Built Environment and Physical Activity: Emerging Research Opportunities to Promote Environmental Justice and Community Health

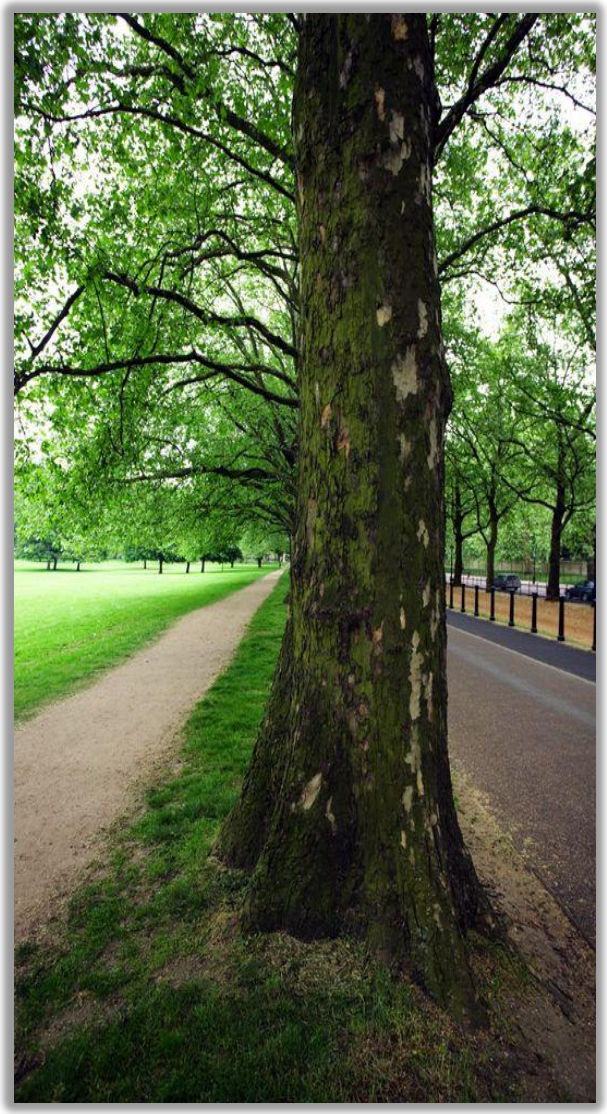
Andrew T. Kaczynski, PhD
Department of Health Promotion, Education and Behavior
Prevention Research Center
Arnold School of Public Health
University of South Carolina

Just a bit about Andy …

- Originally from Southwestern Ontario
- PhD from the Faculty of Applied Health Sciences at the University of Waterloo
- 3.5 years at Kansas State University
- 10 years at University of South Carolina
- Director, Built Environment and Community Health (BEACH) Laboratory (www.beachlab.sc.edu)
- Dad, tennis player, and craft beer lover
- PAPH Research Course Graduate 2008!

Presentation Outline

- **Overview of the built environment, environmental justice and physical activity**
- Methods for researching the built environment and physical activity
- Research opportunities
- Questions and discussion



Built Environment and Health

"Most of the communities where Americans live are important contributors to current public health problems. Simultaneously, they can also be the source of important solutions to these problems".

Frank, L. D., Engelke, P. O., & Schmid, T. L. (2003). *Health and community design: The impact of the built environment on physical activity*. Washington, DC: Island Press.

Why Target the Built Environment?

- Large numbers of people affected
- Relatively permanent effects
- Impacts active living behaviors, not just exercise-related physical activity
- More strongly related to moderate than vigorous physical activity
- Endorsements from IOM, CDC, AHA, AMA, AAP, etc.

Sallis, J. F., Cervero, R., Ascher, W. W., Henderson, K., Kraft, M.K., & Kerr, J. (2006). An ecological approach to creating active living communities. *Annual Review of Public Health, 27*, 297-322.

Environmental Justice[1]

- According to the U.S. Environmental Protection Agency, EJ involves:
  - fair treatment and meaningful involvement of all people regardless of race, colour, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies
  - everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work

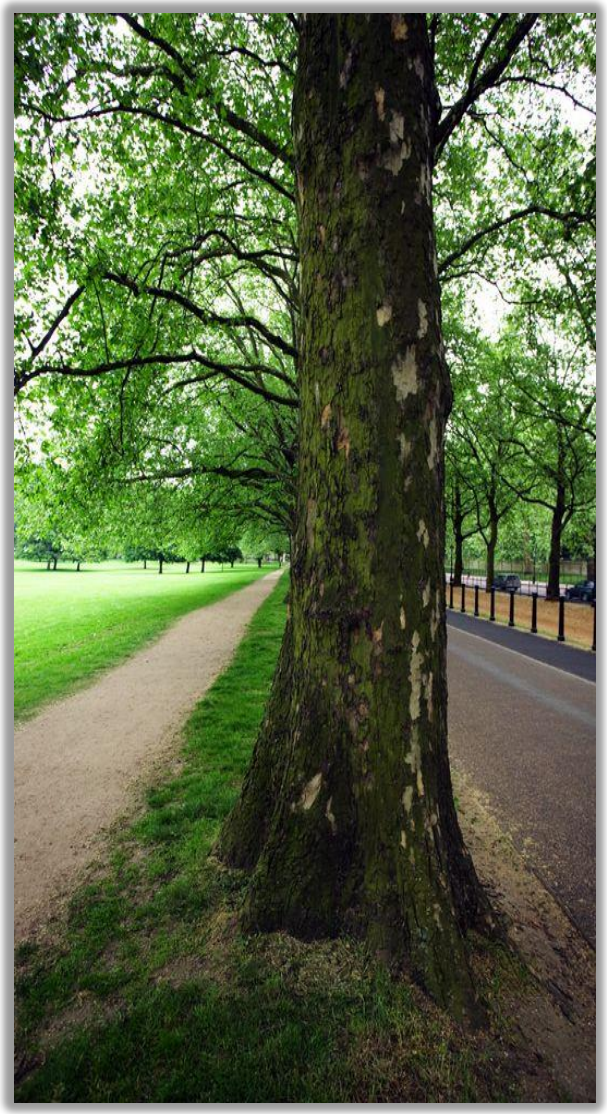
Deprivation Amplification[2]

- Persons with fewer personal resources that support physical activity and healthy eating (e.g., income, knowledge, etc.) tend to reside in areas that are more deprived of neighborhood physical activity and nutrition resources (e.g., sidewalks, park, grocery stores)

1. Taylor, W.C., Poston, W.S.C., Jones, L., & Kraft, M.K. (2006). Environmental justice: Obesity, physical activity, and health eating. *Journal of Physical Activity and Health, 3*(S1), 30-54.
2. Macintyre, S. (2007). Deprivation amplification revisited: Or, is it always true that poorer places have poorer access to resources for healthy diets and physical activity? *International Journal of Behavioural Nutrition and Physical Activity, 4*(32), 32-38.

Presentation Outline

- Overview of the built environment and physical activity
- **Methods for researching the built environment and physical activity**
- Research opportunities
- Questions and discussion



Methods for Measuring the Built Environment

The primary methods used to measure characteristics of the built environment that may be related to physical activity include:

- Perceptions of residents (e.g., surveys)
- Direct observation (e.g., audits)
- Geographic databases (e.g., GIS)

Brownson, R.C., Hoehner, C.M., Day, K., Forsyth, A., & Sallis, J.F. (2009). Measuring the built environment for phsyical activity: state of the science. *American Journal of Preventive Medicine, 3(4 suppl),* S99-123.

Neighborhood Environment Walkability Scale (NEWS)

- One of the first and most widely used self-report measures for assessing neighborhood walkability perceptions
- In the abbreviated version, seven dimensions assessed using 56 questions:
  - residential density
  - land use mix – diversity
  - land use mix – access
  - street connectivity
  - walking/cycling facilities
  - aesthetics
  - safety

- Adequate to good test-retest reliability and validity
- Numerous other studies since reporting NEWS adaptations and properties

Saelens, B.E., Sallis, J.F., Black, J.B., & Chen, D. (2003). Neighborhood-based differences in physical activity: An environmental scale evaluation. *American Journal of Public Health, 93*(9), 1552-1558.

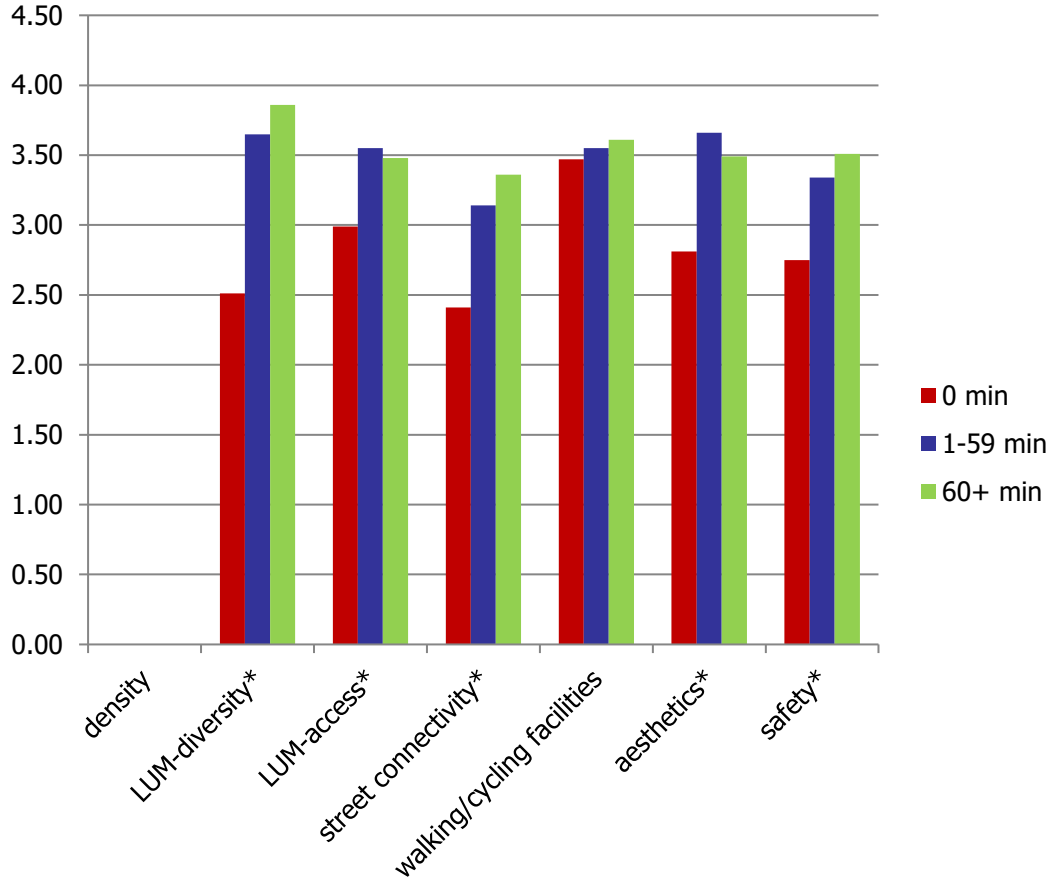
NEWS and Neighborhood-Based Physical Activity

