

**Access to Low Cost Groceries in Nonmetropolitan Counties: Large Retailers and the
Creation of Food Deserts***

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Abstract

Using data from the 1999 Zip Code Business Pattern files, we show how the placement of 'supercenter' retail grocery stores, like Wal-Mart, have 'distanced' disadvantaged rural populations from stores that sell low cost groceries. Access to affordable sources of food in many nonmetropolitan counties requires access to transportation and may require lengthy commutes. This emergent issue is important for both rural and urban communities alike in that disadvantaged residents, such as the poor, the disabled, and the very old and very young may not be able to take advantage of the low prices offered in supermarkets and supercenters. A typology based on residential access to retail grocery outlets in an area is developed.

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Introduction

As the United States enters the 21st century, the geographic landscapes of production and consumption are being transformed by the forces of economic globalization. On the production side of the equation, the current restructuring of the global economy toward increased corporate integration is premised on the assumption that core firms (i.e., large national and multinational corporations) will be the primary engines of change and development (Barber, 1994; McMichael, 1996b; Harrison, 1994). According to this perspective, over the long-run, rising productivity should translate into higher wages and presumably more prosperous communities (Thurow, 1996), even though over the short-run some workers and communities may fare less well than others.

On the consumption side, large retailers and privately controlled shopping malls are penetrating all corners of the country. Smaller-scale, locally owned and operated businesses on Main Street are forced to compete for consumer dollars against the like of corporate giants like Wal-Mart. In an era when price is the bottom line, it is not surprising that the large retailers are winning the game.

In this paper, we examine how economic restructuring in the retail food sector has 'distanced' disadvantaged rural populations from stores that sell low cost groceries. In particular, we are interested in the recent and on-going spread and distribution of grocery 'supercenters' throughout rural America. The emergence of the supercenter as a source of low cost food may have profound implications not only for smaller-scale, locally-owned groceries, but also for consumers whose access to affordable sources of food in many nonmetropolitan counties may depend on the availability of transportation and

may require traveling a great distance. Low income individuals, people with disabilities, and the very old and very young may be disadvantaged if they do not live close to a supercenter.

The Growth of Supercenters

Over the past ten years, the retail grocery sector has been undergoing a radical transformation. Spurred by the entrance of Wal-Mart into the retail food industry, consumer shopping habits are rapidly changing. Data from a recent study by ACNielsen shows that consumers are making fewer trips to grocery stores and more trips to supercenters. In 1998, the average shopper went to the grocery store 85 times. By 2001, the number of visits was only 75. During this same period, visits to supercenters went from 14 to 18. More importantly, while 100 percent of their sample shopped at a grocery store in both 1998 and 2001, household penetration of supercenters went from 47 percent in 1998 to 63 percent in 2001 (Duff, 2002).

The importance of supercenters to the food buying habits of consumers and to the structure of the grocery industry cannot be overstated. An analysis of food purchasing habit at Wal-Mart Supercenters showed that seven percent of Wal-Mart Supercenter growth in 2001 came from new shoppers, 21 percent came from existing shoppers who increased their purchases at the supercenter, and 72 percent came from a direct shift in dollars from other types of grocery stores (Duff, 2002).

Finally, it is important to note that 70 percent of Wal-Mart Supercenters are located outside urban areas. Almost all of Wal-Marts major competitors (i.e., Safeway, Kroger, Albertsons) have focused their operations on urban markets. This suggests that the potential for retail food restructuring may be greater in nonmetropolitan than in metropolitan counties.

Food Deserts

The term food desert was coined by researchers in Northern Ireland to describe areas in which local residents have limited access to affordable food (Furey, et. al, 2002). Food deserts are most numerous in inner city urban neighborhoods and in rural areas. Indeed, as many rural areas lose population, they also lose access to food. The emergence of supercenters is likely to exacerbate food desertification. When a supercenter opens in a nonmetropolitan county, it draws customers from a wide radius. Within that radius are presumably smaller grocery stores that have been servicing the food needs of local residents. As previous research has shown, existing grocery stores may not be able to withstand the loss of customers to the supercenter. When they close down, further food desertification takes place.

Data and Methods

We employ two data sets to delineate low retail access areas in the U.S. To identify areas with limited access to supercenters and supermarkets, we draw on 1999 Zip Code Business Patterns (ZBP) data provided by the U.S. Bureau of the Census. ZBP data come from an annual business register maintained by the Bureau of the Census and provide information on both single and multi-establishment firms in the U.S. The files provide counts of establishments by zip code for all businesses with employees in 1999. ZBP summary statistics are derived from the same source as County Business Patterns files, but, unlike data from the Economic Censuses are collected and reported on an annual

basis. The 1999 ZBP data are the most recently available and are temporally closest to the 2000 Census of Population and Housing tabulations.¹

We selected establishment counts from two types of retail industries to identify *supermarkets* and *supercenters*. To calculate the number of *supermarkets* in a zip code, the number of establishments in NAICS industry code 445110 (Grocery (except convenience) stores) with at least 50 employees was used. Ideally, we would select establishments in this NAICS classification that have 90 or more employees. Economic Census Data from 1997 on the top 25 largest supermarket chains indicate that the average employment size of a supermarket is 90 employees. Because establishments with 90 employees fell into the 50-99 employee size category, we chose establishments with 50 or more employees. Establishment counts for *supercenters* and *warehouse clubs*, such as Super Wal-Mart, Super K-Mart, and Sam's Club, were tabulated from NAICS category 452910 (Warehouse clubs & superstores).

