

# EVOLVING WALKABILITY:

THE USE OF SUB-STREET SCALE INDICATORS TO MONITOR CHANGING WALKABILITY IN THE CONTEXT OF REDEVELOPMENT IN JOHNSON CITY, NEW YORK

-Evan Larsen

### Introduction

- Walkability: The measure of how friendly an area is towards walking
- More walkable areas have well connected walking networks, an aesthetic built environment, and high levels of perceived safety
- As neighborhoods evolve through development and redevelopment efforts the perceived walkability changes too
- This research looks views walkability as a dynamic process by measuring and weighting aspects of the neighborhood which effect walkability
- The overall objective of this research is to determine the effects that the changes to the environment have on the level of the walkability
- The goal of this portion of this project has been creating a reusable model to measure the walkability at a sub-street scale
- Most measures of walkability do so at the county, census tract, or block group level, while this research looks to measure walkability at a more dynamic, square foot level

### Methodology

- Pre and post development variables will be collected
- Using ModelBuilder in ArcGIS Pro a model was created which rasterizes each variable, reclassifies it according to the weight that variable has, and then an aggregate Walkability Score is calculated
- The central portion of this poster replicated each part of the model with an explanation of each variable
- The top seven variables are the independent variables, which have colors and arrows indicating which dependent variables they effect
- Each variable has a specific weight associated with it, as shown on the table below


Walkability Variable Weights		
Dependent Variables	Independent Variables	Score
<b>Proximity and Connectivity</b>	WalkScore	40
	Transit	10
<b>Aesthetics</b>	Greenspace	4
	Buildings	4
	Crosswalks	4
	Lighting	4
	Sidewalks	4
	Crime	4
	Buildings	4
<b>Safety</b>	Crosswalks	4
	Lighting	4
	Sidewalks	4

- The output, represented by "Walkability Score" is on a 0 – 100 scale, with 0 being totally car dependent and 100 being extremely walkable

### Lighting

- Lighting helps to lower the perceived amount of crime in an area, while also enhancing aesthetic aspects of the built environment
- This data will be collected using drone footage and ESRI Full motion Video
- Streetlights will be the main source of lighting used in this project
- Buffers will be given descending values dependent on their proximity to the light source

\*not currently shown in map



### Building Quality


- Buildings are essential parts of the built environment which help give a feeling of community to a neighborhood, which can add both safety and aesthetic value
- The building quality value will be interpolated using Empirical Bayesian Kriging

\* Currently only showing housing, not commercial buildings




### Sidewalks and Crosswalks

- Proper sidewalks and crosswalks provide safe places for pedestrians to walk while not distracting from the visuals of the built environment
- ADA compliance data is used to measure the quality for both crosswalks and sidewalks
- Crosswalks will be given valued buffers while points along the sidewalks will be interpolated using Empirical Bayesian Kriging



### Crime

- Despite common belief, crime does not directly effect walkability, but is believed to have mutual effect on aspects of the built environment that effect walkability
- Crime data comes from Broome County Department of Planning, GIS, & Mapping Services
- Different types and natures of crime where given different values, which given to valued buffers around each point



### Greenspace

- Greenspace boost the aesthetic quality of an area, while also providing both physical and mental health benefits
- Land cover data will be reclassified and used to show which areas have more and less vegetation
- Different types of vegetation will be given different values, which will be given to valued buffers around the vegetation

\*not currently shown in map



### Proximity and Connectivity

- The walkability of neighborhoods depends most heavily on the proximity and connectivity, because without places to walk, the other factors do not matter

### Safety

- Safe walkability depends more on the perception of safety than the actual level of safety within an area
- The perception of safety comes from the quality of the built environment, while crime acts more as a confirmation factor
- Neighborhoods that are statistically safe can still be perceived as unsafe