- NEWS used to collect neighborhood perceptions data from 585 residents of four neighborhoods; also measured *neighborhood* moderate-intensity PA

- People reporting some PA in their neighborhood had more positive perceptions on most dimensions than people reporting no PA in their neighborhood (see graph)

- However, NEWS scores <u>not</u> different between those reporting *some* neighborhood PA and those reporting *a lot*

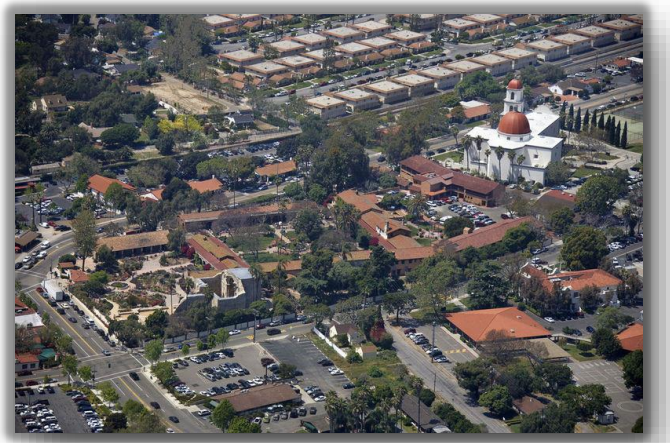
- Neighborhood gets people "off the couch"?



Kaczynski, A.T. (2010). Neighborhood walkability perceptions: Associations with amount of neighborhood-based physical activity by intensity and purpose. *Journal of Physical Activity and Health*, *7*, 3-10.

Microscale Audit of Pedestrian Streetscapes (MAPS) tool

- Tool developed in three metropolitan areas (Baltimore, MD/Washington, DC, San Diego, CA, and Seattle, WA) and included neighborhoods representing a wide range of urban design and incomes to assess details of streetscapes considered relevant for physical activity
- Multiple versions designed for researchers (MAPS-Full), researchers and advanced practitioners (MAPS-Abbreviated), and community members (MAPS-Mini)
- Four sections of the tool: overall route, street segments (defined as the area between crossings), crossings, and cul-de-sacs
- Microscale factors are collected, such as road crossing features, presence of trees, bicycle lanes, curbs, and characteristics of the social environment (e.g., stray dogs, graffiti, trash)
- MAPS items and subscales predominantly demonstrated moderate to excellent reliability



Millstein, R.A., Cain, K.L., Sallis, J.F. et al. (2013). Development, scoring, and reliability of the Microscale Audit of Pedestrian Streetscapes (MAPS). BMC Public Health 13, 403.

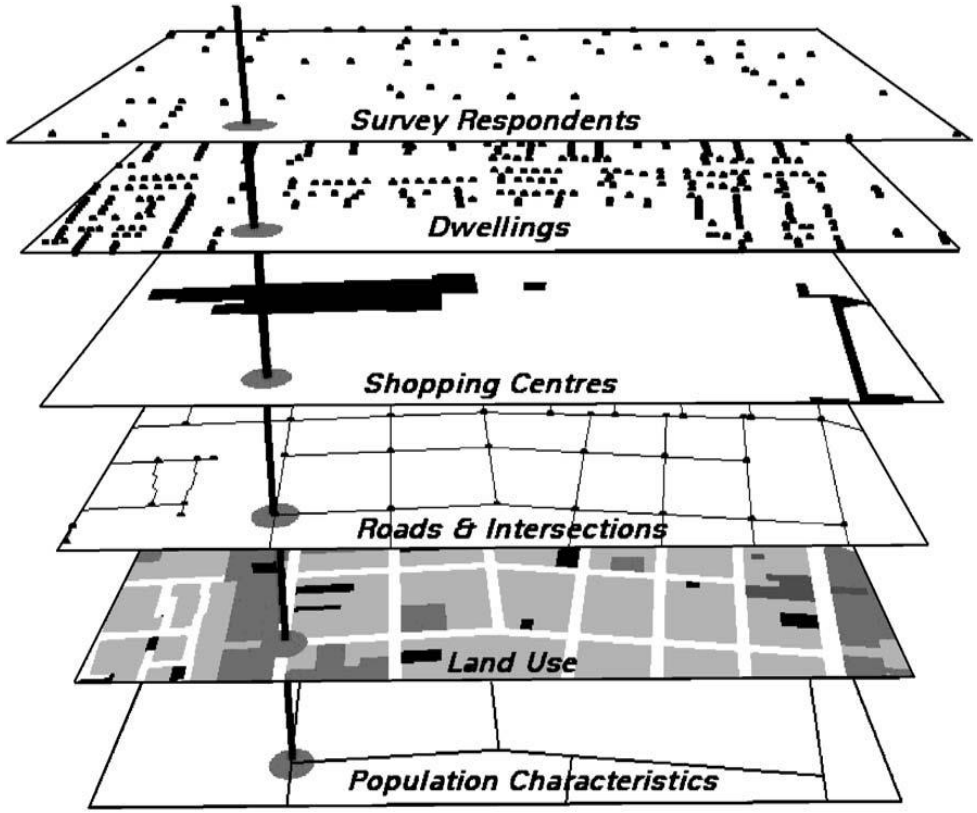
Microscale Audit of Pedestrian Streetscapes (MAPS) tool

- Examined associations of microscale attributes with multiple physical activity (PA) measures across four age groups – children, adolescents, adults, older adults
- 3,677 participants in San Diego, Seattle, and Baltimore
- Walking/biking for transport and leisure PA were measured with surveys; objective PA measured with accelerometers
- Microscale attributes were consistently found to be associated with walking or biking for transport
- Overall aesthetics was negatively associated with walking for transportation for adults/older adults
  - Overall aesthetics was positively associated with leisure time PA of children and adults

Cain, K.L., Millstein, R.A., Sallis, J.F., Conway, T.L., Gavand, K.A., Frank, L.D., Saelens, B.E., Geremia, C.M., Chapman, J., Adams, M.A., Glanz, K., King, A.C. (2014). Contribution of Streetscape Audits to Explanation of Physical Activity in Four Age Groups Based on the Microscale Audit of Pedestrian Streetscapes (MAPS), *Social Science & Medicine, 116*, 82-92

Geographic Information Systems (GIS)

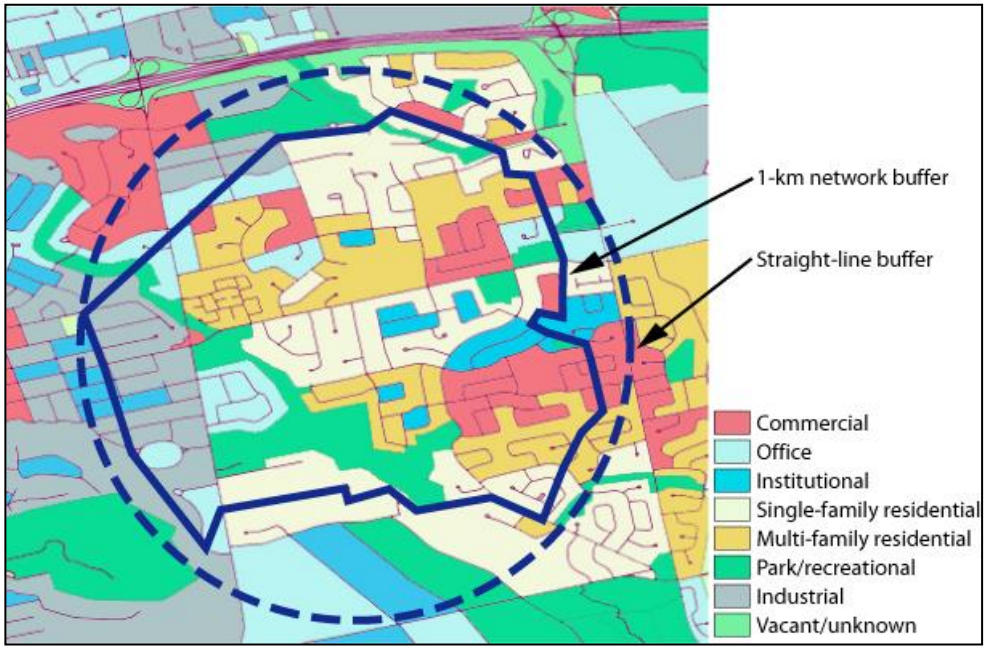
- GIS are a bundle of software programs combining mapping and database tools
- A GIS runs off 'shape' files composed of multiple layers of individual features
- Layers can be:
  - Points (e.g., homes, stores, centers of parks)
  - Lines (e.g., streets, rivers)
  - Polygons (e.g., parks, parcels of land)
- All features within a layer are 'stored' in an attribute table (like an Excel worksheet) with common geographic coordinates



Leslie, E., Coffee, N., Frank, L., Owen, N., Bauman, A., & Hugo, G. (2007). Walkability of local communities: Using geographic information systems to objectively assess relevant environmental attributes. *Health & Place, 13*(1), 111-122.