Because establishment counts from employment size categories do not disclose information on any single establishment, the Bureau of the Census does not withhold tabulations at the zip code level. In some cases, the Bureau of the Census is not able to assign an establishment to a zip code because the establishment operates from a vehicle or there was an error in the reporting of zip code information in administrative records. Establishments without zip code information are assigned a zip code of '99999.'

In 1999, 29 grocery stores with 50 or more employees and 1 supercenter/warehouse club fell into this zip code category. In 1999 U.S. Zip

¹ Alternatively, tabulations from the 1997 Economic Census Zip Code Summary files could be used to construct our measures. In an exploratory analysis comparing 1997 ZBP and 1997 Economic Census Zip Code establishment counts for the two industries of interest in this study, we did not find substantial differences between the two sources. Thus, we chose the source more temporally proximate to our population and housing data.

Codes contained 1,840 supercenter/warehouse clubs and 18,430 supermarkets.²

Population came from the 2000 Census of Population and Housing Summary File 1. We summarize population counts to the block group level to perform our calculation of retail access. We chose block groups because this is the smallest subdivision of a county for which boundary files are readily available for spatial processing. Additionally, the use of block group geography allows researchers to further characterize these block groups using Summary File 3 data that will be released by the end of 2002.

Methodology

To identify populations in counties that have limited access to large supermarkets or supercenters, we use ARCVIEW Geographic Information System (GIS) mapping software, which provides a means to assess spatial relationships. For the purposes of this analysis, GIS is employed to identify populations that reside within a given distance from supermarkets and supercenters. We selected those zip codes that contained at least one supermarket with 50 or more employees or supercenter/wholesale club in 1999. To assign a spatial location for these business establishments, we matched zip code data from ZBP to the 1999 U.S. Bureau of the Census Zip Code File that contains longitude and latitude coordinates for U.S. Zip Codes. Longitude and Latitude coordinates of each zip code represent the spatial center of a zip code area. The center of each zip code area is used to calculate distances. Figure 1 and Figure 2 provides an example of the use of zip code centroids for the state of Mississippi and the relation between the location of interstate highway, places of 10,000 or

²Note that the supercenter/warehouse club classification does not include traditional general merchandisers, such as Wal-Mart and K-Mart, because these stores do not sell the variety of grocery and produce items normally contained in a supermarket. This classification does include Super Wal-Mart and K-Mart stores that are a hybrid general

more persons, and the location of supermarket and supercenters.

All census block groups whose boundaries intersect a ten mile radius of the zip code centroid are classified as high retail access areas, while those blockgroups falling outside of the ten mile radius are considered low retail access areas. We chose a ten mile radius based on the National Transportation Survey. NTS survey data suggest that in 1995 the average U.S. resident traveled approximately 8 miles during grocery shopping trips. We selected ten miles rather than the national average because travel times vary between urban and rural locales. Our ten mile radius also assumes a point to point drive time of approximately 20 minutes, traveling at an average rate of speed of 30 miles per hour. We also adjusted our measurements based on proximity to an interstate highway. In the event that an interstate intersected the ten mile radius boundary, we extended the boundary to include an additional five miles of space that extended one mile around the highway. We included this additional boundary area to account for higher road speed on interstate highways. Figure 3 provides an example of the ten mile boundaries calculated for each zip code centroid containing a large supermarket or supercenter for the state of Mississippi. Figure 4 displays the remaining block groups that fall outside of the boundary areas. These county remainders are classified as low access areas for retail food distribution and can be characterized as a food desert. For the example state of Mississippi, 443,079 persons reside in areas classified as low access. After identifying food deserts within each county in the U.S., we calculate the proportion of the total county population in these low access areas.

Descriptive Analysis

Table 1 reports means, standard deviations, and medians for the proportion of the population

merchandise and supermarket.

who reside in food deserts. The results indicate that counties located in the West region of the U.S. experience the least amount of access to large supermarkets and supercenters. Additionally, 24% and 34% of the South's and Midwest's population, respectively are more than 10 miles away from a supermarkets or supercenters. The Northeast has the smallest proportion of persons with low access.

