Considering Path Quality When Exploring Environmental Determinants of Walking to School

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Introduction

Methods

Results and Conclusions

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Physical Activity and the Environment

The Big Question: What environmental features make a person more likely to walk?

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Physical Activity and the Environment

The "Environment" includes:

- Physical Sidewalks, distance, traffic
- Economic Car ownership, Occupational status
- Socio-cultural Attitudes toward physical activity, walking partners
- Political School policies on walking, local bike laws

Walking could be for:

- Leisure
- Access to retail or other facilities
- Transportation

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Measuring the Environment

- Personal Perceptions ex. "How safe is the neighborhood for walking?"
- Archival Databases ex. Data from city planning department with presence/absence of sidewalks, street width, population density, etc.
- Objective Measurement ex. Raters collect information on physical structures, layout, street activity, etc.

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Goal & Aims

Goal: Use an objective measure of physical and social disorder, spatial statistics, and a Geographic Information System (GIS) to create a detailed measure of the path quality for each individual in study.

- Use sample of objectively measured values to predict values at unsampled locations
- Use values at sampled locations and predictions at unsampled locations to calculate a measure of path quality
- Demonstrate the use of path quality variable in a walking to school analysis in Baltimore City.

Spatial Prediction at Unsampled locations

We have a sample of objectively measured physical and social disorder for Baltimore City. Using ordinary kriging, a geostatistical technique for spatial prediction, we get values of physical and social disorder across all of Baltimore City.

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Sample Locations



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Predicted Physical and Social Disorder



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Walking Path Quality

Since we now have a physical and social disorder value for every block, we can estimate path quality for any route through the study region.

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Block Quality Around School 3 & 4



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School 3 & 4 Shortest Paths



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School 3 & 4 Shortest Paths and Block Quality



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Walking to School example

The path quality was included in multivariable logistic and GEE models along with other potentially important factors.

- The average path quality variable was significant in univariate analysis (Odds Ratio; 1.0541.1451.250).
- Average path quality was not significant in multivariable models accounting for clustering at neighborhood level (Odds Ratio; 0.720.881.07).

In this example, path quality was likely a proxy for neighborhood level socioeconomic status and was not significant when adjusting for neighborhood SES and clustering.

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Future Research

- Spatial Prediction Better estimation using extended kriging models
- Path Quality Explore different measures, factor analysis
- Physical Activity models Structural Equations Modeling, more complex multilevel models

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