

Social-Economic Vulnerability to a Winter Weather Whiplash Event

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Outline

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- ▶ Why are Fall Winter Weather Whiplash events important?
- ▶ 2011 Snowstorm
- ▶ Research Questions and Predictions
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- ▶ Sociodemographic factors Contributing to High Impact
- ▶ Physical factors Contributing to High Impact
- ▶ Conclusions
- ▶ Implications

Winter Weather Whiplash

Definition

- ▶ “a type of extreme event in which a collision of unexpected conditions produces a forceful, rapid, back-and-forth swing in winter weather and may induce an unexpected impact on coupled human and natural systems” (Casson, et al., 2019, p. 1436).

Why are Fall Winter Weather Whiplash events important?

- ▶ The trees still have leaves which is important to study because:
 - ▶ Snow on leaves can bring down power lines, damage homes and injure people
 - ▶ With the changing climate, are expected to become common
 - ▶ Vary spatially



The New York Times, Oct. 30, 2011



The New York Times, Oct. 30, 2011

Cleaning Up After Nature Plays a Trick



Ramon Nunez on Sunday in Central Park, where 1,000 trees might be lost to the snow and high winds that struck a day before. Yana Pusikova for The New York Times.

2011 Snowstorm

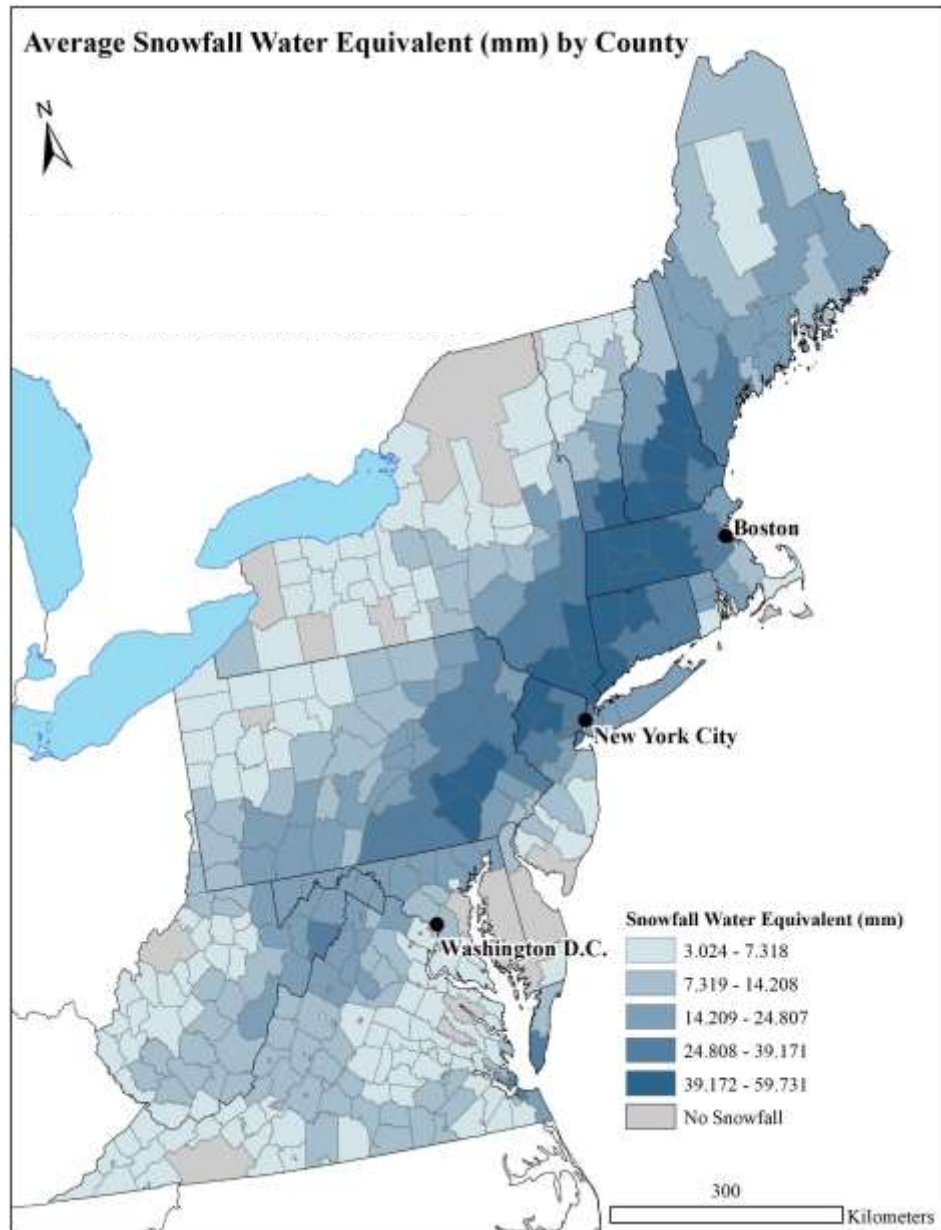
- ▶ Most costly October snow event in terms of insurance claims since 1987
- ▶ \$ 900,000,000 in damages at the time
- ▶ Approx. 4.3 million people without power
- ▶ “The heavy, wet snow caused tree limbs and branches to bring down power lines, causing outages throughout Luzerne County. PPL Electric had 1,880 customers without power” (The Times Leader, October 30, 2011).



