

Introduction

Increases in rates of obesity and related chronic diseases that may be linked with poor diets, such as diabetes and heart disease, are major public health concerns. Some advocates, community leaders, and researchers are worried that these problems, and poor diets in general, may be more severe in certain poor and rural American communities because these areas have limited access to affordable and nutritious foods. A primary concern is that some poor or rural areas do not have access to supermarkets, grocery stores, or other food retailers that offer the large variety of foods needed for a healthy diet (for example, fresh fruits and vegetables, whole grains, fresh dairy and meat products). Instead, individuals in these areas may be more reliant on food retailers or fast food restaurants that only offer more limited varieties of foods. It is hypothesized that the relative lack of access to full-service grocery stores and the easier access to fast and convenience foods may be linked to poor diets and, ultimately, to obesity and other diet-related diseases.

It was this concern that led Congress, in the Food, Conservation, and Energy Act of 2008, (hereafter referred to as the 2008 Farm Bill) to direct the U.S. Department of Agriculture (USDA) to conduct a 1-year study of areas with limited access to affordable and nutritious food. The 2008 Farm Bill directed USDA to assess the extent of the problem of limited access, identify characteristics and causes of limited access and the effects limited access has on local populations, and outline recommendations for addressing the causes and effects of limited access. The USDA study was conducted by a team of researchers, policy analysts, and program leaders from USDA's Food and Nutrition Service (FNS), Cooperative State Research, Education, and Extension Service (CSREES), and the Economic Research Service (ERS), which served as the lead agency. This report provides the analysis and findings of the USDA study. A number of information-gathering and data-analysis activities were conducted as part of the study. Each of these activities and their purposes is described later in this introduction.¹

Definitions, Concepts, and Background Literature

The language in the 2008 Farm Bill defined a food desert as an "area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominantly lower income neighborhoods and communities" (Title VI, Sec. 7527). In order to consider the extent of such areas, the following questions first need to be answered:

- What is affordable food and nutritious food?
- What does it mean to have (or not have) access to such food?
- Do individuals or do areas lack access?

The concern over food deserts is that some consumers have difficulty accessing food retailers that offer affordable and nutritious food.² The ease or difficulty in getting to a food retailer depends on the location of the store in relationship to the consumer and the consumer's travel patterns, the

¹One additional activity that is not further described in this report is the Workshop on Access to Affordable and Nutritious Foods: Understanding Food Deserts held on October 9, 2008, in Washington, DC. An agenda for this workshop is included in appendix A.

²We note that this study focuses on the ease at which households and individuals can get to stores that sell the foods they want at affordable prices. We do not focus on the related concept of food security, which measures whether households or individuals have access to enough food for an active, healthy life. The concepts are clearly related, but, in general, food security measures focus less on physical access and more on whether a household can afford food. For example, some individuals or households may have low food security but may live only one block from a large supermarket, so that physical access to food is less of a problem than whether the family can afford to buy the food.

consumer's individual characteristics (e.g., income, car ownership, disability status), and neighborhood characteristics (e.g., the availability of public transportation, availability of sidewalks, and crime patterns in the area). Before considering how many people and places may be affected by limited access to affordable and nutritious food, one must first determine what is meant by "nutritious food" and "affordable," and how access to affordable and nutritious foods can be measured.

It may be easy to identify some foods as highly *nutritious* and others as much less nutritious, but the nutrition levels of most foods fall somewhere in between. Those foods that may be easily identified as highly nutritious are available in different forms (fresh, frozen, canned, in prepared sauces or dishes). They can also be purchased at many food outlets, including those that many consider lacking in nutritious foods, such as fast food restaurants. It is likely that even the smallest food retailers stock foods that have nutritional merits; however, it is also likely that some retailers may offer very few of these options. No one food can fulfill the recommendations for a healthy diet. So measuring what "nutritious" food is and where it can be found must necessarily encompass a broad array of foods and sources of foods.

