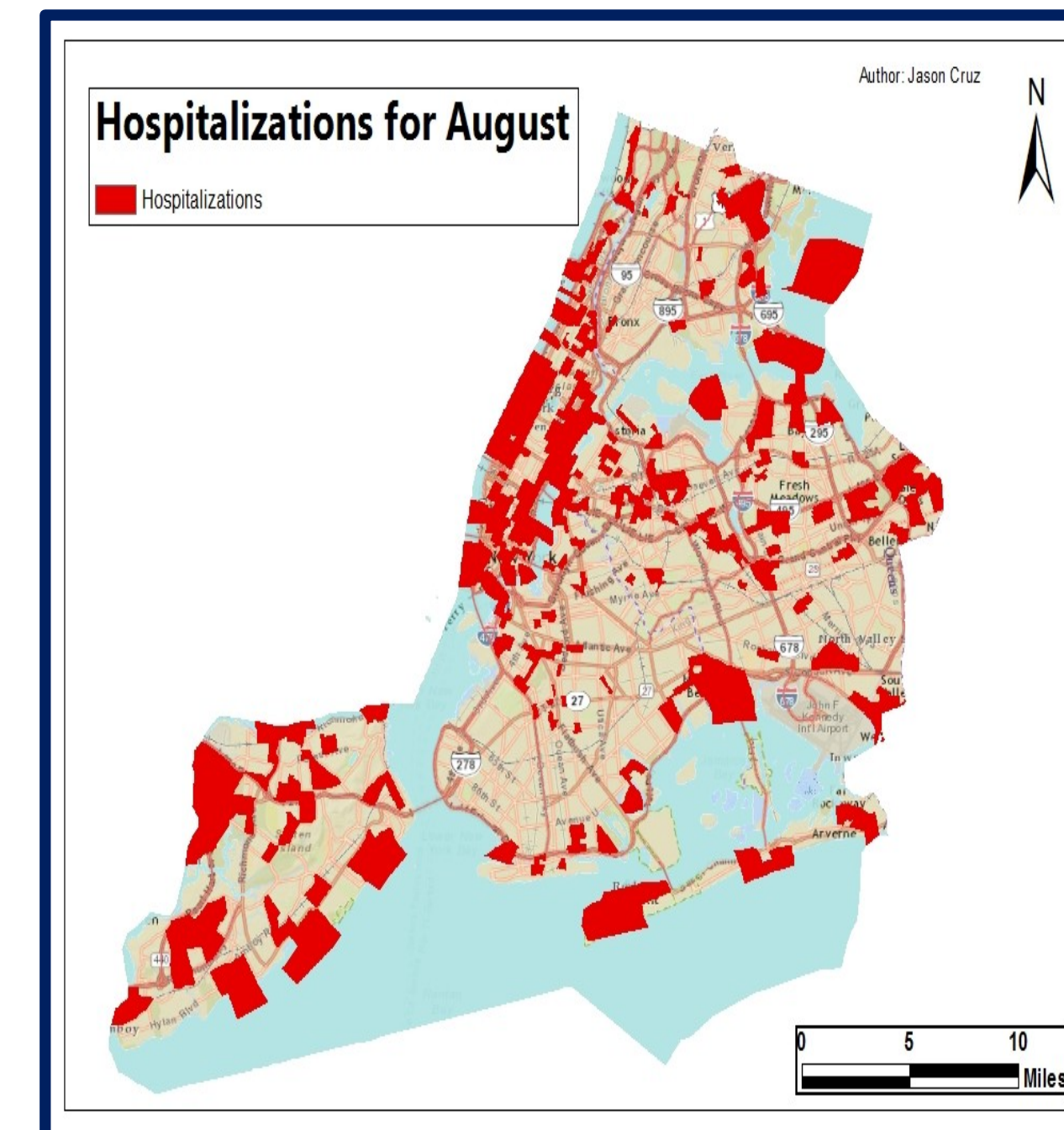
