Applying the Neighborhood Environment-Wide Association Study (NE-WAS) Approach to Contextual Influences on Physical Activity among Older Adults

Stephen J Mooney[1], Magdalena Cerdá[2], Spruha Joshi[3], John R Beard[4], Gary J Kennedy[5], Andrew G Rundle[1]

[1]Department of Epidemiology, Columbia University; [2]Department of Emergency Medicine, University of California, Davis; [3]Division of Epidemiology and Community Health, University of Minnesota; [4]Department of Ageing and Life course, World Health Organization; [5]Albert Einstein College of Medicine;

COLUMBIA UNIVERSITY | MAILMAN SCHOOL of PUBLIC HEALTH
EPIDEMIOLOGY

Columbia University
Built Environment & Health Project
www.beh.columbia.edu

Background

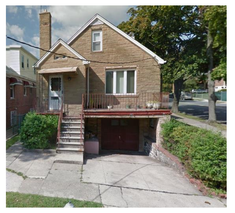
- We piloted an 'Neighborhood Environment-Wide Association Study (NE-WAS)' approach to studying neighborhood influences on health, analogous to a Genome Wide Association Study (GWAS) approach.

Genetic Study		Neighborhood Study
Candidate gene approach	→	Conventional neighborhood effects analysis
GWAS	→	NE-WAS

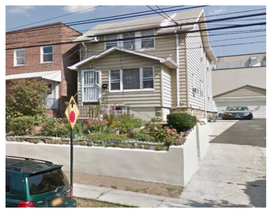
Methods

NYCNAMES-II was a telephone survey of 3,497 adult residents of New York City aged 65-75.

Please Note: New York City is not only Manhattan



The Bronx



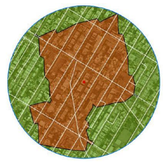
Brooklyn

Queens

Images courtesy of Google Street View

Using regression and machine learning, we identified the **neighborhood measures** most predictive of:

1) Total physical activity (PASE score)
2) Gardening (ever/never)
3) Walking (ever/never)
4) Housework (ever/never, as a negative control)



All measures were computed for 0.25 km network buffers

Neighborhood measures were compiled from:

- US Census (e.g. extreme poverty -- % of population living below half the poverty line)
- Street View Audit (e.g. neighborhood disorder)
- Administrative records (e.g. pedestrian injury rates)

All Neighborhood measures

Category	Number of Measures	Examples
Demographics and Housing	121	Population density
Education, Employment, and Income	102	% college grad, % in labor force
Urban Form	50	% walk to work, bus stop density
Crime and Disorder	35	% of streets rated as filthy
Parks	5	% of land area dedicated to large parks
Pedestrian Safety	24	Pedestrian injury count from 2000-2009
Total	337	

Results

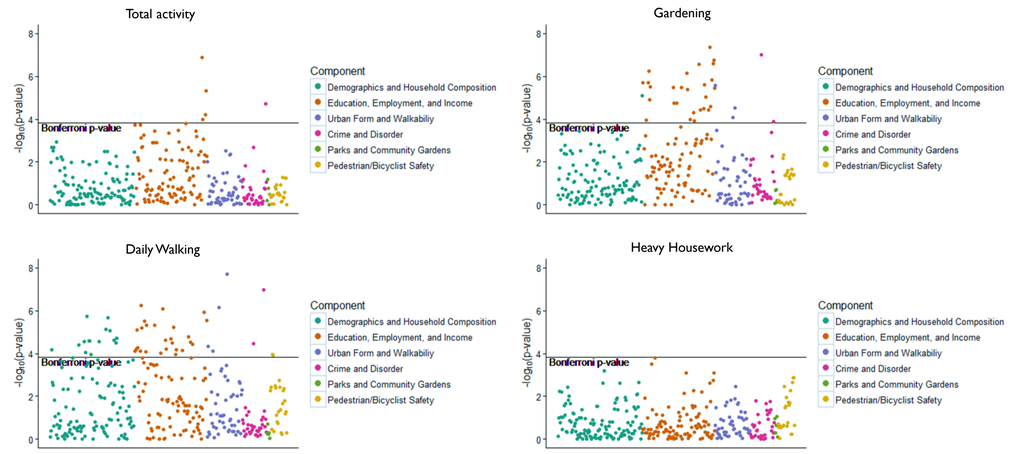
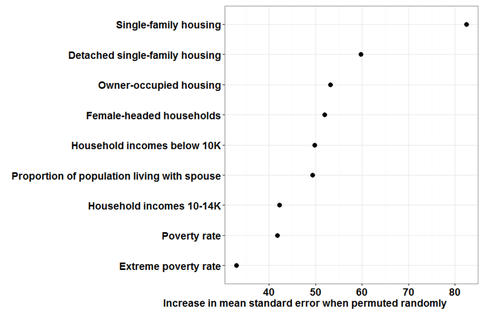


Figure: Manhattan plots of all neighborhood measures against different measures of physical activity

- In adjusted regression, **proportion of residents living below half the poverty line** was the best predictor of total physical activity (estimated decrease of 0.85 PASE units (95% CI: 0.56, 1.14) per 1% increase).
- Only **socioeconomic** and **disorder** measures predicted **gardening**
- By contrast, a **broad range of measures** predicted **walking**.
- **No neighborhood measures** predicted **housework**.
- **Machine learning** analyses were **too sensitive to tuning parameters** for substantive inference



Most important variables selected by random forest predicting total physical activity

PASE Score	Gardening	Walking Daily	Heavy Housework
Extreme Poverty	Poverty, no kids	Group quarters	--
Sales occupations	Cul-de-sac intersections	5-9 year old males	--
Severe Poverty	Well-maintained windows	Hispanic or Latino householders	--

Most important variables selected by LASSO

Conclusions

- The systematic approach to comparing neighborhood measures to activity measures revealed **patterns in the domains of neighborhood measures associated with activity**.
- **The NE-WAS appears to hold promise for hypothesis generation**

Contact and Acknowledgments

Email: smooney27@gmail.com

This work was supported in part National Institute for Mental Health grant 5R01MH085132-05