Affordability of food refers to the price of a particular food and the relative price of alternative or substitute foods. Affordability of food is also impacted by the budget constraints faced by consumers, who must consider not only the prices of different foods to meet their food needs, but also the prices of other necessities (e.g., housing, clothing, and transportation). USDA provides guidance on national standards for nutritious diets at various costs levels—the Thrifty, Low-cost, Moderate-cost and Liberal Food Plans (Carlson et al., 2007a; Carlson et al., 2007b). Within each plan is a market basket of foods in quantities that reflect current dietary recommendations, food composition data, food prices, and actual consumption patterns. According to the Low-cost Food Plan, a family of four with two adults (age 19 to 50) and two children (ages 6 to 8 and 9 to 11) could consume a nutritious diet for \$175.60 per week (USDA, 2009).

In addition to considering food prices, consumers also consider travel and time costs in deciding where to shop and what to buy. There are also monetary and time costs in preparing and serving food, as well as cleaning up. The time costs of these activities may affect consumer decisions about whether to shop for and prepare a home-cooked meal, buy products that require less preparation time, or eat a meal prepared by a restaurant.

Measuring access to affordable and nutritious food is an enormous data collection task that requires information on all the food retailers in a neighborhood or within the reach of the consumer, the types and prices of food sold in these stores, and a measure of the quality of the food. Many studies approximate the availability of these foods and a wide range of other foods by using the existence of supermarkets and grocery stores, arguing that these stores are known to carry a variety of foods and have many options for "nutritious foods," such as fresh, frozen, and canned, and carry them at the lowest prices. But focusing only on supermarkets and larger grocery stores is likely to underestimate the availability of healthy foods since some of these foods are also available at small grocery stores, convenience stores,

pharmacies, dollar stores, farmers' markets, and restaurants. There is also some evidence of substitutability in stores—that is, areas without large chain supermarkets are often served with independent, and often smaller, grocery stores (Neckerman et al., 2009; Powell, 2009). These smaller stores may have adequate and affordable food choices, so that in ignoring them, researchers may underestimate the food that is available in those areas.

The limitations of considering only supermarkets and large grocery stores in measuring the availability of food are well recognized in the literature on food access. This has led to more localized studies that collect an extensive amount of data on the food environment. Some studies collect additional information about the locations of food retailers other than supermarkets, such as farmers' markets, meat markets, bakeries, or veggie carts (see, for example, Neckerman et al., 2009). Other studies actually measure a store's contents to see if "healthy foods" are sold, how much shelf space is dedicated to them, and in which forms they are sold (e.g., fresh, frozen, or canned; low-fat or regular) (see, for example, Rose et al., 2009; Sharkey and Horel, 2009). Standardized tools for conducting such studies have also been developed and tested, such as the Nutrition Environment Measures Survey (NEMS) (<http://www.sph.emory.edu/NEMS/>.) Such extensive data collections have been conducted on more localized levels, for example, in New Orleans, New York City, and six rural counties in Texas. But because these efforts require such intensive data collection and resources, they are not easily conducted on a national level.

Studies of food access have also measured the availability and prices of foods in USDA's Thrifty Food Plan (TFP) in stores as a standardized way to compare availability and affordability of foods in geographic areas (for example, Block and Kouba, 2005; Hendrickson et al., 2006; Mantovani et al., 1997; Rose et al., 2009). Such uses of the TFP provide an absolute measure of availability and price (as opposed to a relative measure) and allow aggregation across store types (Bitler and Haider, 2009).

Once the availability and price of food has been measured, studies of food access typically then measure how easy it is for consumers to access the food. The ease or difficulty of food access has been measured many ways.⁴ One common method is to measure distance from consumers' residences to the nearest food retailer that offers healthy and affordable foods (often to supermarkets or large grocery stores).⁵ Distances in sparsely populated areas are often not directly comparable to distance in densely populated areas. As a result, many studies consider access in rural areas separately from access in suburban and urban areas. "Walkable" distance measures have often been used to characterize access in urban areas. The definition of such a distance is often 1 kilometer or about a half mile (app. table B.1). Similar concepts for less densely populated suburban and rural areas have not been applied, but often a distance is designated to distinguish access limitations. For example, areas more than 10 miles from a supermarket have been called food deserts (Blanchard and Lyson, 2006; Morton and Blanchard, 2007). These designations of what may be considered an "acceptable" distance to a food source in less densely populated areas are somewhat arbitrary, especially considering that without a car, any distance of more than a mile or so could be considered unacceptably far.