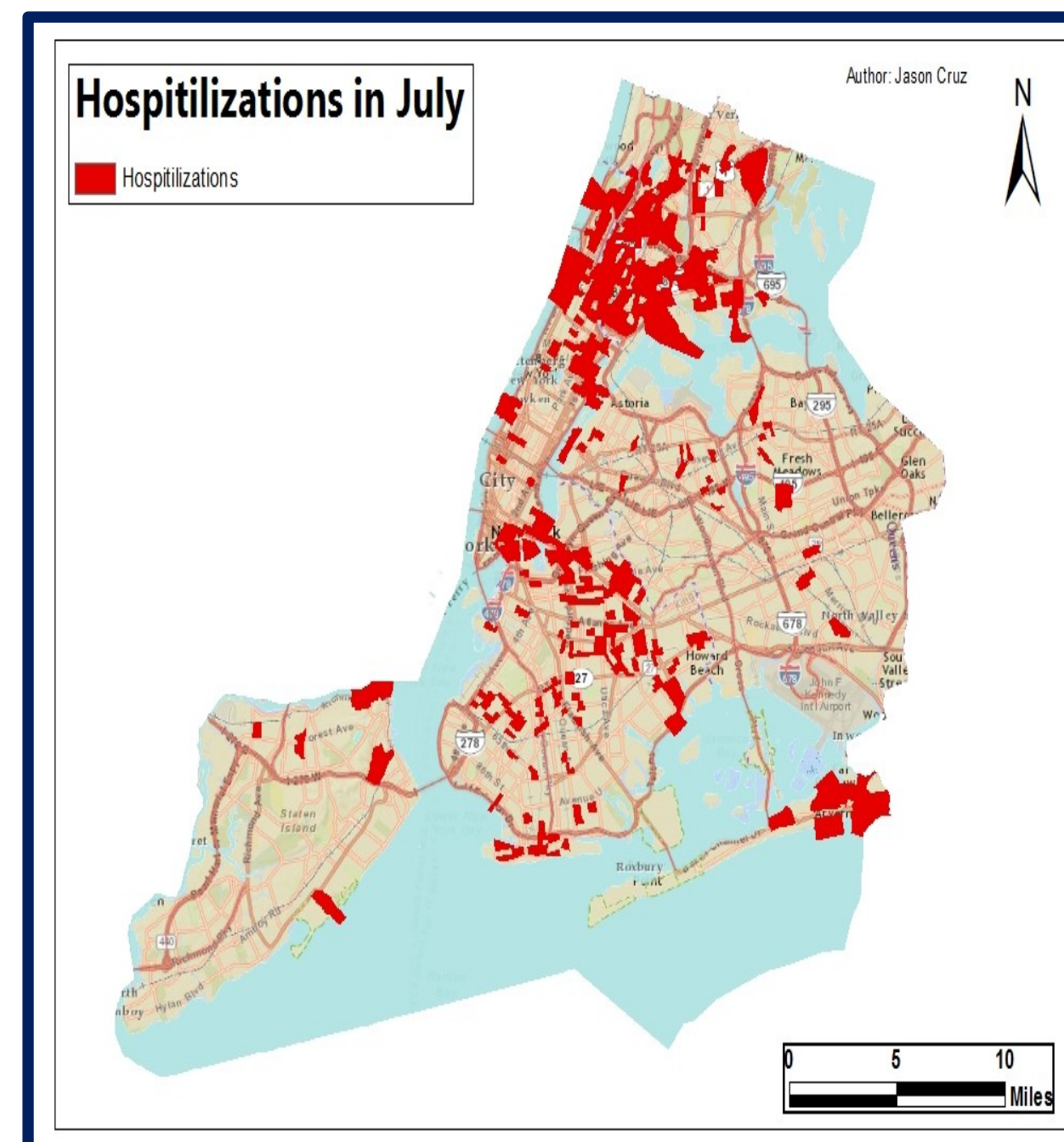
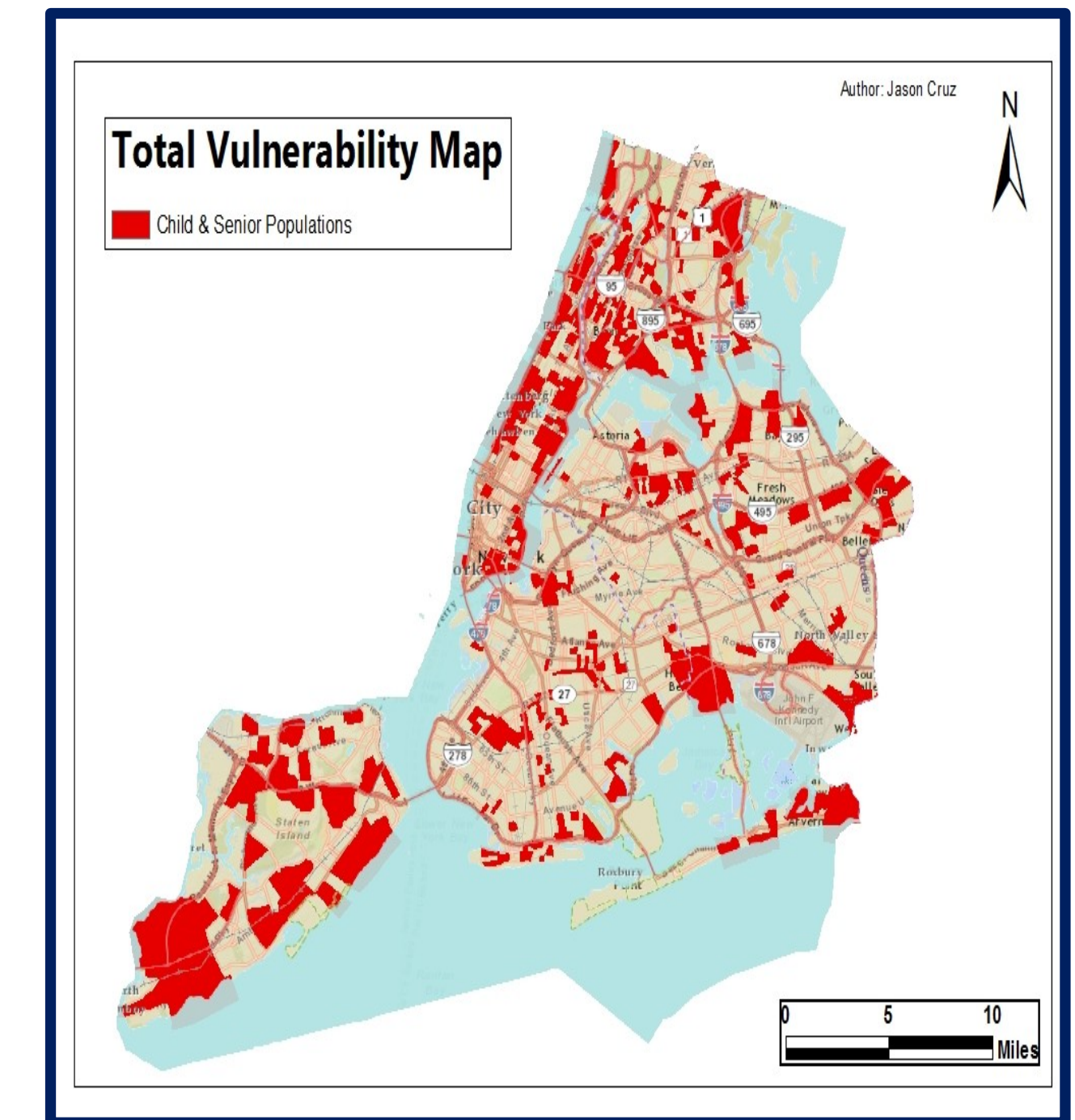