Table 1 also provides descriptive statistics sorted by the 1993 Urban Influence Scale. A number of key findings can be drawn from these statistics. First, not surprisingly, populations in metropolitan areas have greater access to supermarkets and supercenters. Indeed, over 95% of persons residing in MSA's live within 10 miles of a large grocery or supercenter. On average, only 3% of persons in metropolitan counties of 1,000,000 or more residents and 5% of persons in metro areas with fewer than 1,000,000 persons travel over 10 miles to access supermarkets and supercenters. This finding is consistent with prior research on the relation between population concentration and retailing activity (Johnson, 1985).

Second, access in nonmetro counties varies and depends on the size of cities within nonmetro counties. Residents in nonmetro counties containing a city of at least 10,000 persons have greater access to supermarkets and supercenters than individuals living in nonmetro counties with smaller cities. Nonmetro counties with no cities over 2,500 persons and not adjacent to a metropolitan area have the largest proportions of low access populations. For these counties it is also important to note that the median proportion is 1.00. This means that in at least one half of all nonmetropolitan nonadjacent counties no one has ready access to supermarkets and supercenters.

Tables 2-5 report means, standard deviations, and medians for the proportion of the population with low access by the 1993 Urban Influence Scale for each region. Looking first at the South (Table 2), two important findings are evident. First, people living in nonmetropolitan counties with a city of

10,000 or more persons but not adjacent to a metropolitan area have the greatest access to supermarkets and supercenters. This finding conforms to prior research on the locational strategies of the Wal-Mart corporation (Graff, 1998). Wal-Mart supercenter stores have been targeted primarily towards small cities in the South where competition from other food retailer is presumably low. Nonmetropolitan counties that are adjacent to metropolitan areas seem less likely to attract a supercenter, probably because of their proximity to urban retail markets. A second important finding for the South is that residents of nonmetro counties with no places larger than 2,500 persons have greater access to supermarkets and supercenters relative to the U.S. average. This suggests that the most rural residents of the south may have greater access to lower cost groceries than individuals living in similar counties elsewhere in the U.S.

Findings for the Midwest (Table 3) suggest that individuals residing in nonmetropolitan counties that contain a city of at least 10,000 and are adjacent to a metropolitan area have the same access to supermarkets and supercenters as people who live in metropolitan counties. Midwestern nonmetropolitan counties without a city of at least 10,000 persons have the greatest proportion of residents who live in food deserts. In contrast, nonmetropolitan counties with no city larger than 2,500 persons and not adjacent to a metropolitan area have, on average, 80% of their population residing in low access areas. In other words, most individuals residing in rural counties in the Midwest live in food deserts.

Compared to the other three regions, metropolitan counties in the West have higher than average proportions of individuals who live in food deserts (Table 4). For counties with one million or more residents, the proportion of the population living in low access areas is twice the national average. As was the case in the other regions, adjacency to a metropolitan area in the West appears to be less

important than the size of the cities located within the county. Nonmetropolitan counties without a city of at least 10,000 persons have high proportions of the population living in food deserts. In the most rural counties, almost 90% of the population resides in low access areas.

In the Northeast, metropolitan counties have the greatest access to large grocery stores and supercenters compared to the other three regions (Table 5). Similarly, individuals who live in nonmetropolitan counties also have greater than average access to supermarkets and supercenters. Even within the most isolated rural counties, only 32% of the population is more than 10 miles from a large supermarket or supercenter.

Conclusions

The purpose of this analysis was to develop and measure the emerging concept of retail food access and food desertification as it relates to the globalization of retail activity in the 21st century. Over the past 20 years, the U.S. has witnessed a transition from smaller scale retail distribution of groceries to larger scale supermarkets and supercenters. This trend has signaled a decline in "mom and pop" stores and the increasing penetration of large national and multinational corporations. While this process involves many actors, including wholesalers, processors, retailers, and consumers, we focused on the spatial relationships between one type of supplier (supermarkets, supercenters, and wholesale clubs) and the consumer. Our central objective was to address the question, do all consumers equally benefit from "economy of scale" food retailing?

To address this question, we developed an exploratory methodology for identifying the proportion of a county's population that has convenient access to a supermarket, supercenter, or wholesale club. Using data from the 1999 Zip Code Business Patterns file, we identified all zip codes in the U.S. that contained a large food retailer (i.e. supermarket, supercenter, or wholesale club). Next,

we determined what areas in the U.S. were proximately located to these zip codes. Using block group data, we selected all block groups that fell outside of a 10 mile radius of any zip code that contained a large food retailer. We adjusted this radius for interstate highways, due to the shorter travel time permitted by higher speed limits. After identifying block groups that were outside of the radius of a large food retailer zip code, we summarized the total population residing in these block groups and calculated the proportion of the county population residing in low access areas.