Geographic Information Systems (GIS)

- Common applications of GIS in built environment research include:
  - calculating distance between environmental features (e.g., home to nearest grocery store or park)
  - relating features and behavior (e.g., comparing physical activity in neighborhoods with differing land use patterns)
  - overlaying data about two or more neighborhood characteristics (e.g., junk food consumption and convenience store access)
  - seeing if an outcome is spatially clustered (e.g., obesity)



Multicomponent Obesogenic Built Environment Measure for Youth

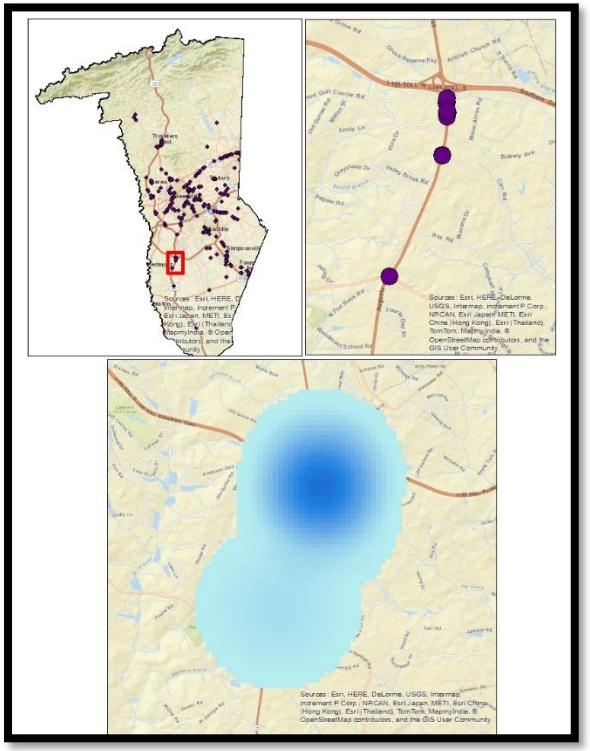
- Development of a unique methodology to quantify the obesogenic built environment for youth; used to examine the association between youth obesity, race/ethnicity, socioeconomic status, and level of urbanization

- Data collected from Greenville County, SC
  - 3rd, 4th, and 5th grade youth BMI, SES, and home address
  - Demographic data for block groups

- Park data collected via the Community Park Audit Tool and scored by summing sub-components from the tool

- Food environment developed from geocoded listings of food stores and restaurants from SC DHEC and InfoUSA

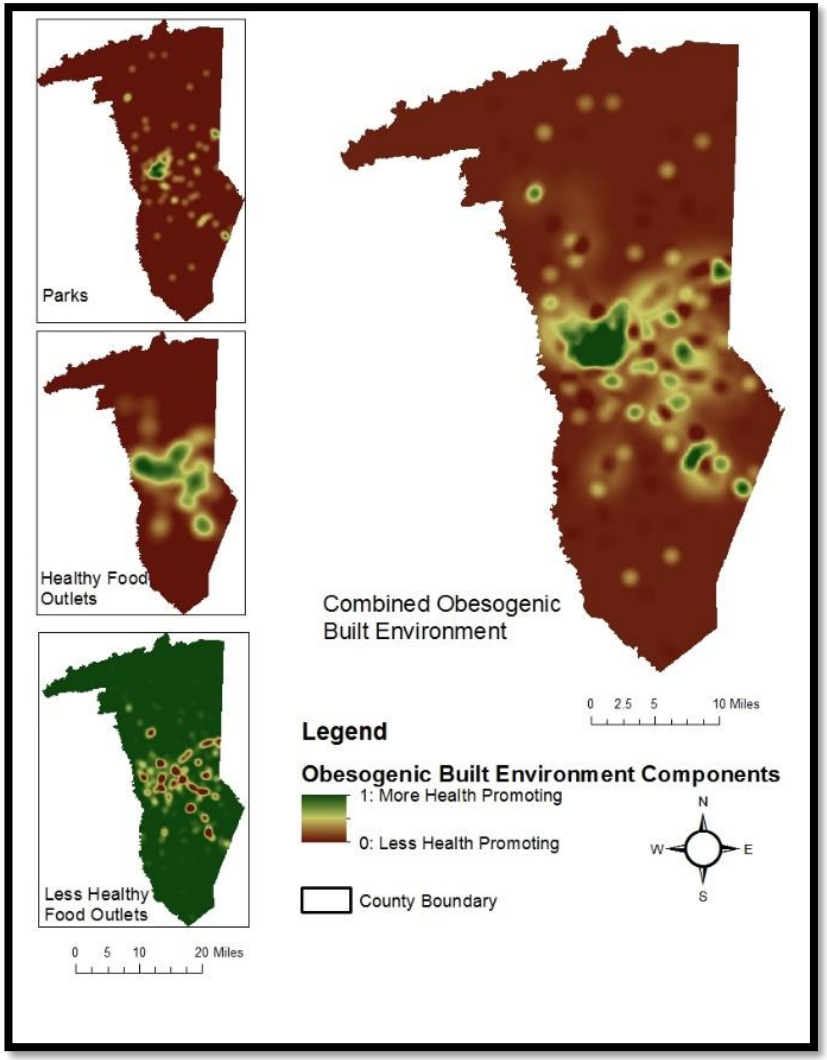
- Utilized kernel density measures to transform data points to a raster surface



Hughey, S. M., Kaczynski, A. T., Porter, D. E., Hibbert, J., Turner-McGrievy, G., & Liu, J. (2019). Development and testing of a multicomponent obesogenic built environment measure for youth using kernel density estimations. *Health & Place*, *56*, 174–183.

Multicomponent Obesogenic Built Environment Measure for Youth

- Obesogenic environments quantified into three components: Parks, Healthy Food Outlets, and Less Healthy Food Outlets
- Weighted so that both PA and nutrition each comprised 50% of the total score
- Multilevel linear regression to test for associations between BE and sociodemographic and BMI scores
- Supportive BE was associated with lower weight status among youth ($\beta = -0.25$, $p < 0.05$)



Hughey, S. M., Kaczynski, A. T., Porter, D. E., Hibbert, J., Turner-McGrievy, G., & Liu, J. (2019). Development and testing of a multicomponent obesogenic built environment measure for youth using kernel density estimations. *Health & Place*, *56*, 174–183.

GPS & Greenspace Use in Children's Physical Activity

- How much of children's physical activity occurs within different types of urban greenspace and how does this activity contribute to total levels of non-school PA?
- Both GPS and accelerometer data collected from adolescents in Bristol, UK
- Majority of activity took place indoors, with 26.4% (weekday evening) & 17.6% (weekend) of MVPA occurring outdoors and within Bristol
- Larger percentage of outdoor MVPA took place in greenspaces on the weekend and the percentage of outdoor MVPA within parks was also higher on the weekend (except sport areas)
    - Some children are particularly high users of greenspace for play and PA; therefore, greenspace use may be an important contributor to overall PA levels

Lachowycz, K., Jones, A.P., Page, A.S., Wheeler, B.W., & Cooper, A.R. (2012). What can global positioning systems tell us about the contribution of different types of urban greenspace to children's physical activity? *Health & Place, 18, 586-594.*

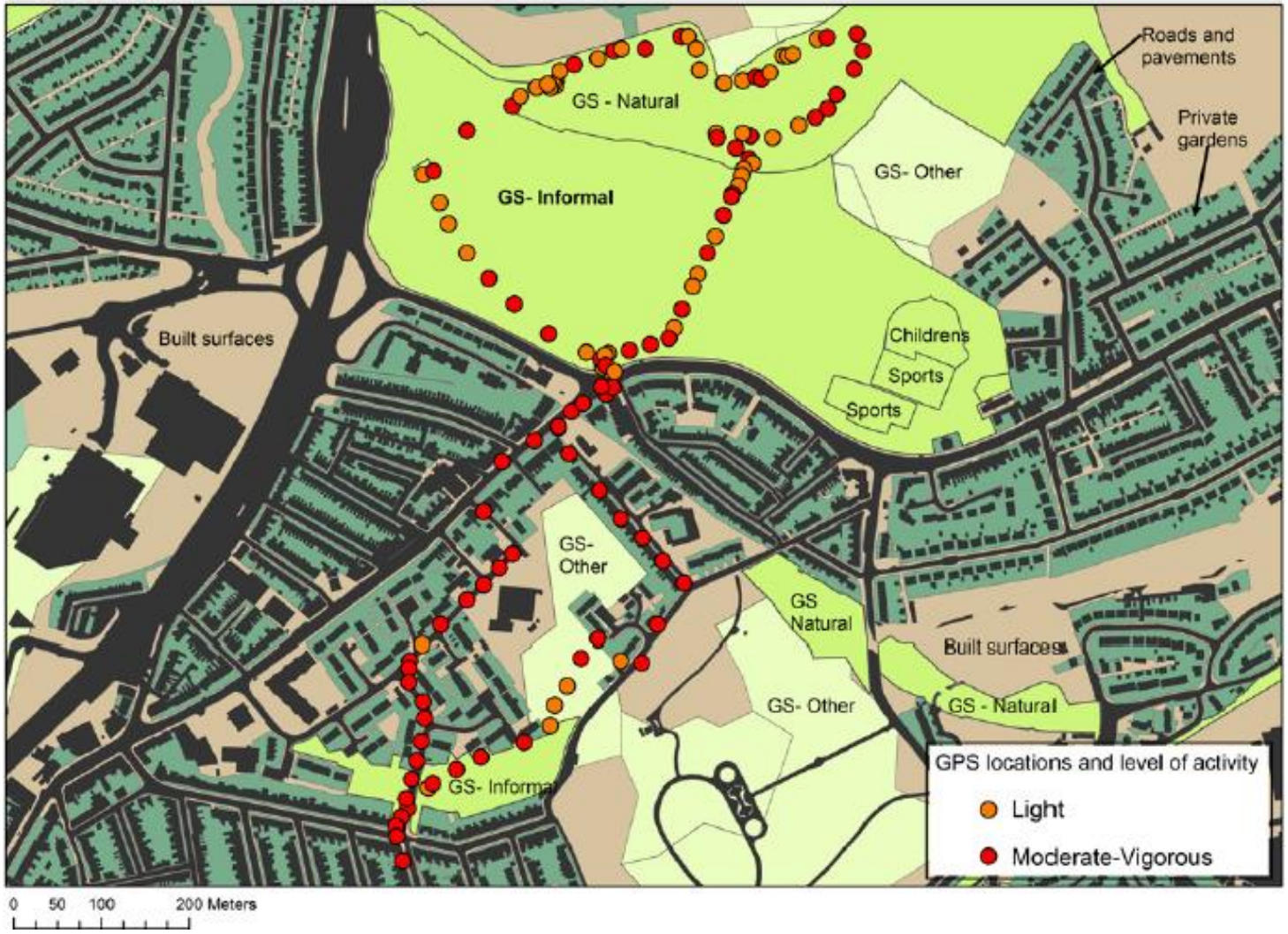
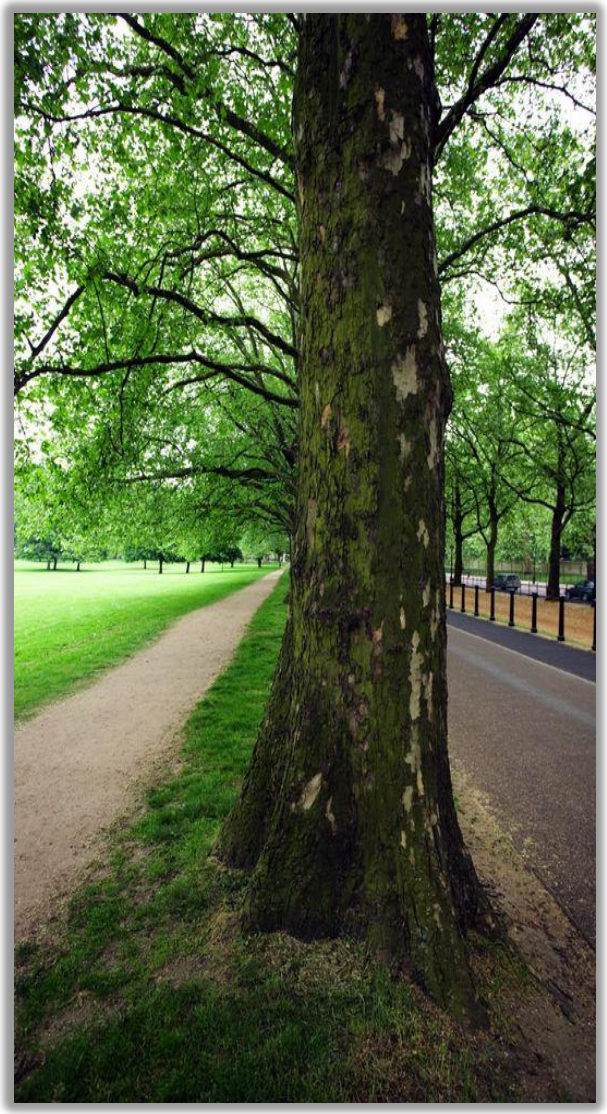


Fig. 1. An example of data collected from one child during one hour on a weekday evening, showing GPS locations and intensity of physical activity. GS=Greenspace. Data Crown Copyright© OrdnanceSurvey. Used under licence.

