

AN EXPLORATION OF ALTERNATIVE FOOD DESERT DEFINITIONS IN SOUTH DALLAS

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1. INTRODUCTION

More than one-third of adults and approximately 17 percent of children and adolescents in the United States are obese. Heart disease, diabetes, and cancer are amongst the leading causes of death for Americans today—all of which are linked to obesity (Ogden *et al.*, 2012). In the United States, high Body Mass Indices (BMIs)¹ are associated with socioeconomically distressed populations (regardless of race), suggesting that environmental influences outside of a person's biological makeup affect their health (Ford and Dzewaltowski, 2009). One prominent area of research into these influences has focused on the built environment, specifically the retail food environment (Smoyer *et al.* 2006; Larsen and Gilliland 2008). This literature refers to low income areas where there is little or no access to healthful foods as 'food deserts'. One crucial area of concern in the food desert literature is the definition of a food desert.

Past studies have typically focused their food desert definitions on some combination of access, affordability, and store type considerations. In particular, these definitions frequently focus on access to large national grocery retail chains, and usually exclude smaller grocery retailers (*i.e.*, dollar stores, drug stores, and convenience stores). It is easy to assume that large chain stores provide the best variety and most competitive pricing of food items, but ignoring smaller food retailers omits an important source of food for consumers in communities with income and mobility issues. This study examines how food desert geographies are impacted by varying food desert definitions, including the incorporation of various kinds of small-format food retailers.

2. LITERATURE

Before engaging with the details of the present study, it is important to delineate the contributions of previous research in the area. Much of the literature on food deserts can be organized into three major themes: defining food deserts, defining accessibility, and food retailing/marketing.

2.1 DEFINING FOOD DESERTS

Food deserts are generally defined in the literature of the field as socioeconomically distressed areas with limited access to healthful food (Jeeter and Cassady, 2005; Larsen and Gilliland, 2008; Larson *et al.*, 2009; Leete *et al.* 2011; Smoyer *et al.*, 2006). The specifics of the actual definitions employed in each study vary from author to author. For the sake of brevity and consistency, the discussion here will focus on one of the most prominent food desert definitions, the one used by the United States Department of Agriculture (USDA). According to

¹ BMI is a primary measure of obesity.

the USDA, a food desert is a low-income census tract where a substantial number or share of residents has low access to a supermarket or large grocery store. Low income tracts are defined as those where at least 20 percent of the people have income at or below the federal poverty levels for family size of four, or where median family income for the tract is at or below 80 percent of the surrounding area's median family income. Tracts qualify as low access tracts if at least 500 persons or 33 percent of their population live more than a mile from a supermarket or large grocery store (USDA, 2009). Based on the USDA criteria, 10 percent of all census tracts in the US are considered food deserts; with the vast majority (82 percent) of these census tracts falling in urban areas (USDA, 2009). This fact accounts for the almost-complete focus of the food desert literature on food deserts in urban areas, although it does leave open the additional question as to issues related to food deserts in non-urban settings.

As an example of issues with food desert definition, Morland *et al.* (2001) look at the physical availability of food stores and how it affects individuals' diets. This includes *all* food services such as any type of restaurant, convenience store, supercenter, or drug stores. This definition overlooks two major components of defining factors of a food desert. It does not indicate the availability of *healthful* food, just the presence of food services. Also, the definition does not address the issue of affordability with relation to food deserts. Thus, simple knowledge of food access is not helpful for decision makers when identifying food needs. Some articles have a different approach and focus on the 'food security' of a neighborhood. An example of this would be Berg and Murdoch's (2008) definition of areas as "no grocery store neighborhoods" as opposed to food deserts. Their approach focuses on the number of grocery stores in a census tract, ignoring the distribution of the stores within the census tract.

2.2 DEFINING ACCESSIBILITY

Much of the existing food desert literature defines food deserts based on accessibility to, and affordability of, food (usually from grocery stores). These variables differ from author to author and the type of area that is studied. Some authors even use these terms interchangeably: even if food is geographically accessible, it may not be monetarily accessible to consumers, especially in low-income areas. However, it is important that a distinction is made: accessibility deals more with the geographical and transportation issues in the area of study, while affordability refers to the actual cost of obtaining and consuming the good. Most of the literature on food deserts defines accessibility based on a one-mile radius around a grocery store, or a one-mile radius in a census tract because the literature broadly assumes that one mile is a reasonable distance if the consumer had to walk (Berg and Murdoch, 2008; Sparks *et al.*, 2011; USDA, 2009; Wrigley *et al.*, 2002). However, use of a one-mile radius to identify food deserts is fairly simplistic and ignores the complexities that can be associated with urban travel (e.g., multiple modes of transport, such as walking, public transit, and automobile use, and the existence of travel barriers such as rivers or rail lines that can prevent a store from effectively serving all residents that are technically within one mile of a food store location).

