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Geohealth meets Geodesign:

multidisciplinary challenges of informing the regional design studio with human health research

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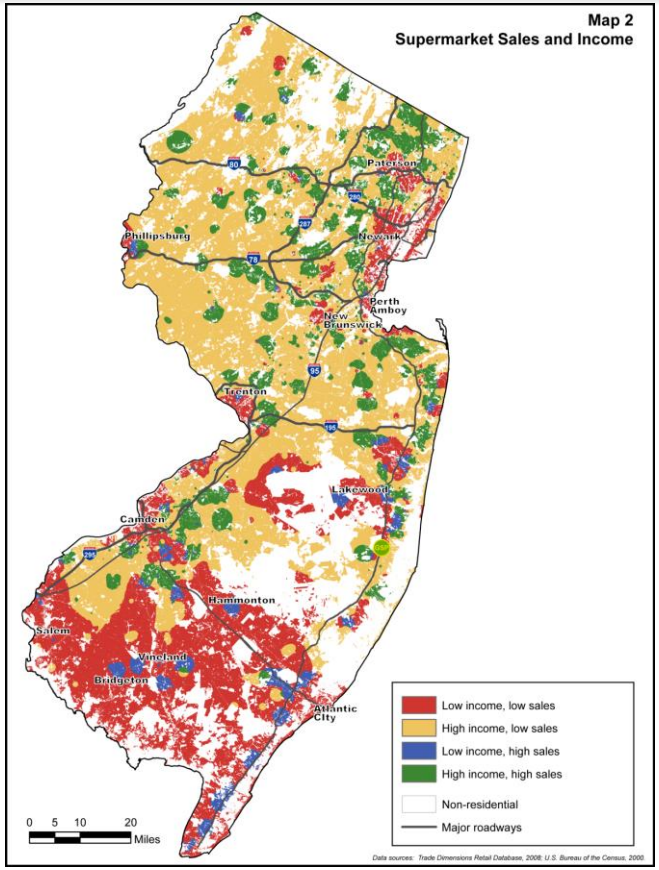
Mapping the landscape of health

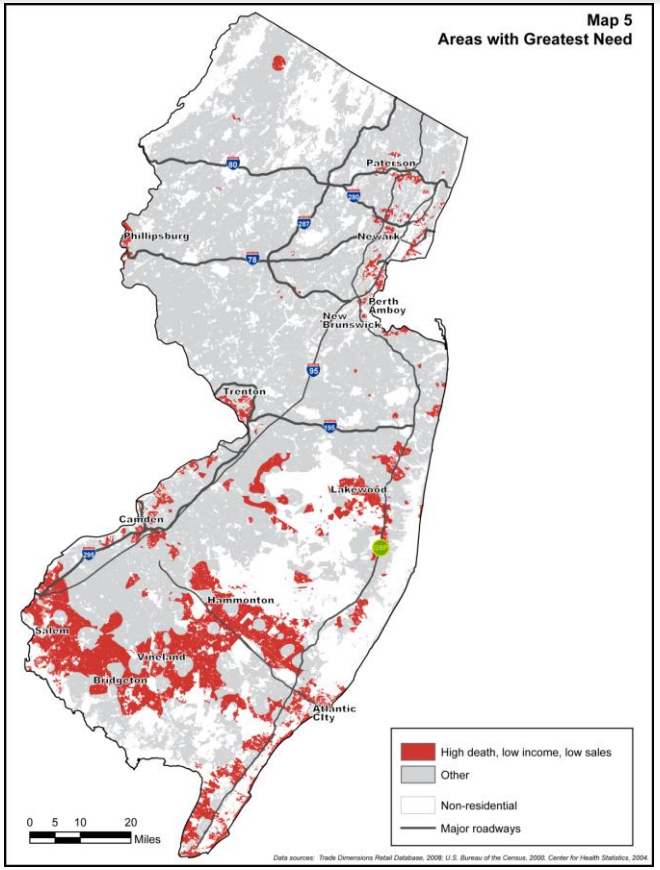
Health and Communities

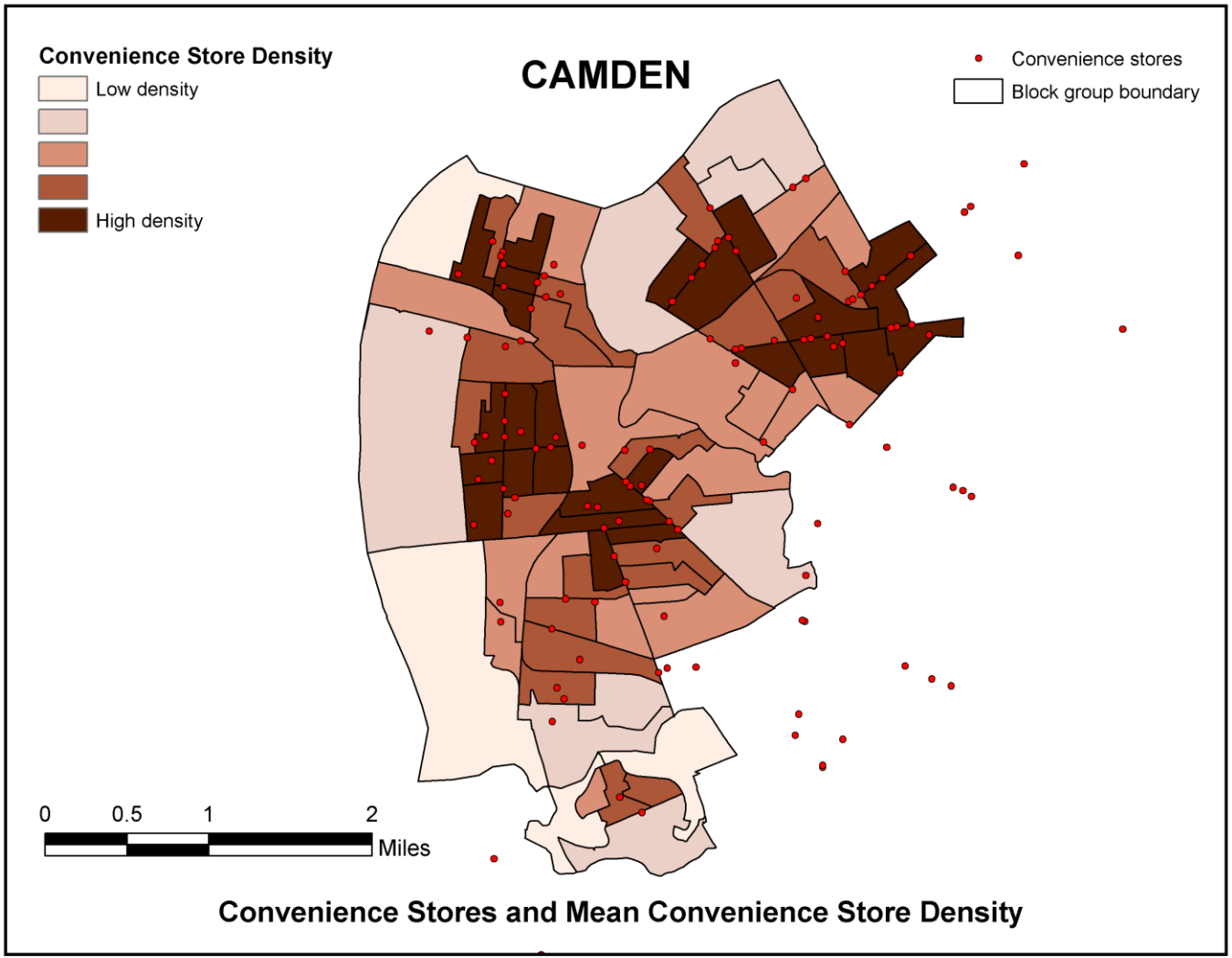
- A fundamental understanding: our environment shapes our health (e.g., Kweon, Sullivan, and Wiley 1998; Burdette and Whitaker 2004)
  - RWJF: “Does where you live affect how long you live?”
- Key dimensions include viewing the landscape as food environment and physical activity environment (e.g. Ohri-Vachaspati et al. 2013)