### Aesthetics

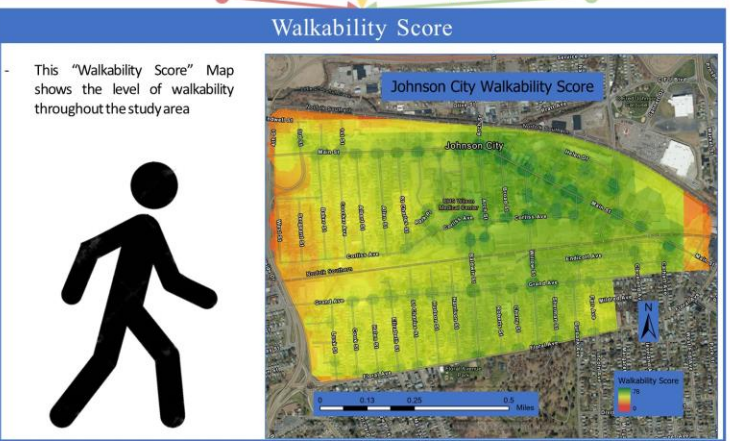
- Pedestrians are more likely to want to walk for leisure in more aesthetically pleasing neighborhoods
- Factors of the built environment determine the aesthetic value of the a neighborhood

### WalkScore

- WalkScore.com gives users the ability to find the level of walkability for a neighborhood based on proximity to valued destinations
- Points will be placed every 150 feet of the street network in the study area and given the WalkScore for that address
- The points will be interpolated using Inverse Distance Weighting


### Walkability Score

- This "Walkability Score" Map shows the level of walkability throughout the study area



### Results

- The current Walkability Score map does not include lighting or vegetation, however distinct patterns have already emerged
- The western edge of the study area has the lowest scores throughout the whole area, likely due to the highway cutting off its connectivity
- \*The western most portion of the study area has low scores due to shortages which will be remedied
- The area between and surrounding Main Street and Corliss Ave have the highest level of walkability
- Commercial districts have higher levels of walkability than residential districts
- Areas near crosswalks have a distinct visual effect on the final map, and shows that crosswalks are higher quality in commercial districts than I residential districts
- \*The effect will be remedied in the final part of the project by having the average value of the other variables as the crosswalk value or area not near crosswalks
- Areas near crosswalks have a distinct visual effect on the final map, and shows that crosswalks are higher quality in commercial districts than I residential districts
- The current walkability scores, without lighting and vegetation, would be considered mostly car dependent on average
- With all the variables JC is likely to have some very walkable



### Future Research

- The second portion of this research will involve both collecting new data as well as amending the existing data to represent the future built environment variables after the current and future developments take place
- These new post-development variables will create a new walkability raster which can be compared to the pre-development raster for walkability
- More variables of the built environment, such as parking and complete streets could be added to the model to create a more holistic view of walkability

### References

Bracy, N., R. Millstein, J. Carlson, T. Conway, J. Salas, B. Swelens, J. Kerr, C. Cain, L. Frank, and A. King. 2014. Is the relationship between the built environment and physical activity mediated by perceptions of crime and safety? *International Journal of Behavioral Nutrition and Physical Activity* 11(1):24.

Brown, B., C. Werner, K. Smith, C. Tribka, and H. Miller. 2014. Physical activity mediates the relationship between perceived crime safety and obesity. *Preventive Medicine* 62(1):40-44.

Carti, L., S. Dunne, and B. Marcus. 2010. WalkScore™: Aerial Global Estimate of Neighborhood Walkability. *American Journal of Preventive Medicine* 39(5):460-463.

Duncan, D., J. Abbot, J. Whalen, S. Maly, and S. Gortmaker. 2011. Validation of WalkScore™ for Estimating Neighborhood Walkability: An Analysis of Four US Metropolitan Areas. *International Journal of Environmental Research and Public Health* 8(11):1160-1179.

Foster, S., and B. Giles-Corti. 2008. The built environment, neighborhood crime and constrained physical activity: An exploration of inconsistent findings. *Preventive Medicine* 47(2):241-251.

Shaharuk, A., and N. Schurman. 2019. Unpacking walkability indicators and their inherent assumptions. *Health & Place* 55:145-154.

vandenBerg, A., and M. vandenBerg. 2015. HEALTH-BENEFITS OF PLANTS AND GREENSPACE: ESTABLISHING THE EVIDENCE BASE. *Acta Horticulturae* 1370:19-31.

Zuniga-Teran, A., B. Ortiz, G. Gierke, N. Chaffin, S. Marsh, D. Guertin, and S. Goings. 2017. Designing healthy communities: testing the walkability model. *Frontiers of Architectural Research* 6(1):63-73.