Lachowycz, K., Jones, A.P., Page, A.S., Wheeler, B.W., & Cooper, A.R. (2012). What can global positioning systems tell us about the contribution of different types of urban greenspace to children's physical activity? *Health & Place, 18, 586-594.*

Presentation Outline

- Overview of the built environment and physical activity
- Methods for researching the built environment and physical activity
- Research opportunities
  - **Leveraging technology**
  - Engaging citizens
  - Analyzing big data
  - Environmental surveillance
  - Taking advantage of natural experiments
- Questions and discussion



Influence of BE Features on Pedestrian Physiological Responses

- Tested a novel approach to assess conditions of walkable environments using body responses
  - Also examined the association between built environment and PA
- Physiological data – gait stability, gait acceleration, relative heart rate
- 30 individuals (15 men, 15 women) in Lincoln NE, November 2017
  - Walked a street segment with monitors (smartphone, IUM sensor, and physiological response collector)
  - Subjective ratings of street segments on walkability features
- Significant positive relationships between physiological responses and built environment features and subjective ratings

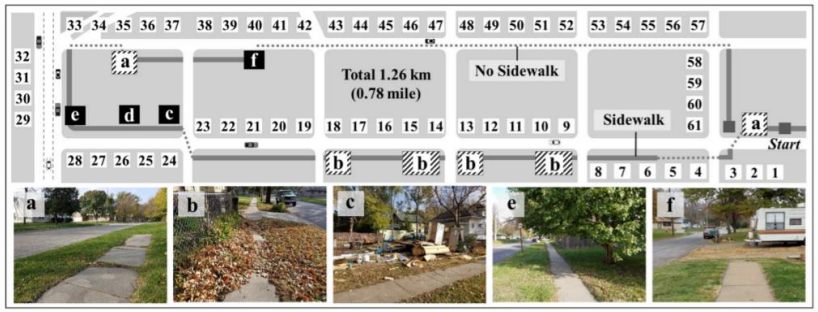
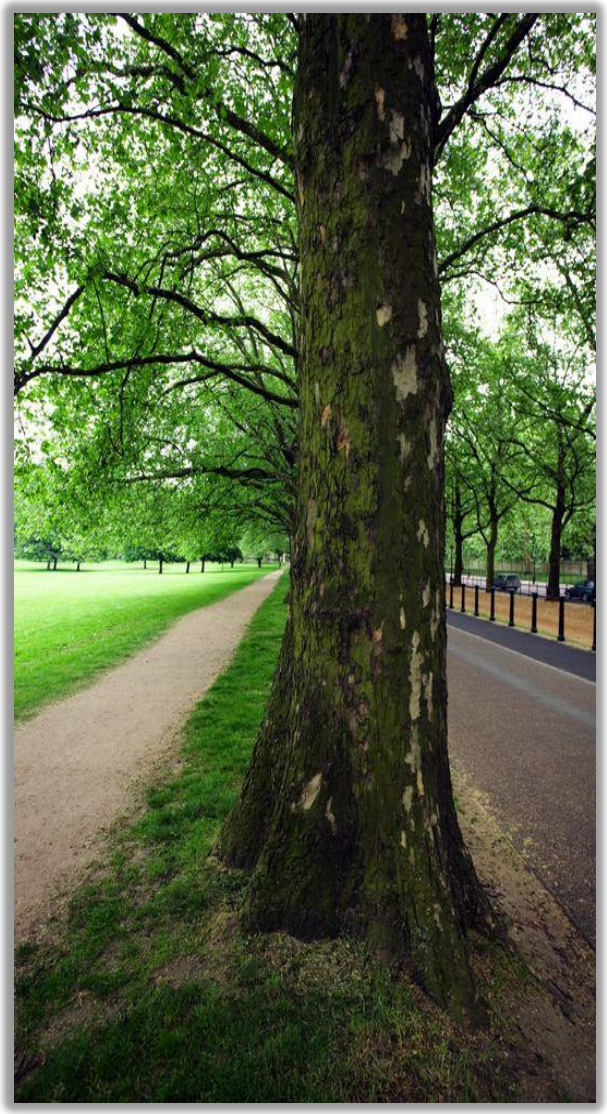


Fig. 1. Terrain rendering and built environment features; (a) uneven sidewalk; (b) dead branches and leaves overhanging a sidewalk; (c) partially-demolished house; (d) barking dogs; (e) tree limb; and (f) a container for gas storage.

Kim, J., Ahn, C. R., & Nam, Y. (2019). The influence of built environment features on crowdsourced physiological responses of pedestrians in neighborhoods. *Computers, Environment and Urban Systems, 75*, 161–169.

Presentation Outline

- Overview of the built environment and physical activity
- Methods for researching the built environment and physical activity
- Research opportunities
  - Leveraging technology
  - **Engaging citizens**
  - Analyzing big data
  - Environmental surveillance
  - Taking advantage of natural experiments
- Questions and discussion



Harnessing Technology and Citizen Science to Support Active Neighborhoods

- A pilot test of the 'Our Voice' approach in Cuernavaca, Mexico with adults and adolescents
  - Involved neighborhood residents acting as "citizen scientists" to systematically gather information on barriers and facilitators to PA using the Discovery Tool
  - Goal was to examine acceptability and feasibility of the citizen scientist approach
- 32 adults, 9 adolescents participated as citizen scientists
  - Responded to surveys that assessed sociodemographic information, self-efficacy for using the Discovery Tool, NEWS-A, and acceptability of using the Discovery Tool
- Overall self-efficacy for using the Discovery Tool was higher among adolescents than adults (9.3 vs. 7.7, $p < 0.01$)
- Rated five of the nine acceptability survey items with an average of 4.0 or higher out of 5.0
  - Engagement and acceptability of the approach were highest in neighborhoods characterized by low SES and low walkability

Rosas, L. G., Salvo, D., Winter, S. J., Cortes, D., Rivera, J., Rodriguez, N. M., & King, A. C. (2016). Harnessing Technology and Citizen Science to Support Neighborhoods that Promote Active Living in Mexico. *Journal of urban health*, *93*(6), 953–973.

Stress experiences in neighborhood and social environments (SENSE): A pilot study to integrate the quantified self with citizen science to improve the built environment and health

- Aimed to determine the initial feasibility and utility of adding biometric sensor data to the built environment data collected with the Discovery Tool app to collect photos and audio narratives of the built environment that contributed to or detracted from well-being
- 14 adults (8 women, 6 men) in San Francisco participated in a 20-25 minute walk utilizing the Discovery Tool; biometric data collected via electrodermal activity monitor (EDA)
- Geospatial technology identified that positive image clusters represented 4.3% of the route, while negative image clusters represented 2.7% of the route
  - Average participant EDA levels observed inside a positive cluster were significantly higher than those observed elsewhere

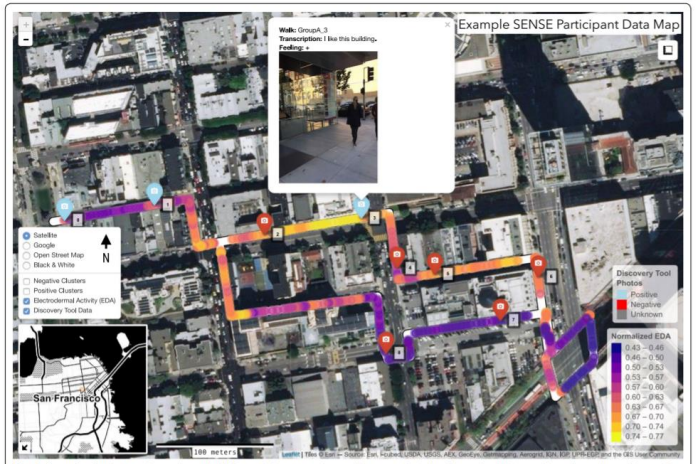
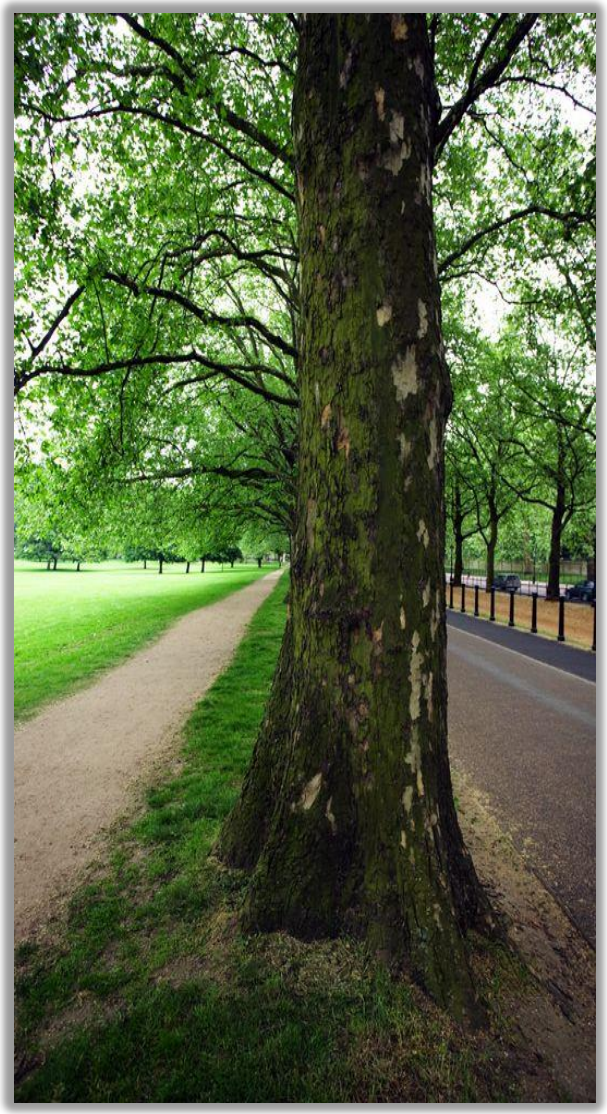


Fig. 1 Example of an interactive webpage built for participants to view and interpret their data. The red and blue markers show where this specific participant took photographs with the DT app. The participant's path is color-coded by their EDA level, from dark purple to yellow (low to high). The complete html file and underlying R code has been uploaded as Additional files 1 and 2

Chrisinger, B.W., & King, A.C. (2018). Stress experiences in neighborhood and social environments (SENSE): a pilot study to integrate the quantified self with citizen science to improve the built environment and health. *Int J Health Geogr* 17**,** 17.

