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Exploratory Study of Environmental Effects on Physical Activity and Overweight in Older Women: Research Update

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Background

Physical inactivity and obesity are major public health issues. Recent studies have provided evidence that attributes of the built environment influence physical activity among adults and that factors such as greater urban sprawl are related to overweight and obesity. Few studies have developed objective individual-level measures of the built environment, a geographic scale that may be more relevant to certain types of physical activity, such as walking. In addition, further research is needed to assess the associations of both objective and perceived environmental factors with physical activity. In this 2-year exploratory study funded by the National Cancer Institute, we are addressing these research gaps.

Objectives

The purpose of this poster presentation is to provide a brief overview of progress to date on a major aspect of this study, which is to develop objective measures of the built environment for approximately 30,000 women in the Nurses' Health Study (NHS) using Geographic Information Systems (GIS) techniques. In particular, we will briefly summarize pilot work focused on development and assessment of built environment variables.

Pilot study sample

NHS participants (n=300) from six counties in Massachusetts, Pennsylvania, and California.



NHS Survey data

Every two years NHS participants complete a comprehensive survey with items on health care, symptoms and diagnoses, risk exposures, and health behaviors. Self-reported height and weight are used to calculate body mass index. Physical activity items are used to derive estimates of daily energy expenditure and to measure specific activities such as walking and bicycling.

Funding

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Built environment variables

Street Connectivity

Intersection density	Number of intersections per length of road within 400m, 800m, and 1200m network distances
Street density	Kilometers of streets per km ² within 400m, 800m, and 1200m network buffer areas
Pedestrian route directness	Ratio of road-network distance to straight-line distance from participants' homes to facilities within 400m, 800m, and 1200m network distances

Land-use Mix (LUM)

LUM access	Median distance to facilities within 400m, 800m, and 1200m network distances
LUM density	Number of facilities within 400m, 800m, and 1200m network distances per km ² of the respective network buffer areas
LUM diversity	Diversity of facilities (using an entropy formula and five categories of facility types) within 400m, 800m, and 1200m network distances

Residential Density

Population density in buffer	Number of residents per km ² within 400m and 800m network buffers (residents assumed to live within 50m of roads)
Census tract	Number of residents per km ² of area of census tract

