Community and Child Energy Balance: The Relationship between Neighborhood Environments and the Risk of Obesity and Physical Activity

Lori Kowaleski-Jones, PhD
Associate Professor
Department of Family and Consumer Studies
University of Utah
lk2700@fcs.utah.edu

Ming Wen, PhD
Associate Professor
Department of Sociology
University of Utah
380 S 1530 E RM 301
ming.wen@soc.utah.edu

Xingyou Zhang, PhD
Health Geographer and Statistician
Division of Adult and Community Health
Centers for Disease Control and Prevention

Background

Overweight and obesity are risk factors for a range of health problems. In the United States, the prevalence of overweight and obesity has been steadily rising among every segment of the U.S. population. It has been found that only smoking exceeds overweight/obesity in its contribution to total mortality rates in the United States, that overweight/obesity is more strongly linked to chronic diseases than living in poverty, smoking, or drinking, and that the direct and indirect costs of overweight/obesity in the United States approximated 10% of the national health care budget. In view of the rapid development of weight problems in genetically stable populations, the obesity epidemic is widely viewed as primarily rooted in obesogenic environmental forces that encourage consumption of energy and discourage expenditure of energy. To alter this trend, strategies and programs for weight maintenance and weight reduction have become a high public health priority in the recent decade.

In searching for factors driving the obesity epidemic, the overweight/obesity research is now focused on the balance between diet and physical activity (PA). PA, a key element in the energy balance equation, and having dramatically decreased over the past three decades, is an important contributory factor to the obesity epidemic. Partly via its impact on body mass index (BMI) and partly via other non-weight-related pathways, regular PA is associated with reduced morbidity and mortality and increased longevity and enhanced psychological well-being. Therefore, increasing PA among all segments of the population is a national health priority in the United States. However, despite the fact that it has been more than 10 years since the publication of the Surgeon General's Report on PA and Health, today only about half of Americans engage in the recommended amount of PA. This frustrating situation partially reflects the inability of behaviorally based interventions to increase PA levels in the long run.

To address the obesity epidemic, the physical inactivity trend, and their health consequences, there is a growing interest in the ecological approach which highlights that factors at a variety of levels, for instance from the individual to the neighborhood, influence the prevalence of health related behaviors. This ecological approach has been adopted by health promotion initiatives primarily in the area of PA. Constituting an important dimension of our living environment, neighborhoods are a popular locale for exercise. A key assumption about the ecological model is that neighborhood physical, social, and demographic environments exert contextual effects on individual levels of PA and risks of being overweight or obese over and above individual-level risk or protective factors. A neighborhood approach is consistent with concern about obesity-related health inequalities since obesity prevalence often varies widely across places. However, while the literature on neighborhood environmental correlates of PA and weight status is burgeoning, we do not know how these neighborhood socio-demographic characteristics may interact with factors of the built environment affecting PA and weight status. Moreover, the majority of studies are localized; so we lack national evidence about the unique and/or relative influences of neighborhood socio-demographic factors compared to built environmental factors on the chances of maintaining an active living lifestyle and

healthy weight. Moreover, the potential for differing effects on adults and children is still an area in need of more research.

Therefore, even though available evidence suggests the importance of considering the built environment, our evidence base is currently underdeveloped such that there is not yet a reliable picture of how neighborhood environmental factors contribute to PA and weight status and for whom these environmental forces are most relevant.

Study Purposes

The purpose of this paper is two-fold. First, using a nationally representative data set that provides objectively assessed and self-reported BMI, we examine whether features of the built environment are associated with child overweight and physical activity. Second, we explore whether these associations are consistent or whether the impact of neighborhood characteristics across developmentally appropriate childhood periods. Our prior work has considered the linkages between built environment and obesity and physical activity among adults [1]. We wish to compare these findings with analyses based solely on a child sample. We draw upon the institutional model and socio-cultural model proposed by Jencks and Mayer [2] as the theoretical guidance of our analytical work.

Data and measures

We use data from a nationally representative, cross-sectional study of American children aged 2 through 11. We use the 2003 and 2004 continuous National Health and Nutrition Examination Survey (NHANES) as our individual sample. We categorize the respondents into two age groups: age 2-8, and 9-11 representing the age periods of early and middle childhood. Four racial/ethnic groups are examined: non-Hispanic whites (NHW), non-Hispanic black (NHB), Hispanics, and Others. Immigrant status was indicated by US-born versus foreign-born. Parental marital status was dichotomized into married or cohabitating versus other marital status. Parental educational attainment was grouped into 5 levels: less than 9th grade (1), 9-11th grade (2), high school graduate or equivalent (3), some college or associate degree (4), and college or above (5). Household income was grouped into 11 levels ranging from the lowest level of $4,999 or below (1) to the highest level of $75,000 or above (11).