⁴Appendix table B.1 summarizes the measures of access to health foods used by over 30 studies. Figure B.1 shows the locations of these studies.

⁵Distance is usually measured from the centroid of an area (e.g., ZIP Code, census tract, or block) to the nearest supermarket.

Distance is almost always measured as distance from a residential area to a store, assuming home to store travel is the way most people access supermarkets. But people do not just travel from home to store. They travel to work, school, church, and beyond and often purchase food on the way. Using an access measure that only considers distance from home is likely to underestimate the options available for food shopping.

Measures of distance to the nearest food retailer do not consider whether the consumer has other choices that can offer better products or lower prices. Thus, many studies have tried to capture the amount of choice consumers have in their measures of food access. Apparicio et al. (2007) and Sparks et al. (2009) calculate the distance to three different stores, or the distance to three different chain supermarkets to add a dimension of the level of competition in an area. Density measures that count the number of stores in a certain geographical area are also often used to describe the food environment. For example, measures such as the number of supermarkets, fast food restaurants, or convenience stores per resident within a census tract or the ratio of fast food restaurants to supermarkets per capita have been used to describe food environments within a geographic area (see, for example, Gallagher, 2007 and 2006). Density measures add richness to a measure of the food environment by looking beyond distance. Further, relatively higher densities of a store type could be a signal of the level of competition among that type of store and may signal lower prices.

A problem with both distance and density measures, however, is that they only measure “potential access,” and not “realized access.”⁶ Potential access shows where consumers could possibly shop, while realized access shows where consumers actually shop. A consumer that does not care to eat at fast food restaurants or convenience stores may have high access to these stores but may pass by them on the way to a supermarket that is farther away. And even if the concentration of convenience stores is higher in some neighborhoods, most of the food shopping could be conducted at larger supermarkets. For example, Broda et al. (forthcoming) find that compared with higher income families, low-income families spend slightly more of their food budget at convenience stores, which offer prices that are, on average, greater than those in traditional grocery stores. However, the study also found that compared with higher income families, low-income families spend a greater share of total expenditures at supercenters, where lower prices almost completely offset the higher prices at convenience stores. To further illustrate this point, data show that, on average, SNAP participants lived 1.8 miles from the nearest supermarket but traveled 4.9 miles to the foodstore they most often used (Cole, 1997). (More details on both of these findings are provided in chapter 5).

Area-based versus individual based concepts of access

Studies that use area-based measures of access, either distance or density, usually focus only on areas with high concentrations of vulnerable populations.⁷ Examining only areas in which a relatively high proportion of poor people live, for example, will miss many poor people who live in less poor areas, but who may also have limited access.⁸ Further, not everyone who lives in low-income areas is poor. There will certainly be people who live in a low-income area with limited access but who themselves have

⁶This helpful distinction is made by Sharkey and Horel, 2009.

⁷Most studies consider only areas with high concentrations of poor people. Some also consider areas with low vehicle ownership rates, high concentrations of elderly, and the availability of public transportation. See Neckerman et al., 2009, for more details.

⁸A separate concern is for those who are too poor to buy food regardless of how accessible it is. USDA's Household Food Security in the United States series reports the percent of Americans who do not have access to enough food for an active, healthy life for all household members. In 2007, 11.1 percent of households were food insecure at some time during the year and about 4.1 percent of all households had very low food security some time during the year (Nord et al., 2008).

adequate resources to travel to a supermarket regularly. Ownership of, or easy access to, a motorized vehicle may be the best marker of access regardless of whether someone lives in a poor area or not. The majority of U.S. households own cars (89.7 percent).⁹ Vehicle ownership rates among those living in rural areas (94.6 percent) are higher than among those living in urban areas (87.8 percent). Those with low incomes are less likely to own a vehicle, but time use and travel mode data reported in Chapter 2 show that most people, even low-income people, take their own vehicles or drive with someone else to do their grocery shopping.

