ENVS 381

Mini Project 2: Neighborhood Walkability in King County

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Research Question: How does the proximity of food centers affect neighborhood walkability in Seattle? What is the influence of demographic factors on pedestrian accessibility patterns in Seattle?

Contents:

- Results (attached separately)
- Presentation
- Analysis (this summary document)

Background:

Walkability is measured by the proximity to basic necessities, such as food stores and transit stops. We choose Seattle, WA as our site of interest since it is ranked as the 4th most walkable city in the United States, according to Conde Nast Traveler, and a walkability score of 99, according to WalkScore.com. Rather than compare two different cities' walkability, we choose to compare the block groups of King County, WA due to time and data availability. Furthermore, King County has a diverse spread of geography and population which would allow us to compare the walkability of block groups with high population densities, low population densities, etc.

Data Used:

King County GIS Open Data, EPA GeoPlatform, Seattle GeoData

- Demographic Shapefile
- Food Facilities
- National Walkability Index

Data Cleaning Procedures:

First, we had to write some queries to refine our walkability index data to just include King County. We also had to create a unique ID for our OLS model to run properly. With this we were then able to write some joins to merge the walkability data with our food facilities and demographics data sets. We also decided to visualize walkability, food facility count, distance to the nearest transit stop, street intersection density, and median household income to better understand them.

Methods:

We first ran an OLS model to determine which variables were significant in our model. We found that after testing 14 variables, 11 were significant. These 11 variables all had p-values less than 0.05, indicating that they were significant to our model. We had an adjusted r-squared value of 0.55, which is low, but our goal is to improve it with each model we run. As well as an AIC value of 6600.

Moving to exploratory regression, we were able to test multiple combinations of variables. We set our maximum number of explanatory variables to five, as to not overwhelm the model and prevent multicollinearity. We found that our best model included the variables: total geometric area, distance from the population-weighted centroid to the nearest transit stop, street intersection density, median household income, and food facility count in each block. The model had an adjusted r-squared value of 0.51, and an AIC value of 6693. With these variables, we moved forward in running our GWR model.

In our GWR model, we made our neighborhood type number of neighbors and ran a golden search to find the optimal number of neighbors. We ended up with an r-squared value of 0.81, which is significantly better than our previous models. As well as an AIC value of 5803, which was lower than our previous models.

Results:

By running our GWR model, we were able to get a closer look into how different variables affected walkability in King County. Distance to the nearest transit stop proved to be statistically significant, as the closer the nearest transit stop is to the population-weighted centroid, the higher the walkability index score will be. There was a strong relationship between distance to the nearest transit stop and walkability in the eastern half of the county, most likely because of the block's size. More area means more time to travel to a transit stop. We found that food facility count had a positive correlation with the walkability index score, the more food facilities there were within a given block, the higher the walkability score was. This makes sense, as you need to have food within a close distance in order to improve walkability scores. For total geometric area, understandably, the larger the total area of a block, the less walkable it will become. For areas with a higher street intersection density (pedestrian-oriented intersections) meant more walkable areas. If there are a lot of pedestrian oriented intersections in one block, we can assume that there are a lot of retail businesses, homes, or jobs in that area. For average median household income, the blocks with a higher average were in less walkable areas.

Potential Limitations:

Our data for "food centers" consisted of many different types of food facilities, such as grocery stores, mobile food units, restaurants with multiple seating ranges (facilities that 0-12, 13-50, etc), caterers, school lunch programs, etc. Depending on one's perspective this could be a benefit or a limitation. By including over 10,000 food facilities, a more comprehensive and realistic assessment of how people in Seattle access food is possible. On the flipside, the many different types of food facilities makes standardization somewhat difficult, especially if we wanted to compare multiple cities/states. Our model doesn't take into account the physical travel of people to food facilities which could be a problem due to varying walkability within census blocks.

We also questioned if a location is considered walkable if you need to access other modes of transportation to get to your destination. Roads that eliminate all vehicles and prioritize transportation methods that don't emit greenhouse gases are the goal. But for now, we settled on including public transit stops as that encourages less personal vehicle use.

Conclusion:

This study examined the King County's walkability in Seattle, WA by analyzing the significance of food and transit stop proximities. This is essential to understanding environmental impacts of vehicles, environmental justice, and accessibility issues. With the urgency of eliminating the amount of cars on the road and increasing food insecurity, we were interested how King County's walkability addresses this. Utilizing OLS models, regression analysis, and GRW models we found that both food center and transit stop locations greatly influence the walkability score of a given location. It is important that the number of food and transit sites positively correlate to the size of the location. It ensures that larger locations don't have less effective and inaccessible public services simply due to the size.

For future research, it would be beneficial to look at more variables such as hospitals/emergency centers, schools, first response personnel, and pharmacies. This would give us a more well-rounded view of how walkable a location is by including other places necessary to daily life. Implications of this study have the potential to address the lack of basic necessities in disadvantaged locations. It would be helpful to present this research to local governments and urban planning departments.