We measure physical amenities of the neighborhood by utilizing measures of greenness, distance to parks, and commute times. We obtained neighborhood socioeconomic variables from the 2000 census and constructed an indicator of neighborhood socioeconomic status (SES) based on percent residents living in poverty. We also obtained population density (number of residents per square miles) from the census data as a proxy indicator of pedestrian-friendly built environment. These measures are meant to index the institutional resources that might be protective against excess weight gain. Lastly, based on the 2000 BRFSS data, we constructed percent residents being overweight or obese to tap weight-related subcultural orientation in the neighborhood. Census tract was used to define neighborhood.

Analytical Strategy

Multilevel logistic regression models were fit to examine the research questions. The neighborhood variables were standardized before they were included in the analytical models. Models will be fit separately for the two dependent variables: a dichotomous indicator of risk of overweight based on objectively measured BMI and CDC guidelines of bmi for age and an indicator of physical activity based on time per week the child plays or exercises enough to make him sweat and breath hard.

Prior Work

All of these analyses are performed at the secure sites associated with the Research Data Center (RDC) of the National Center for Health Statistics (NCHS). Once the estimates are completed, they must be cleared by RDC staff before release. We were not able to gain clearance for results associated with the children in the NHANES by the PAA deadline. We instead present some analyses for adults in this abstract as guide to our analyses of the children in the NHANES sample. These estimates are part of ongoing work and provide a model of the types of analyses we plan to complete for the child samples.

Descriptive statistics, presented in Table 1, indicated that adult NHANES respondents live in census tracts where, on average, 8 percent of residents report commuting at least an hour a day. Results also indicate that respondents live in communities where, on average, 20 percent of the residents meet the CDC recommended physical activity recommendations and also where 20 percent of the respondents are obese.

In Tables 2, we present estimates between neighborhood characteristics and obesity outcomes for adults. Data presented indicates that living in a census tract with longer distances to parks is associated with higher risk obesity. However subgroup analyses reveal that this association is present only among the younger portion of the sample, those aged 20 to 49, and not among respondents aged 50 and over. Additionally, there is a positive association between residing in a community where higher proportions of the census tract are obese on an individual's risk of obesity, but again sub group analyses reveal this association is robust only among the younger portion of the sample. These results suggest that features of the neighborhood community operate differently for younger and older adults. Our objective is to evaluate whether community characteristics operate differently in for children as compared to adults.

Conclusion

Using data from the 2003 and 2004 continuous NHANES, focusing on adults age 20 or above and based on objectively measured BMI, our prior work suggests that the influence of neighborhood characteristics will vary by age. Our proposed analyses are poised to further comment on the question of whether the characteristics associated with adult BMI operate in similar or different ways for children. This work will help shape the emerging

debate over how community settings may be modified to aid in the interdiction of childhood obesity and promote physical activity.

References (more references will be added in the final paper)

1. Kowaleski-Jones, Lori and Ming Wen. Communities and Energy Balance. Paper presented at the 2010 Annual meeting of the American Sociological Association, Atlanta Georgia, August, 2010.
2. Jencks, C. and S.E. Mayer, *The social consequences of growing up in a poor neighborhood*, in *Inner City Poverty in the United States*, L.E. Lynn and M.G.H. McGeary, Editors. 1990, National Academy: Washington, DC.

Table 1. Measures of Neighborhood Characteristics

	Census Tract
% commuting at least 1 hour a day	8.3
Distance to Parks (measured in miles)	8.4
% meeting CDC PA recommendations	21.5
% who are obese	21.1
% living in poverty	14.9

Table 2. Odds ratios of the associations among community characteristics and obesity.

obese	**Total sample age 20 and over**	**Sample aged 20 to 49**	**Sample aged 50 and over**
Long commute	.96	.92	1.01
Distance to parks	**1.17**	**1.22**	.99
Community Physical activity	1.01	1.04	.99
Community obesity	**1.13**	**1.20**	1.09
Community poverty	1.06	1.04	1.12

Note:

1. Analyses also control for gender, education, income, ethnicity, self reported health status, and age.
2. Odds ratios in bold are significant at the $p < .05$ level.