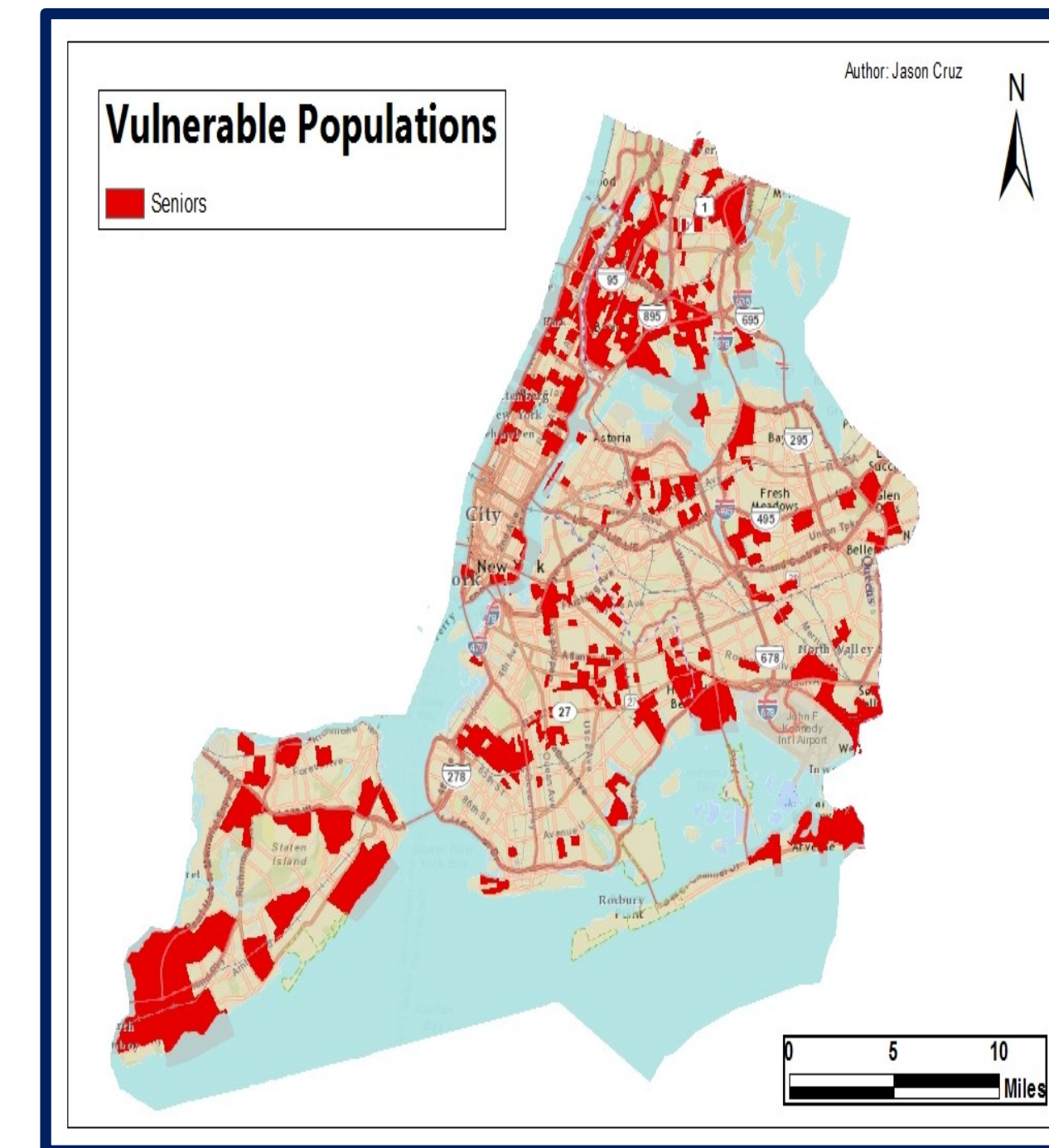