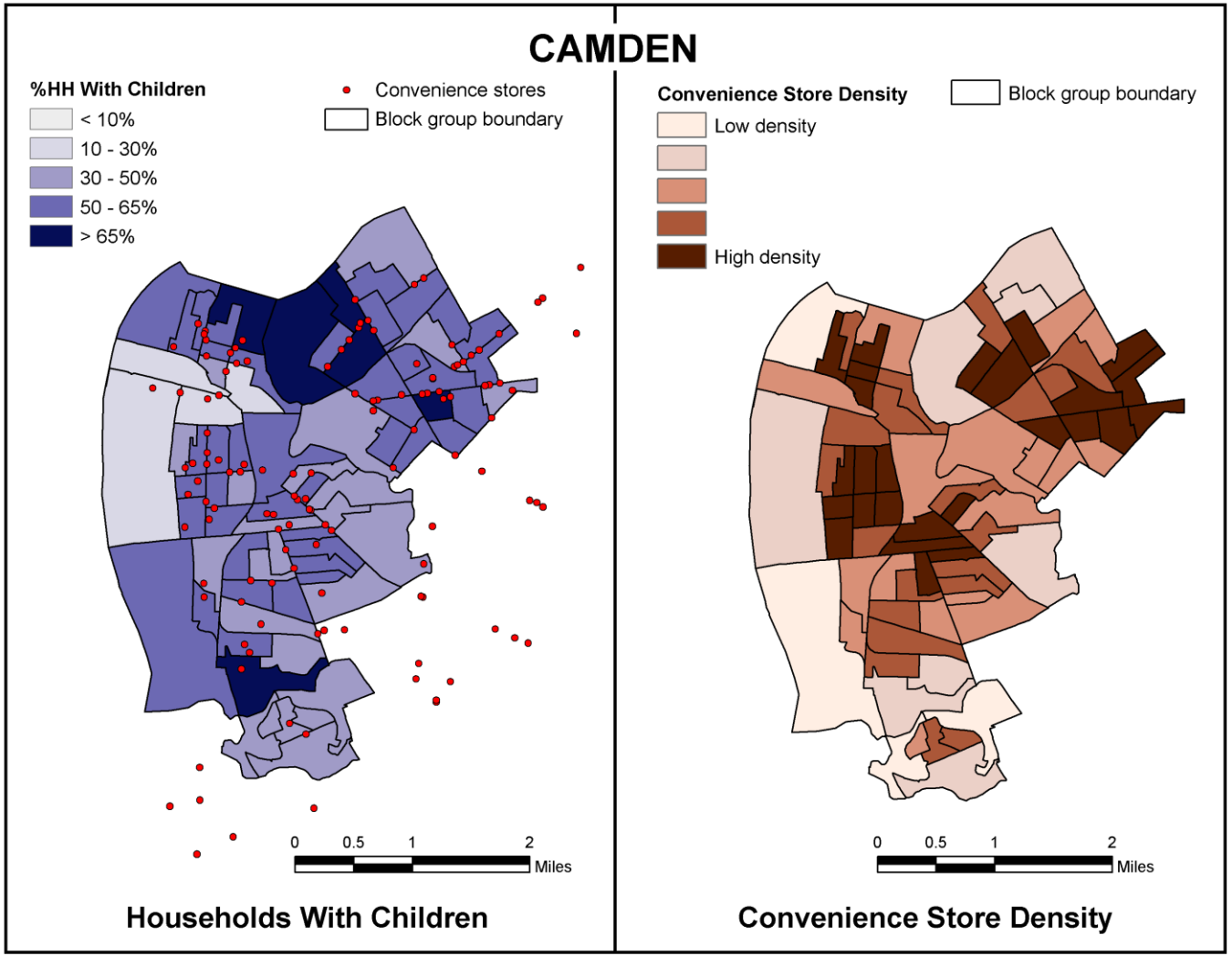
Mapping the community

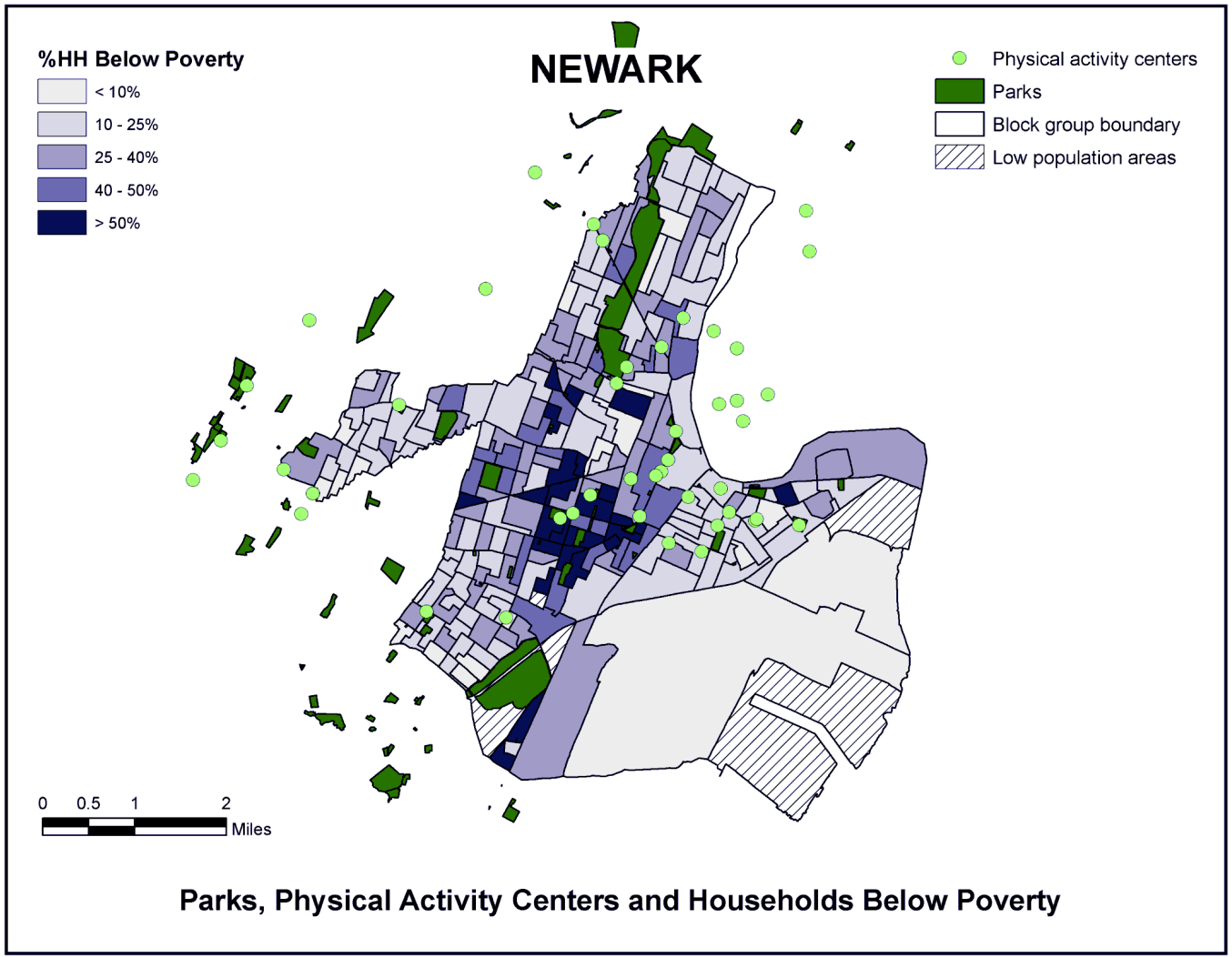
- Four New Jersey cities
  - Camden, Newark, New Brunswick, Trenton
- Data from multiple sources – Commercial and public
- Combined and checked with calls, supplemental data
- Food Environment
  - Corner stores, grocery stores, supermarkets, limited service restaurants
- Physical Activity
  - Small parks, large parks, physical activity outlets


Map 2
Supermarket Sales and Income
Paterson
Phillipsburg
Newark
Perth Amboy
New Brunswick
Trenton
Lakewood
Camden
Hammonton
Salem
Vineland
Bridgeton
Atlantic City
Low income, low sales
High income, low sales
Low income, high sales
High income, high sales
Non-residential
Major roadways
0 5 10 20
Miles
Data sources: Trade Dimensions Retail Database, 2008; U.S. Bureau of the Census, 2000.