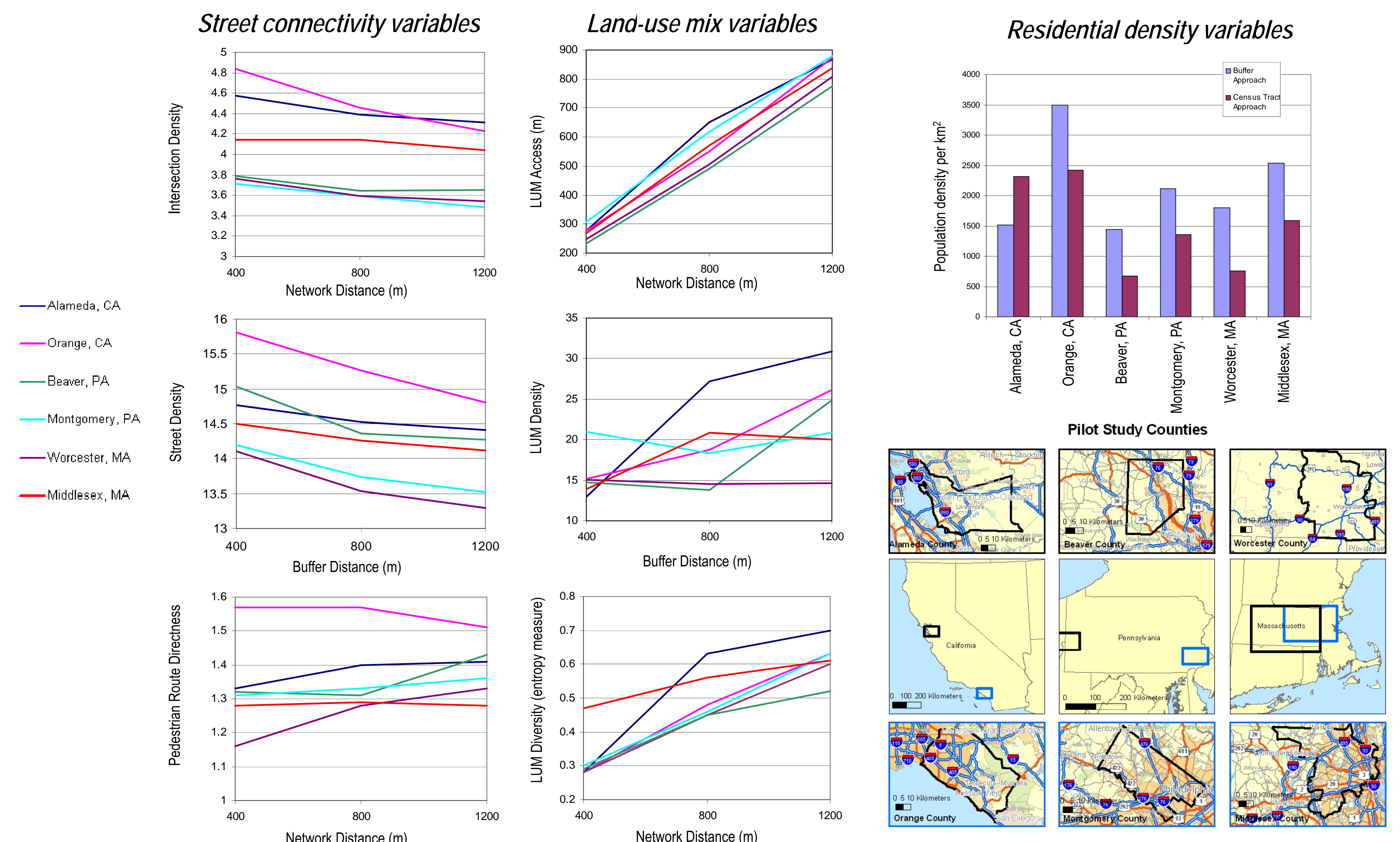
Data layer sources:

- Subjects' geocoded home addresses
- ESRI StreetMap 9.2 (road classes 2-6, and 9)
- 2000 U.S. Census Blocks (population counts)
- Facility Database with geocodes from InfoUSA

Projections appropriate for each of the three states:

