Applied Geography 97 (2018) 119–127

Contents lists available at ScienceDirect

Applied Geography

journal homepage: www.elsevier.com/locate/apgeog

Neighborhood racial composition, neighborhood wealth, and the surrounding food environment in Fulton County, GA

Mingyang Li[a,*], Baabak Ashuri[b]

[a] School of City and Regional Planning, College of Design, Georgia Institute of Technology, 280 Ferst Drive, Atlanta, GA, USA
[b] School of Building Construction and School of Civil & Environmental Engineering, Georgia Institute of Technology, 280 Ferst Drive, Atlanta, GA, USA

ARTICLE INFO

Keywords:
Food accessibility
Supermarket and fast food restaurant
Food environment
Neighborhood socioeconomic characteristics
Fulton County, GA

ABSTRACT

Inequalities in accessibility to food outlets might be associated with the disproportionate burden of obesity observed in minority and low income communities. While a large body of literature has explored the disparities in accessibility to certain type of food outlet (healthy or unhealthy), few has analyzed the accessiblity to the overall food environment by taking the spatial dependence of both types of food outlets into account. Understanding that food outlets tend to cluster spatially, isolated accessiblity measures to one type of food outlets might lead to biased findings.

As an attempt to overcome this issue, this study quantifies the food environment in Fulton County, GA, by examining the balance of healthy and unhealthy food outlets, and then explored its association with key neighborhood characteristics using spatial logit models. Results show that neighborhoods with higher percentage of African-American residents were less likely to have a healthy food outlet balance. Additionally, the high mobility group (people with access to personal vehicles) was found to be associated with greater levels of disparity, compared to the low mobility group (people without access to personal vehicles). Income, on the other hand, was not a significant factor in predicting the food outlet balance in both the high mobility and the low mobility groups. These findings urge for future planning efforts to bring more food outlets, especially at a healthy balance, closer to neighborhoods with higher percentage of African-American residents.

1. Introduction

Obesity has become a serious social issue in the US – According to American Heart Association (American Heart Association, 2016), nearly 78 million adults and 13 million children are suffering from negative health and emotional effects of obesity nationwide. Such burden, however, was found to be disproportionately distributed upon non-Hispanic African Americans and individuals with low socio-economic status (Oliver & Hayes, 2005; Skelton, Cook, Auinger, Klein, & Barlow, 2009; Wardle, Waller, & Jarvis, 2002). The national study conducted by Skelton et al. (Skelton et al., 2009) found that African-American children and adolescents had the highest prevalence of severe obesity (BMI ≥ 99th percentile), compared to the White population in the United States.

Understanding that individual's dietary choices, one of the major behavioral factors in obesity, are affected by the environment surrounding them (Swinburn, Egger, & Raza, 1999), a growing body of literature is focusing on the disparities in the food environment across different racial compositions and income levels (James, Arcaya, Parker, Tucker-Seeley, & Subramanian, 2014; Morland, Wing, Roux, & Poole, 2002; Wrigley, Warm, & Margetts, 2003). Amongst these literature, supermarkets and fast food restaurants are treated as proxies for food outlets that supports healthy and unhealthy dietary choices, respectively (Lamichhane et al., 2013; Smoyer-Tomic et al., 2008).

Disparities in accessibility to supermarkets were found throughout the United States (US). A study conducted by Morland et al. (Morland et al., 2002), for instance, found that 4 times more supermarkets were located in white-dominant neighborhoods (neighborhoods with less than 20% African-American residents) in Mississippi, North Carolina, Maryland, and Minnesota. Another study in Metropolitan Detroit found that among the neighborhoods with the lowest socioeconomic status, neighborhoods with more than 2% African-American residents were 1.1 miles further from the nearest supermarket, compared with other neighborhoods in the study area (Zenk et al., 2005). Such findings were later supported by Richardson et al. (Richardson, Boone-Heinonen, Popkin, & Gordon-Larsen, 2012) in their nationwide study, where inequalities in supermarket availability were identified across different racial compositions and income levels, especially in low-density urban

* Corresponding author.
E-mail address: mingyli@gatech.edu (M. Li).

https://doi.org/10.1016/j.apgeog.2018.06.004
Received 17 May 2017; Received in revised form 15 June 2018; Accepted 16 June 2018

areas.

Evidence about disparities in accessibility to fast food restaurants were also found in the US. Study have showed that the percentage of African-American residents were positively associated with the density of fast food restaurants within the City of New Orleans, Louisiana and New York City (Block, Scribner, & DeSalvo, 2004; Kwate, Yau, Loh, & Williams, 2009). Such trend was later supported by several studies in Los Angeles County, CA, and the State of Mississippi, North Carolina, Maryland, and Minnesota, where neighborhoods with low socioeconomic status were found to be associated with an increased availability of fast food restaurants (Lewis et al., 2011; Morland et al., 2002). Across the US, a national study conducted by James et al. (James et al., 2014) concluded that neighborhoods with more African-American residents were found to be associated with closer proximity to fast food restaurants.

