



Does opening a supermarket in a food desert change the food environment?☆



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ARTICLE INFO

Keywords:

Evaluation
Food desert
Food prices
Healthy food availability
Inequities in food access
Supermarket opening

ABSTRACT

Improving access to healthy foods in low-income neighborhoods is a national priority. Our study evaluated the impact of opening a supermarket in a 'food desert' on healthy food access, availability and prices in the local food environment. We conducted 30 comprehensive in-store audits collecting information on healthy and unhealthy food availability, food prices and store environment, as well as 746 household surveys in two low-income neighborhoods before and after one of the two neighborhoods received a new supermarket. We found positive and negative changes in food availability, and an even greater influence on food prices in neighborhood stores. The supermarket opening in a 'food desert' caused little improvement in net availability of healthy foods, challenging the underpinnings of policies such as the Healthy Food Financing Initiative.

1. Background

1.1. Inequities in food access

Many low-income, minority neighborhoods in the United States (U.S.) lack access to high-quality healthy and affordable food (Walker et al., 2010). Lack of access to supermarkets in such neighborhoods may constrain residents to buy food from small neighborhood or convenience stores with poor selection of healthy foods, wide selection of unhealthy foods, and higher food prices (Alwitt and Donley, 1997; Block and Kouba, 2006; Bodor et al., 2008; Chung and Myers, 1999; Gittelsohn et al., 2008; Laska et al., 2010) relative to grocery stores. Contributing to the selection of unhealthy foods is the greater density of fast food outlets in areas of socioeconomic deprivation (Maguire et al., 2015). The lack of access to healthy foods may require residents to travel to supermarkets outside the neighborhood, despite financial and physical constraints to mobility (LeDoux and Vojnovic, 2013). While spatial access to healthy foods is critical, high prices may also

contribute to inequities in food access (Breyer and Voss-Andreae, 2013). Multiple studies have linked living in a neighborhood without supermarkets or sources of healthy foods to worse dietary intakes (Laraia et al., 2004; Moore et al., 2008; Rose and Richards, 2004) and diet-related health outcomes such as obesity and type 2 diabetes (Black and Macinko, 2008; Bodor et al., 2010; Keenan and Rosendorf, 2011; White, 2007). Collectively, these studies indicate a need for policy action and intervention strategies to ensure equitable access to healthy foods across the U.S.

1.2. What can be done about food access inequities?

Efforts are underway to improve healthy food access by transforming small stores already located in low-income minority neighborhoods (Gittelsohn et al., 2012) or by bringing in large grocery stores. Efforts that involve bringing supermarkets to 'food deserts' have gained more attention, with multiple policy initiatives (e.g. the Healthy Food Financing initiative or HFFI) underway (Flournoy et al., 2010;

☆ This research was supported by the National Cancer Institute (Grant no. NIH/NCI R01CA149105—Does a New Supermarket Improve Dietary Behaviors of Low-income African Americans?).

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<http://dx.doi.org/10.1016/j.healthplace.2017.06.002>

Received 26 October 2016; Received in revised form 12 June 2017; Accepted 13 June 2017

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Treuhaft and Karpyn, 2010). The HFFI policy has invested more than \$500 million through one-time financing assistance to bring grocery stores and other healthy food retailers to underserved urban and rural communities across America. The goal of HFFI is to provide areas without lack of access to a supermarket with access to a supermarket to bring major improvements in geographic access. One evaluation of such an effort found that a supermarket opening in a food desert increased perceptions of healthy food access, based on a pre-post survey of residents (Cummins et al., 2014). Another large quasi-experimental study, the Pittsburgh Hill/Homewood Research on Eating, Shopping, and Health (PHRESH) study also included surveys of residents and also found significant improvement in perceptions of healthy food access (Dubowitz et al., 2015). Although the primary goal of these policy initiatives is to expand healthy food access, studies have not gone beyond residents' perceptions to determine the impact of opening a supermarket on the neighborhood food environment.

Supermarkets are meant to increase the variety and quality of fresh produce and the number of healthy food options (e.g. broccoli), as well as to reduce the price of healthy foods and the distance residents have to travel to access these foods directly, through their products, prices and location of the store in the neighborhood. However, supermarkets may also modify the availability of unhealthy foods by offering such foods. The introduction of a supermarket into the local food system may also influence healthy and unhealthy food access by acting as a driver for wider food system change (Diez Roux, 2011). For example, the increased competition may cause some local food stores to fail, stimulate changes in price, or prompt changes to stocking and inventory practices in other local food stores, thereby changing food availability and prices indirectly. These potential changes may be positive or negative. One study found that the opening of a Wal-Mart supercenter, which sets grocery prices significantly lower than its competitors (Leibtag, 2006), decreased prices by 6–7% for national brand goods and by 3–8% for private label goods in other grocery stores in New England (Volpe and Lavoie, 2008).