The New York Times, Oct. 30, 2011

Snowfall, October 29 - 31, 2011

- ▶ The snowfall was recorded in mm
- ▶ Converted to snow water equivalent
- ▶ Aggregated to county level



Research Questions and Predictions

▶ Research Questions:

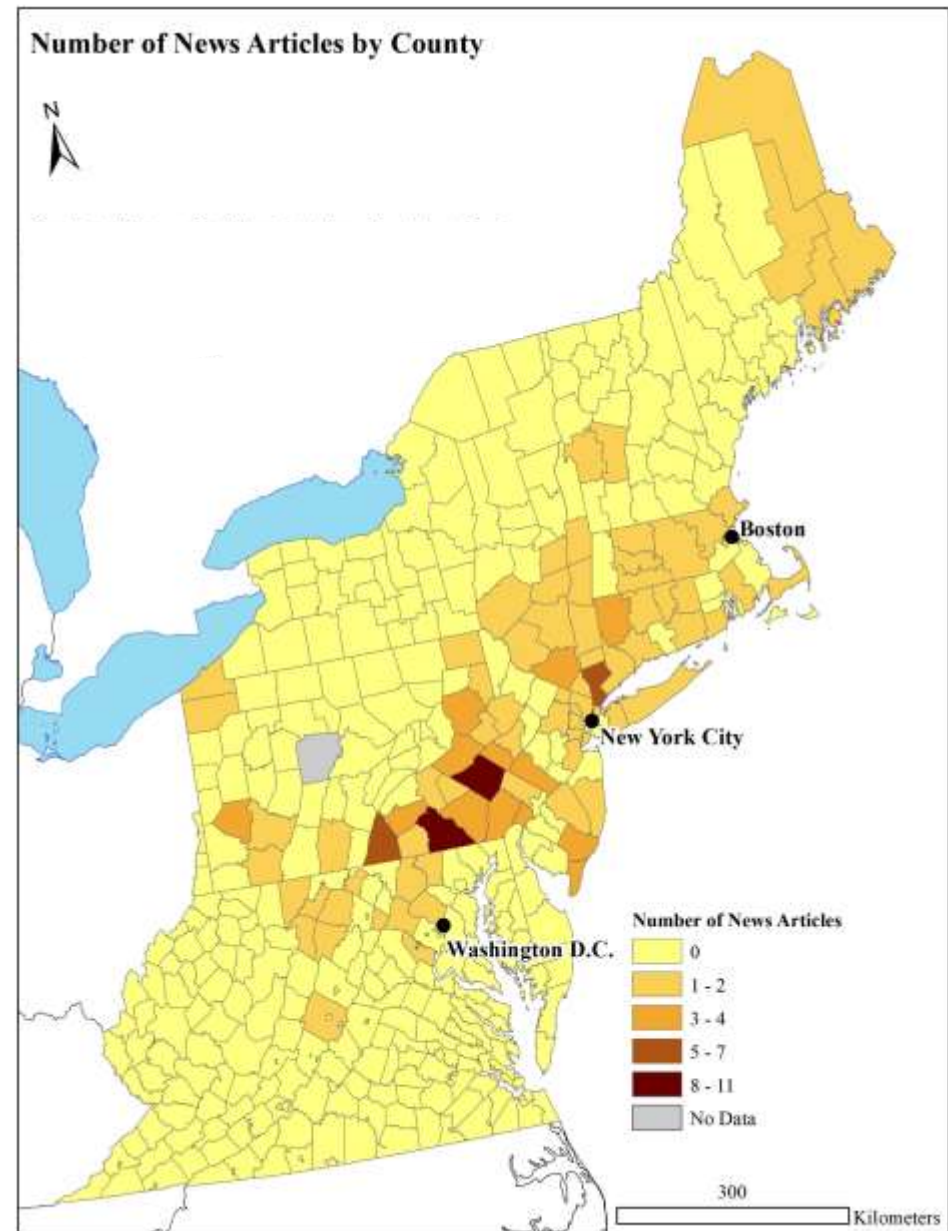
- ▶ Which factors contribute to vulnerability to a Winter Weather Whiplash event?
- ▶ Is this relationship uniform or does it vary spatially?