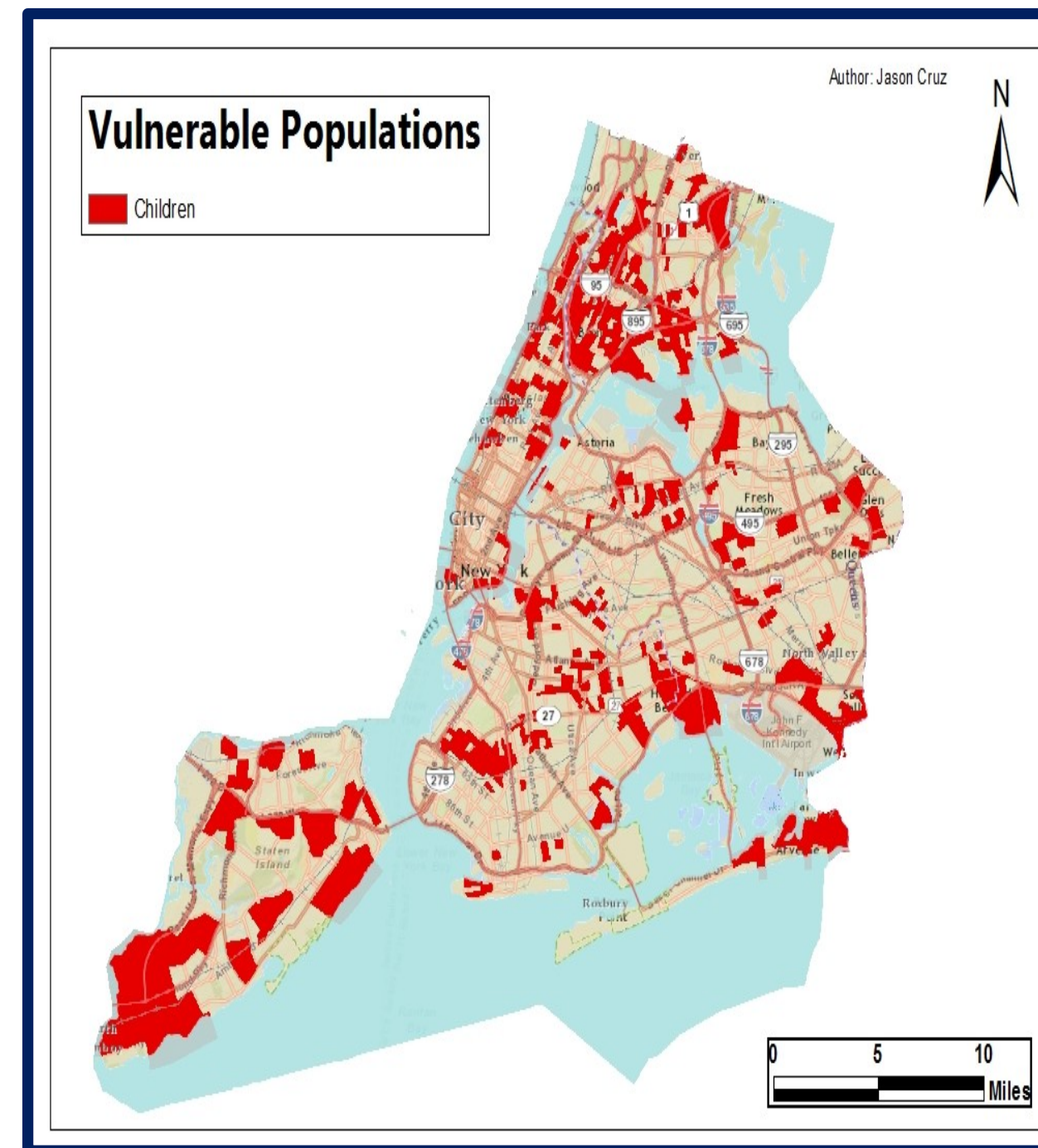
(1) City College Academy of the Arts, (2) CUNY CREST (3) The City College of New York