The distinction between individual-level access and area-based access has significant implications for measuring the size of the problem of limited access—that is, the number of people with limited access. Chapter 2 illustrates this. The distinction also has implications for the design of policies that may be most cost effective in reducing the problem. For example, if those people who have low incomes and limited access are scattered throughout areas with lower concentrations of poor people, then opening up a new supermarket may be less effective than policies that make individual or group transportation to stores less expensive (for example, bus/transit subsidies, store shuttle services, or improved bus routes). However, if people with low income and low access are concentrated in certain areas, then finding a way to open a new store or improve the variety of foods carried in existing stores in that area may be more effective.

The bulk of studies of food access find relative differences across areas in access to some types of food retailers and foods.¹⁰ Researchers have documented the inequality of access to supermarkets in urban inner city areas (Donohue, 1997), while others have focused on differences in access to supermarkets in poor versus nonpoor areas (O’Conner and Abell, 1992; Cotterill and Franklin, 1995; Pike, 2000). Moore and Diez Roux (2006) investigated racial disparities in the number and variety of grocery stores in neighborhoods. Zenk et al. (2005) compared distances to the nearest supermarket among poor White and poor non-White households. Extending that approach, Gallagher (2007 and 2006) compared differences in the ratio of supermarkets to other foodstores in a neighborhood in Detroit and Chicago. More recently, Neckerman et al. (2009) examined the retail food environment in New York City. They considered the characteristics of households, such as race, income, and forms of available transportation, including vehicle ownership or access to mass transit, as factors affecting a household’s foodstore access. Findings show lower access to supermarkets and other healthy food stores for neighborhoods composed primarily of African-Americans, where populations were heavily reliant on mass transit for transportation.

While there may be relative disparities in access to specific types of food retailers, there is not general agreement on whether areas with relatively less access have *inadequate* access to food. That is—there is not a widely agreed standard above which an area has “adequate” access to affordable and nutritious food and below which, an area has “inadequate” access to food. To draw such a distinction would require more systematic consideration of what inadequate access to affordable and nutritious food means, which would require collection of very detailed data on food availability and price. That does not mean that there are not areas with inadequate access. The research

⁹See chapter 3 for details on household access to vehicles.

¹⁰Larson et al. (2009) (Not in references) reviewed 54 studies of disparities in access to healthy food.

highlighted above certainly shows some areas may have inadequate access. Rather, the point here is that the data and methods that have been used to document relative differences cannot be implemented easily on a national level to make a national-level distinction.

Absolute standards of similar concepts, such as *poverty* or *food insecurity*, have been made and are commonly used in describing conditions of the U.S. economy and the well-being of U.S. households and in making public policy. While these absolute distinctions are certainly not universally agreed upon, there is a much deeper and richer literature from which a concept like poverty can be defined and measured than there is for food deserts.

Report Outline

A variety of data and methods was used to assess the extent of limited access to affordable and nutritious food, including both individual measures of access and area-based measures of access. Responses to a national-level household survey of food adequacy and access were analyzed, as were data estimating differences among households in the time spent traveling to grocery stores and the travel mode used. To determine the extent of areas with limited access, a comprehensive database was developed to identify the location of supermarkets and large grocery stores within the continental United States. Food access was estimated as the distance to the nearest supermarket or large grocery store, which is used as a proxy for the availability of affordable and nutritious food. The analysis specifically considered distance to the nearest supermarket for low-income populations and for households without access to a vehicle. Differences in rural, urban, and areas in between were considered. These results are presented in Chapter 2. Chapter 3 uses the same data on the location of supermarkets to analyze the household and neighborhood characteristics that distinguish areas with low access from areas with better access. The novel contribution of these analyses is that they are national in scope and combine two databases on supermarket and grocery store location.