▶ Predictions:

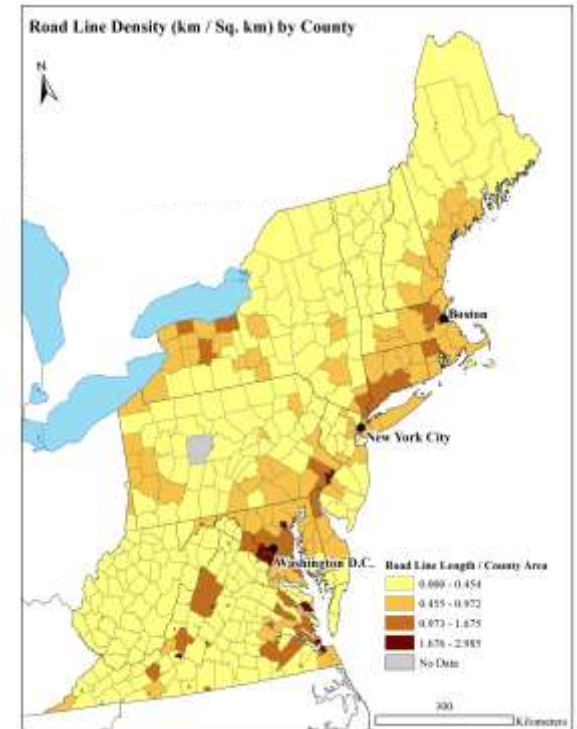
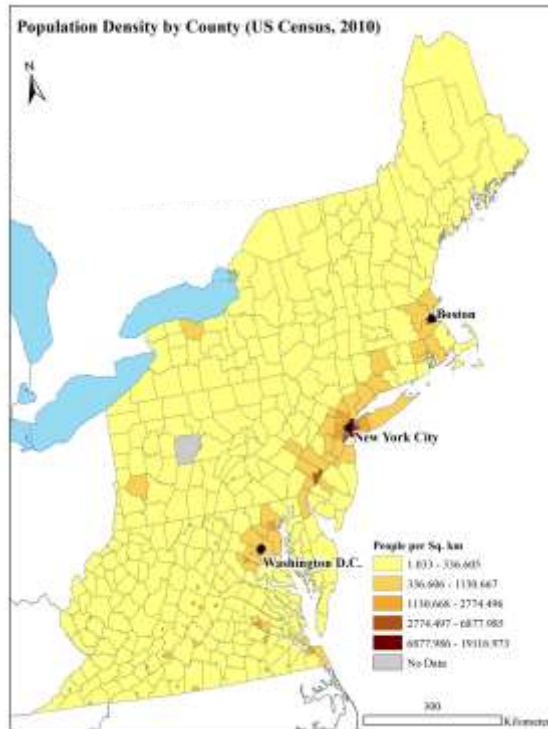
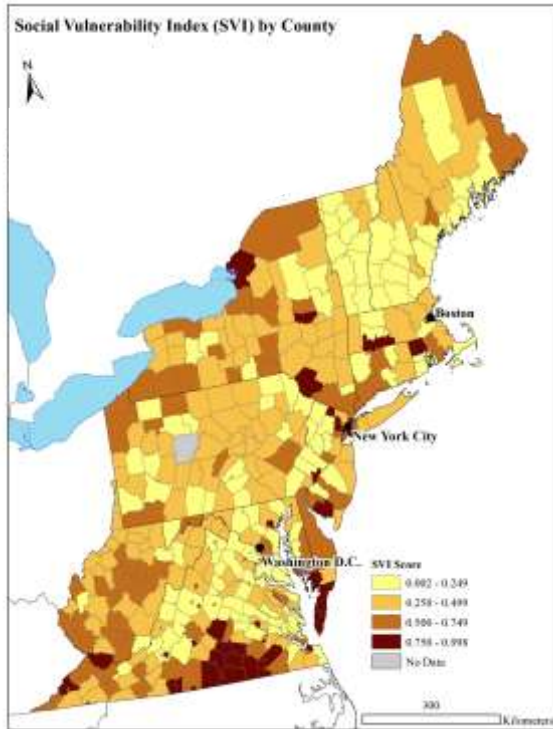
- ▶ Yes, the relationship will be location dependent
- ▶ Considering the newspaper articles, it will be based on:
 - ▶ Snowfall
 - ▶ Power lines
 - ▶ Population Density and Characteristics
 - ▶ Tree Characteristics

