Do minority and poor neighborhoods have higher access to fast-food restaurants in the United States?

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ABSTRACT

Background: Disproportionate access to unhealthy foods in poor or minority neighborhoods may be a primary determinant of obesity disparities. We investigated whether fast-food access varies by Census block group (CBG) percent black and poverty.
Methods: We measured the average driving distance from each CBG population-weighted centroid to the five closest top ten fast-food chains and CBG percent black and percent below poverty.
Results: Among 209,091 CBGs analyzed (95.1% of all US CBGs), CBG percent black was positively associated with fast-food access controlling for population density and percent poverty (average distance to fast-food was 3.56 miles closer (95% CI: -3.64, -3.48) in CBGs with the highest versus lowest quartile of percentage of black residents). Poverty was not independently associated with fast-food access. The relationship between fast-food access and race was stronger in CBGs with higher levels of poverty (p for interaction < 0.0001).
Conclusions: Predominantly black neighborhoods had higher access to fast-food while poverty was not an independent predictor of fast-food access.

1. Background

Substantial health disparities in obesity and obesity-related diseases exist, with individuals of black race and lower income suffering a disproportionate burden (Ogden et al., 2006; Mujahid et al., 2005). In recent years, research on distal causes of obesity have explored whether neighborhood effects, or contextual factors in the neighborhoods in which people live, might play a role in driving these disparities (Lovasi et al., 2009; Ludwig et al., 2011). Although debate continues, evidence is growing that neighborhood access to fast-food establishments may lead to a diet that is high in fat, carbohydrates, and sugar and subsequent higher obesity risk (Larson et al., 2009; Caspi et al., 2012; Reitzel et al., 2014; Richardson et al., 2011; Morland et al., 2002; Burgoine et al., 2014). If fast-food access influences dietary patterns and obesity risk, different levels of fast-food access by neighborhood income or racial composition may contribute to the observed health disparities.

Researchers are beginning to examine whether neighborhood access to unhealthy food varies by neighborhood income or racial composition. Using a broad array of methods in a diverse range of settings, studies have demonstrated that low income neighborhoods with a large proportion of black residents have higher access to unhealthy foods (Walker et al., 2010; Black et al., 2012; Block et al., 2004; Cummins et al., 2005; Kwate et al., 2009; Powell et al., 2007; Fraser et al., 2010). While the literature has elucidated variability in access to fast-food by neighborhood race and poverty composition, we know little about the distribution of fast-food access relative to poverty and race across the entire US. This is due, in part, to a lack of reliable and valid measures of local food environments that can help researchers better understand the

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relationship between these environments and health, as well as to identify potential intervention points, such as food establishment zoning, to improve access to healthy foods (Kelly et al., 2011). The vast majority of fast-food access studies focus on small areas. Studies that have attempted to estimate the distribution of fast-food access across the US have relied on administrative boundaries and industry classification codes to determine restaurant types (Powell et al., 2007). Alternative approaches to measuring access to fast-food are necessary because individuals may obtain food outside of the administrative boundaries in which they live and research has demonstrated the inadequacy of industry classification codes to identify restaurant types (Powell et al., 2007). In order to build on the prior research, the present study identifies fast-food restaurants by their business name to reduce differential misclassification. In this analysis, we measure the average distance to the closest five fast-food restaurants from the centroid of Census block groups (CBGs), irrespective of Census boundaries, across the entire US and for each US state. We use these novel measures to estimate whether fast-food access varies according to CBG poverty and racial composition.