Supermarkets are not the only sources of healthy and affordable foods. Many smaller scale sources may be used by those who are underserved by supermarkets. However, a complete assessment of the food environment of every area in the United States is an enormous task that is beyond the scope of this study. Instead, USDA cooperated with the National Poverty Center (NPC) at the University of Michigan to commission six studies of the food environment at more localized levels. These studies provide more detail on the food environment in New York City; Indianapolis, Indiana; New Orleans, Louisiana; Salt Lake County, Utah; the Brazos Valley in rural Texas; and Portland, Oregon. Methods and findings from these studies, along with the national level analyses, are discussed in Chapters 2 and 3.¹¹

People who live in areas with limited access may be more prone to poor diets and have poor health outcomes, such as obesity or diabetes, because they lack access to healthy foods and may have too easy access to less healthy foods. Chapter 4 considers the extent of knowledge on the relationship between limited access and diet and health outcomes. This chapter draws heavily upon a workshop summary of the Institute of Medicine (IOM) and the National Academies. This workshop, sponsored by ERS, was

¹¹Drafts of these papers and an agenda for a conference that featured the papers are available on the NPC website: www.npc.umich.edu/news/events/food-access/index.php. Final versions of these papers and a summary of the papers will accompany the final version of this report.

conducted on January 26-27, 2009. It included sessions on measuring access; methodological challenges in assessing causal relationships between food access and diet and health outcomes; reviews of existing knowledge about the links between access and diet and health outcomes; and promising strategies for mitigating the impacts of food deserts that have been suggested, implemented, or are in the planning stages. A workshop summary will be published in June 2009.

Populations that live in areas with limited access to affordable and nutritious food may adjust their food shopping behaviors and diets based on the food environment in their area. These adjustments could be due to the lack of availability of some foods or to the relative prices of different foods offered from different food retailers. Chapter 5 considers how food access relates to food choice—that is, whether consumers in areas with limited access face higher prices for similar goods and whether they have different food purchasing behaviors. Comparisons of the prices that consumers paid for similar foods (milk, ready-to-eat cereal, and bread) purchased at different retail outlets (supermarkets and grocery stores vs. convenience stores) are made using hedonic price models. Differences in the prices offered at different retail outlets could lead consumers to adjust where they shop and what they purchase. The chapter also considers shopping behavior for populations with limited access, which can further the understanding of the adjustments that consumers make to different prices and retail availability. A summary of a body of work conducted by FNS on the shopping patterns of participants of the Supplemental Nutrition Assistance Program (SNAP—formerly called the Food Stamp Program) is provided in the chapter. ERS also analyzed how SNAP participants' expenditures on foods in several food groups (e.g., canned and noncanned fruits and vegetables) varied by self-reported measures of access to supermarkets. Spending on these food groups by people with relatively easy access to supermarkets is compared with spending by those with less access to supermarkets. Finally, findings from a study conducted by ERS and external researchers on whether poor people pay more for similar foods relative to higher income people are integrated.

Economic and market conditions may contribute to the existence of food deserts. The costs facing food retail businesses and the choices available to consumers could both account for differences among stores in where they choose to locate. Chapter 6 provides an economic framework for understanding supply and demand for food and factors that may account for difference in access to food retailers across different areas. USDA, through NPC, contracted with two economists, Marianne Bitler and Steven Haider, to provide an economic framework for understanding food access issues. The chapter draws heavily upon this paper (Bitler and Haider, 2009).

In addition to administering SNAP and other nutritional assistance programs, USDA administers programs to improve food security in low-income communities. States and localities have also implemented programs to increase access to affordable and nutritious food for underserved populations. Private retailers have responded to the needs of low-income and bargain food shoppers. Chapter 7 describes USDA's Community Foods Project Competitive Grants Program and lessons learned from this program. Chapter 8 highlights several programs that have been implemented by States and

localities, as well as describes several other policy options that may be considered to reduce the effects of limited access.

Not all of the questions about the extent, causes, and consequences of food deserts will be answered in this report. The final chapter, Chapter 9, outlines an agenda for further research on the causes and consequences of areas with limited access to affordable and nutritious food.

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