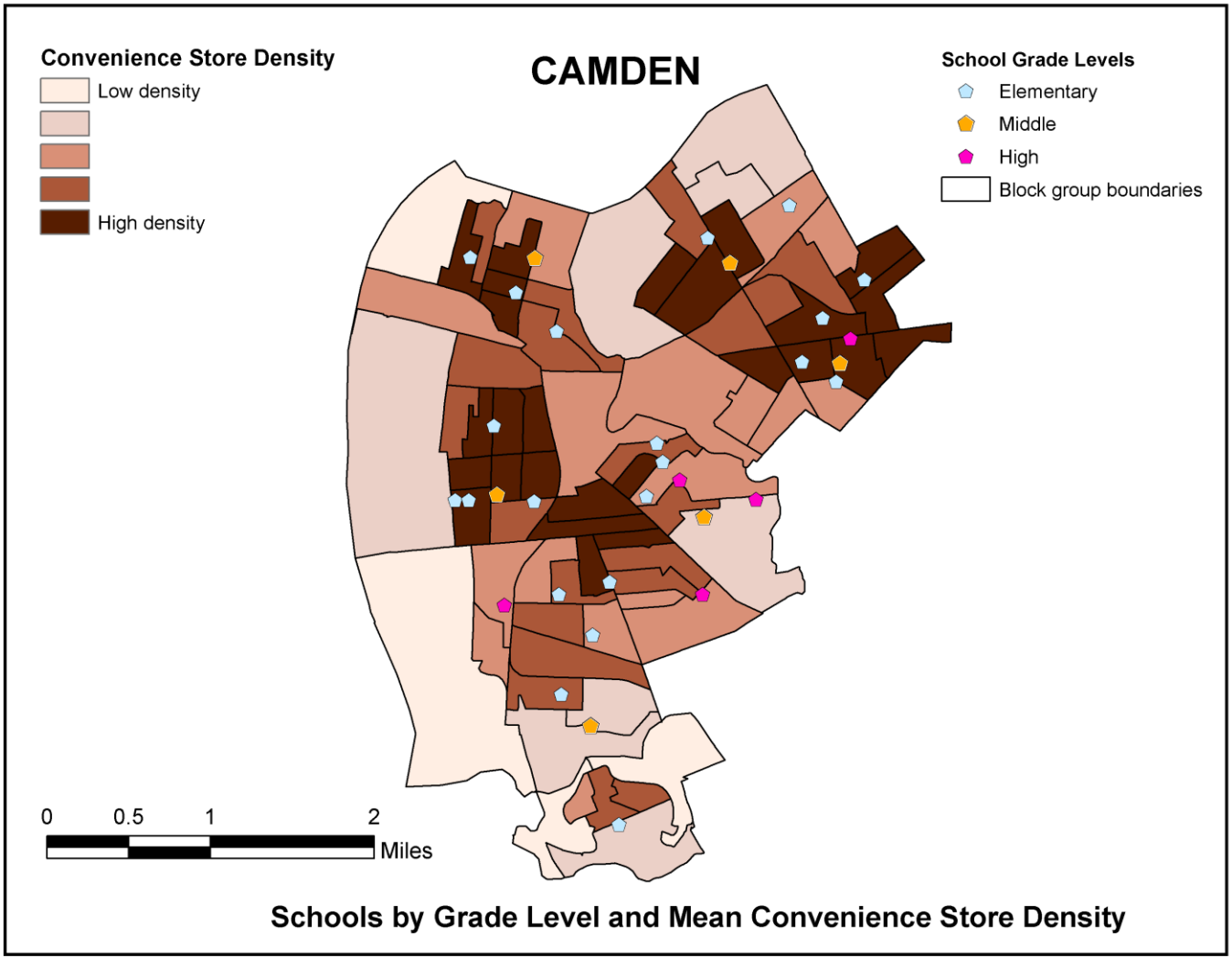

Map 5
Areas with Greatest Need
Paterson
Phillipsburg
Newark
Perth Amboy
New Brunswick
Trenton
Lakewood
Camden
Hammonton
Salem
Vineland
Bridgeton
Atlantic City
High death, low income, low sales
Other
Non-residential
Major roadways
0 5 10 20
Miles
Data sources: Trade Dimensions Retail Database, 2008; U.S. Bureau of the Census, 2000. Center for Health Statistics, 2004.

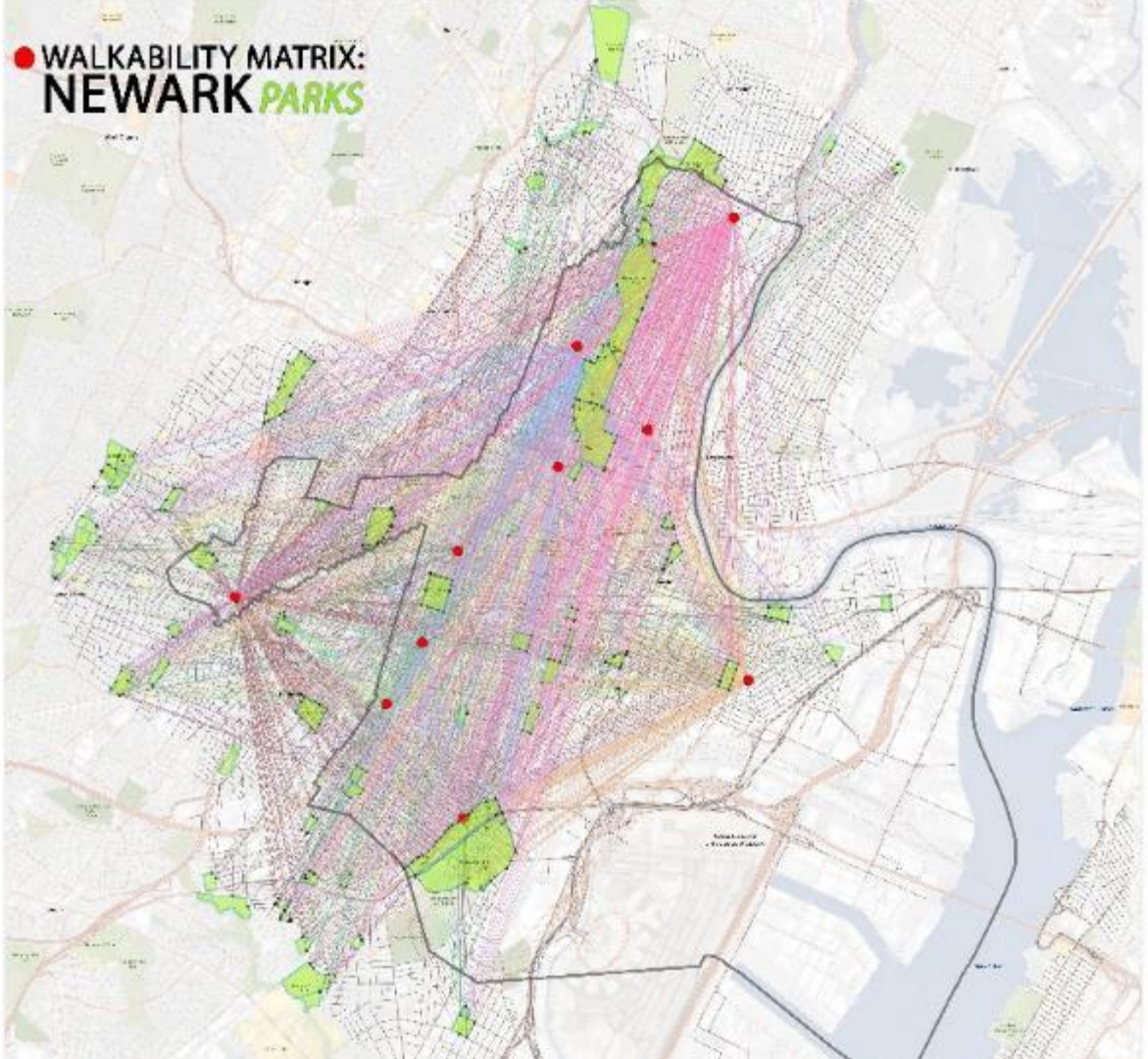

Convenience Store Density
Low density
High density
CAMDEN
Convenience stores
Block group boundary
0
0.5
1
2
Miles
Convenience Stores and Mean Convenience Store Density


CAMDEN
%HH With Children
< 10%
10 - 30%
30 - 50%
50 - 65%
> 65%
Convenience stores
Block group boundary
0 0.5 1 2
Miles
Households With Children
Convenience Store Density
Low density
High density
Block group boundary
0 0.5 1 2
Miles
Convenience Store Density



Parks, Physical Activity Centers and Households Below Poverty


Convenience Store Density
Low density
High density
CAMDEN
School Grade Levels
Elementary
Middle
High
Block group boundaries
0
0.5
1
2
Miles
Schools by Grade Level and Mean Convenience Store Density


WALKABILITY MATRIX:
NEWARK PARKS

Team science results

Table 3
Multivariate logistic regression analysis of the association of proximity to elements of the food and physical activity environment with child's weight status ($n^a = 702$).