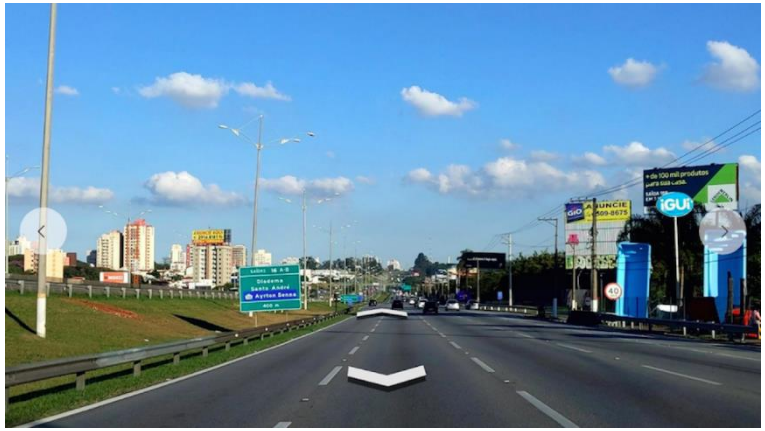
Presentation Outline

- Overview of the built environment and physical activity
- Methods for researching the built environment and physical activity
- Research opportunities
  - Leveraging technology
  - Engaging citizens
  - **Analyzing big data**
  - Environmental surveillance
  - Taking advantage of natural experiments
- Questions and discussion



Deriving Built Environment Indicators with Google Street View

- Examined associations between select neighborhood built environment indicators and health outcomes, at the state level
  - BE Indicators: crosswalks, non-single family homes, single lane roads, visible wires
  - 12 health outcomes, including obesity/overweight, diabetes, PA, premature mortality
- 31,247,167 images collected from Google Street View
- Health outcome data obtained from CDC
- BE indicators aggregated into 3 tertiles
  - Low, medium, high
  - High = states with the most of that BE indicator



- More crosswalks predicted lower levels of obesity among adults and children
- More visible wires predicted increased rates of obesity and decreased rates of PA among adolescents

Phan, L., Yu, W., Keralis, J. M., Mukhija, K., Dwivedi, P., Brunisholz, K. D., … Nguyen, Q. C. (2020). Google Street View Derived Built Environment Indicators and Associations with State-Level Obesity, Physical Activity, and Chronic Disease Mortality in the United States. *International Journal of Environmental Research and Public Health*, *17*(10), 3659.

Association between Streetscapes and Human Walking Activities using Google Street View and Human Trajectory Data

- Investigated the interaction between walking behaviors and physical characteristics of the environment in Boston (street canyons and visibility of greenery)
- Data collected via smartphone data for walking behaviors and Google Street View (Walk Score and OpenStreetMap data also used)
- Data from 6,000 anonymous users (300,000+ trips) between May 2014-May 2015
- Street greenery and enclosure of street canyons were significantly associated with walking behaviors
- Associations between walking behaviors and streetscape variables varied by land use types

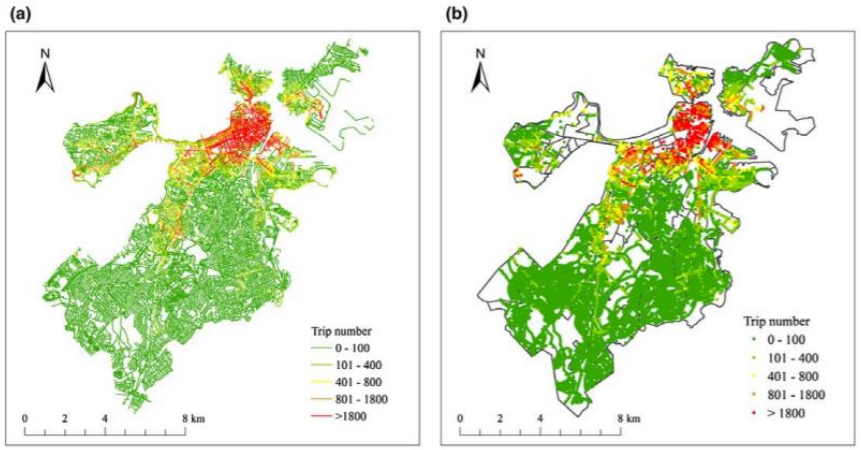
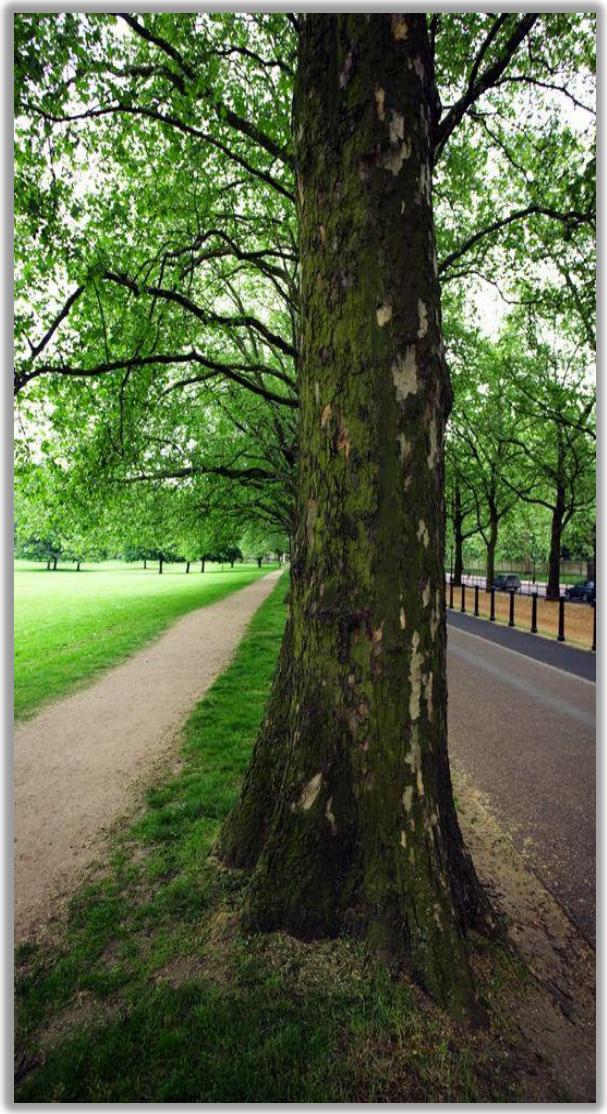


FIGURE 4 The spatial distributions of the trip number at street level and site level in Boston

Li, X., Santi, P., Courtney, T. K., Verma, S. K., & Ratti, C. (2018). Investigating the association between streetscapes and human walking activities using Google Street View and human trajectory data. *Transactions in GIS, 22*(4), 1029–1044.

Presentation Outline

- Overview of the built environment and physical activity
- Methods for researching the built environment and physical activity
- Research opportunities
  - Leveraging technology
  - Engaging citizens
  - Analyzing big data
  - **Environmental surveillance**
  - Taking advantage of natural experiments
- Questions and discussion



Development of a Childhood Obesogenic Environment Index

- No large-scale measures exist characterizing environments that pose a risk for obesity
- Are such environments worse in rural areas?
- Funded by HRSA/Federal Office of Rural Health Policy
- Project objectives:
  - Develop an obesogenic environment index score for all U.S. counties
  - Explore differences in obesogenic environment scores by factors such as region, rurality, income, etc.