How to measure impact (Dependent Variable)

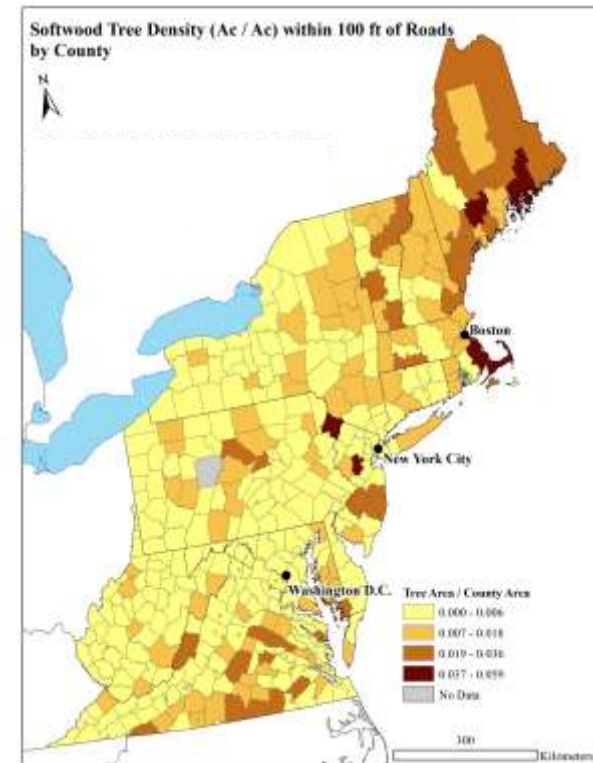
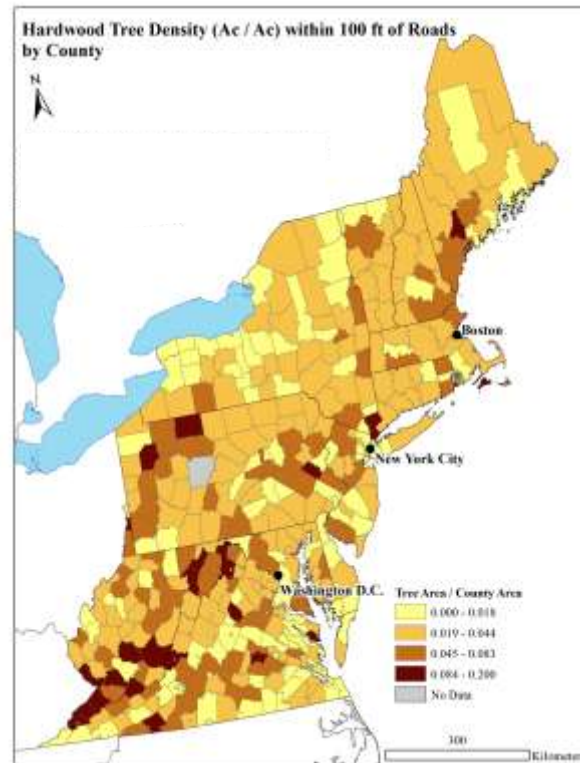
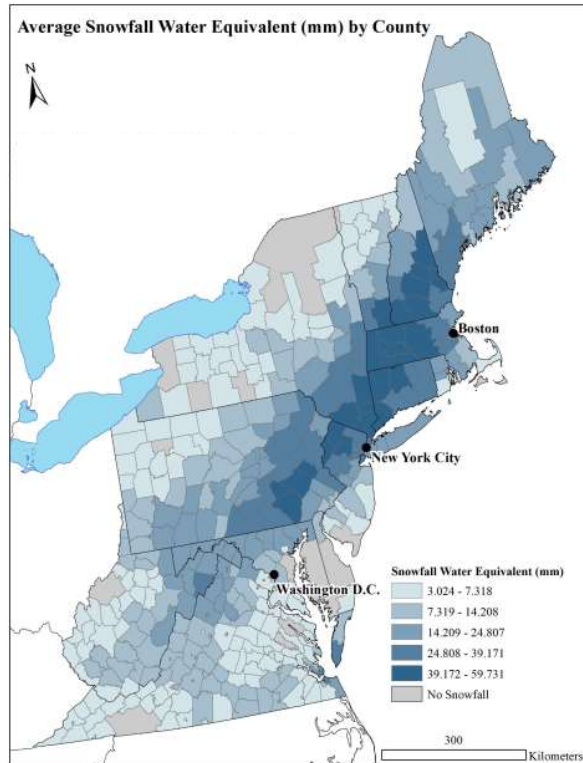
- ▶ Actual vs. perceived impact?
 - ▶ Actual - insurance claims or power outages (limited)
 - ▶ Perceived - Discuss snowstorm in the newspapers
- ▶ Selected perceived - The number of articles about the storm which reference each county