2. Methods

2.1. Data sources

2.1.1. Fast-food data

We used geocoded information on businesses across the United States from the commercially available Dun & Bradstreet dataset based on the ArcGIS Business Analyst Package (ESRI, Redlands, CA) from 2013. Industry classification codes for business types have been shown to have extensive misclassification. The extent of this misclassification has been demonstrated to vary by the socio-economic status (SES) and racial makeup of neighborhoods, with greater misclassification in lower SES and high minority neighborhoods (Powell et al., 2011). Therefore, we selected fast-food restaurants based on business names to improve accuracy in classifying fast-food establishments. Fast-food restaurants were selected from the 2011 top ten "limited service restaurants" sales list, a resource compiled by the food industry consulting firm Technomic Inc. (Technomic, 2013). These restaurants were McDonalds, Burger King, Starbucks, Dunkin Donuts, Pizza Hut, Subway, Taco Bell, KFC, Chick-Fil-A, and Wendy's. Although the choice of using the names of the top ten fast-food restaurants as a measure of fast-food access does not assess access to all types of fast-food destinations, this proxy of overall fast-food access is likely to capture a more homogenous, well-characterized category (Richardson et al., 2011) and has less potential bias than using industry classification codes due to the documented differential code misclassification of fast-food establishments by neighborhood socioeconomic status (SES) (Powell et al., 2011).

2.1.2. Neighborhood composition

We used US Census American Community Survey 2006–2010 and 2010 Decennial Census data to characterize CBGs according to SES, percent black, and population density.

2.2. Access to fast-food

The outcome for the study was a measure of *access to fast-food* for each CBG. We calculated fast-food access based on the road network distance from each CBG population-weighted centroid to the five closest restaurants (Fig. 1). The population-weighted centroid is based on the mean-weighted *x*- and *y*-coordinate values of the Census block population centroids. Road network distance accounts for both the location of fast-food and the feasibility of accessing it from each CBG center, and taking an average of the closest five establishments provides insight into the multiple opportunities to access fast-food compared to access to the single closest establishment. To estimate this measure, we used the closest facility calculation from the ArcGIS (ESRI, Redlands, CA) network analyst package. Similar methods have been applied in previous studies of food stores (Sharkey and Horel, 2008). CBG centroids more than 50 km from a road were excluded, as were CBGs in Alaska and Hawaii. Calculations of the five closest facilities were estimated independent of administrative boundaries, such that the five closest facilities could be located across CBG, tract, or state boundaries.
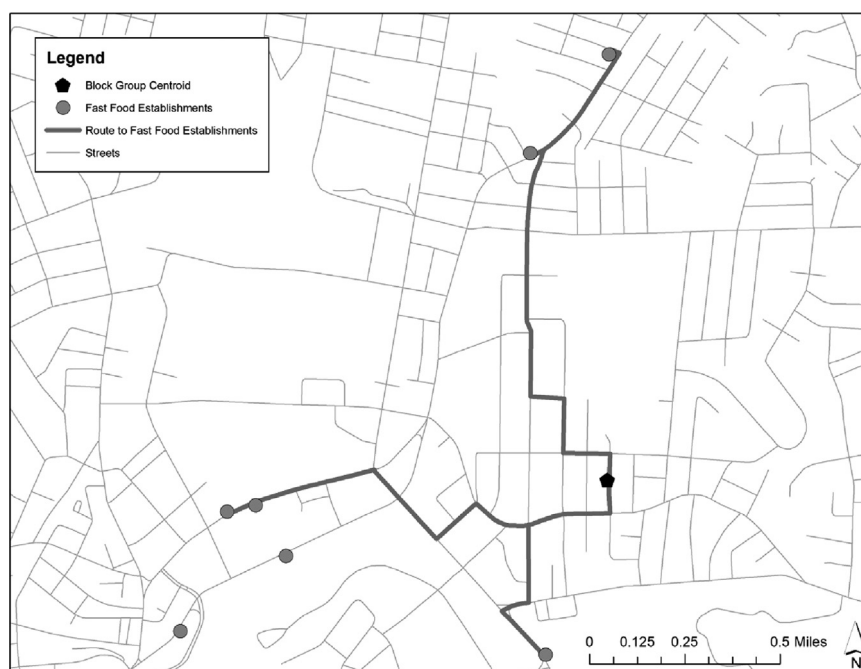

Fig. 1. Example of closest fast-food establishment by street network distance.