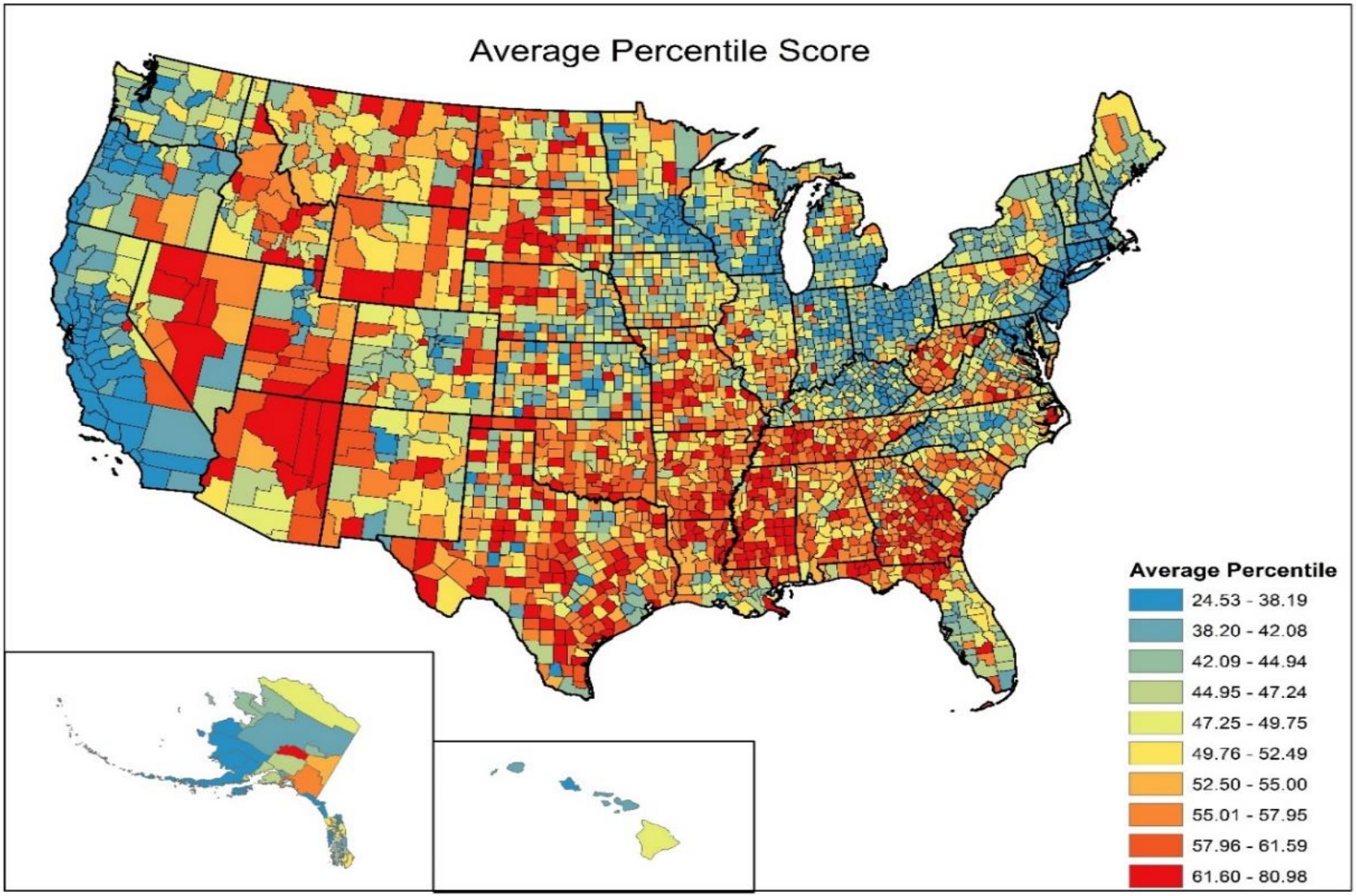
Kaczynski, A.T., Eberth, J.M., Stowe, E.W., Wende, M.E., Liese, A.D., McLain, A.C., Breneman, C.B., & Josey, M.J. (2020). Development of a national childhood obesogenic environment index in the United States: Differences by region and rurality. *International Journal of Behavioral Nutrition and Physical Activity*, *17*: 83.

Developing a County-Level Obesogenic Environment Index

- Comprehensive search of review articles (n=20) that summarized associations between the environment and its impact on nutrition, physical activity, and overweight/obesity levels in youth
- Experts (n=12) provided ratings and input on 24 identified variables with respect to importance, potential data sources, etc.
- Extensive discussion and expertise of project team to refine variable list
- Data obtained for all counties (n=3148) from USDA, County Health Rankings, etc.

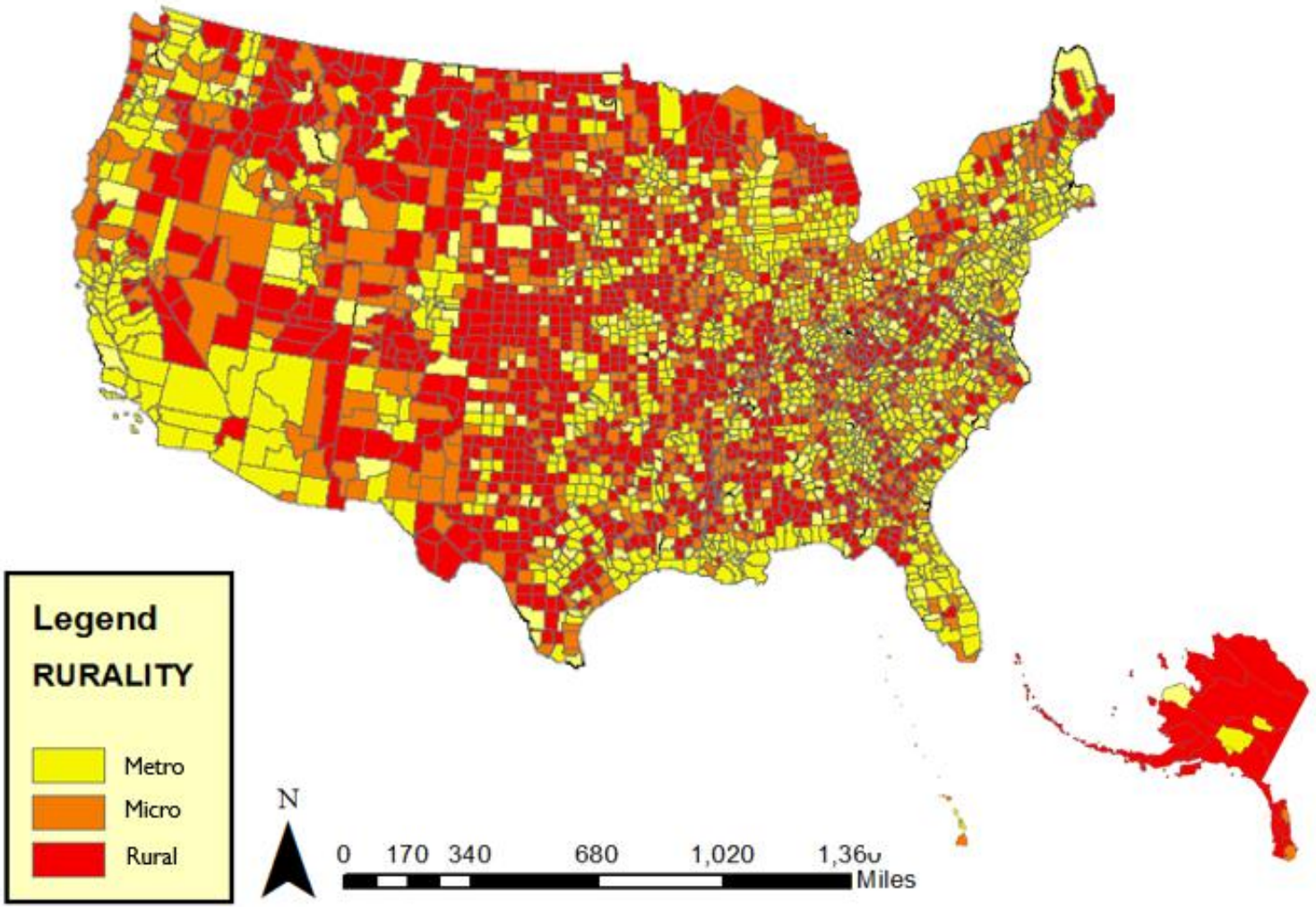
Variables in the Childhood Obesogenic Environment Index
Grocery stores and superstores*
Farmers markets*
Fast food restaurants
Full-service restaurants
Convenience stores
Births at baby-friendly facilities*
Exercise opportunities*
School proximity*
Walkability*
Violent crime
* Variable was reverse scored such that higher values for all variables indicate a more obesogenic environment

Total obesogenic environment index score generated by calculating the average percentile for all 10 variables.



Kaczynski, A.T., Eberth, J.M., Stowe, E.W., Wende, M.E., Liese, A.D., McLain, A.C., Breneman, C.B., & Josey, M.J. (2020). Development of a national childhood obesogenic environment index in the United States: Differences by region and rurality. *International Journal of Behavioral Nutrition and Physical Activity*, *17*: 83.

Rurality of United States Counties



Urban-rural differences in obesogenic environment scores

Childhood Obesogenic Environment Index by County Rurality	
	Average Percentile (SD)
Metropolitan Counties	46.5[a] (8.4)
Micropolitan Counties	50.3[b] (8.1)
Rural Counties	52.9[c] (8.8)
ANOVA F statistic	175.86
ANOVA p-value	<.0001

Note: a larger percentile indicates a more obesogenic environment

Means with different superscript letters indicate significant differences at the p<.05 level

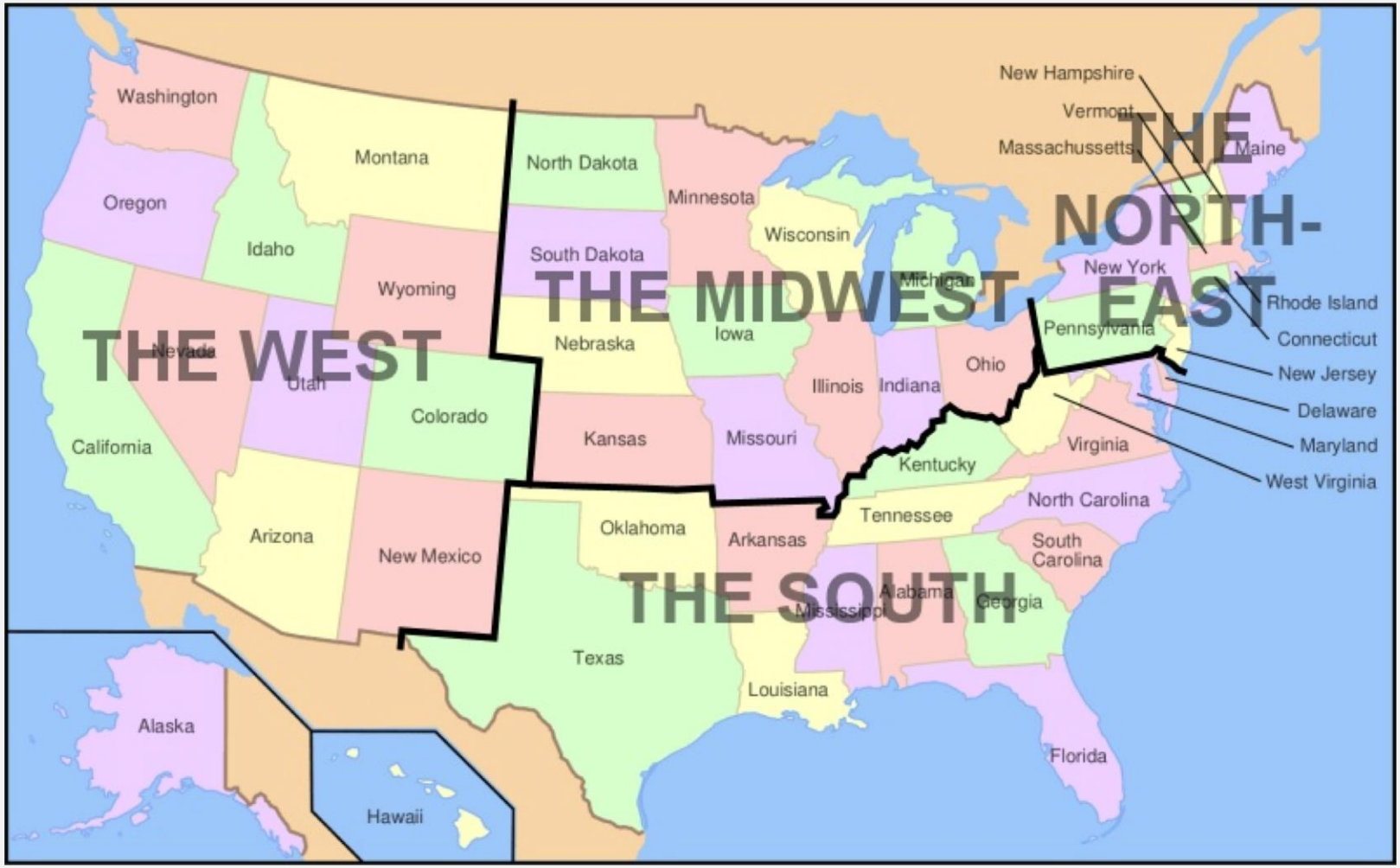
Kaczynski, A.T., Eberth, J.M., Stowe, E.W., Wende, M.E., Liese, A.D., McLain, A.C., Breneman, C.B., & Josey, M.J. (2020). Development of a national childhood obesogenic environment index in the United States: Differences by region and rurality. *International Journal of Behavioral Nutrition and Physical Activity*, *17*: 83.