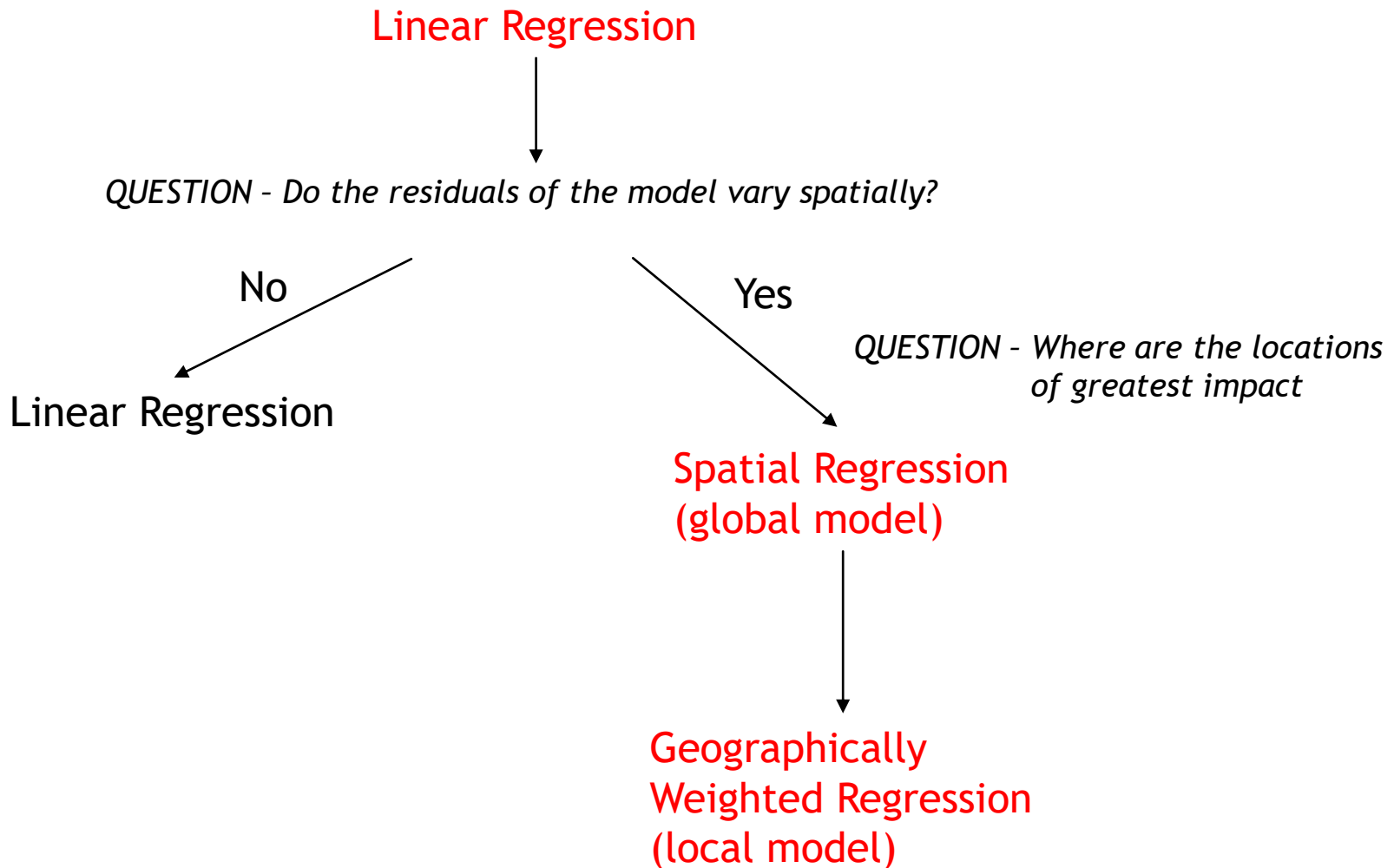
What factors influence impact? Sociodemographic Variables