Key geospatial predictor(s)[b]	Logit models Adjusted odds ratio (95% CI)[c]	Probit models Marginal effects[c,d] (95% CI)	Heckman-probit models Marginal effects[c,d,e] (95% CI)
Distance to nearest (miles)			
Convenience store	0.32 (0.07–1.37)	−0.23 (−0.51, 0.05)	−0.16 (−0.39, 0.07)
Presence in 1/2 mile radius			
Convenience store	1.47 (0.35–6.20)	0.05 (−0.24, 0.34)	−0.08 (−0.35, 0.18)
Fast-food restaurant	1.41 (0.47–4.28)	0.09 (−0.14, 0.32)	0.13 (−0.08, 0.35)
Park (1 acre or more)	0.41 (0.21–0.81)**	−0.19 (−0.33, −0.05)**	−0.14 (−0.30, 0.02)*
Presence in 1/4 mile radius			
Convenience store	1.90 (1.04–3.45)**	0.13 (0.01, 0.25)**	0.13 (0.01, 0.26)**
Number in 1/4 mile radius			
Convenience store	1.11 (1.00–1.22)**	0.02 (0.002, 0.04)**	0.02 (−0.001, 0.04)*

[a] Unweighted sample size.
[b] Multivariate regressions were run for geospatial variables having a significant ($p < 0.1$) bivariate association with child's weight status (see Table 2).
[c] Sample weighted and SE adjusted for complex survey design; each model controlled for child's age, child's sex, race/ethnicity, household poverty status, parental nativity, mother's education level, household language status, parental BMI, median income in the block group of child's residence, and racial/ethnic composition in the block group of child's residence.
[d] Marginal effects indicate the change in the likelihood of being overweight/obese for individuals with the average value of the remaining covariates in the model.
[e] The first-stage selection equation of the Heckman-Probit model was run on an unweighted sample of n = 2200.
** $p < 0.05$.
* $p < 0.10$.

Key findings

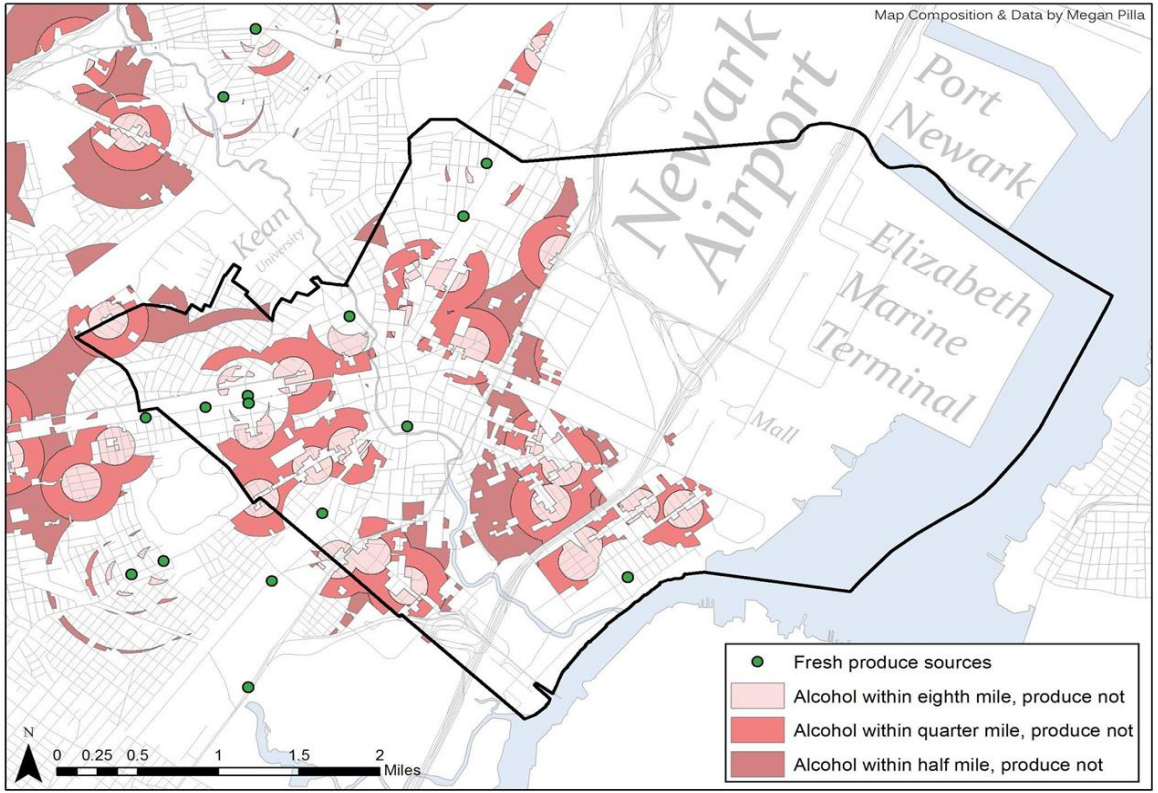
- Several patterns, but two key findings
  - We found that after adjusting for covariates, children living within 1/4 mile of a convenience store had nearly twice the odds of being overweight or obese than children living farther away.
  - Children who lived within 1/2 mile of a park had less than half the odds of being overweight or obese compared to children who did not.
  - Different than other cities

- Ohri-Vachaspati, P., K. Lloyd, D. DeLeia, D. Tulloch, N. Petlick, D. Martinez, M. Yedidia. 2013. “A Closer Examination of Measures of Food and Physical Activity Environments as They Relate to Childhood Obesity,” *Preventive Medicine*, 57: 162–167.
- DeWeese, R., M, J. Yedidia, D. L. Tulloch, P. Ohri-Vachaspati, 2013. "Neighborhood Perceptions and Active School Commuting in Low-Income Cities," *American Journal of Preventive Medicine*, 45(4): 393–400.