Other articles use a variety of different measurements including geographical information systems (GIS) that calculate the minimum distance and coverage methods in order to determine the supermarket accessibility within a city (Smoyer *et al.*, 2006; Sparks *et al.*, 2011). For example, the use of public transit (bus and rail) is examined with GIS, using census tracts as a good indicator of 'neighborhoods', with a buffer or container of some kind then being created for that particular area. However, many authors use a network-based approach and look at footpaths, roads, or public transit routes in order to better examine the accessibility of food retailers. This approach is useful for determining accessibility, but the studies will ignore (or are unable to include) the population who actually use those forms of transportation for their shopping trips to the grocery store.

Access to a vehicle/vehicle ownership is another means of determining accessibility. This makes sense because car ownership is widespread in the US, so lack of access to an automobile could be conceived as a serious impediment to food procurement. Automobiles have shaped the way in which many cities in the US were developed, and are a basic force in the evolution and ongoing operation of US society.

2.3 FOOD RETAILING/MARKETING

A growing body of research suggests that the suburbanization of food retailers in North America and the United Kingdom in recent decades has contributed to the emergence of urban food deserts (Larsen and Gilliland, 2008). This is based on the idea that grocers locate near the consumers with high disposable incomes. Thus, as more affluent populations moved to the suburbs, grocery stores followed, leaving populations remaining in the inner city underserved. Research from this perspective is also based on insights provided by the spatial demand curve concept: people consume more from stores that are physically closer to them, and less from stores located further away.

Within the food retailing industry, there is an increasing diversity in the kinds of stores providing food. Along with grocery stores, convenience stores, drug stores, and dollar stores have also become important food providers in recent years (Whol, 2011; Martinez and Kaufman, 2008). With an increase of competition, traditional grocers may endure pressure to lower their prices. This increased pressure to lower prices combined with the perceived costs of locating in an area of low socioeconomic status (typically due to crime and lower demand) form an ideal combination of the obstacles that create food deserts. Also, with an unstable economy and increasing gas prices, many food retailers are looking for alternative distribution channels in order to better reach their consumer. For example, Wal-Mart is expanding their mid-sized stores and their Wal-Mart Market (small-format) stores because the return on investment in those retail formats is comparable to that of its larger supercenters and can allow them to increase their reach into more and different markets than in the past (Boyle, 2011).

3. STUDY AREA, DATA, AND METHODS

3.1 STUDY AREA

Dallas County, Texas, is home to one of the largest collections of food deserts in the US (USDA, 2009). Most of these food deserts can be found in south Dallas. The study area for this project focuses on south Dallas within the confines of major highways. Figure 1 shows the extent of this study area within the southern part of the city of Dallas.

3.2 DATA

The first dataset is a list (including addresses) of all food retail establishments within Dallas city limits. This dataset was obtained from the Department of Code Compliance Services for the City of Dallas. Each retail establishment is assigned a category based on store type. Store type is determined by square footage and the good or service that provides the store with the majority of its sales (not profits). The categories that were already assigned to each retail establishment have been modified into more useful categories for this particular study. The categories and their criteria used in this study are outlined in Table 1.

Caterers and food available for purchase located inside a school, hotel, or other non-food establishments (such as a gym or a corporate office) were removed from the dataset. Those food purchase options are removed from the analysis based on the idea that members of the general community may not have access or ability to purchase the items from the store (e.g., they are not a member of the gym or work in the office with the food establishment). Also, any business noted in the database as “currently under construction” was not included in the analysis because the store type was undeterminable.

Referring to the store type classification in Table 1, the USDA only includes the *Supercenters and Large Supermarkets* category in their food desert definition. The store types *Small Supermarkets*, *Gas Stations*, *Drug Stores*, and *Dollar Stores* are referred to as ‘smaller grocery retailers’ throughout the rest of this paper and used in the alternative food desert definition employed in this study. Wholesale stores and clubs were not included in the analysis because they are not considered grocery stores by industry standards (USDA, 2009).

