Bikeability Analysis: An exploration Case Study in Washington DC

YAQI SHEN UEP 0232—Introduction to GIS December 18, 2015

Project Introduction

Introduction

Over the past decade there has been a strong movement to increase bicycling. It has been shown to improve health through greater activity, reduce vehicle miles travelled, and improve air quality among other benefits (Krizek 2007). **We explore**:

a) How is bicycling ability presented in Washington DC?

b) Which area have the highest Bicycling Score in Washington DC?

c) How is the index used, and what factors enter into the index,

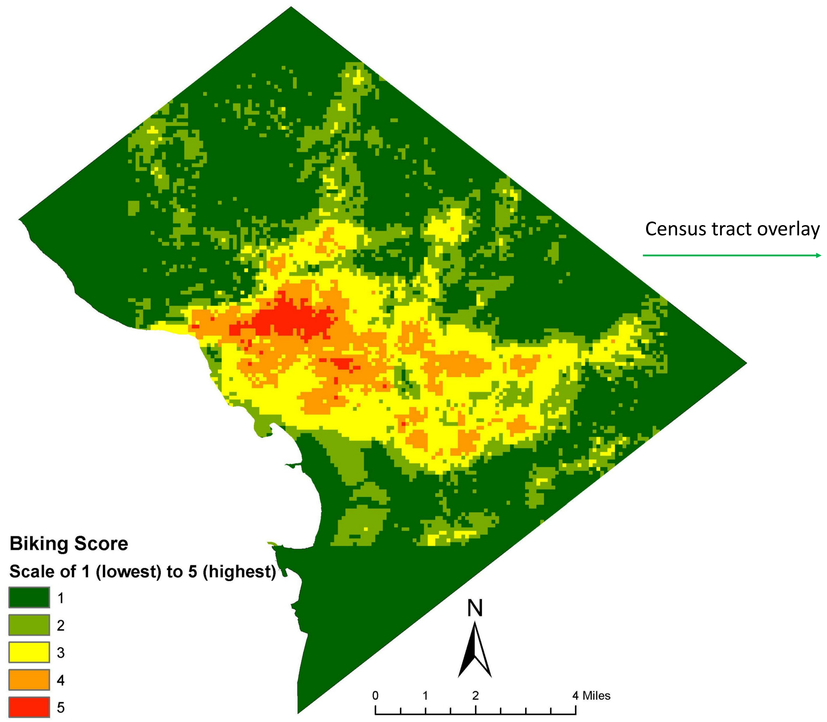
d) What is the relationship between population density and biking areas?

The physical environment is an important variable in explaining bicycling behaviors. Particularly distances to destinations as determined by land use patterns for transportation bicycling. Also as a network of off-street bicycle paths, for transportation and recreational purposes (Handy, Xing, and Buehler, 2010). Thus, I will use **six physical environmental factors** to evaluate bike areas in Washington DC:

● bike trail● signed bike routes● capital bike share location● hilliness ● destination density● intersection density

This will produce six individual factor maps, and then use a weighted average to calculate an overall score (scale of 1 to 5, 5 is the highest) to rate bike areas in Washington DC.

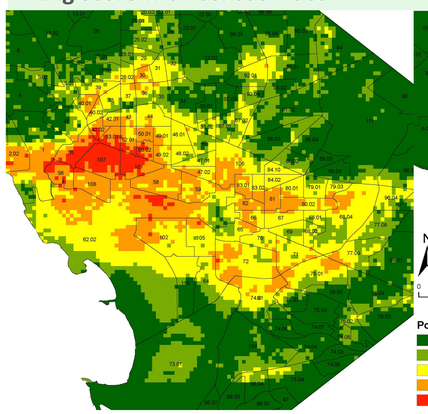
Washington D.C.: Overall Biking Score



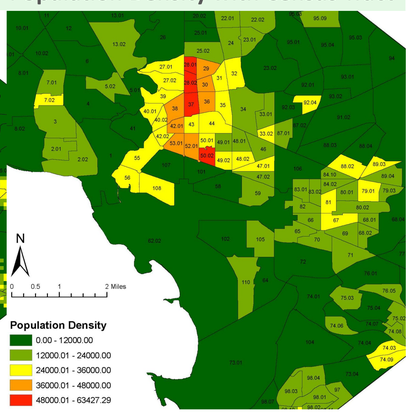
Census tract overlay

Results

Biking Score with Census Tract



Population Density with Census Tract



- Best bike areas are located in Census Tract 107, and adjacent areas.
- Best bike areas are adjacent to but do not overlap highest population density areas.
- Destination-density score and capital-bike-share-location score follow a similar pattern as biking score in Washington, D.C.
- Biking scores between 3 to 5 are mainly centrally located.

Methods

To determine bikeability in Washington D.C., **six physical environmental factors were analyzed using different ArcMap tools:**

*Destination Density Score***:** Point data from ReferenceUSA were processed with the "Display XY Data" and "Point Density" tools to rank proximity to existing destinations.