Choosing the right models

Model based on multiple planar geometries

Residential areas where alcohol is more accessible than fresh produce



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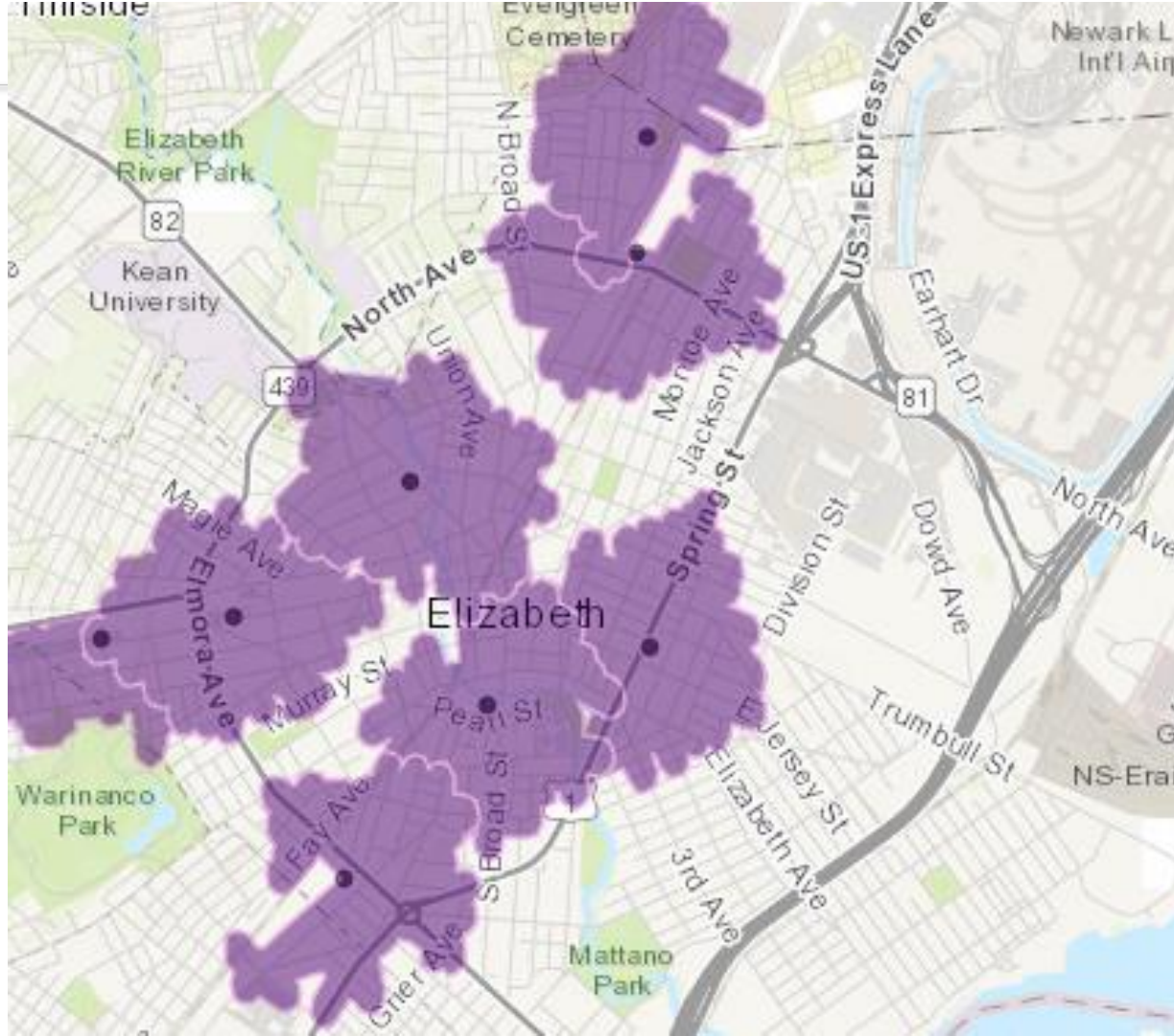
Model based on walking distance or time



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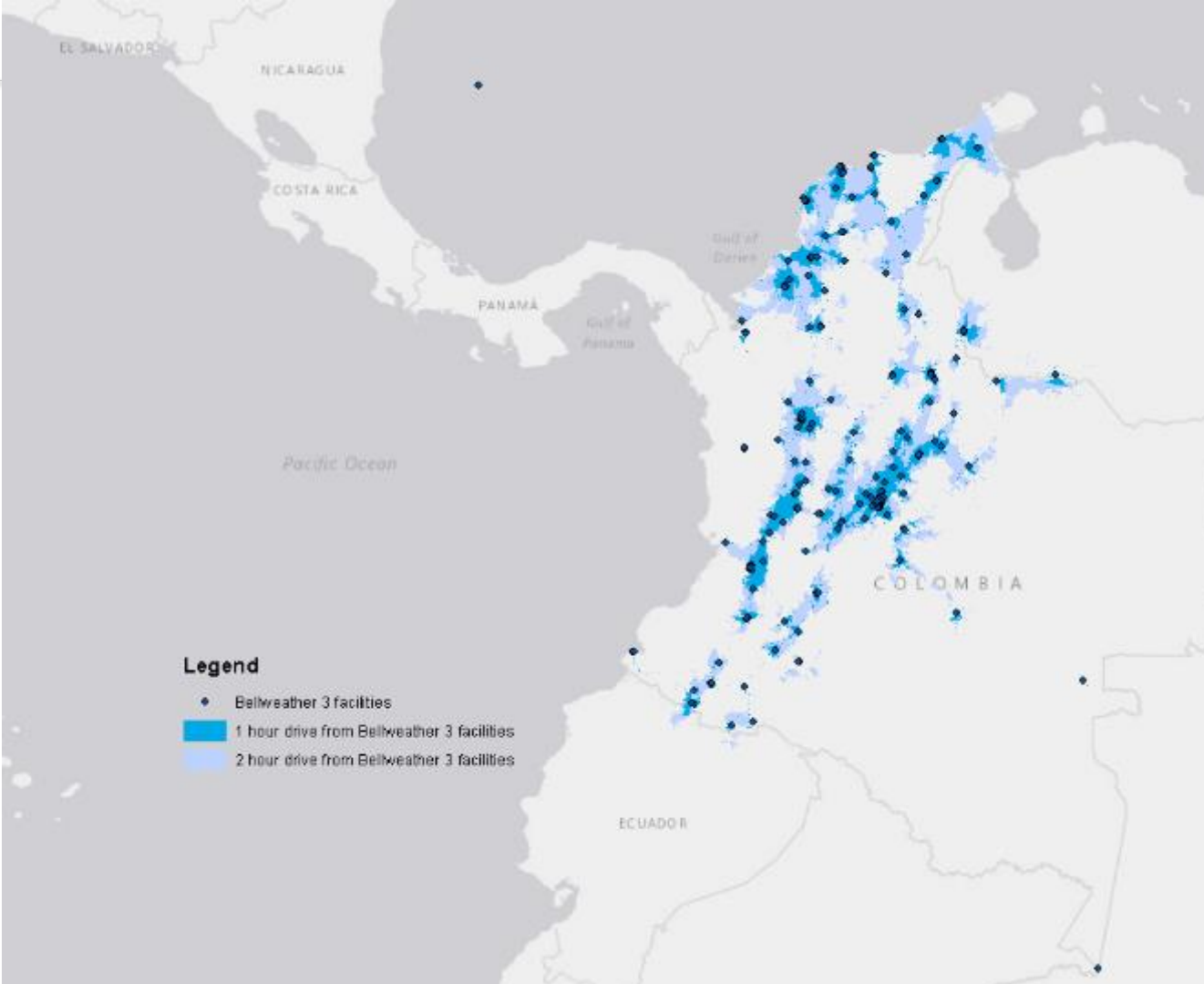
Model based on driving time



