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Examining the role between the residential neighborhood food environment and diet among low-income households in Detroit, Michigan

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ABSTRACT

Neighborhood food environments have long been thought to play an important role in explaining differentials in dietary intake levels among disadvantaged populations. Yet, many studies have neglected whether or not respondents actually utilize their local food environment. This study utilizes household survey data, Geographic Information Systems (GIS) and a negative binomial regression framework to examine the relationship between neighborhood food environments, diet, and shopping behavior among socially and economically marginalized residents living in the lower eastside neighborhoods of Detroit, Michigan. The results provide support for a more nuanced understanding of the role that neighborhood food environments play in shaping consumption. While the number of fast food establishments negatively impacts dietary intake levels regardless of scale and travel patterns, spatial proximity to supermarkets impact wanes as distances increase and shopping behaviors are incorporated. Sociodemographics continue to play a vital role in explaining consumption patterns. Such findings are a direct result of the additional burdens placed on marginalized households to navigate the built-environment in search of affordable, nutritious food staples.

Introduction

With obesity emerging as a one of the most pressing public health issues in America, given the considerable and growing health and monetary costs of this epidemic, a new emphasis has been placed nationally on healthy eating. Diet has long been considered an important contributor to public health outcomes in the United States. Diets laden in energy dense and high sugar foods increases one's risks for chronic diet-related diseases such as type II diabetes, certain types of cancer, excessive weight gain, obesity and heart disease. In contrast, increased intake of whole grains, fruits and vegetables can prevent such diet-related diseases (Carter, Gray, Troughton, Khunti, & Davies, 2010; Riboli & Norat, 2003; World Health Organization, 2002). An important component in explaining diet-related public health outcomes is the neighborhood food environment, especially those within disadvantaged communities.

Inequities in the neighborhood food environment have been shown to influence diet-related public health outcomes. Predominately low-income and minority urban neighborhoods are composed disproportionately of convenience, party and liquor stores as well as fast food establishments (Block, Scribner, & DeSalvo, 2004; Lisabeth et al., 2010; Moore & Diez-Roux, 2006; Morland, Wing, Diez-Roux, & Poole, 2002; Powell, Chaloupka, & Bao, 2007; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007). Such neighborhood food environments have been correlated with increased consumption of fast foods, sugar-sweetened beverages and high-energy dense foods low in nutritional value but laden with fat and sugar (Jago, Baranowski, Baranowski, Cullen, & Thompson, 2007; Laska, Hearst, Forsyth, Pasch, & Lytle, 2010). While these studies offer important insights into the role the neighborhood food environment plays in shaping diet-related public health outcomes, these studies do not control for the shopping and travel behavior of respondents. Past research has found that marginalized consumers frequently shop outside of their neighborhood food environment (Hillier et al., 2011; LeDoux & Vojnovic, 2013; Shannon, 2014). By neglecting whether or not individuals purchase and consume in their neighborhood, researchers and public health officials could be inferring inaccurate causalities and conflating the role that the neighborhood food environment plays in shaping diet-related public health outcomes.

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This study fills the gap by investigating the relationship between the neighborhood food environment, sociodemographics, food consumption and shopping behavior among low-income African Americans residing in the lower eastside neighborhoods of Detroit, Michigan. The research examines how residents living in communities confronting extreme disinvestment and decline adapt to the loss of amenities within their neighborhoods. It employs household survey data and utilizes Geographic Information Systems (GIS) to analyze how the shopping behavior of individuals impacts the role that the neighborhood food environment plays in explaining differential dietary intake levels among low-income residents in Detroit, Michigan. This paper is divided into five additional sections. The next section briefly highlights the major findings that have emerged from the food desert literature on neighborhood food associations and diet. Section 2 outlines the survey data and methodology used in this study. Sections 3 and 4 present the results and discusses the main research findings. The last section offers concluding remarks.

Neighborhood food environments, diet and accessibility

The dietary intake of individuals is complex and influenced by factors at multiple levels. Consequently, research exploring the association between socioeconomic variables, food environments and food consumption tends to be divided into household/individual level and place-based studies. At the household and individual level sociodemographics, nutritional knowledge, the ability to purchase and prepare certain foods and cultural preferences all have been linked to dietary intake levels (Kamphuis et al., 2006; Powell, Han, & Chaloupka, 2010; Rose, 1999; Vojnovic et al., 2014).

Nutritious food staples such as produce cost more than high-energy dense foods laden with fat and sugar (Drewnowski & Barrett-Fornell, 2004; Drewnowski & Darmon, 2005). For households looking to maximize food quantities, it is easier to stock up on foods with low nutritional value than more nutritious foods. Moreover, households on a fixed budget or food support program often cannot afford the increased costs of increasing fruit and vegetable consumption levels recommended by nutritional dietary guidelines (Cassady, Jetter, & Dulp, 2007; Powell, Zhao, & Wang, 2009; Smith, Butterfass, & Richards, 2010). Such economic constraints are concentrated among low-income and minority households, which has contributed to widening socioeconomic differentials in dietary intake levels across the United States (Darmon & Drewnowski, 2008; Wang & Chen, 2011).