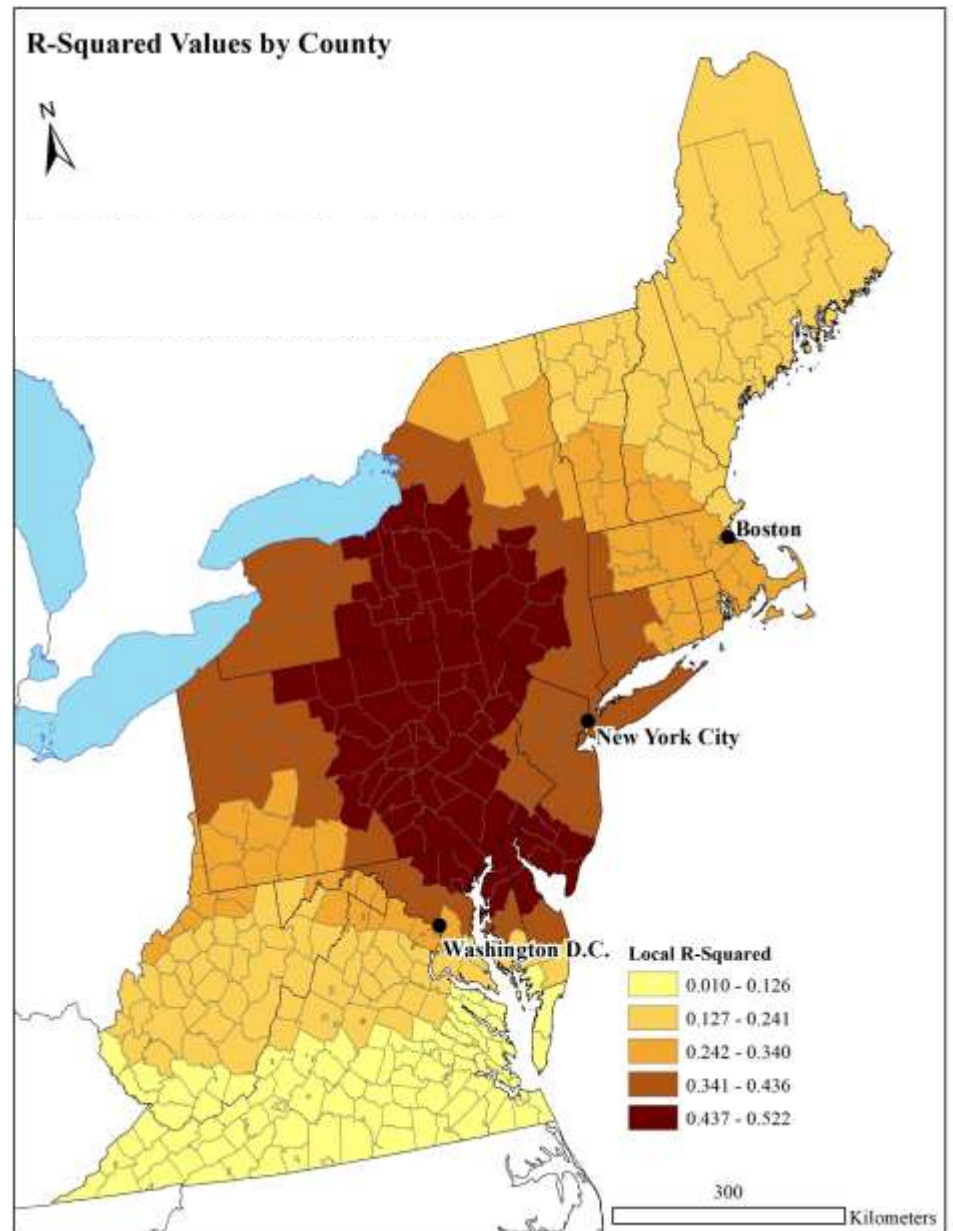
Contextual Physical Variables



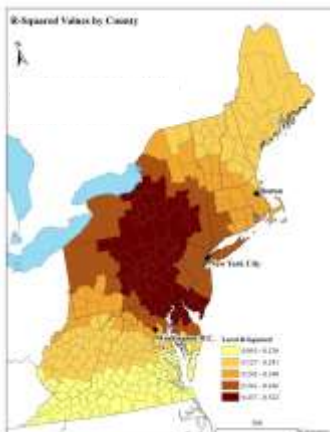