DLA 2019 Dessau

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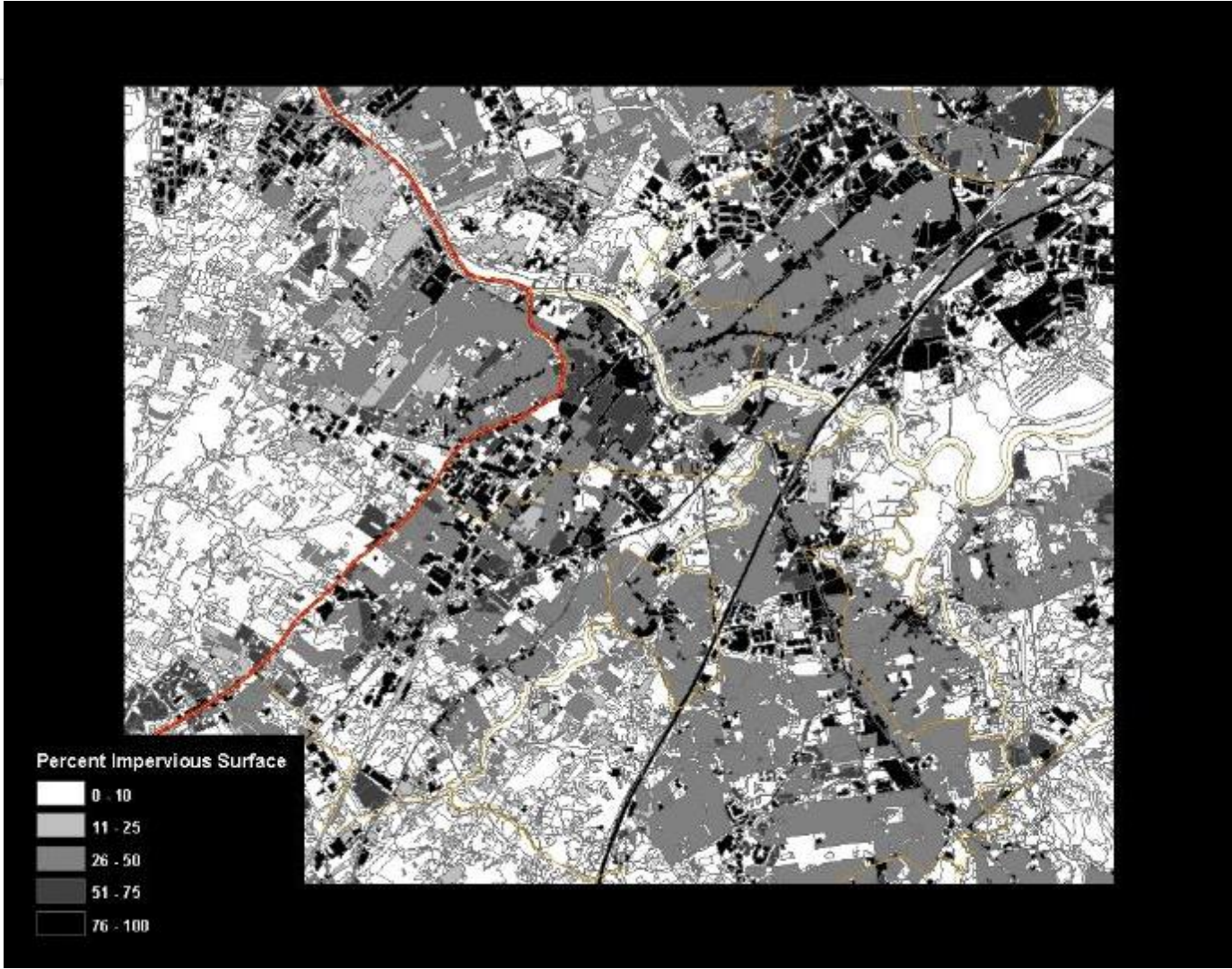
Models derived from landuse and other public data



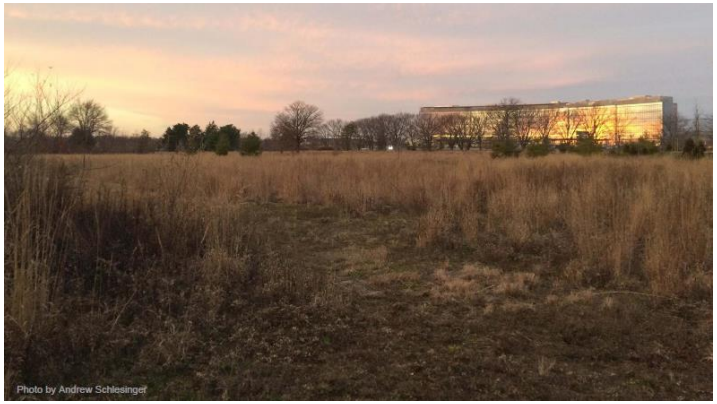
Recurring wellness themes

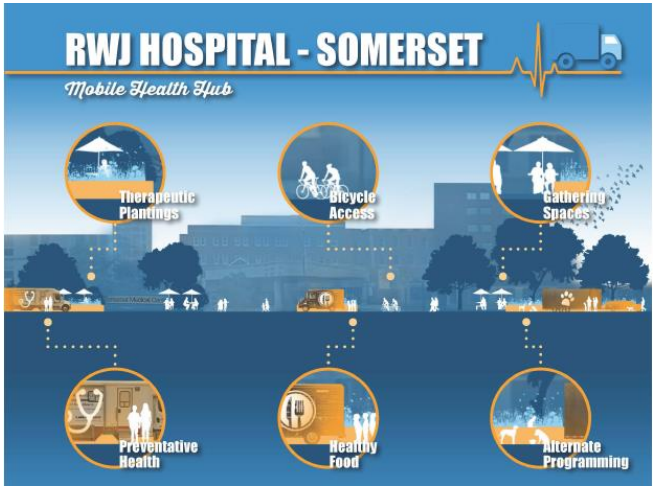
- Food access
- Food education
- Exercise and fitness
- Active lifestyle
- Access to healthcare
- Environmental education
- Mental health and stress
- Wildlife
- Lyme disease