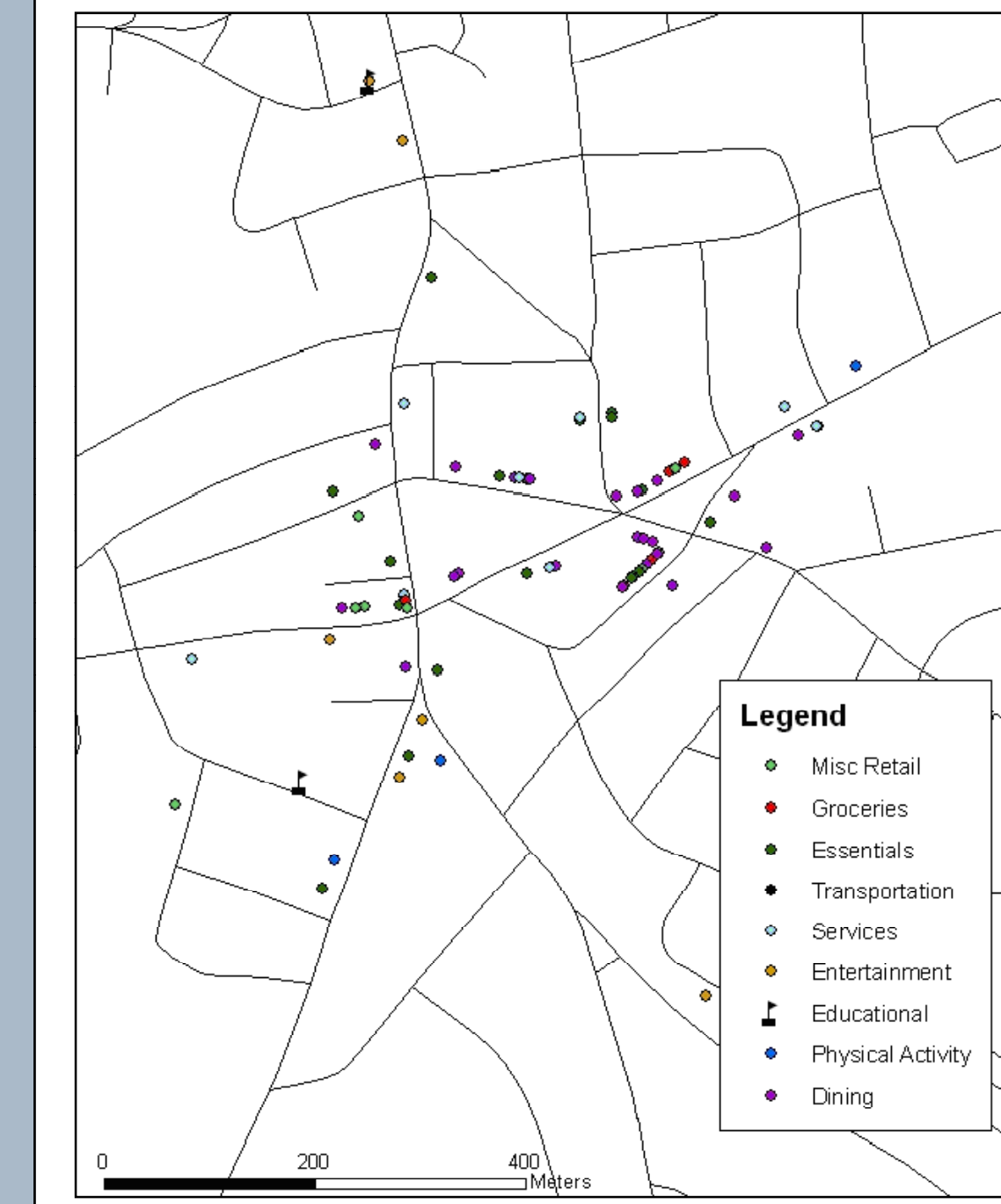
- Massachusetts- State Plane Mainland
- Pennsylvania- State Plane South
- California- Teale Albers

