

# Interstate Accessibility of Selected Illinois Cities

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## INTRODUCTION

- Research problem: How is the population weighted interstate accessibility of Illinois cities spatially distributed? Is there a correlation between accessibility and poverty in these cities?
- Illinois has the third highest total interstate mileage among all U.S. states, with 2185 miles of interstate highways within its borders.
- Poverty is of particular concern in southern Illinois. A 43% above state average poverty level is found in the 16 counties located in the southern region of Illinois.
- Local policy makers in southern Illinois have had the desire for the state to invest in more highways in the region for quite some time.
- The research problem is important since mapping accessibility enables the visualization of the parts of the state that are well-connected, and parts that are more isolated.
- Combining mapping with correlation analysis allows the identification of communities in need, and the information can be used by policy makers to direct resources and services to these areas.

## HYPOTHESES AND DATASETS

- Hypothesis for accessibility map: Chicago area is the most accessible due to large population
- Ho for correlation analysis:  $R \leq 0$
- Ha for correlation analysis:  $R > 0$
- Geographic scale: The state of Illinois
- Number of cities (observations): 59
- Time period: 2017
- Independent variable: population weighted accessibility index values
- Dependent variable: percent population below poverty in each of the cities

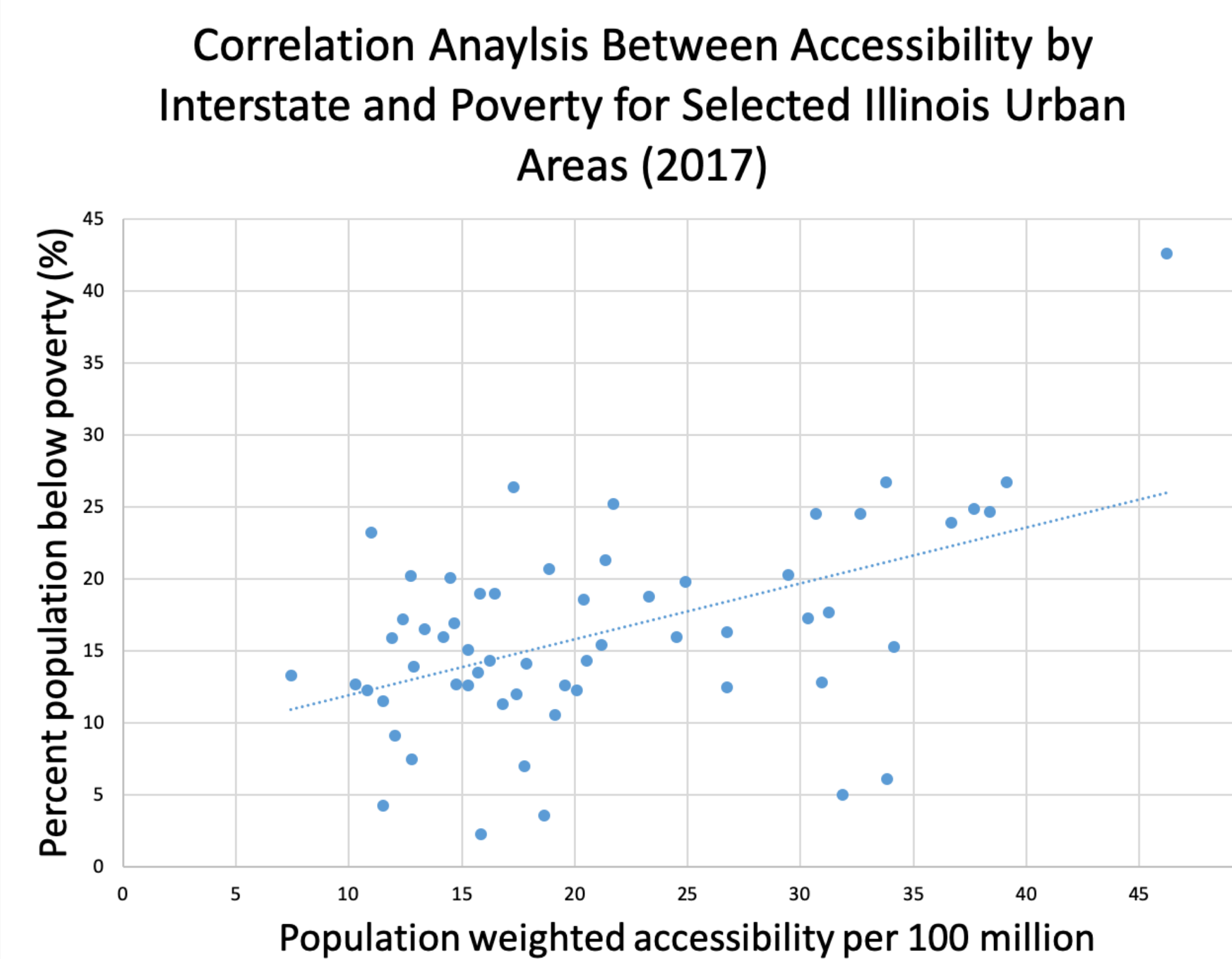
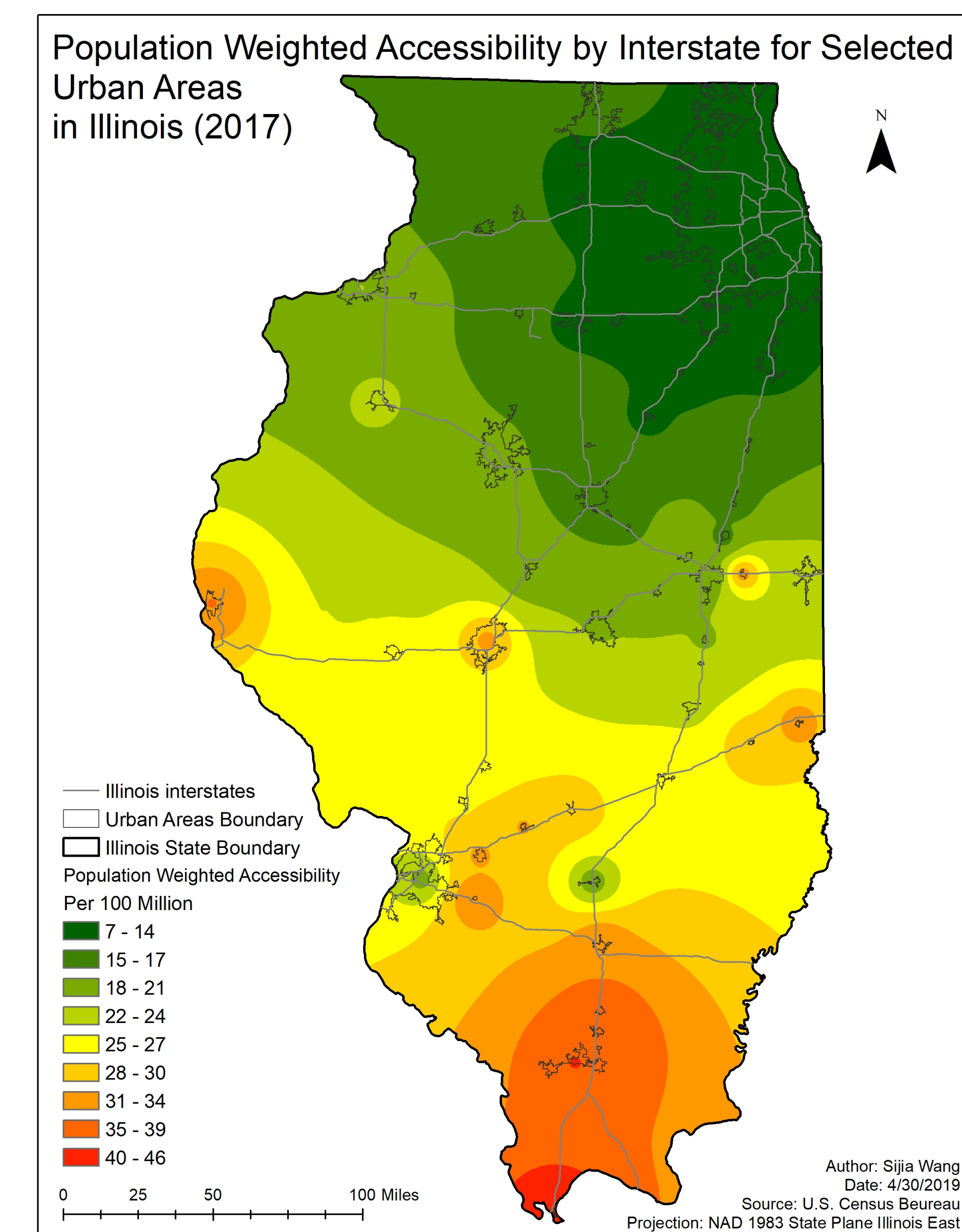
## METHOD