*Intersection Density Score***:** Line data from M Drive was calculated with "intersect" tool, and then used "Selection" to filter results where more than two lines intersect (ICOUNT>=3); I then processed the layers created by previous steps with the "Point Density" tool, to rank proximity to existing intersection points.

**Hilliness Score*: Spot elevation data was processed with the IDW interpolation and Slope tools to rank hilliness level.

**Signed Bike Routes Score*: A line shapefile was processed with the Line Density tool to rank proximity to existing signed bike routes.

Methods Cont.

**Capital Bike Share Locations Score:* Point shapefile of capital bike share locations was processed with the Point Density tool to rank proximity to existing capital bike share locations.

**Bike Trail Score:* A line shapefile of bike trail was processed with the Line Density tool to rank proximity to existing bike trails.

*This data was from DCGIS open data (opendata.dc.gov)

Note: above data was reclassified to match dominance distribution from 1 to 5; and all were clipped by Washington D.C. border outline.

Biking Score: "Raster Calculator" was used to calculate biking score by the six factors described above, which were given equal weights (100/6).

*Population Density***:** Census tracts data from TIGER and Social Explorer were processed with the "joins and relates" tool by using GEOID; then "Quantities" was used to choose Colors, and "Classify" to separate population density into 5 intervals.

Limitation & Future Research

Limitations

- Assume higher biking score means better bike areas.
- Only six factors selected from physical environmental factors.
- All six factors were given the same weight (100/6) in calculated score.

Future Research

- To compare physical environment factors, specially on bicycling facilities in different biking score areas, and give suggestions to improve.
- Identify additional physical environment factors that would affect score.

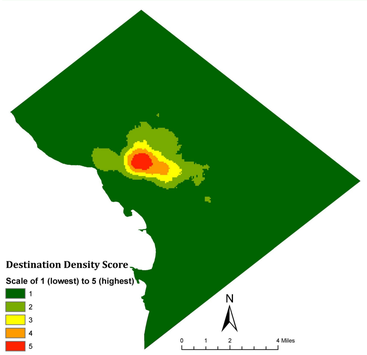
Sources & reference

Data Sources: DCGIS Open Data (opendata.dc.gov), ReferenceUSA, Social Explorer, and cencus.gov.

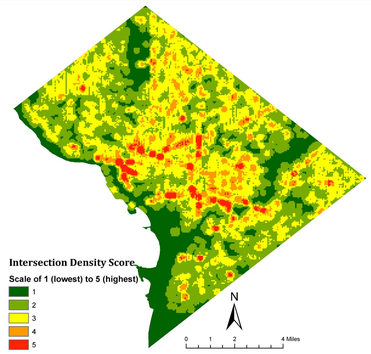
Reference: 1) Krizek, K. J., Wl-Geneidy, A., & Thompson, K. (2007). A detailed analysis of how an urban trail system affects cyclist's travel. *Transportation*, *34*(5), 611-624. 2). Handy, S. L., Xing, Y., & Buehler, T. J. (2010). Factors associated with bicycle ownership and use: A study of six and small U.S. cities. *Transportation, 37*, 967-985.

Coordinate system: GCS_North_American_1983

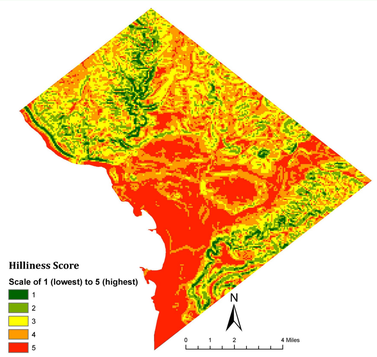
Destination Density Score



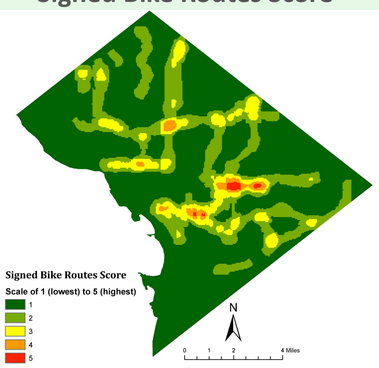
Intersection Density Score



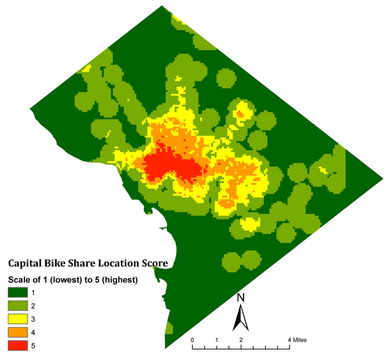
Hilliness Score



Signed Bike Routes Score



Capital Bike Share Location Score



Bike Trail Score