Data summary of built environment variables

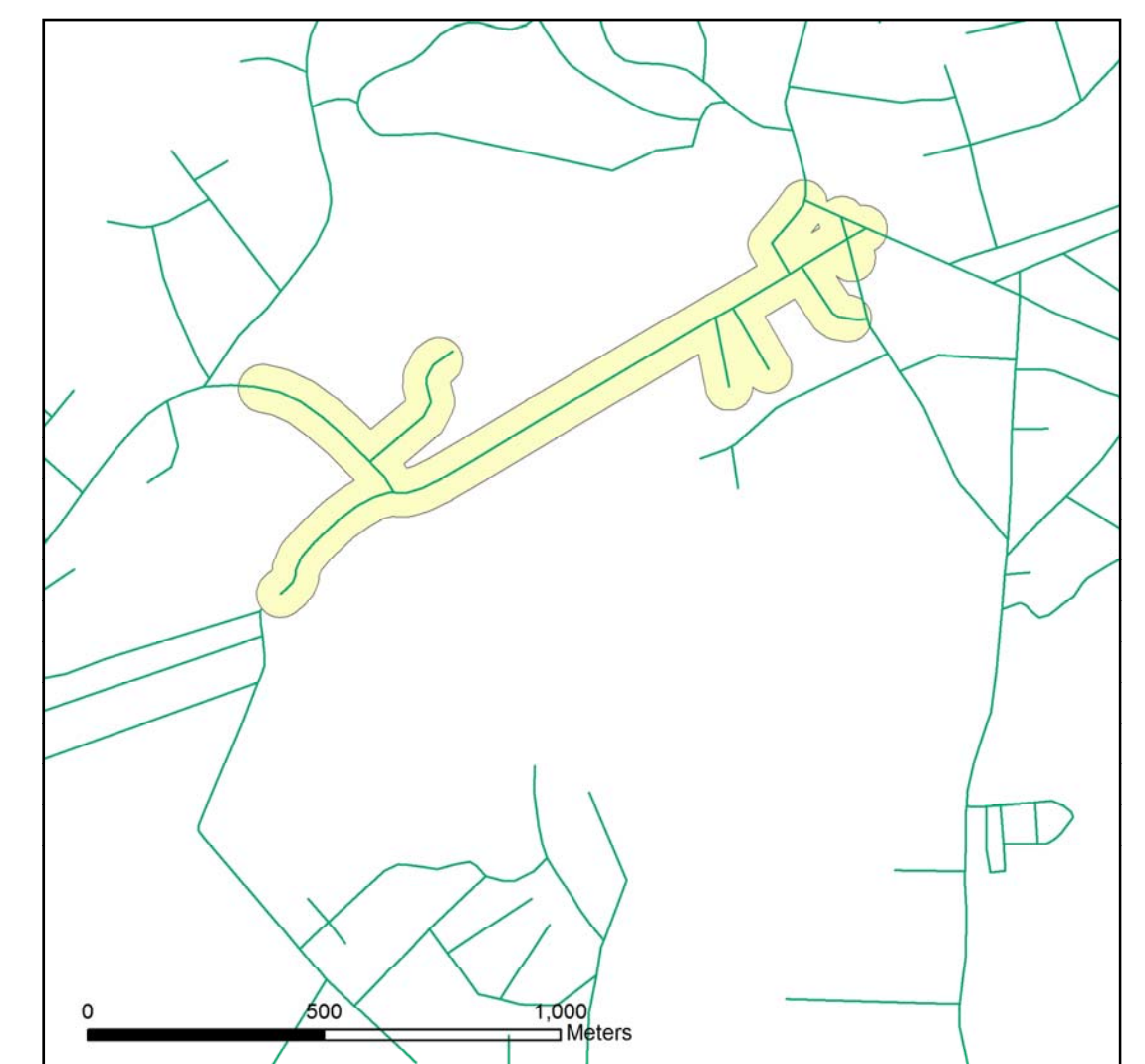


Illustrations of facilities and network buffer in GIS

Facilities from InfoUSA database



Network buffer (800m)



Next steps

- Create environmental variables for the full study sample
 - Participants in CA, MA, and PA (n≈30,000)
- Merge these data with NHS survey data
- Test associations with physical activity and overweight outcomes

Ongoing work

- Conduct validation study of the InfoUSA database
 - Map facilities from the database for Tippecanoe County and one county in Connecticut
 - Conduct field audits this fall/winter
 - Verify the count, attribute, and positional accuracy of the facilities
- Implement supplemental survey with sub-sample (n≈3,800) of NHS participants
 - Using modified version of the Neighborhood Environment Walkability Survey (NEWS) and the Community Healthy Activities Model Program for Seniors (CHAMPS) Survey
 - Assess perceptions of the neighborhood environment and elicit detailed information about physical activity behaviors
- Test the use of available tools to develop micro-scale measures of the neighborhood environment
 - Using a sub-sample (n=30) of NHS participants in MA
 - Testing feasibility and validity of the use of tools such as Google Map/Earth, Google Street View, and Microsoft Visual Oblique

GIS Day 2008

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