- Select the cities in Illinois that are located on interstate highways
- Conduct network analysis (OD cost matrix) using the interstates as routes to find the shortest distances between every pair of cities
- Construct a population weighted accessibility index table using the distance calculated and the population of the cities
- Each city's population weighted accessibility index value is equal to the sum of the products of the distance from the city to the destination cities and the population of the destination cities:  $\text{Index}_{\text{city}_1} = \text{distance}_{\text{city}_1-2} * \text{population}_{\text{city}_2} + \text{distance}_{\text{city}_1-3} * \text{population}_{\text{city}_3} + \dots$
- Since the product of distance and population yields a large number, which accessibility index value is then divided by 100 million for more intuitive display of data
- Use GeoDa software package to conduct correlation analysis (Pearson's r) between population weighted accessibility index values and percent population below poverty

## RESULTS

- Chicago, IL has the lowest population weighted accessibility index value and the highest accessibility.
- Cairo, IL has the highest population weighted accessibility index value and the lowest accessibility.
- In general, cities in northern Illinois are more accessible, with accessibility gradually decreasing for cities located in central and southern Illinois.
- The correlation between population weighted accessibility index values and percent population below poverty is linear and fairly positive.
- Correlation coefficient ( $r$ ) = 0.502
- $R^2 = 0.252$
- P-value < 0.001

## RESULTS



## CONCLUSIONS

- There is a fairly strong north-south pattern in regards to the population weighted accessibility of Illinois cities by interstate.
- The null hypothesis is rejected. There is a fairly strong, statistically significant positive correlation between population weighted accessibility index values and percent population below poverty in the selected cities.
- Southern Illinois can be a target area for more supporting resources and services due to its lower accessibility and higher poverty rates.

## LIMITATIONS

- This study only included Illinois Cities that are located on the interstates. This left the map with large areas where there are no cities to serve as data points.
- When calculating the population weighted accessibility index, the travel times on the different routes were not considered.
- Since the study area is limited to Illinois, the map does not reflect the accessibility of cities near the state border to cities of neighboring states.

## REFERENCES

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