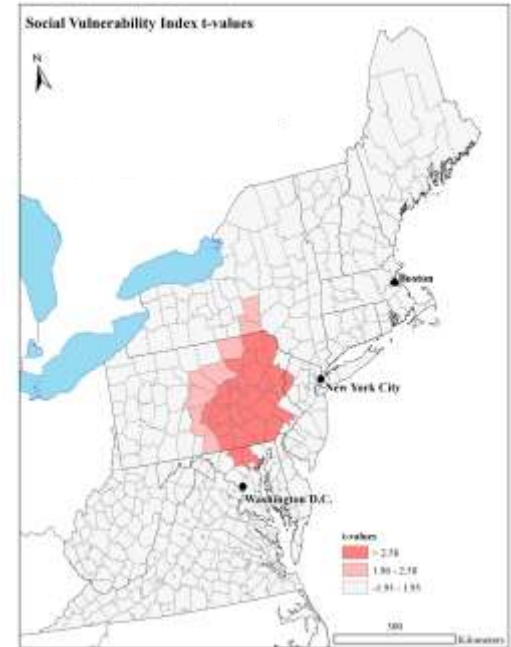
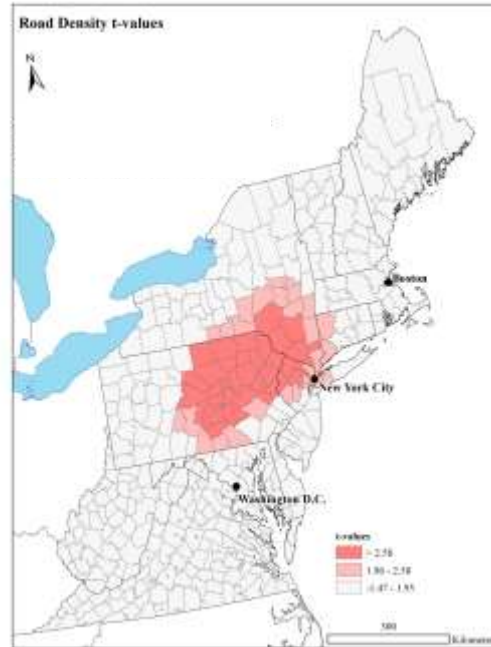
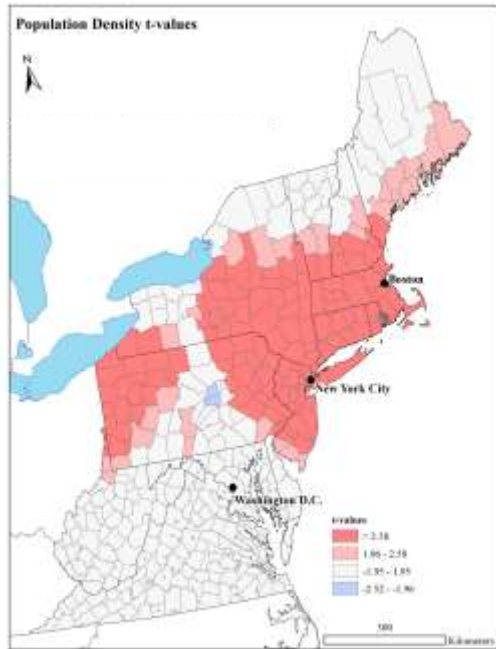
Research Framework