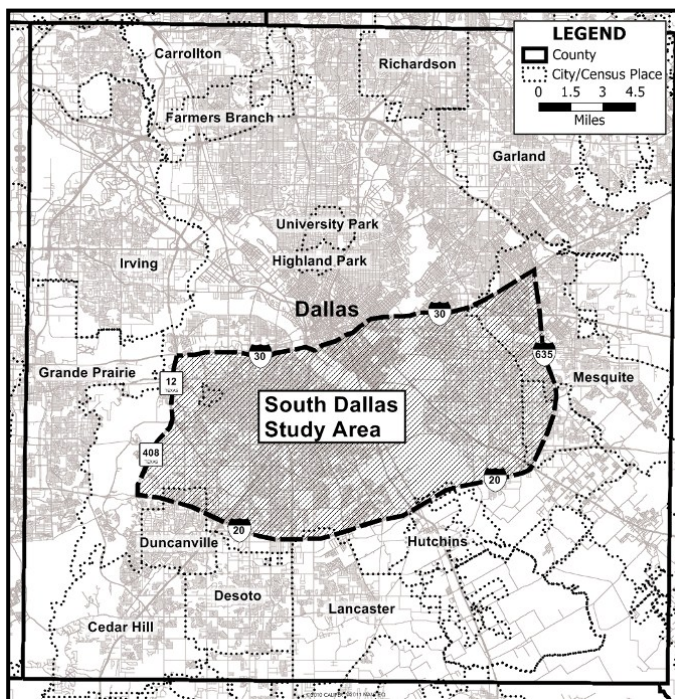


FIGURE 1
SOUTH DALLAS STUDY AREA

TABLE 1
STORE TYPE CATEGORIES AND DESCRIPTIONS

STORE TYPE	DESCRIPTION	NUMBER OF STORES IN STUDY AREA
<i>SUPERCENTERS & LARGE SUPERMARKETS</i>	Large national chain supercenters and supermarkets.	20
<i>SMALL SUPERMARKETS</i>	Smaller grocery retailers and convenience stores that do not have gas pumps (<i>i.e.</i> , local mom and pop grocery stores).	82
<i>GAS STATIONS</i>	Convenience stores with gas pumps.	58
<i>DRUG STORES</i>	Stores that sell convenience and food items but position the store as primarily a pharmacy.	11
<i>DOLLAR STORES</i>	Deep discount stores that sell predominately commodity items, including food items.	31

Income data from the 2006-2010 American Community Survey (ACS) are used to identify the income levels of the census tracts. Block level population data from the 2010 census is used to identify the location of the population outside a one mile radius of a food retailer from one of the categories listed above.

The datasets used in the study are the most recent available at the time of the study. Data for food retail establishments are current as of 2011. Neighborhood data come from 2006-2010 (incomes) and 2010 (populations) respectively. The time frame of the 2006-2010 ACS encompasses much of the recent economic recession.

3.3 METHODS

Before identifying food deserts, food stores were classified into the categories from Table 1. A broad range of online yellow pages, customer reviews, Google maps, and Google Earth were used to assign each store within this classification system. For example, Google Maps and Google Earth were used to provide confirmation of the presence of gas pumps (and thus include a store in the “gas station” category).

After food stores were categorized, low income census tracts were identified based on the USDA’s criteria cited earlier, using the income data from the ACS and the national poverty level for a family of four in 2010². Also, part of the definition of a food desert relies in part on relative income; therefore the mean income³ for Dallas County was used to find which census tracts fell below 80% of the mean income of the area.

A GIS analysis was then implemented to identify the census blocks that fall in low income census tracts, and then which of those blocks are outside of a one mile radius of a food retailer (this analysis repeated for each of the store categories already mentioned). GIS analysis also used census tract population data to identify the percent of the population in each tract that lies outside a one mile radius of a food retailer (again, this analysis was repeated for each store category).

4. RESULTS

Based on the USDA’s criteria for food deserts, 48 of census tracts in south Dallas (61%) are food deserts. Figure 2 represents the geographic distribution of these tracts. 19 of the food desert tracts in south Dallas had 100% of the population outside of a one mile radius of a large grocery store or supermarket, and 10 additional food desert tracts had 80% or more of the population living outside of the one mile radius. There are 177,663 persons in south Dallas who live more than a mile from a major or large grocery store, which is about 99% of the population that lives in a census tract that qualifies as a low income tract. This shows us that income level is likely to be a strong determinant of food deserts, which makes sense given grocery retailers are for-profit organizations and tend to locate in areas where profit is potentially maximized.

The USDA currently identifies food deserts using 2000 census data, which finds 28 census tracts as food deserts in the study area (USDA, 2009). Figure 2 displays the 48 census tracts that are food deserts using the 2010 census data. There is actually a 71.4% increase in the number of tracts that are food deserts from 2000 to 2010. With the recession, it can be assumed the number of low income tracts may have increased in areas that possibly already had low access, or that grocers have left certain neighborhoods that could no longer financially support it. Though many of the persons (at least more than 500 or 33%) in the food deserts do not have access to large grocery retailers, they may have access to smaller grocery retailers.