Our findings indicate that accessibility to large supermarkets and supercenters varies considerably across space. For example, people living in the West experience the highest levels of inaccessibility to large retailers, followed by individuals residing in the Midwest, South, and Northeast. In general, low access to large retailers is more prevalent among people living in nonmetropolitan areas than among their metropolitan counterparts. For nonmetropolitan counties, major differences are found between those counties with and without a city of at least 10,000 residents. This pattern is most evident in the South and Midwest. Another important finding from our study is that people living in nonmetropolitan counties that do not have a place with at least 2,500 persons, regardless of region, have the highest proportion of the population with low access to large food retailers. This finding indicates that many rural areas are clearly food deserts.

In summary, all consumers do not benefit from economy-of-scale food retailing and there are clearly winners and losers in the economy-of-scale game. There are a number of implications that speak to issue of food security and food desertification. First, individuals living in areas with low access to large food retailers are likely to pay higher prices for groceries at small local stores or incur greater travel costs to access large food retailers. The travel costs may offset the savings available at these stores. This is especially troubling for economically vulnerable segments of the population such as the

elderly, children, people without access to transportation, and single-parent families. For these individuals it may not be feasible or practical to shop at a large food retailer because of travel cost and time considerations. Without access to the large food retailers, these individuals are left to shop at convenience stores, gas stations, and small "mom and pop" grocers. However, the viability of small grocers is also threatened in this process. They are forced to purchase goods from wholesalers who service a shrinking clientele, increasingly comprised of only small grocers in areas inaccessible to large food retailers and specialty stores that survive the economy-of-scale transition. Thus, while large food retailers have much to offer the general public, only certain consumers can benefit.

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Appendix--Methodological Limitations

While our methodology for identifying populations with low access to supermarkets and supercenters takes advantage of available public data and computing resources, we have identified a series of limitations to our analysis.

First, we have selected the most conservative estimation of food access. For example, we classify block groups as low access if they do not intersect a boundary area surrounding a zip code centroid. Alternative estimates could be calculated based on the whether a block group is completely contained within a boundary area or if the centroid of the block group is contained within the boundary.

Second, road distance or travel time measured through a road network could be used to identify high and low access areas. However, construction of this measure for the U.S. would be costly, involve substantial computing resources, and involve a large number of assumptions because road network data does not include speed limits.

Finally, we assign the location of the businesses to the centroid of a zip code polygon. Centroids represent the spatial center of a zip code area. The centroid of a zip code is defined as by longitude and latitude coordinates. Because the actual latitude and longitude of a given business is not available in Census tabulations, we employ the zip centroid as the best estimate of the point location of the business. Alternatively, researchers could employ business register information collected by corporations such as Dunn and Bradstreet and Info USA. While these sources would provide more accurate data regarding the location of the business, these data also have an associated set of limitations. Primarily, establishment information in privately collected business registers is normally updated in three-year intervals. Thus, businesses that change location or go out of business may be inadvertently included or misrepresented. Because the supercenter/wholesale club industry is rapidly changing, newly

emerging establishments may be missed. A second limitation of these data is that street address information from these sources must be geocoded (assigned a latitude and longitude point) using a GIS system. Because addresses may not refer to a physical address of the business (i.e. PO Box) or addresses may be misreported, there is a possibility that some establishments may not be able to be geocoded. A third limitation of private business register data is that businesses are not required by law to respond to private business register surveys. Thus, there is a potential for nonresponse and misreporting of important information such as employment size.

