Neighborhood Effects on Physical activity: The Social and Physical Environment

Ming Wen, Ph.D.
University of Utah

Xingyou Zhang, Ph.D.
American Academy of Family Physician

Physical Activity and Neighborhood Environment

- The health benefits of physical activity well established
- A growing recognition that the impact of the built environment on active living can be remarkable and hold the promise of creating long-term change in physical activity.
- Meanwhile, the interest in and the literature on neighborhood effects on health status and behavior have been rapidly growing.
- While the two lines—the impact of the built environment and the social environment on physical activity—have been explored fruitfully, a dialogue between the two has been weak.

Research Questions

- **Our goal is to study the contextual effects of the built and the social environment of urban neighborhoods on physical activity in adulthood.**

Data

- **Neighborhood social environment: the 1990 Census, the Project on Human Development in Chicago Neighborhoods-Neighborhood Survey (PHDCN-CS) conducted in 1995.**

- **Neighborhood-level built environment: multiple sources, including the Metropolitan Chicago Information Center (MCIC), City of Chicago, Chicago Area Transportation Study (CATS), and Northern Illinois Planning Commission (NIPC).**

- **Individual data: the Metropolitan Chicago Information Center-Metro Survey (MCIC-MS) which is a repeated cross-sectional survey conducted annually.**

Neighborhood Definition

- PHDCN-CS combined the census tracts in the city of Chicago into larger, ecologically meaningful "neighborhood clusters" (NC).

- "The overriding consideration in formation of NCs was that they should be as *ecologically meaningful* as possible, composed of geographically contiguous census tracts, and *internally homogeneous* on key Census indicators." *(Sampson, Raudenbush & Earls, 1997)*

Measures of Physical Activity

- **Regular exercise over last year:** **1='Yes' to the question "In the past year to stay healthy or improve your fitness did you exercise regularly?"**

- **Regular weekly exercise:** **1='At least once a week' to the question "How often a week, on average, do you work out or exercise?"**

- **Regular weekly exercise:** **1='At least four times a week' to the question "How often a week, on average, do you work out or exercise?"**

Measures of Neighborhood Deprivation and Social Capital

- **Neighborhood deprivation:** a scale that includes neighborhood-level affluence, poverty, education, percent of female-headed households, percent on public assistance ($\alpha=0.92$)

- **Neighborhood social capital:** neighborly trust, norms of reciprocity, perceived violence, and homicide rate, and combined into a composite index of social capital ($\alpha=0.83$).

    --*Ecometric method* was used to construct these social capital variables except the homicide rate.

Measures of the Built Environment

- **Block density:** The number of blocks per square miles within a neighborhood cluster.

- **Distance to subways:** The flying distance (miles) from a neighborhood centroid to the nearest subway station.

- **Distance to parks:** The flying distance (miles) from a neighborhood centroid to the nearest public park.

- **Land use pattern:** The land use mix (residential, commercial, office)

- **Pedestrian injury rate:** Number of pedestrian injury accidents per square miles

Measures of the Built Environment

- **Access to restaurants and bars:** Percentile in terms of access to eating and drinking establishments based on number of 1-mile buffers drawn around each point included the center of NC divided by the population density

- **Access to art, culture, leisure, and entertainment facilities:** Percentile in terms of access to facilities (3-mile buffers)

- **Access to social institutions:** Percentile in terms of access to institutions (3-mile buffers)

- **Access to health and human services:** Percentile in terms of access to services (2-mile buffers)

Statistical Modeling

- **To test our hypotheses, a series of random intercept logit models are fit for the three dichotomous dependent variables**

- **The models of regular exercise over a year feature 907 individuals living in 242 neighborhoods** *(MCIC-CS 96; 6 persons per NC on average)*.

- **The models of weekly workout or exercise feature 3,530 individuals living in 266 neighborhoods** *(MCIC-CS 95, 96, 97, 99 ; 11 persons per NC on average).*

Findings: Dependent Variables

Regular exercise over last year: 62.6%

At least once a week exercise: 69.7%

At least four times a week exercise: 24.9%

Findings: Correlations among Neighborhood Variables

	1	2	3	4	5	6	7
1. Deprivation	1						
2. Social capital	-.8*	1					
3. Distance to subways	-.2*	.2*	1				
4. Distance to parks	-.1*	.2*	.3*	1			
5. Land use mix	.2*	-.2*	-.3*	-.1	1		
6. Pedestrian injury rate	.2*	-.4*	-.4*	-.2*	.2*	1	
7. Access to amenities	-.1~	.2*	-.2*	-.1*	.4*	-.1*	1

~ p<=0.10; * p<=0.05

Findings: Regular exercise over last year

NC Variables	1	2	3	4	5
Deprivation	0.70**		0.75**	0.73**	0.72**
Social Capital		1.32**	1.12		
Restaurants/Bars				1.24*	
Facilities (e.g., arts, leisure)					1.22*

N=907 individuals in 242 neighborhoods
Odds ratios are presented.
*•significant at 5%; ** significant at 1%*
Controlled for age, gender, race/ethnicity, marital status, education, income, and neighborhood age structure

Findings: Exercise at least once a week

NC Variables	1	2	3
Aggregate education	1.11**		1.12**
Social Capital		0.96	
Block density			0.94*

N=3,530 individuals in 266 neighborhoods
Odds ratios are presented.
*•significant at 5%; ** significant at 1%*
Controlled for age, gender, race/ethnicity, marital status, education, income, and neighborhood age structure

Findings: Exercise at least four times a week

NC Variables	1	2	3	4
Aggregate education	1.07~		1.05	1.06
Social Capital		1.03		
Land use mix			2.34***	
Health and human services				1.08~

N=3,530 individuals in 266 neighborhoods
Odds ratios are presented.
*~ significant at 10%; * significant at 5%; ** significant at 1%*
Controlled for age, gender, race/ethnicity, marital status, education, income, and neighborhood age structure

Conclusion

- **Neighborhood social and built environments are both important for individual leisure-time physical activity.**

- **The effect of neighborhood socioeconomic status (SES) seems persistently strong for moderate exercise but weaker for more intensive exercise.**

- **Different aspects of the built environment matters for different measures of physical activity controlling for neighborhood social environment.**

- **Neighborhood environment matters for health behaviors in complex ways.**

Limitation

- **Cross-sectional design**

- **Self-reported dependent variables**

- **Spatial dependency not considered**

Acknowledgement