Households lacking nutritional knowledge might find it more difficult to obtain and apply nutritional guidelines and information that promotes better eating habits. Moreover, households lacking the time necessary to prepare meals are more likely to eat highly processed prepared foods or eat out at fast food establishments (Mancino & Newman, 2007). Temporal constraints also influence when and how people can access food resources. Low-income households are overly burdened by temporal restrictions imposed by food retailers' hours of operation and the public transit system (Chen & Clark, 2013). Consequently, affluent and highly educated households tend to consume higher quality diets than low-income and less educated households. In essence, households that can afford nutritious foods, obtain nutritional knowledge, have the capacity to spend time preparing foods and can overcome temporal constraints within the food environment and transportation system have higher quality diets than households struggling to make ends meet (Mancino, Lin, & Ballenger, 2004).

Many of these household and individual determinants of dietary intake also are shaped by sociocultural factors (Ball, Timperio, & Crawford, 2006; Brug, de Vet, de Nooijer, & Verplanken, 2006). Preferences and eating habits are learned behaviors within households. While conditioning of food preferences is ongoing, early experiences with food can shape lifelong outcomes. For example, children exposed to energy dense high sodium foods at home and school find these foods more familiar and preferred in adulthood (Skinner, Carruth, Wendy, & Ziegler, 2002). Likewise, the social environments surrounding individuals also exert pressures and passes along acceptance to eat certain types of foods. Social and peer networks play a role in shaping information and norms on diet, body type and physical activity (Blanchflower, Oswlad, & Van Landeghem, 2009; Christakis & Fowler, 2007).

Restricted economic access often increases the saliency of sociocultural constraints on individual purchasing decisions. For example, a low-income household with children will most likely purchase items that the children knowingly will eat rather than taking risks to introduce healthier options that may go uneaten. The same household also might sacrifice quality for price. Moreover, economic access constraints are not uniformly experienced within a household and frequently fall disproportionately on female-headed households with children and the elderly (Travers, 1996; Whelan, Wrigley, Warm, & Cannings, 2002). Despite the evidence about the role of individual and household factors in promoting and deterring positive diet-related health outcomes, these factors alone fail to explain differentials in dietary intake (Powell et al., 2010). The role of the neighborhood food environment in which residents reside may influence indirectly or directly their dietary intake.

Structural inequities in the neighborhood food environment have been shown to influence diet-related public health outcomes. Low-income and minority urban neighborhoods tend to be composed disproportionately of convenience, party and liquor stores as well as fast food establishments (Lisabeth et al., 2010; Moore & Diez-Roux, 2006; Powell, Chaloupka, et al., 2007; Powell, Slater, et al., 2007). Such neighborhood food environments have higher prices and poorer quality goods than middle-class and affluent neighborhoods with large-scale full service supermarkets (Andreyeva, Blumenthal, Schwartz, Long, & Brownell, 2008; Bovell-Benjamin, Hathorn, Ibrahim, Gichuhi, & Bromfield, 2009; Hendrickson, Smith, & Eikenberry, 2006; Jetter & Cassady, 2006).

Subsequently, residents residing in nutritionally devoid neighborhood food environments tend to consume less produce, have lower quality diets and consume more fast food and energy-dense processed foods than residents living in abundant food environments (Boone-Heinonen et al., 2011; Durbowitz et al., 2008; Franco et al., 2009; Morland, Wing, & Diez Roux, 2002). Thus, the presence of convenience stores has been shown to decrease the dietary intake of fruits and vegetables in the African American community in Detroit (Zenk et al., 2009) and increase the consumption of sugar-sweetened beverages in adolescents in Minneapolis (Laska et al., 2010). Likewise, neighborhood food environments dominated by fast food establishments have been found to promote increased fast food consumption (Boone-Heinonen et al., 2011; Moore, Diez-Roux, Nettleton, Jacobs, & Franco, 2009). These neighborhood food environments also have been shown to shape food-buying habits (Chen & Yang, 2014; Walker et al., 2011). For example, residents who live in a sparse food environment and work nontraditional hours commonly tend to purchase energy-dense food staples from 24-h stores and late night fast food establishments (Walker, Block, & Kawachi, 2012). In essence, people cannot consume nutritious foods if the only stores open or available to them are convenience and fast food establishments. Overall, such diets lead to excessive weight gain, obesity and increasing incidences of diet-related diseases (Baker, Schootman, Barnidge, & Kelly, 2006; Bowman & Vinyard, 2004; Larson, Story, & Nelson, 2009; Mehta & Chang, 2008).

In contrast, the presence of full-service supermarkets in a neighborhood food environment translates not only into increases