Figure 1. Mississippi Counties and Places

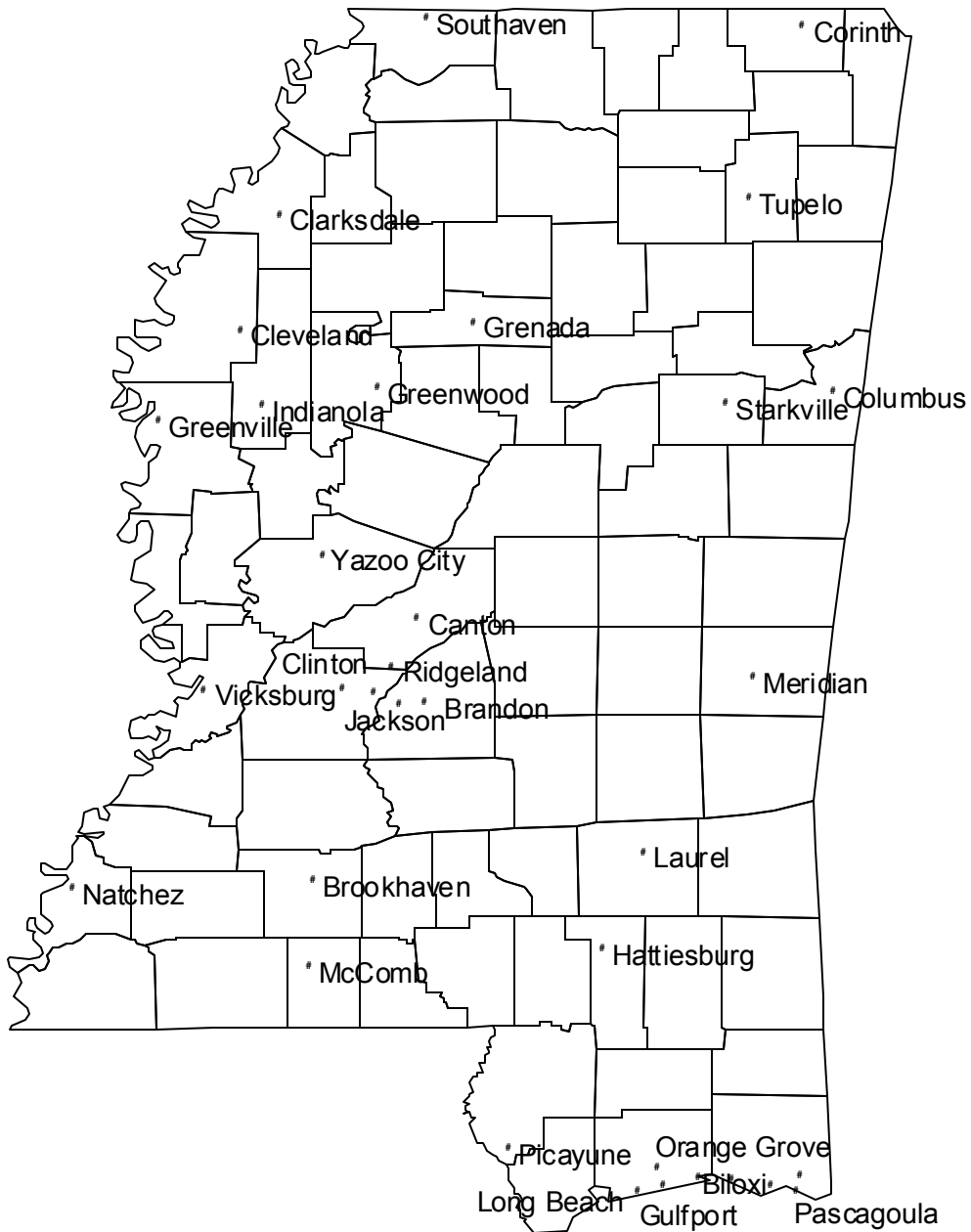
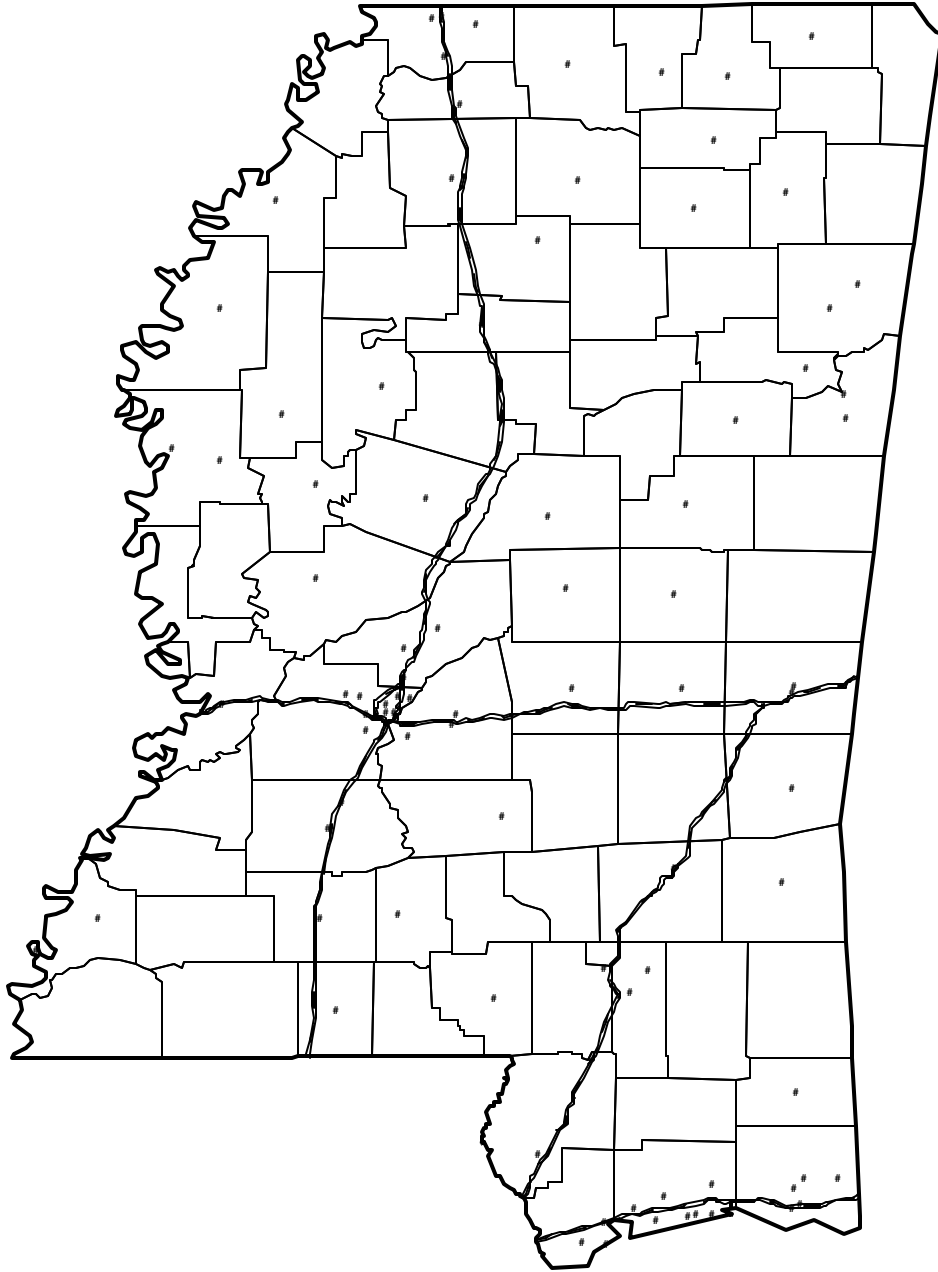


