PAA Submission – Sept 2006

Title: Does the food environment predict obesity in New York City?

Authors: Andrew Rundle, Ana Diez Roux, Samuel Field, Lance Freeman, Shang-min Liu, Kathryn Neckerman, Marnie Purciel, James Quinn, Christopher Weiss

Short abstract (150 words)

Researchers in demography, public health, and other social sciences have identified the quality of the local food environment as one factor in the rising rates of obesity in the United States. A number of studies have documented racial, ethnic, and socioeconomic disparities in access to supermarkets and other types of food outlets, yet few empirical studies have provided direct evidence on the relationship of the food environment to body weight or obesity. In this study, we examine the effects of the food environment on body mass index (BMI) using data from a large health study conducted in the New York City; our analysis is conducted on a racially- and ethnically-diverse sample of more than 13,000 adult residents, and employs unusually detailed measures of the food environment using data on business locations from Dun & Bradstreet.

Long abstract

Title: Does the food environment predict obesity in New York City?

Authors: Andrew Rundle, Ana Diez Roux, Samuel Field, Lance Freeman, Shang-min Liu, Kathryn Neckerman, Marnie Purciel, James Quinn, Christopher Weiss

Researchers in demography, public health, and other social sciences have identified the quality of the local food environment as one factor in the rising rates of obesity in the United States. A number of studies have documented racial, ethnic, and socioeconomic disparities in access to supermarkets and other types of food outlets, yet few empirical studies have provided direct evidence on the relationship of the food environment to body weight or obesity. In this study, we examine the effects of the food environment on body mass index (BMI) using data from a large health study conducted in the New York City.

Our analysis is conducted on a racially- and ethnically-diverse sample of more than 13,000 adult residents, and employs unusually detailed measures of the food environment using data on business locations from Dun & Bradstreet.

Theoretical background

The local food environment – including grocery stores as well as restaurants, fast food, and other food vendors such as farmers markets – has received increasing attention as an important contributor to obesity, since individuals' food decisions are likely to reflect the kinds of establishments available in their neighborhood. Research has found disparities in access to supermarkets for lower-income and/or predominantly black neighborhoods (Eisenhauer 2001; Moore and Diez Roux 2006; Morland et al. 2002; Zenk et al. 2006; but see Small and McDermott 2006). Food outlets in poor neighborhoods also tend to be smaller than those in more affluent neighborhoods (Alwitt and Donley 1997; Dunkley et al. 2004).

Recent evidence from epidemiology and public health has found effects of the local food environment on food decisions (e.g., Moore and Diez Roux 2006). In addition, Morland et al. (2006) recently reported that the presence of supermarkets was associated with a lower prevalence of obesity and overweight. However, there are very few studies that similarly relate the food environment directly to body weight or obesity.

Data

This analysis employs data from the New York Cancer Project, which collected objective measures of height and weight as well as standard demographic and socioeconomic measures for a convenience sample of 13,102 healthy adult residents of New York City. Subject recruitment was designed to produce an ethnically and economically diverse sample; the demographic distribution of the resulting cases is similar to the city's demographic profile. Our primary outcome measure is individual-level body mass index (BMI), calculated from individuals' self-reports of height and weight.

Socio-demographic measures are drawn from the 2000 Census and include poverty rates and racial/ethnic composition (percent Black and percent Hispanic). Built environment measures include population density (Census), mixed land use (based on parcel-level data obtained from the New York City Department of City Planning), subway and bus stop density (NYC Department of Transportation), and measures of street design (NYC LION files). Detailed measures of the food environment are taken from a sample of data acquired from Dun & Bradstreet, which provide detailed SIC code and geocoded location; measures of supermarkets, grocery stores, convenience stores, fruit and vegetable stores, meat and fish markets, bakeries, natural food stores, and specialty stores Moore & Diez Roux 2006). We will distinguish between fast food and other types of restaurants.

Measures and Methods

Our analysis employs geographic information systems (GIS) to create person-specific measures of the food environment. The study subject's neighborhood is defined as the half-mile "network buffer" around his or her residential address; the network buffer which comprises places reachable within a half-mile walk along the street network. Socio-demographic and built environment measures, including food environment variables, are constructed for each of these buffer neighborhoods. Recent analysis by our research team has demonstrated the superiority of this measure to neighborhood constructs traditionally used in demographic research.

Our analysis will examine which of the factors characterizing the food environment has the greatest influence on individuals' BMI. We will begin by examining the relationship between each of the contextual variables and BMI, then investigate whether/how composite measures of these factors influence health outcomes. We are particularly interested to examine the relationship between neighborhood composition variables and the availability of high quality food.

Expected findings

Findings from previous analyses of these data, which does not include the food environment measures, indicates that built environment measures have a significant effect on BMI after controlling for individual and neighborhood-level sociodemographic characteristics. For instance, in a multi-level analysis using census tract as a neighborhood measure, mixed land use, density of bus and subway stops, and population density were significantly inversely associated with BMI. As an indication of the magnitude of these effects: comparing the 90^{th} to the 10^{th} percentile of each built environment variable, the predicted adjusted difference in BMI with more mixed land use was -0.41 units, bus stop density was -0.33 units, subway stop density was -0.34 units, and population density was -0.86 units.

For the research to be discussed at PAA, we will introduce measures of the food environment into the analysis.

Alwitt, Linda, Donley, Thomas. 1997. “Retail Stores in Poor Urban Neighborhoods.” The Journal of Consumer Affairs 31: 139-164.

Dunkley et al. 2004. “Accessibility versus Scale.” Journal of Planning Education and Research 23: 387-401.

Eisenhauer, Elizabeth. 2001. “In poor health: Supermarket redlining and urban nutrition.” GeoJournal 53: 125-133.

Moore, Laeticia, Diez Roux, Ana V. 2006. “Associations of Neighborhood Characteristics with the Location and Type of Food Stores.” American Journal of Public Health 96: 325-331.

Morland et al. 2002. “Neighborhood Characteristics Associated with the Location of Food Stores and Food Service Places.” American Journal of Preventive Medicine 22: 23-29.

Morland et al. 2006. “Supermarkets, Other Food Stores, and Obesity: The Atherosclerosis Risk in Communities Study.” American Journal of Preventive Medicine 30: 333-339.

Small, Mario Luis, Monica McDermott. 2006. “The Presence of Organization Resources in Poor Urban Neighborhoods: An Analysis of Average and Contextual Effects.” Social Forces 84: 1697-1724.

Zenk et al. 2006. “Neighborhood Racial Composition, Neighborhood Poverty, and the Spatial Accessibility of Supermarkets in Metropolitan Detroit.” American Journal of Public Health 95: 660-667.