When smaller grocery retailers are included in the analysis of food deserts, 11% of the census tracts in south Dallas are still food deserts (all food deserts shown in Figure 3 are also food deserts based on how the USDA defines them in Figure 2). There are 7,960 persons in

² National poverty level for a family of four in 2010 was \$22,314 (U.S. Bureau of the Census, 2010).

³ The mean income for Dallas County in 2010 was \$47,974 (U.S. Bureau of the Census, 2010).

south Dallas who live more than a mile from a grocery retailer of any kind, which is 4% of the population that lives in a low income tract. The difference (77%) that the smaller grocery retailers make in the food deserts possibly points to an over estimation of the impact of food deserts. If the smaller grocery retailers do in fact provide adequate groceries, a major source of where a neighborhood shops is ignored. This could become problematic when policy intervention or business strategy is based on the ideas that certain areas are food deserts when they may not be.



FIGURE 2
SOUTH DALLAS FOOD DESERTS BASED ON THE USDA CRITERIA



FIGURE 3
SOUTH DALLAS FOOD DESERTS WITH SMALLER GROCERY FORMATS INCLUDED

5. CONCLUSION, DISCUSSION, AND FUTURE RESEARCH

5.1 CONCLUSION

Researching the geography of food access and the built environment of food retailing enhances the understanding of the constraints that impact healthful eating. This is especially important in those communities where there is low mobility and high economic distress. Many arguments can be made for how to measure access and what components make up a food desert; this paper is aimed at emphasizing store type as the key differentiating factor. Using the USDA's definition of food deserts makes it possible to easily compare the differences that arise when smaller format grocery retailers are included. The results show a decrease in the number of census tracts classified as a food desert by 77%, which includes 169,730 people, when smaller format grocery retailers are included in the definition.

It is important to note that this paper does not suggest *all* of the smaller retailers offer healthful food options. The key point here is that it is important to notice how big a difference

there is between the USDA definition and the broader, small store-inclusive definition employed here. Thus, it is possible that use of the USDA food desert definition may overestimate the geographic extent of food deserts. This is becoming a more important component to consider in measuring food deserts as we see an increase in the variety of retail formats that provide food services (Martinez and Kaufman, 2008). This large geographic gap in the two definitions of food deserts highlights the importance of looking into multiple elements of the food desert to see what is driving such a large change.

5.2 DISCUSSION

Including small grocery retailers in food desert definitions could call attention to the idea that small businesses play an important role in providing food to the surrounding community. If these stores are viable substitutes for major national chain grocery retailers, the food desert landscape will look more like the map in Figure 3 as opposed to Figure 2. Identifying the substitutability of the smaller grocery retailers for the larger national chain stores would require a survey of the products in individual stores.

There are also policy and business strategy implications that can come from this analysis. Figure 3 indicates areas that are the most important census tracts to focus on for any policy intervention to provide access to grocery retailers or assist smaller stores in providing fresh food options. The tracts could even be areas that have high incentives for firms to locate (*i.e.*, tax breaks). This analysis also suggests how vital it is to understand the food retail environment beyond the income of the population and major grocery stores. For example, looking at product offerings in stores would be an ideal place to start in order to better identify the service gaps in healthful food access. Also, Mom and Pop stores may play a much larger role in the communities than what can be seen in Figure 2, and understanding how those stores function and what they provide is essential to a successful business strategy.

Some key limitations impact this study. Use of a one mile radius as a measure of access to a store ignores the actual distance that must be traveled by the consumer. The consumer may have to travel along a road, footpath, or public transportation that could require them to travel more than a mile to get to the store, even though they may live within one mile of a grocery store. This way of measuring access also neglects vehicle ownership, relative location to public transportation, and other mobility issues (such as age). Another limitation of this study is inherent in the datasets used. Stores currently under construction in south Dallas are not included in the analysis, as the nature of their food offerings (if any) cannot be adequately known. The development of any of these new stores into partial or full-service full retailers would in turn impact the geography of food deserts represented here.

5.3 FUTURE RESEARCH

Future research should include further investigation of the products (type of food) offered in the different types of store formats. This will tell us if the smaller grocery retailers provide healthful food options and can serve the surrounding population sufficiently. Including all of Dallas County will yield a better understanding of what is going on in north Dallas versus south Dallas or suburban versus urban. Also, looking at how different measures of access differ depending on definition would be an interesting topic to explore. For example, comparing highways, foot paths, and public transportation networks to identify areas where access is more than a mile away. This study yields results that may be unique to Dallas given the nature of the city structure. A fruitful direction for future research would be to do parallel analyses for other metropolitan areas, as this would help to identify the degree to which this Dallas case study is truly unique.

6. REFERENCES

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