Figure 2. Zip Codes Centroids Containing Supermarket-Supercenter Establishments, 1999



 U.S. Interstate Highway
 Supermarket/Superstore Zip Code Centroids

Figure 3. Supermarket-Supercenter Accessibility for Mississippi Counties, 1999

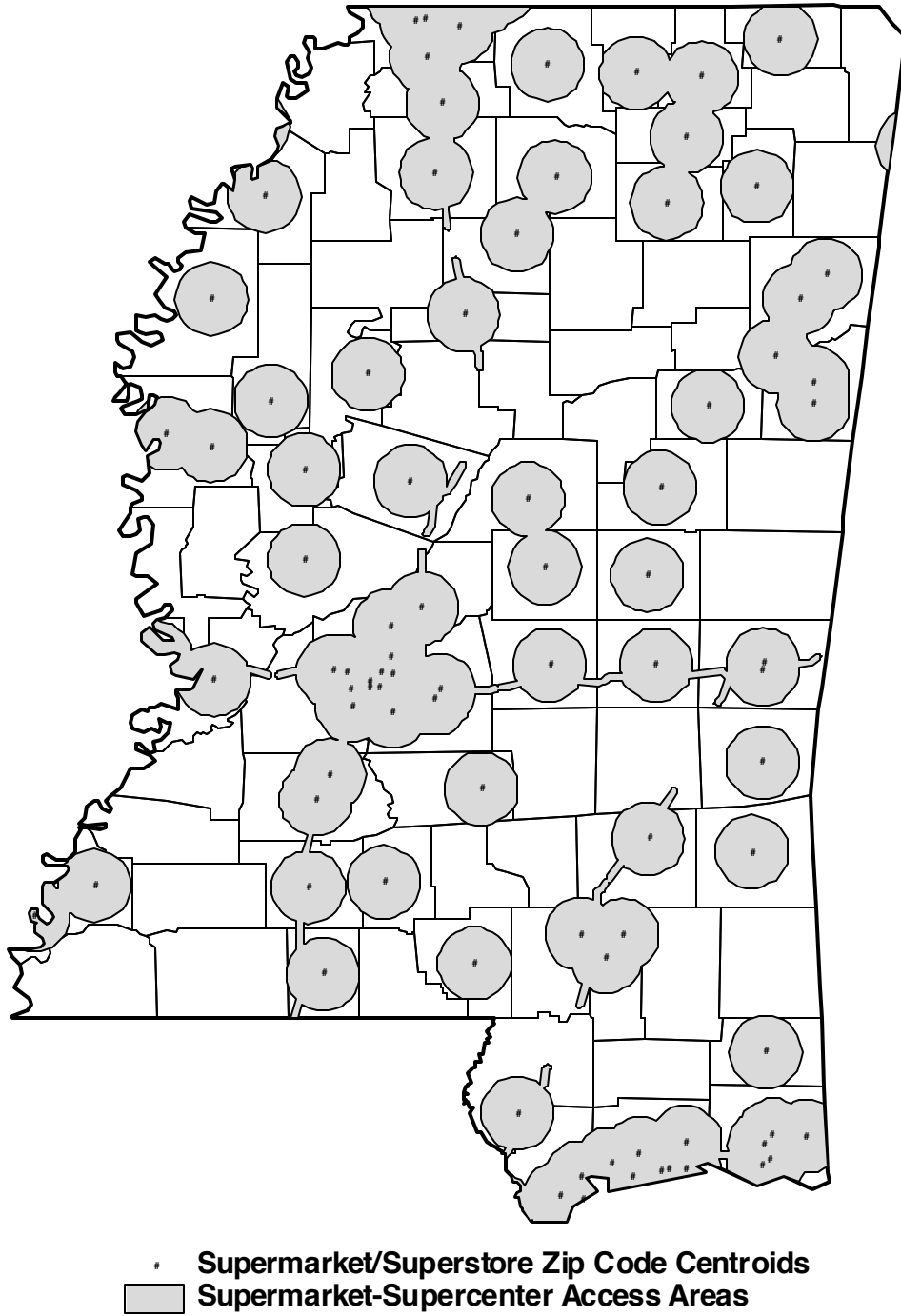


Figure 4. Low Supermarket-Supercenter Access Areas in Mississippi Counties, 1999

Total Population in Low Access Areas in 2000: 443,079

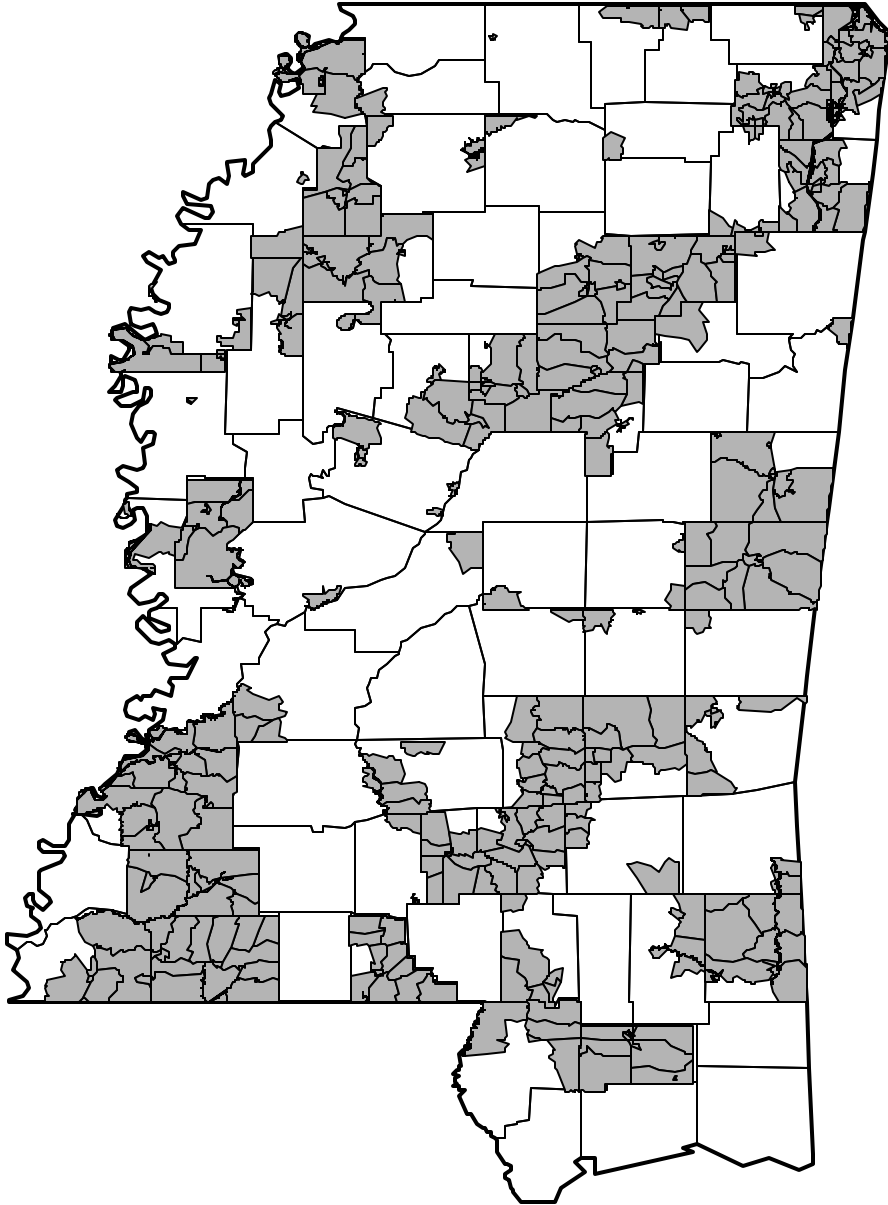


Table 1. Proportion of Population With Low Access to Supermarkets and Supercenters by Residence

	Mean	Standard Deviation	Median
Region			
South (N=1424)	.24	.34	.05
Midwest (N=1055)	.34	.39	.12
West (N=445)	.44	.41	.28
Northeast (N=217)	.10	.17	.02
<i>Urban Influence Scale (1993)</i>			
Central and Fringe Counties of Metro Areas of 1,000,000 or more (N=311)	.03	.10	.00
Counties in metro areas of fewer than 1,000,000 (N=525)	.05	.10	.01
Adjacent to a large metro area with a city of 10,000 or more (N=63)	.11	.17	.04
Adjacent to a large metro area without a city of at least 10,000 (N=123)	.23	.31	.10
Adjacent to a small metro area with a city of 10,000 or more (N=188)	.11	.18	.06
Adjacent to a small metro area without a city of at least 10,000 (N=626)	.34	.36	.19
Not adjacent to a metro area and with a city of 10,000 or more (N=234)	.15	.22	.06
Not adjacent to a metro area and with a city of 2,500 to 9,999 population (N=554)	.34	.38	.15
Not adjacent to a metro area and with no city or a city with a population less than 2,500 (N=517)	.74	.36	1.00

