Health Promoting Community Design; Weight Control

Local Concentration of Fast-Food Outlets Is Associated With Poor Nutrition and Obesity

Daniel J. Kruger, PhD; Emily Greenberg, BA; Jillian B. Murphy, MPH; Lindsay A. DiFazio, MPA; Kathryn R. Youra, MS

Abstract

Purpose. *We investigated the relationship of the local availability of fast-food restaurant locations with diet and obesity.*

Design. *We geocoded addresses of survey respondents and fast-food restaurant locations to assess the association between the local concentration of fast-food outlets, BMI, and fruit and vegetable consumption.*

Setting. *The survey was conducted in Genesee County, Michigan.*

Subjects. *There were 1345 individuals included in this analysis, and the response rate was 25%.*

Measures. *The Speak to Your Health! Community Survey included fruit and vegetable consumption items from the Behavioral Risk Factor Surveillance System, height, weight, and demographics. We used ArcGIS to map fast-food outlets and survey respondents.*

Analysis. *Stepwise linear regressions identified unique predictors of body mass index (BMI) and fruit and vegetable consumption.*

Results. *Survey respondents had 8 ± 7 fast-food outlets within 2 miles of their home. Individuals living in close proximity to fast-food restaurants had higher BMIs $t(1342) = 3.21$, $p < .001$, and lower fruit and vegetable consumption, $t(1342) = 2.67$, $p = .008$.*

Conclusion. *Individuals may be at greater risk for adverse consequences of poor nutrition because of the patterns in local food availability, which may constrain the success of nutrition promotion efforts. Efforts to decrease the local availability of unhealthy foods as well as programs to help consumers identify strategies for obtaining healthy meals at fast-food outlets may improve health outcomes. (Am J Health Promot 2014;28[5]:340–343.)*

Key Words: Food Environment, Nutrition, Body Mass Index, Geographic Information System, Prevention Research. Manuscript format: research; Research purpose: relationship testing; Study design: survey; Outcome measure: behavioral, biometric; Setting: local community; Health focus: nutrition, weight control; Strategy: culture change, built environment; Target population age: adults; Target population circumstances: education, geographic location, and race/ethnicity

Daniel J. Kruger, PhD; Emily Greenberg, BA; Jillian B. Murphy, MPH; Lindsay A. DiFazio, MPA; and Kathryn R. Youra, MS, are with the Prevention Research Center of Michigan, University of Michigan School of Public Health, Ann Arbor, Michigan.

Send reprint requests to Daniel J. Kruger, PhD, School of Public Health, University of Michigan, 1420 Washington Heights, Ann Arbor, MI 48109-2029; kruger@umich.edu.

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PURPOSE

American rates of overweight and obesity are high and have increased dramatically over the past few decades. About 66% of Americans are currently overweight or obese, and these proportions grow each year.[1] There are multiple contributing factors, including frequent fast-food consumption, which is associated with high-fat diets and high body mass index (BMI),[2] as well as reduced vegetable,[3] fruit,[4] and fiber consumption,[4] and lower physical activity.[3] Lower consumption of fruits and vegetables is associated with higher risk for cardiovascular disease,[5–7] cancer,[8,9] and ischemic stroke,[7,10] which are the three leading causes of death in the United States.[11] Recent research has attempted to elucidate the interaction between these factors and identify causation for these trends.

The geographical concentration of fast-food outlets may be associated with adverse health outcomes such as increases in all-cause mortality and comorbidities related to overweight and obesity.[12,13] Across New Zealand, neighborhood median travel distances to fast-food locations are at least twice as far in the most economically affluent neighborhoods compared to the most economically deprived neighborhoods.[14] Several other studies found similar associations between the geographic concentration of fast-food outlets with neighborhood deprivation[15–17] and minorities as a proportion of the population.[17,18]

Concentration of fast-food outlets may be associated with lower fruit and vegetable consumption. A study of driving distance to fast-food outlets showed a negative association between

proximity and vegetable consumption. However, those living farthest from fast-food outlets were also more likely to be overweight.[19] Another study found that car ownership was an important indicator for increased BMI in addition to fast-food outlet proximity,[20] which may explain the discrepancy between vegetable consumption and overweight. Other studies have also found a negative association between distance to fast-food outlets and fruit and vegetable consumption among school-age children.[21,22]