Childhood Obesogenic Environment Index Variable Percentiles by County Rurality			
	Metropolitan Counties	Micropolitan Counties	Rural Counties
Grocery stores/superstores[a]	62.6	54.7	36.8
Farmers markets[a]	54.3	47.0	47.7
Fast food restaurants	56.8	56.7	40.9
Full-service restaurants	45.6	50.1	53.8
Convenience stores	36.0	50.2	62.1
Births at baby friendly facilities[a]	46.3	48.1	54.1
Exercise opportunities[a]	38.6	48.0	60.9
School proximity[a]	28.4	48.1	69.8
Walkability[a]	39.8	46.2	60.8
Violent crime	56.9	54.3	41.4
Average percentile	**46.5**	**50.3**	**52.9**

Note: a larger percentile indicates a more obesogenic environment

[a]Variable was reverse scored such that higher values indicate unhealthier environments for all variables)

Regions of the United States



Differences by U.S. region in obesogenic environment scores

Childhood Obesogenic Environment Index by Region	
	Average Percentile (SD)
Northeast	43.2[a] (6.9)
Midwest	48.1[b] (8.5)
South	53.0[c] (8.3)
West	48.4[b] (9.8)
ANOVA F statistic	130.43
ANOVA p-value	<.0001

Note: a larger percentile indicates a more obesogenic environment

Means with different superscript letters indicate significant differences at the p<.05 level

Kaczynski, A.T., Eberth, J.M., Stowe, E.W., Wende, M.E., Liese, A.D., McLain, A.C., Breneman, C.B., & Josey, M.J. (2020). Development of a national childhood obesogenic environment index in the United States: Differences by region and rurality. *International Journal of Behavioral Nutrition and Physical Activity*, *17*: 83.

Average Childhood Obesogenic Environment Index Variable Percentile Rank by U.S. Region				
	Northeast	Midwest	South	West
Grocery stores/superstores[a]	42.8	45.7	56.9	41.8
Farmers markets[a]	39.1	43.5	58.1	45.5
Fast food restaurants	61.3	45.4	51.1	52.0
Full-service restaurants	67.5	57.2	38.1	62.2
Convenience stores	35.2	48.1	57.8	37.0
Births at baby friendly facilities[a]	45.5	53.5	49.4	45.7
Exercise opportunities[a]	38.6	47.7	56.6	40.0
School proximity[a]	25.5	52.6	45.6	69.7
Walkability[a]	31.8	46.3	59.4	37.7
Violent crime	45.6	39.8	57.2	52.5
Average percentile	**43.2**	**48.1**	**53.0**	**48.4**

Note: a larger percentile indicates a more obesogenic environment

[a]Variable was reverse scored such that higher values indicate unhealthier environments for all variables)

Obesogenic Environment Differences by Rurality AND Region

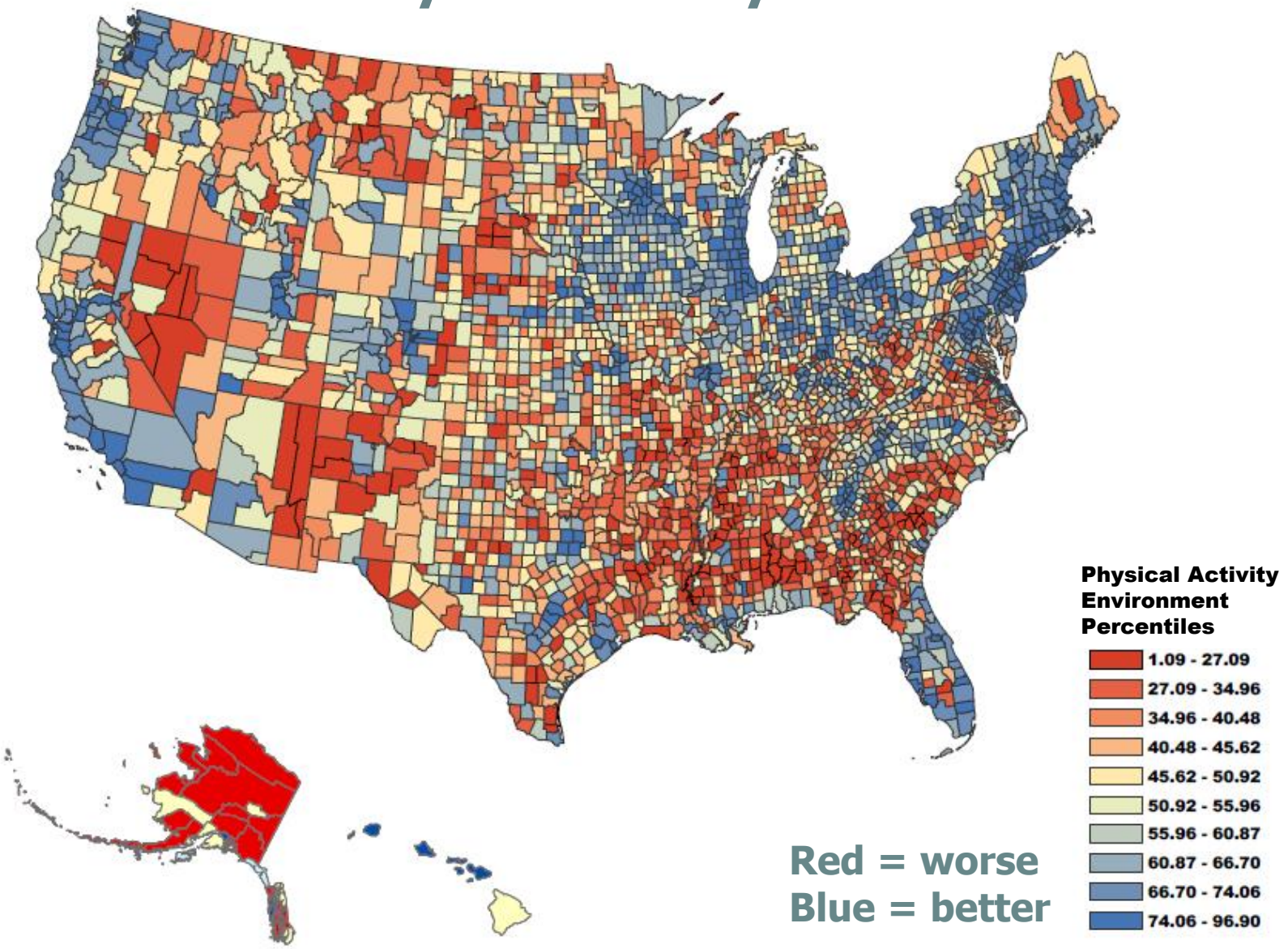
Childhood Obesogenic Environment Index by County Rurality and U.S. Region

	Northeast	Midwest	South	West
Metropolitan Counties	40.5[a]	43.7[a]	50.1[a]	43.0[a]
Micropolitan Counties	45.1[b]	47.0[b]	54.8[b]	48.9[b]
Rural Counties	49.4[c]	51.1[c]	55.2[b]	51.8[c]
ANOVA F statistic	38.31	89.81	67.88	40.19
ANOVA p-value	<.0001	<.0001	<.0001	<.0001
ANOVA interaction term F statistic	82.07			
ANOVA interaction term p value	<.0001			

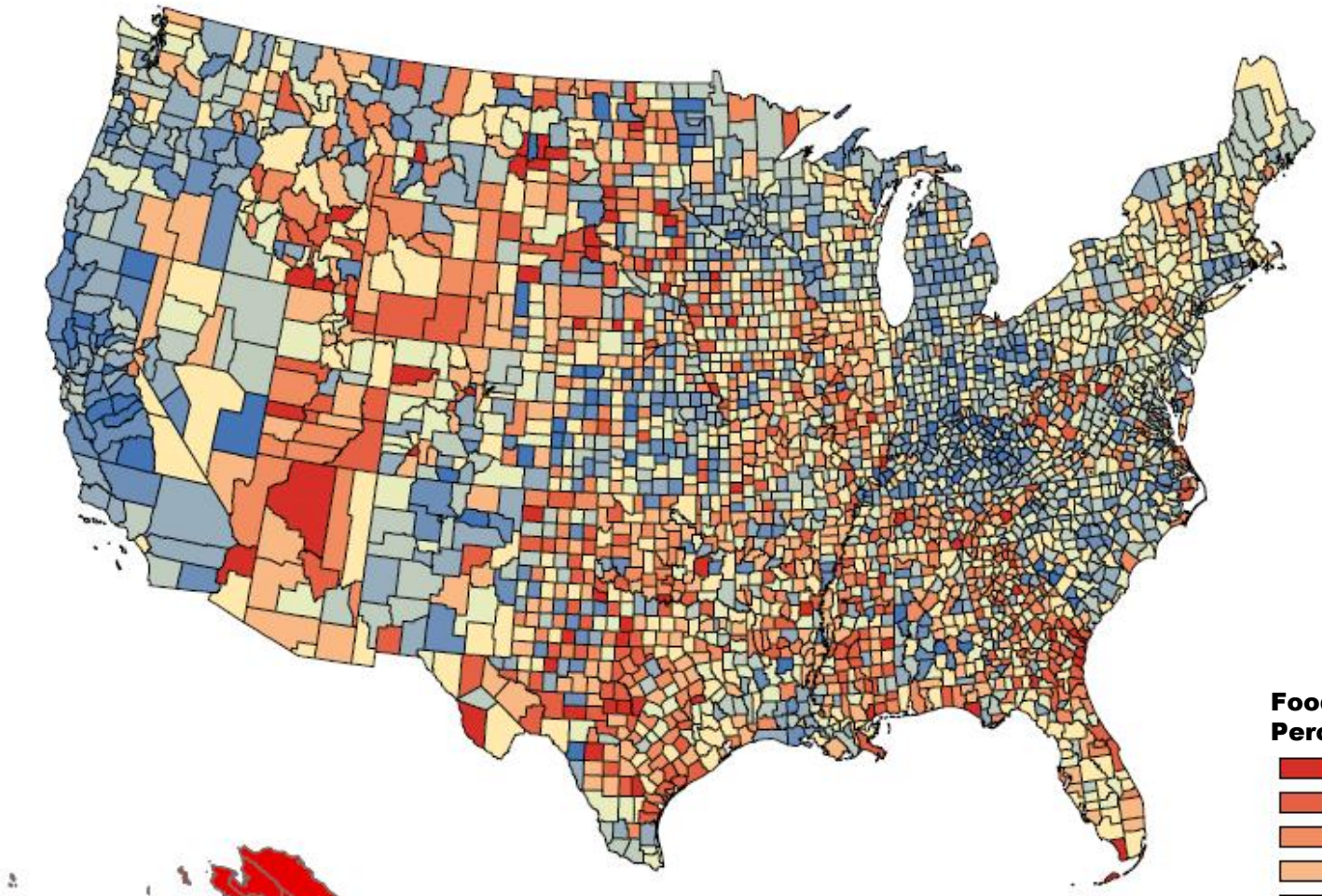
Notes: A larger percentile rank indicates a more obesogenic environment.