Table 2. Proportion of Population With Low Access to Supermarkets and Supercenters in the South by Urban Influence Scale

	Mean	Standard Deviation	Median
<i>South</i>			
<i>Urban Influence Scale (1993)</i>			
Central and Fringe Counties of Metro Areas of 1,000,000 or more (N=126)	.03	.11	.00
Counties in metro areas of fewer than 1,000,000 (N=276)	.04	.08	.00
Adjacent to a large metro area with a city of 10,000 or more (N=23)	.14	.19	.04
Adjacent to a large metro area without a city of at least 10,000 (N=62)	.18	.28	.06
Adjacent to a small metro area with a city of 10,000 or more (N=91)	.11	.19	.05
Adjacent to a small metro area without a city of at least 10,000 (N=355)	.33	.36	.16
Not adjacent to a metro area and with a city of 10,000 or more (N=87)	.07	.13	.02
Not adjacent to a metro area and with a city of 2,500 to 9,999 population (N=232)	.31	.38	.11
Not adjacent to a metro area and with no city or a city with a population less than 2,500 (N=172)	.58	.40	.70

Table 3. Proportion of Population With Low Access to Supermarkets and Supercenters in the Midwest by Urban Influence Scale

	Mean	Standard Deviation	Median
<i>Midwest</i>			
<i>Urban Influence Scale (1993)</i>			
Central and Fringe Counties of Metro Areas of 1,000,000 or more (N=88)	.03	.09	.00
Counties in metro areas of fewer than 1,000,000 (N=133)	.05	.10	.01
Adjacent to a large metro area with a city of 10,000 or more (N=23)	.06	.08	.05
Adjacent to a large metro area without a city of at least 10,000 (N=43)	.33	.35	.20
Adjacent to a small metro area with a city of 10,000 or more (N=59)	.08	.09	.06
Adjacent to a small metro area without a city of at least 10,000 (N=184)	.33	.35	.18
Not adjacent to a metro area and with a city of 10,000 or more (N=89)	.15	.19	.08
Not adjacent to a metro area and with a city of 2,500 to 9,999 population (N=191)	.29	.35	.13
Not adjacent to a metro area and with no city or a city with a population less than 2,500 (N=245)	.80	.32	1.00

Table 4. Proportion of Population With Low Access to Supermarkets and Supercenters in the West by Urban Influence Scale

	Mean	Standard Deviation	Median
<i>West</i>			
<i>Urban Influence Scale (1993)</i>			
Central and Fringe Counties of Metro Areas of 1,000,000 or more (N=40)	.06	.15	.00
Counties in metro areas of fewer than 1,000,000 (N=51)	.08	.12	.04
Adjacent to a large metro area with a city of 10,000 or more (N=12)	.16	.24	.05
Adjacent to a large metro area without a city of at least 10,000 (N=14)	.23	.27	.14
Adjacent to a small metro area with a city of 10,000 or more (N=19)	.26	.30	.17
Adjacent to a small metro area without a city of at least 10,000 (N=51)	.50	.37	.46
Not adjacent to a metro area and with a city of 10,000 or more (N=49)	.30	.30	.16
Not adjacent to a metro area and with a city of 2,500 to 9,999 population (N=114)	.49	.40	.38
Not adjacent to a metro area and with no city or a city with a population less than 2,500 (N=95)	.89	.25	1.00

Table 5. Proportion of Population With Low Access to Supermarkets and Supercenters in the Northeast by Urban Influence Scale

	Mean	Standard Deviation	Median
<i>Northeast</i>			
<i>Urban Influence Scale (1993)</i>			
Central and Fringe Counties of Metro Areas of 1,000,000 or more (N=57)	.01	.04	.00
Counties in metro areas of fewer than 1,000,000 (N=65)	.06	.11	.01
Adjacent to a large metro area with a city of 10,000 or more (N=5)	.06	.05	.09
Adjacent to a large metro area without a city of at least 10,000 (N=4)	.05	.06	.05
Adjacent to a small metro area with a city of 10,000 or more (N=19)	.07	.08	.05
Adjacent to a small metro area without a city of at least 10,000 (N=36)	.19	.22	.12
Not adjacent to a metro area and with a city of 10,000 or more (N=9)	.19	.20	.14
Not adjacent to a metro area and with a city of 2,500 to 9,999 population (N=17)	.27	.27	.20
Not adjacent to a metro area and with no city or a city with a population less than 2,500 (N=5)	.32	.40	.19