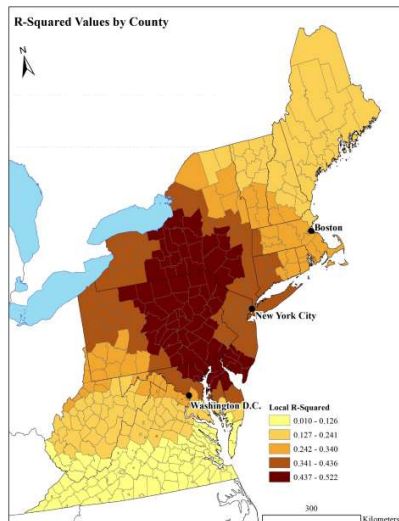
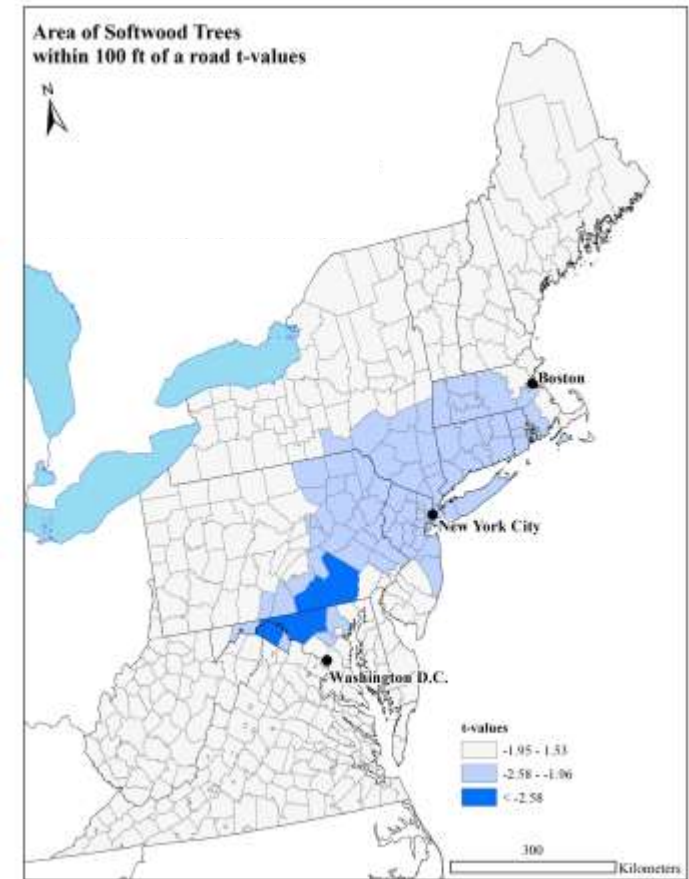
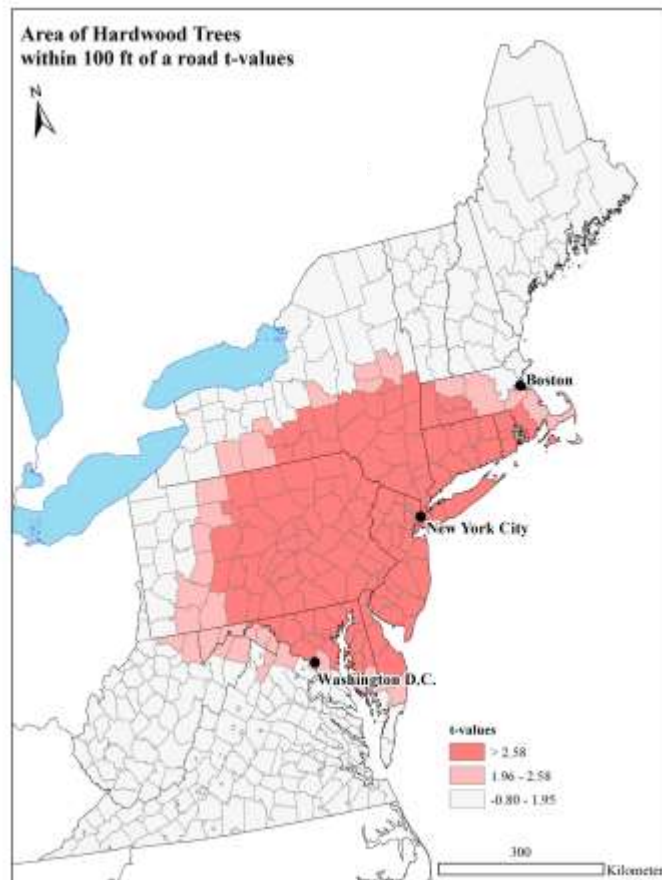
Overall Impact



Sociodemographic factors Contributing to High Impact



Physical factors Contributing to High Impact



Conclusions



Winter Weather Whiplash events are real



Potential vulnerability to Winter Weather Whiplash is not the same for all



Context dependent



Counties with predominantly hardwood trees near power lines are more likely to have tree damage and power outages than those with softwood trees

Implications



Infrastructure Planning i.e. where to place power lines



Insurance Rates i.e. higher rates in a more risk prone neighbourhood



Tree Management i.e. removing branches which could damage power lines



Disaster Management i.e. shelters for people who might lose power for an extended amount of time