1.3. What's new about this study?

In this paper, we evaluate the impact of a supermarket opening in a 'food desert' (Economic Research Service, 2012) on residents' food accessibility and neighborhood food availability and prices. We draw on additional data from PHRESH (Dubowitz et al., 2015) obtained through in-store audits of the entire food retail environment in two urban neighborhoods at two time points. Both neighborhoods were predominantly African-American and without a supermarket at the start of the study. One of the two neighborhoods experienced major food system change with the opening of a full-service supermarket after the initial audit and before the follow-up; the other neighborhood was highly similar to the first but did not experience this change, providing a comparison that can account for 'secular' trends, or any independent, long-term trends, in local food marketing. In addition to food store audits, surveys were conducted with a random sample of households before and after the supermarket opening.

Using the audits and surveys, we tested the following hypotheses: relative to secular trends in the comparison neighborhood (Homewood), opening a supermarket in the Hill District will: (i) improve resident geographic access by a significant reduction in distance to any supermarket, and residents' place of regular food shopping; (ii) increase the availability of healthy foods; (iii) increase the availability of unhealthy foods; and (iv) lower prices of healthy and unhealthy foods (due to competition from a larger grocery) in the Hill District (intervention neighborhood). In addition, we explored changes in the store environment (e.g. orderliness). We conjectured that competition among stores may lead to improvements along this dimension. We evaluated orderliness and hypotheses ii through iv using two analyses involving different samples of food stores. In the first approach, we include all stores open at each assessment. This

analysis addresses the question of what the impact of the supermarket opening is on the environment of each neighborhood as a whole (i.e., it accounts for the opening or closing of other stores in response to the new supermarket, as well as the supermarket itself). The second approach shines a spotlight on one important aspect of these changes in more detail. In it, we only included stores that were open before and after the supermarket opening. This analysis assesses the impact of the supermarket opening on offerings and prices of other stores in the area.

2. Methods

2.1. Study design

PHRESH is a five-year study of two urban 'food deserts' – both lacked a supermarket at baseline, and residents' lacked access to healthy foods (Economic Research Service, 2012). The intervention neighborhood (Hill District) is approximately 3.55 km² (1.37 square miles) with a population of 10,000, and the control (Homewood) is approximately 3.76 km² (1.45 square miles) with a population of 8000. The two neighborhoods were similar with over 90% African Americans, and half of households reporting an annual income below \$10,000. Boundaries of the neighborhoods correspond to 'official' city neighborhoods, and also align with resident-defined neighborhoods within the City of Pittsburgh. Neighborhoods in the city are comprised of multiple census tracts and boundaries of the census tracts align with neighborhood boundaries. Colloquially, the five neighborhoods comprising what we call the Hill District are referred to as one Hill District neighborhood. Our control neighborhood includes Homewood (divided into three smaller official neighborhoods) and Larimer. A new supermarket opened in the Hill District in October 2013, the first in three decades. Study protocols were approved by the RAND Human Subjects Protection Committee.

The PHRESH study surveyed a random sample of household primary food shoppers in the two neighborhoods prior to (between May and December 2011) and again twelve months after (between May and December 2014) the supermarket opening. The household sample was drawn from a complete list of residential addresses generated by the Pittsburgh Neighborhood and Community Information System, with stratified sampling conducted in the intervention neighborhood. Out of 4002 sampled addresses, 2900 households were inhabited. A household member was contacted at 1956 addresses, with up to ten attempts per household; 1372 households completed a baseline survey. The analysis in this paper includes 746 households that completed both a baseline and a follow-interview, and continued to live in the same neighborhood.

We combined a thorough neighborhood examination by trained-resident data collectors combing the streets, with input from community stakeholders, to create a listing of all stores selling any food at both time points. All stores in this analysis are within the boundaries of their respective neighborhoods. Stores present at both assessments were audited twice; stores that closed and new stores at follow-up were audited once. We completed in-store audits of 30 food stores in the two neighborhoods. Stores were categorized using definitions from the Food Marketing Institute (FMI) and the North American Industry Classification System (NAICS); we initially classified stores into one of 11 categories. To simplify, we further reduced these categories to the following three categories: (i) **supermarkets** are large regional or national chain owned stores; (ii) **convenience stores** are small chain stores with or without a gas station (e.g. Get Go, AM/PM, Shell Station), neighborhood stores are small individual/locally owned stores, drug stores, or dollar stores with limited assortment of low-priced and perishable items (e.g. Family Dollar); and (iii) **other stores** such as fruit and vegetable stores, and meat or seafood markets (Bureau, 2007).

The audit tool was adapted from the Bridging the Gap (BTG) Food Store Observation Form, which has demonstrated high validity and

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