Previous studies operationally defined access to fast food in terms of the number of locations or locations per capita in relatively large geographical areas represented by postal codes.[5,23] Other studies have shown that self-reported concentration of fast-food outlets increased the odds of fast-food consumption and unhealthy diets.[24] Geographical information system (GIS) methodologies enable a more precise and direct analysis using geographically identified data. The GIS-derived density of supermarkets was associated with perceived availability of produce and low-fat foods, although the density of smaller food outlets had mixed relationships with the perceived availability of healthy food across populations.[25] Other GIS analyses of food stores found that lower local availability of healthy foods was associated with lower dietary quality and that each addition of a supermarket and subtraction of a fast-food outlet or convenience store resulted in a decrease in obesity.[26,27]

We anticipated that the availability of exact addresses for both fast-food locations and respondents from a countywide health survey would enhance the accuracy of the analyses of fast-food outlet concentration. We predicted that the local concentration of fast-food outlets would be inversely related to fruit and vegetable consumption and directly related to BMI.

METHODS

Design

The Speak to Your Health! Community Survey in Genesee County, Michigan, was developed through a community-based participatory research process by a survey committee composed of community and university partners. The survey was designed to monitor and understand local health and concerns, monitor the impact of health initiatives on health outcomes, and promote change that improves the health of Genesee County communities. The project was reviewed and approved by the University of Michigan Health Sciences Institutional Review Board.

Sample

Professional survey staff at the Michigan Public Health Institute conducted a 25-minute computer-aided telephone interview (CATI) with randomly selected respondents. Random samples of households were drawn across Genesee County census tracts. At least 20 residents aged 18 and over were interviewed for each of the 39 residential census tracts in Flint, Michigan, and at least 10 from each of the 90 census tracts outside of Flint. The response rate was 25%. As with most telephone surveys, women and older individuals were overrepresented compared to the population, and those with less than a high school education were underrepresented. Only households with landline telephones were included. There were 1688 respondents; of these, 80% had complete data for the variables of interest and were included in the current analyses (1345).

Measures

Fruit and vegetable intake was measured using the eight items from the Behavioral Risk Factor Surveillance System (BRFSS) assessing frequency (servings per day) of intake of fruit juice, other fruits, green salad, nonfried potatoes, dark green leafy vegetables, dark yellow or orange vegetables, beans, and other vegetables.[28] These items were combined to compute an index of fruit and vegetable servings per day. We calculated BMI from self-reported height and weight.

Demographic items included gender, age, race, Flint vs. non-Flint residence, and highest level of education completed (see Table 1). We identified fast-food restaurants (North American Industry Classification System no. 722211, Limited-Service Restaurants) with a current local telephone directory and supplementary Internet searches. We mapped respondents and locations of fast-food restaurants with geographical information systems and calculated the number of fast-food restaurants within a 2-mile buffer zone (Euclidean or straight-line distance) of each survey respondent. Because exercise can influence BMI, we included data from BRFSS exercise items indicating whether or not respondents performed at least 30 minutes of moderate exercise per day for 5 days per week (according to the American College of Sports Medicine and American Heart Association 2007 physical activity recommendations).[29]

Table 1
Demographic and Diet-Related Characteristics of Participants (N = 1345)

Characteristic	No. of Study Participants
Age in years (SD)	54 ± 17
Race	
White	67%
Black	26%
Multiracial	3%
Other	4%
Sex	
Female	70%
Male	30%
Education	
Less than high school	11%
High school	31%
Technical school	2%
Some college	26%
Associate's degree	10%
Bachelor's degree	13%
Master's degree or higher	8%
Residence	
City	46%
Suburban or rural	54%
Fruits and vegetables per day	4 ± 3
At least 5 per day	27%
Adequate exercise	40%
Body mass index (SD)*	29 ± 7
Underweight	2%
Normal weight	30%
Overweight	32%
Obese	37%

* SD indicates standard deviation.