The list of literature with similar findings goes on. While many previous studies have examined the disparities in the accessibility to supermarkets (Larsen & Gilliland, 2008; Richardson et al., 2012; Smoyer-Tomic et al., 2008), or fast food restaurants (James et al., 2014; Kwate et al., 2009; Walker, Block, & Kawachi, 2013), or both (Duran, Roux, Maria do Rosario, & Jaime, 2013; Engler-Stringer, Shah, Bell, & Muhajarine, 2014), they mostly used an accessibility measure in the following general forms:

$$Accessibility = f(supermarket\ locations) \tag{1}$$

or

$$Accessibility = f(fast\ food\ restaurant\ locations) \tag{2}$$

The problem with equations (1) and (2), is that different food outlet types tend to cluster spatially (Lamichhane et al., 2013; Wang, Tao, Qiu, & Lu, 2016). In other words, areas with better/worse access to supermarkets tend to also have better/worse access to fast food restaurants, and vice versa. As a result, accessiblity measures focusing on only one type of the food outlets (equations 1 and 2) might fail to capture the full interactions between residents and the local food environment, and lead to biased policy recommendations (Wang et al., 2016). Only a few literature, to the author's knowledge, such as the study performed by Powell et al. (Powell, Chaloupka, & Bao, 2007), explored accessiblity measures to account for the spatial dependence of both food outlets. It is believed that a more appropriate accessbility measure should the following general form:

$$Accessibility = f(supermarket\ locations,\ fast\ food\ restaurant\ locations) \tag{3}$$

In this study, the author proposes a balance accessibility measure that examining the balance of healthy (supermarkets) and unhealthy (fast food restaurants) food outlets, and explored its relation to neighborhood-level demographic and socioeconomic variables in Fulton County, Georgia. The proposed balance measure (see definition in Section 2.4 below) will serve as an attempt to construct a universal accessibility index that better represents the local food environment by capturing both healthy and unhealthy food outlets. In addition, the methodology employed in this study provides a scalable, systematic, and easily transferrable approach for future food accessibility studies. Last but not the least, this study will also contribute to the research of food accessibility in Metro Atlanta area, the ninth biggest metropolitan area in the United State with more than half a million people stranded in food desert (Burns, 2014).

2. Methods

2.1. Study area and analysis unit

This paper studies the food environment in Fulton County, a fast-growing and populated area in north-west Georgia, with large variations in demographic and socioeconomic status (See in Table 1 for descriptive statistics).

With the development of mapping and analysis technologies, the analysis unit employed in food accessibility studies, in general, has evolved from larger areas, such as Census Tract (Duran et al., 2013; Morland et al., 2002; Zenk et al., 2005), to smaller areas such as Census block group (James et al., 2014; Lamichhane et al., 2013; Richardson et al., 2012). Recent study has also performed analyses on a "micro-scale" of rasters of 100 m resolution (Helbich, Hagenauer, Poelman, & Schadenberg, 2017). Due to the limitations in data availability at the time of the analysis, the author selected Census block group to be the analysis unit, as it is the smallest geographic unit on Census website with demographic and socioeconomic information. Compared to larger units such as Census Tract, Census block group represents a greater level of homogeneity and therefore, less aggregation error (United States Census Bureau, 2012). In this study, Census block groups also served as proxies of neighborhoods in Fulton County.

2.2. Key neighborhood demographic and socioeconomic variables

Many researchers have identified the neighborhood racial composition and the neighborhood wealth as two key variables in food accessibility studies (James et al., 2014; Powell et al., 2007; Zenk et al., 2005). In this study, racial composition was defined as the percentage of non-Hispanic African-American residents of the block group (Block et al., 2004), and neighborhood wealth the median household income (Walker et al., 2013).

Little consensus, however, was built upon the inclusion of other neighborhood demographic and socioeconomic variables in the regression model. In this study, the percentage of families living below the US poverty level and percentage of household receiving Food Stamps/SNAP was identified as two measures the poverty status of the block group (Binkley, 2006; Lamichhane et al., 2013). Unemployment rate was another socioeconomic variable of interest, defined as the percentage of residents over age 16 and were unemployed of the block group (Larsen & Gilliland, 2008). Many studies also considered the effect of the education attainment: Both percentage of residents over age 25 with high school diploma or less and percentage of residents over age 25 with high school diploma or above of the block group were used to measure the average education level (Lamichhane et al., 2013; Larsen & Gilliland, 2008). In addition, percentage of lone-parent children and the percentage of senior residents (65 years old or older) were included in previous studies as controlling variables because such households tend to be more sensitive to the food environment in which they reside (Larsen & Gilliland, 2008; Smoyer-Tomic et al., 2008; Wang et al., 2016). Population density of the neighborhood was another demographic variable included in the literature, as food outlets tend to locate themselves in areas easily accessible by potential customers (James et al., 2014). Variables such as the percentage of commuters using public transportation, the percentage of renter-owned housing units, the urbanicity level of the block group, and the presence of major highway, were also identified in other papers (Block et al., 2004; James et al., 2014; Powell et al., 2007; Richardson et al., 2012; Smoyer-Tomic et al., 2008).

In addition to the variables found in previous studies, the author also explored the effects of four additional neighborhood-level variables: Intersection density, female population, children population, and distance to the closest Metropolitan Atlanta Rapid Transit Authority (MARTA) rail stations. The intersection density served as a proxy for commercial activity level, which was a variable included in Block et al. (Block et al., 2004). Female and children population were included because females tend to take on the responsibility of preparing food in a household, and children tend to be more selective for nutrition intake, making such population more vulnerable to the surrounding food environment. The distance to the closest MARTA rail station from the Census block group centroids was included to test the impact of public transportation system. The definition, descriptive statistics, and data