Repetition is a clue

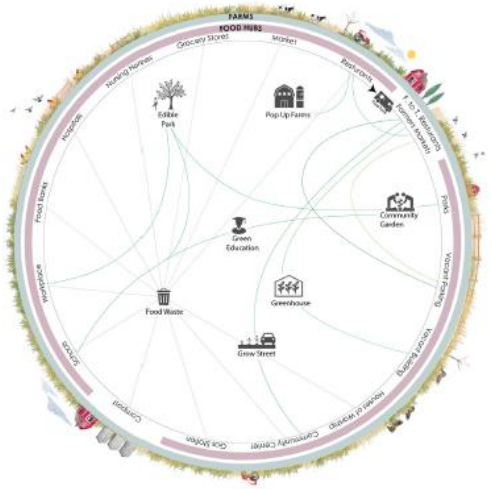
- Student design solutions repeatedly built on hospitals as hubs for access to multiple forms of expertise
- Reaching at-risk populations often featured guerilla designs or pop-up solutions
- Wellness was recognized as benefitting from integrated approaches
- Steps toward wellness were both intimate and regional
- Link between food and community
- Other deserts – park, clinic, nature, physical activity

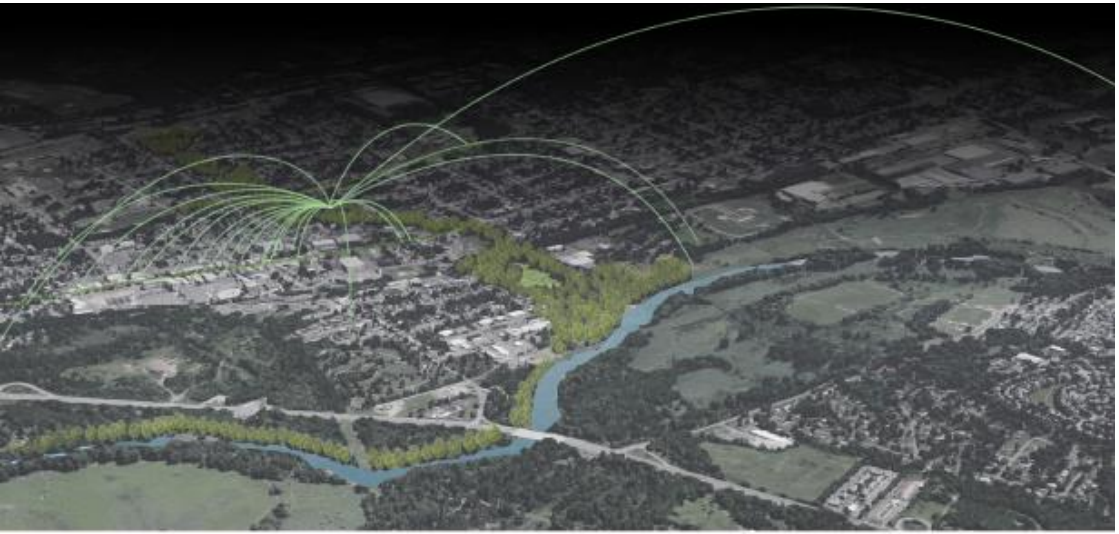
Alternatives - hubs



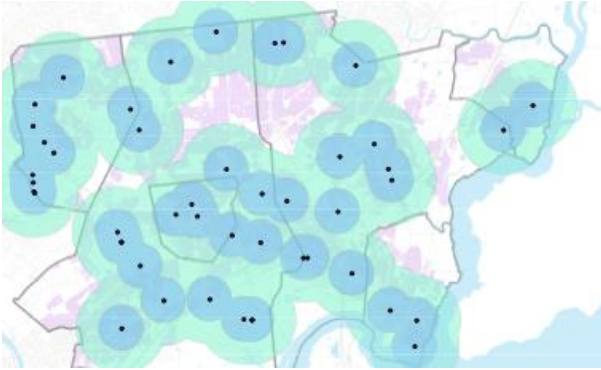


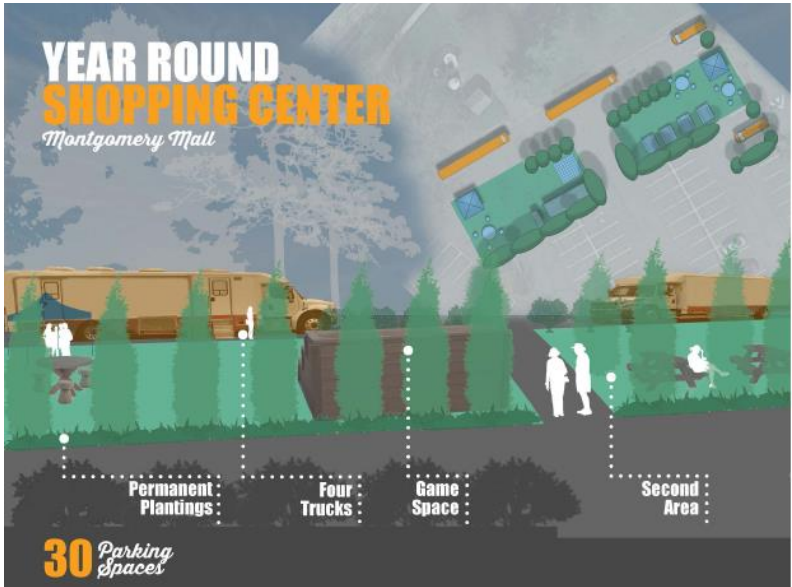
Alternatives - food





Alternatives – small solutions





Repeated returns to community

Moving forward

Impacts

- Research team is following children longitudinally (2008-2019)
- Research team is following changing landscape longitudinally (2008-2019)
- Collaboration with farmers market research team
- Somerset County Planning Board is rethinking county health plan
- Middlesex County is pursuing greenway expansions and prescription parks
- Colombian MoH is pursuing NSOAP

Bridging health research and design in studio

- Place really matters
- Volume versus detail
- Translations
  - Goes both ways
- Defensible or inspired?
- Still stumbling over that circle in the middle?
- Finding deeper connections – Surgical landscape as a metaphor

Acknowledgements

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  - Longjun Ju, Muzi Li, Bo Young Park, Megan Pilla, Andrew Schlesinger, Xiaoliang Zhao, Radhika Bhagwat, Meghan Collins, Donna M Dahringer, Tian Hao, Christopher Hewitt, Constantine Janulis, Sanja Martic, Katharine Patchowsky, Jennifer Ryan, Kimberly Tryba, Thomas Young
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- David Tulloch, Ph.D.
- Department of Landscape Architecture and
- Grant F. Walton Center for Remote Sensing and Spatial Analysis

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Thank you