Table 2
Unique Predictors of Fruit and Vegetable Consumption (FVC), Body Mass Index (BMI), and BMI Category

	B	SE*	β	*t*	*p*
Predictors of FVC					
Constant	4.631	0.150	30.86	0.001	
Gender	−0.540	0.194	−0.076	2.78	0.005
Fast food	−0.034	0.013	−0.073	2.67	0.008
Predictors of BMI					
Constant	28.319	0.350	80.97	0.001	
Non-White	1.743	0.409	0.116	4.26	0.001
Adequate exercise	−1.747	0.386	−0.121	4.53	0.001
Fast food	0.088	0.028	0.087	3.21	0.001
Predictors of BMI category (underweight, normal, overweight, obese)					
Constant	2.927	0.046	64.30	0.001	
Non-White	0.260	0.054	0.137	4.85	0.001
Adequate exercise	−0.195	0.048	−0.112	4.03	0.001
Gender	0.151	0.051	0.082	2.95	0.003
Fast food	0.009	0.003	0.072	2.55	0.011

* SE indicates standard error.

Analysis

We used stepwise linear regressions using the SPSS 17.0 software program to identify unique predictors of the number of fruits and vegetables consumed per day, BMI as a continuous measure, and BMI categories (underweight, normal, overweight, obese). We entered residence (Flint vs. non-Flint), race (White vs. non-White), age in years, gender, education in years, and number of fast-food locations within 2 miles as predictors of the number of fruits and vegetables consumed per day. We included these variables and attainment of recommended exercise level as potential predictors of BMI.

RESULTS

There was an average of 8 ± 7 fast-food restaurants within 2 miles of respondents, with a range from 0 to 29. The local concentration of fast-food outlets significantly predicted fruit and vegetable consumption and BMI in the expected directions (see Table 2). Women had higher fruit and vegetable consumption than did men. Non-Whites and those who did not meet recommended exercise guidelines had higher BMIs. Race, exercise, gender, and fast-food concentration predicted BMI category (see Table 2). For every standard deviation (SD) increase in fast-food concentration, BMI increased by 9% of a SD. This is a statistically small effect, yet comparable to those in similar studies.[2,3,13] In post hoc analyses, we determined that the local concentration of public parks or self-reported fear of crime did not explain any additional variance in BMI.

DISCUSSION

GIS enable powerful tests of hypothesized spatial relationships. We used GIS to demonstrate that the local geographical concentration of fast-food outlets is related to higher BMI and inversely related to the consumption of fruits and vegetables and that these relationships were not accounted for by sociodemographic factors, suggesting that the presence of fast food is a risk factor for the advantaged as well as the disadvantaged. These results build on previous associations found with fast-food prevalence in relatively large geographical areas[7] and perceptions of local fast-food availability,[24] as well as GIS-identified associations between the local availability of healthy foods and beneficial nutritional outcomes.[25,27]

The findings apply to households with landline telephones; those who cannot afford or chose not to purchase landlines were not represented. The high refusal rates likely result in the overrepresentation of older and more highly educated individuals, as well as females, as is typical in telephone surveys. As geographic concentration of fast-food outlets is directly associated with neighborhood deprivation[15–17] and minorities representation,[17,18] it is likely that our results would hold and might be even stronger if our sample more closely resembled the local demographic. Future research incorporating self-reported fast-food consumption may extend these findings, although self-report measures (including those used in this study) may be biased. We acknowledge limitations in the accuracy and precision of our data. We did not confirm that the restaurants were operational at the

SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Previous studies have found relationships between obesity rates and the number of fast-food locations or locations per capita in relatively large geographical areas represented by postal codes. Geographical information system methodologies enable a more precise and direct analysis with geographically identified data.

What does this article add?

High local concentration of fast-food outlets is a risk factor for high BMI and low fruit and vegetable consumption across the population.

What are the implications for health promotion practice or research?

The local food environment may constrain the success of nutrition promotion efforts. Efforts to decrease the local availability of unhealthy foods, as well as programs to help consumers identify strategies for obtaining healthy meals at fast-food outlets, may improve nutrition outcomes.

time of data collection. We used straight-line buffers to determine geographic concentration of fast-food outlets. Analyses based on actual street distance or walking time may yield stronger associations. Unmeasured confounders, such as local access to exercise opportunities, may potentially influence the results.

Individuals may be at greater risk for adverse consequences of poor nutrition because of the patterns in local food availability, which may constrain the success of nutrition promotion efforts. Efforts to increase the local availability of healthy foods, as well as programs to help consumers identify strategies for obtaining healthy meals at fast-food outlets, may improve nutrition outcomes.

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