Means with different superscript letters indicate significant differences at the $p<.05$ level

Physical Activity Environment



Food Environment



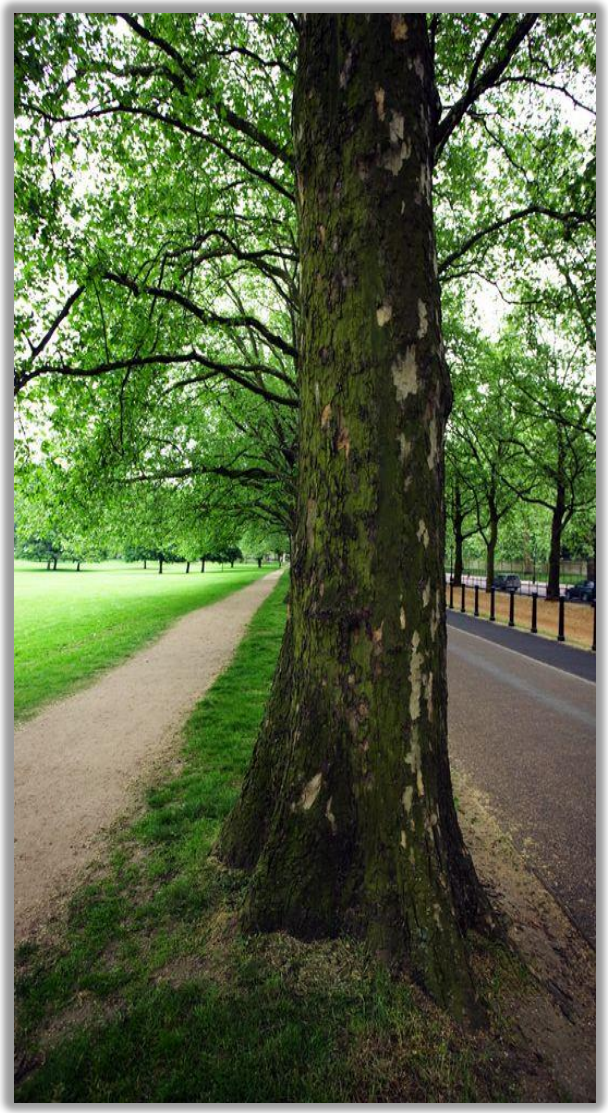
Food Environment Percentiles

- 12.50 - 29.73
- 29.73 - 36.56
- 36.56 - 41.74
- 41.74 - 46.44
- 46.44- 50.50
- 50.50 - 54.38
- 54.38 - 58.82
- 58.82 - 64.25
- 64.25 - 72.04
- 72.04 - 95.46

Red = worse
Blue = better

Presentation Outline

- Overview of the built environment and physical activity
- Methods for researching the built environment and physical activity
- Research opportunities
  - Leveraging technology
  - Engaging citizens
  - Analyzing big data
  - Environmental surveillance
  - **Taking advantage of natural experiments**
- Questions and discussion



If You Build It, Will They Come? Sidewalk Improvements and PA

- Examined changes in self-reported and accelerometer-derived PA associated with living near recently improved sidewalks
- TRAIN Study: prospective cohort study to evaluate the effect of public light rail transit use and PA in Houston (n=430)
- Data collected via S-MAQ, accelerometers, and sidewalk infrastructure improvements by City of Houston via ArcGIS
- Living near two sidewalk improvements was associated with 1.6x more minutes per week of walking and leisure-time PA than those not living near a sidewalk improvement ($p<0.05$)

Knell, G., Durand, C. P., Shuval, K., Kohl, H. W., 3rd, Salvo, D., Olyuomi, A., & Gabriel, K. P. (2018). If You Build It, Will They Come? A Quasi-experiment of Sidewalk Improvements and Physical Activity. *Translational Journal of the American College of Sports Medicine*, *3*(9), 66–71.

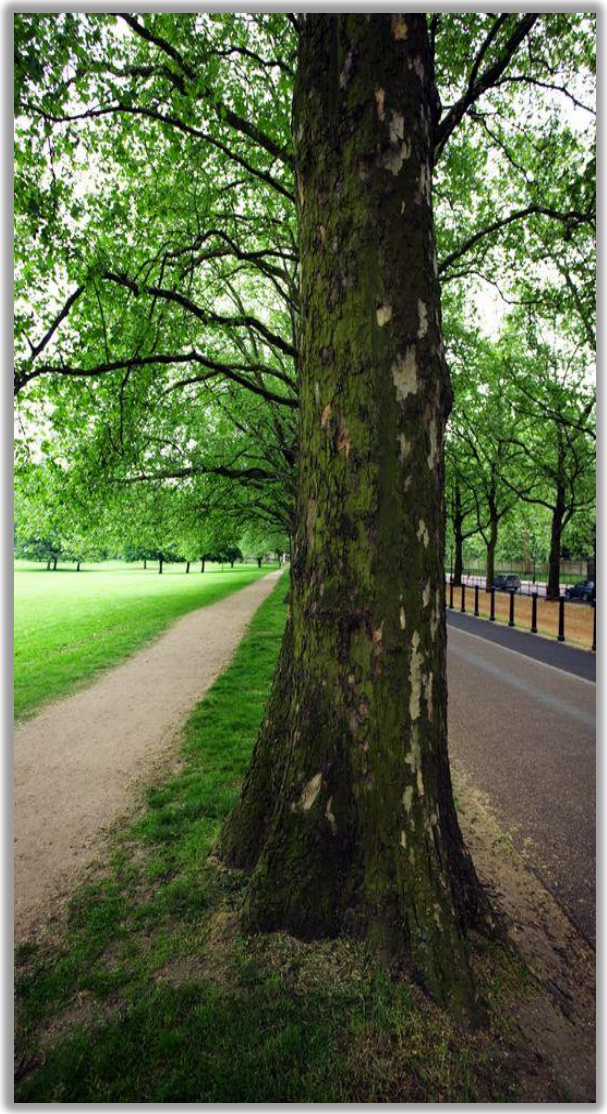
Dose-Response Effect of a Large-Scale Greenway Intervention on PA

- Explored the impact on physical activity of the East Lake greenway constructed in 2016-17 in Wuhan, China
- 1020 participants residing varying distances from greenway in 2016 and 2019
  - Baseline survey and follow up survey of PA behaviors
  - Exposed group defined as those who lived 0-1 km or 1-2 km from greenway; additional buffers of 2-3, 3-4, and 4-5 km groups identified
- Analyzed effect of greenway on MVPA and overall PA by distance
- Greenway had positive effects on both MVPA and overall PA (MET-minutes/week) after controlling for individual and neighborhood covariates
  - Effects of the greenway decreased as distance from greenway increased

Xie, B., Lu, Y., Wu, L., & An, Z. (2021). Dose-response effect of a large-scale greenway intervention on physical activities: The first natural experimental study in China. *Health & Place, 67*, 102502.

Presentation Outline

- Overview of the built environment and physical activity
- Methods for researching the built environment and physical activity
- Research opportunities
- **Questions and discussion**



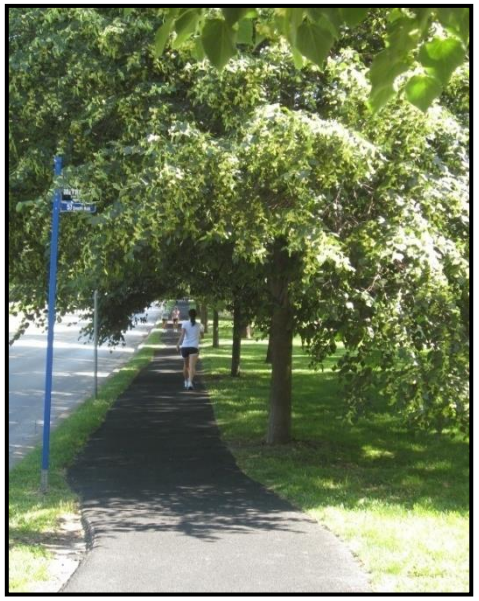
Discussion

- What are some ways you are (or could) incorporate environmental factors into your research on PA and health?
- What are some emerging opportunities you perceive in the field of environment and PA?
- What are some ways you are (or could) incorporate technology and/or citizens into your research on PA and health?
- How do we ensure that emerging research considers environmental justice?

Summary

- Research on the built environment and physical activity is truly interdisciplinary with respect to background knowledge, theories, and methods
- Better understanding how environmental factors in diverse communities impact active living and better engaging citizens in evaluating and improving those resources can foster multiple dimensions of health-related environmental justice
- Still an emerging field with exciting opportunities for furthering public health





Acknowledgments

- Thank you to all of our partners and funding agencies

Robert Wood Johnson Foundation

HRSA
Health Resources & Services Administration

National Recreation and Park Association

SCTR
South Carolina Clinical & Translational Research Institute

NIH
National Institutes of Health

LiveWell greenville

UNIVERSITY OF SOUTH CAROLINA

Built Environment and Physical Activity: Emerging Research Opportunities to Promote Environmental Justice and Community Health

Andrew T. Kaczynski, PhD
Department of Health Promotion, Education and Behavior
Prevention Research Center
University of South Carolina
atkaczyn@mailbox.sc.edu