## Introduction

The aim of this project is to locate areas in New York City that are vulnerable to significant heat events, such as the record-breaking 2010 heat wave that reached a temperature of 106° Fahrenheit. This research is also identifying trends in upper-respiratory illness during these events. Using statistical analysis and GIS (Geographic Information System) along with online geographic data of heat waves, demographic data, and health data, the project maps vulnerability, and the respiratory illness frequency within the greater NYC region, thereby pinpointing areas that are at higher risk. A correlation between heat waves and hospitalizations will be accomplished. With the large urban area of New York City, the main motivation of this research is to identify which populations and subpopulations, if any, are vulnerable to intense and recurring heat events. Geography will be furthered looked into to locate where child and senior

## Methodology

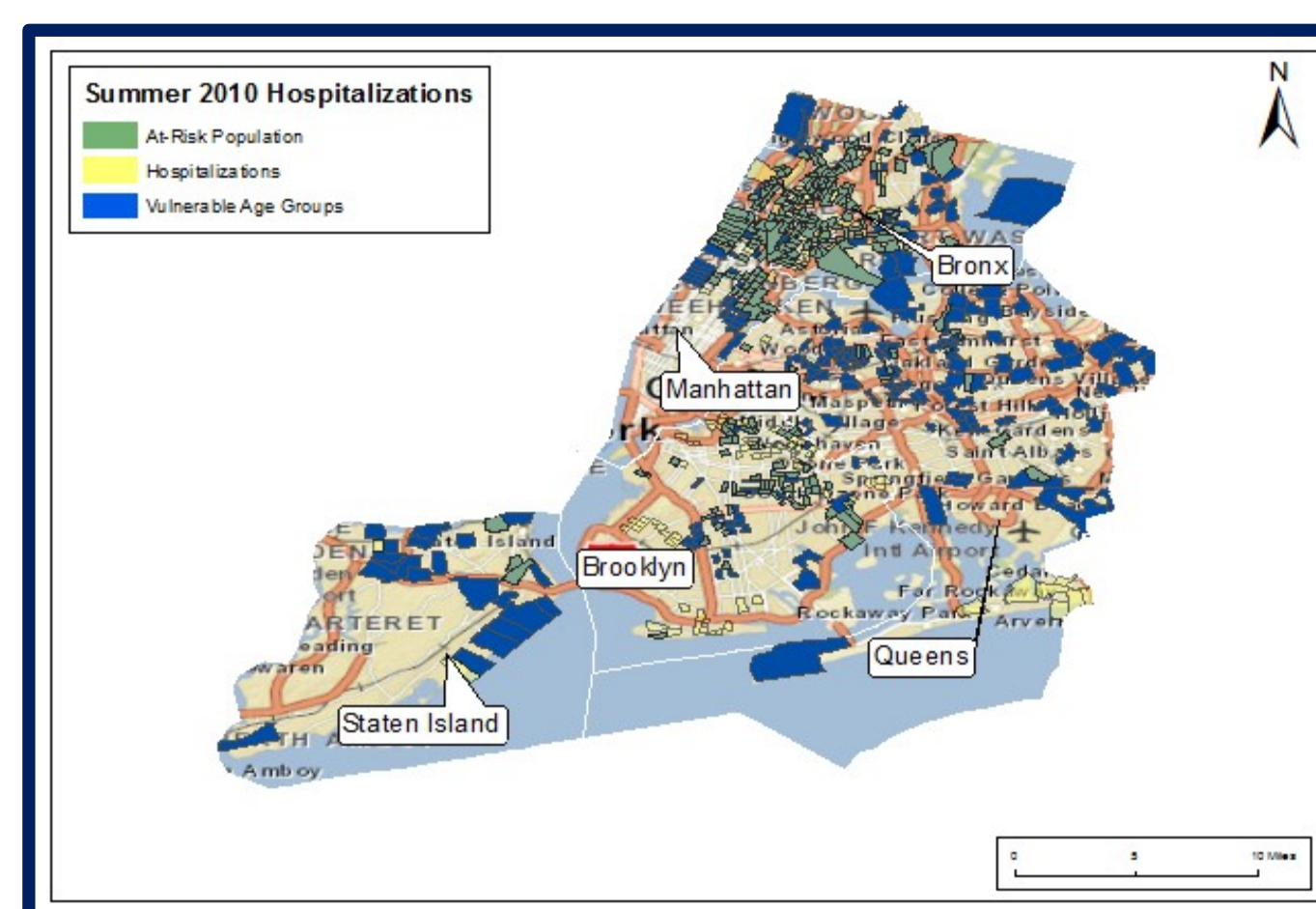
- Our research methodology requires gathering information and relevant data from several different sources concerning significant heat events and the effects that they can cause on the City of New York. Data sources include the U.S. Census, the American Fact Finder, the National Climatic Data Center and InfoShare.org.
- Geographic data was imported and processed within ArcMap and tabular temperature data was processed using Excel.
- A comparison of a heat wave year (2010) and a non heat wave year (2000) were accomplished. Linear statistics were accomplished in order to determine the significance of the trend and the correlation of the two datasets.



$$r = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2} \sqrt{\sum_i (y_i - \bar{y})^2}}$$

2010:  
The value of R is 0.7846. This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa). The value of R<sup>2</sup>, the coefficient of determination, is 0.6156.

2000:  
The value of R is 0.7586. This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa). The value of R<sup>2</sup>, the coefficient of determination, is 0.5755.



## Conclusion

- **Manhattan and the Bronx are the most vulnerable areas of NYC, based on the higher concentration of children and seniors.**
- **The month of July had the most hospitalizations for upper respiratory issues, which correlated to the extreme heat events in that month.**
- **Children and seniors in the Bronx and Manhattan (Upper-Manhattan) are the most vulnerable to significant heat events and experience greater upper respiratory issues, based on the 2010 summer heat wave case study.**

## Acknowledgments

This research was supported by NOAA CREST (NA11SEC4810004 )and funded by the Pinkerton Foundation. A very special thanks to our mentor Rocky Garcia, Dr. Jimmy Booth, Nazia Shah, and Emanuel Rodriguez, for all their help and guidance throughout the research.